US008245764C1

(12) **INTER PARTES REEXAMINATION CERTIFICATE** (1409th)

United States Patent

Eriksen

(10) **Number: US 8,245,764 C1**

(45) **Certificate Issued: Apr. 17, 2017**

(54) **COOLING SYSTEM FOR A COMPUTER SYSTEM**

(75) Inventor: **André Sloth Eriksen**, Aalborg C (DK)

(73) Assignee: **ASETEK A/S**, Bronderslev (DK)

Reexamination Request:
No. 95/002,386, Sep. 15, 2012

Reexamination Certificate for:

Patent No.:	**8,245,764**
Issued:	**Aug. 21, 2012**
Appl. No.:	**13/269,234**
Filed:	**Oct. 7, 2011**

Certificate of Correction issued Sep. 25, 2012

Related U.S. Application Data

(63) Continuation of application No. 11/919,974, filed as application No. PCT/DK2005/000310 on May 6, 2005.

(51) **Int. Cl.**

F28F 7/00	(2006.01)
H05K 7/20	(2006.01)
H01L 23/473	(2006.01)
G06F 1/20	(2006.01)
F04D 15/00	(2006.01)

(52) **U.S. Cl.**
CPC ***H01L 23/473*** (2013.01); ***F04D 15/0066*** (2013.01); ***G06F 1/20*** (2013.01); ***G06F 1/206*** (2013.01); *G06F 2200/201* (2013.01); *H01L 2924/00* (2013.01); *H01L 2924/0002* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

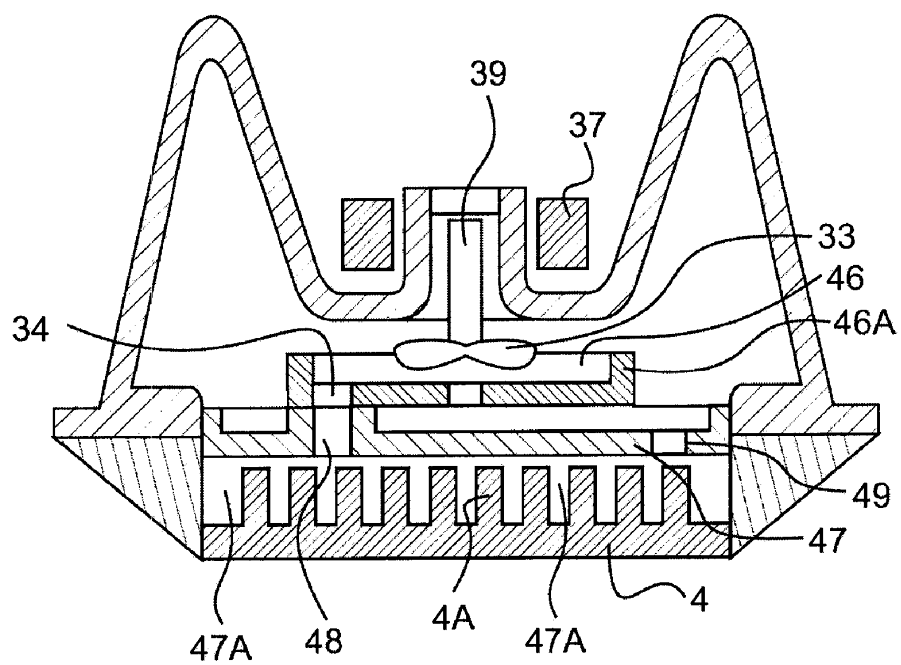
(56) **References Cited**

To view the complete listing of prior art documents cited during the proceeding for Reexamination Control Number 95/002,386, please refer to the USPTO's public Patent Application Information Retrieval (PAIR) system under the Display References tab.

Primary Examiner — Joseph Kaufman

(57) **ABSTRACT**

The invention relates to a cooling system for a computer system, said computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid. The cooling system has a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, Different embodiments of the heat exchanging system as well as means for establishing and controlling a flow of cooling liquid and a cooling strategy constitutes the invention of the cooling system.



INTER PARTES REEXAMINATION CERTIFICATE

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims **1-18** is confirmed.

New claims **19-30** are added and determined to be patentable.

19. The cooling system of claim 1, wherein the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

20. The cooling system of claim 1, wherein the one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber.

21. The cooling system of claim 1, wherein an entire surface of the heat-exchanging interface in contact with the cooling liquid in the reservoir forms the boundary wall of the thermal exchange chamber.

22. The cooling system of claim 1, wherein the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

23. The cooling system of claim 10, wherein the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

24. The cooling system of claim 10, wherein the one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber.

25. The cooling system of claim 12, wherein an entire surface of the heat-exchange interface in contact with the cooling liquid in the reservoir forms a boundary wall of the thermal exchange chamber.

26. The cooling system of claim 10, wherein the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

27. The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by one or more passages, the one or more passages including a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

28. The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by a plurality of passages positioned within the reservoir that open into the thermal exchange chamber.

29. The cooling system of claim 15, wherein an entire surface of the heat-exchanging interface in contact with the cooling liquid in the reservoir forms a boundary wall of the thermal exchange chamber.

30. The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by one or more passages, and the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

* * * * *

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 03/15/2017

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
03/15/2017	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Transmittal of Communication to Third Party Requester *Inter Partes* Reexamination	Control No. 95/002,386	Patent Under Reexamination 8245764	
	Examiner JOSEPH KAUFMAN	Art Unit 3993	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above-identified reexamination prceeding. 37 CFR 1.903.

Prior to the filing of a Notice of Appeal, each time the patent owner responds to this communication, the third party requester of the *inter partes* reexamination may once file written comments within a period of 30 days from the date of service of the patent owner's response. This 30-day time period is statutory (35 U.S.C. 314(b)(2)), and, as such, it cannot be extended. See also 37 CFR 1.947.

If an *ex parte* reexamination has been merged with the *inter partes* reexamination, no responsive submission by any *ex parte* third party requester is permitted.

All correspondence relating to this inter partes reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of the communication enclosed with this transmittal.

NOTICE OF INTENT TO ISSUE INTER PARTES REEXAMINATION CERTIFICATE	**Control No.** 95/002,386	**Patent Under Reexamination** 8245764
	Examiner JOSEPH KAUFMAN	**Art Unit** 3993

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

1. ☒ Prosecution on the merits is (or remains) closed in this *inter partes* reexamination proceeding. This proceeding is subject to reopening at the initiative of the Office or upon petition. *Cf.* 37 CFR 1.313(a). A Certificate will be issued in view of:
   a. ☐ The communication filed on by .
   b. ☐ Patent owner's failure to file an appropriate timely response to the Office action dated .
   c. ☐ The failure to timely file an Appeal with fee by all parties to the reexamination proceeding entitled to do so. 37 CFR 1.959 and 41.61.
   d. ☐ The failure to timely file an Appellant's Brief with fee by all parties to the reexamination proceeding entitled to do so. 37 CFR 41.66(a).
   e. ☒ The decision on appeal by the ☒ Board of Patent Appeals and Interferences ☐ Court dated 29 April, 2016
   f. ☐ Other:

2. ☒ The Reexamination Certificate will indicate the following:
   a. Change in the Specification: ☐ Yes ☐ No
   b. Change in the Drawings: ☐ Yes ☐ No
   c. Status of the Claims:
      (1) Patent claim(s) confirmed:1-18.
      (2) Patent claim(s) amended (including dependent on amended claim(s)):
      (3) Patent claim(s) cancelled: .
      (4) Newly presented claim(s) patentable: 19-30.
      (5) Newly presented cancelled claims: .
      (6) Patent claim(s) ☐ previously ☐ currently disclaimed:
      (7) Patent claim(s) not subject to reexamination: .

3. ☒ Note the attached statement of reasons for patentability and/or confirmation. Any comments considered necessary by patent owner regarding reasons for patentability and/or confirmation must be submitted promptly to avoid processing delays. Such submission(s) should be labeled: “Comments On Statement of Reasons for Patentability and/or Confirmation.”

4. ☐ Note attached NOTICE OF REFERENCE CITED, (PTO-892).

5. ☒ Note attached LIST OF REFERENCES CITED (PTO/SB/08 or PTO/SB/08 substitute).

6. ☐ The drawings filed on ______ is: ☐ approved ☐ disapproved.

7. ☐ Acknowledgment is made of the claim for priority under 35 U.S.C. § 119(a) - (d) or (f).
   a)☐ All b)☐ Some* c)☐ None of the certified copies have
   ☐ been received.
   ☐ not been received.
   ☐ been filed in Application No. .
   ☐ been filed in reexamination Control No. .
   ☐ been received by the International Bureau in PCT Application No. .

   * Certified copies not received: .

8. ☐ Note Examiner's Amendment.

9. ☐ Other: .

All correspondence relating to this *inter partes* reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of this Office action.

conferees: /RMF/ /EDL/	/Joseph A. Kaufman/ Primary Examiner Art Unit: 3993

Notice of Pre-AIA or AIA Status

The present application is being examined under the pre-AIA first to invent provisions.

Reexamination

STATEMENT OF REASONS FOR PATENTABILITY AND/OR CONFIRMATION

The following is an examiner's statement of reasons for patentability and/or confirmation of the claims found patentable in this reexamination proceeding: the PTAB decision of 29 April 2016 followed by the denial of the Request for Rehearing of 19 September 2016 reversed the examiner and overturned the rejections of claims 1-30.

Any comments considered necessary by PATENT OWNER regarding the above statement must be submitted promptly to avoid processing delays. Such submission by the patent owner should be labeled: "Comments on Statement of Reasons for Patentability and/or Confirmation" and will be placed in the reexamination file.

Conclusion

All correspondence relating to this *inter partes* reexamination proceeding should be directed:

By EFS: Registered users may submit via the electronic filing system EFS-Web, at https://efs.uspto.gov/efile/myportal/efs-registered
.

By Mail to: Mail Stop *Inter Partes* Reexam
Attn: Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

By Fax to: (571) 273-9900
Central Reexamination Unit

By hand: Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

For EFS-Web transmissions, 37 CFR 1.8(a)(1)(i)(C) and (ii) states that correspondence (except for a request for reexamination and a corrected or replacement request for reexamination) will be considered timely if (a) it is transmitted via the Office's electronic filing system in accordance with 37 CFR 1.6(a)(4), and (b) includes a certificate of transmission for each piece of correspondence stating the date of transmission, which is prior to the expiration of the set period of time in the Office action.

Any inquiry concerning this communication or earlier communications from the examiner, or as to the status of this proceeding, should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

Signed:

/Joseph A. Kaufman/
Primary Examiner
Art Unit 3993

Conferees:/RMF/ /EDL/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	95002386
	Filing Date	2012-09-15
	First Named Inventor	8245764
	Art Unit	3993
	Examiner Name	Joseph Kaufman
	Attorney Docket Number	COOL-1.012

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code1	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7209355		2007-04-24	Koga	
	2	7222661		2007-05-29	Wei	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code1	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number3	Country Code2 i	Kind Code4	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T5
	1	JP2002151638	JP		2002-05-24	Takayuki		☐

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NON-PATENT LITERATURE DOCUMENTS

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.A.K/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	95002386
	Filing Date	2012-09-15
	First Named Inventor	8245764
	Art Unit	3993
	Examiner Name	Joseph Kaufman
	Attorney Docket Number	COOL-1.012

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
	1	BRUCE R. MUNSON, et al., Fundamentals of Fluid Mechanics, Third Edition, pp. 45-48, Copyright 1998 by John Wiley & Sons, Inc. New York (7 pages).	☐
	2	OXFORD UNIVERSITY PRESS, Shorter Oxford English Dictionary, Fifth Edition, p. 3526, definition of "vertical", 2002 (4 pages)	☐

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EXAMINER SIGNATURE

Examiner Signature	/JOSEPH A KAUFMAN/	Date Considered	02/23/2017

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.A.K/

Reexamination	Application/Control No.	Applicant(s)/Patent Under Reexamination
	95/002,386	8245764
	Certificate Date	**Certificate Number**
		C1

Requester	**Correspondence Address:**	☐ **Patent Owner**	☒ **Third Party**

GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

LITIGATION REVIEW ☒	**JAK** (examiner initials)	**2/23/2017** (date)
Case Name		Director Initials
Asetek Holdings, Inc. et al. v. Coolit Systems Inc.; 3:12cv4498, US Dist. Ct. California Northern; closed.		
Asia Vital Components Co. Ltd. v. Asetek Danmark A/S 1:14cv1293; US Dist. Ct. Virginia Eastern, closed.		
Asia Vital Components Co. Ltd. v. Asetek Danmark A/S 3:16cv7160 and 5:16cv7160; US Dist. Ct. California Northern, open.		
Asetec Danmark A/S v. Cmi USA, Inc.; 3:13cv457; US Dist.Ct. California Northern; open		
Asatek Danmark A/S v. Newegg Inc. et al.; 3:16cv7068; US Dist. Ct. California Northern, open.		

COPENDING OFFICE PROCEEDINGS

TYPE OF PROCEEDING	NUMBER
1. none	
2.	
3.	
4.	

Search Notes	Application/Control No. 95002386	Applicant(s)/Patent Under Reexamination 8245764
	Examiner JOSEPH KAUFMAN	Art Unit 3993

CPC- SEARCHED		
Symbol	**Date**	**Examiner**

CPC COMBINATION SETS - SEARCHED		
Symbol	**Date**	**Examiner**

US CLASSIFICATION SEARCHED			
Class	**Subclass**	**Date**	**Examiner**

SEARCH NOTES		
Search Notes	**Date**	**Examiner**
reviewed patented file's prosecution history	2/22/2017	JAK

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**
none			

Issue Classification	**Application/Control No.** 95002386	**Applicant(s)/Patent Under Reexamination** 8245764
	Examiner JOSEPH KAUFMAN	**Art Unit** 3993

CPC

Symbol					Type	Version
H01L		23	/	473	F	2013-01-01
G06F		1	/	20	I	2013-01-01
F04D		15	/	0066	I	2013-01-01
G06F		1	/	206	I	2013-01-01
G06F		2200	/	201	A	2013-01-01
H01L		2924	/	0002	A	2013-01-01
H01L		2924	/	00	A	2013-01-01
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CPC Combination Sets

Symbol					Type	Set	Ranking	Version
			/					
			/					

NONE (Assistant Examiner) (Date)	**Total Claims Allowed:** 30	
/JOSEPH KAUFMAN/ Primary Examiner.Art Unit 3993 2/23/2017 (Primary Examiner) (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 20

U.S. Patent and Trademark Office Part of Paper No. 20170222

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	95002386	8245764
	Examiner	Art Unit
	JOSEPH KAUFMAN	3993

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS
165	80.4

CROSS REFERENCE(S)

CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
361	699				

INTERNATIONAL CLASSIFICATION									
CLAIMED					NON-CLAIMED				
F	2	8	F	7 / 00 (2006.01.01)					
H	0	5	K	7 / 20 (2006.01.01)					

NONE (Assistant Examiner) (Date)	Total Claims Allowed: 30	
/JOSEPH KAUFMAN/ Primary Examiner.Art Unit 3993 2/23/2017 (Primary Examiner) (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 20

U.S. Patent and Trademark Office Part of Paper No. 20170222

Issue Classification	Application/Control No. 95002386	Applicant(s)/Patent Under Reexamination 8245764
	Examiner JOSEPH KAUFMAN	Art Unit 3993

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE (Assistant Examiner)	(Date)	Total Claims Allowed: 30	
/JOSEPH KAUFMAN/ Primary Examiner.Art Unit 3993 (Primary Examiner)	2/23/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 20

U.S. Patent and Trademark Office Part of Paper No. 20170222

Litigation Search Report CRU 3999

Reexam Control No. 95/002,386

TO: JOSEPH KAUFMAN	From: Shanette Brown
Location: CRU	Location: CRU 3999
Art Unit: 3993	MDE 4B15
Date: 02/23/2017	Phone: (571) 272-6632
	Shanett.Brown@uspto.gov

Search Notes

RE: 95/002,386–Litigation was found for US Patent Number: 8,245,764

Patent	Class	Subclass	Description	Court	Docket Number	Filed	Date Retrieved
8,245,764	165	80.4	Asia Vital Components Co., Ltd. V. Asetek Danmark A/S	US-DIS-VAED	1:14cv1293 CLOSED	9/30/2014	1/28/2016
8,245,764	165	80.4	Asetek Holdings, Inc Et Al V. Coolit Systems Inc	US-DIS-CAND	3:12cv4498 CLOSED	8/27/2012	6/10/2016
8,245,764	165	80.4	Asetek Danmark A/S V. Cmi Usa, Inc.	US-DIS-CAND	3:13cv457 OPEN	1/31/2013	3/17/2016
8,245,764	165	80.4	Asetek Danmark A/S V. Newegg Inc. Et Al	US-DIS-CAND	3:16cv7068 OPEN	12/9/2016	12/12/2016
8,245,764	165	80.4	Asia Vital Components Co., Ltd. V. Asetek Danmark A/S	US-DIS-CAND	3:16cv7160 OPEN	12/16/2016	1/5/2017
8,245,764	165	80.4	Asia Vital Components Co., Ltd. V. Asetek Danmark A/S	US-DIS-CAND	5:16cv7160 OPEN	12/16/2016	12/16/2016

Sources:

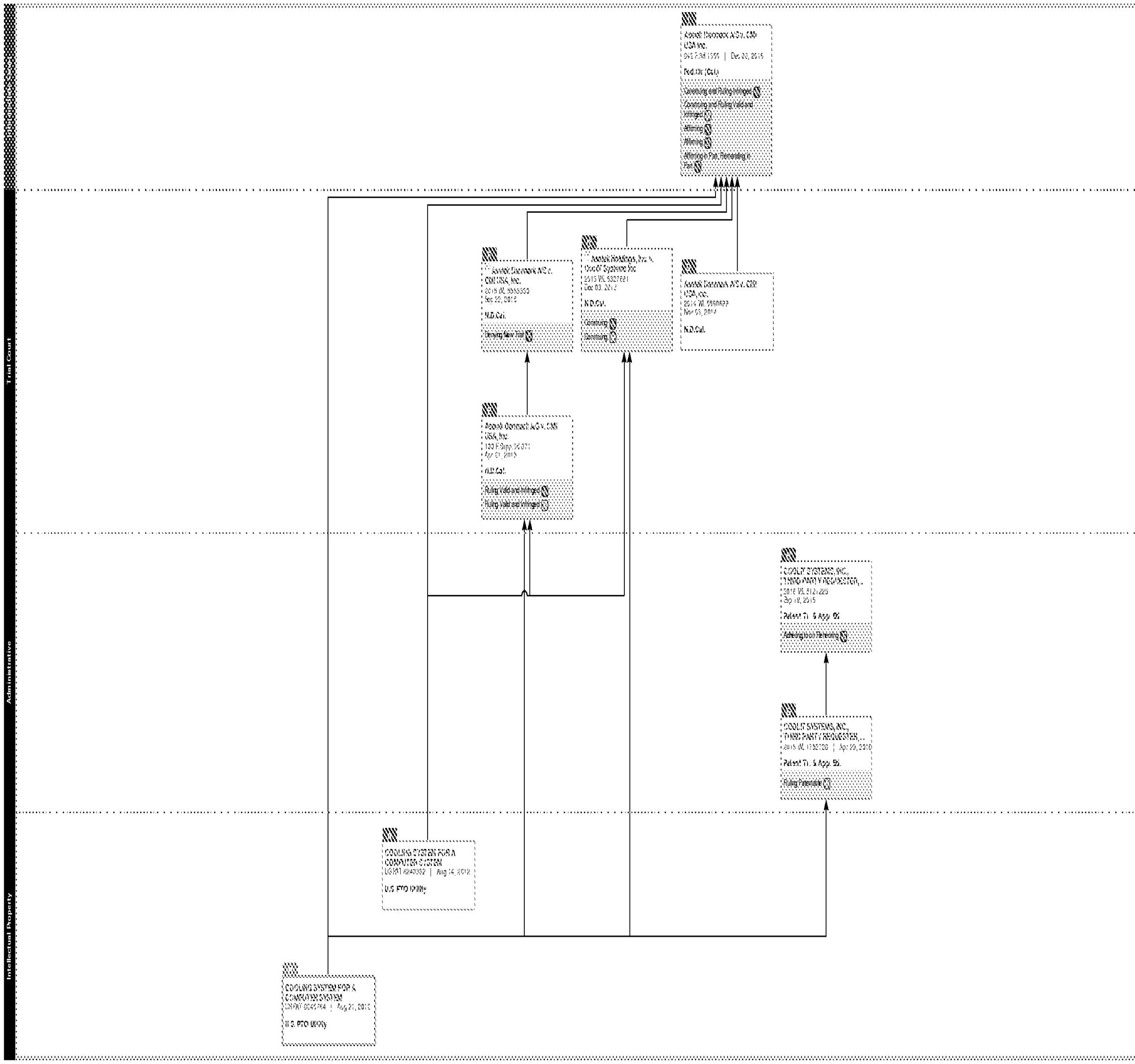
1) I performed a KeyCite Search in Westlaw, which retrieves all history on the patent including any litigation.

2) I performed a search on the patent in Lexis CourtLink for any open dockets or closed cases.

3) I performed a search in Lexis in the Federal Courts and Administrative Materials databases for any cases found.

4) I performed a search in Lexis in the IP Journal and Periodicals database for any articles on the patent.

5) I performed a search in Lexis in the news databases for any articles about the patent or any articles about litigation on this patent.


Trial Court
Administrative
Intellectual Property
Fed.Cir.(Cal.)
Construing and Ruling Infringed
Construing and Ruling Valid and Infringed
Affirming
Affirming
Affirming in Part, Remanding in Part
Asetek Denmark A/S v. CMI USA, Inc.
N.D.Cal.
Denying New Trial
Asetek Holdings, Inc. v. CoolIT Systems Inc
N.D.Cal.
Construing
Construing
Asetek Denmark A/S v. CMI USA, Inc.
N.D.Cal.
Asetek Denmark A/S v. CMI USA, Inc.
N.D.Cal.
Ruling Valid and Infringed
Ruling Valid and Infringed
COOLIT SYSTEMS, INC., THIRD PARTY REQUESTER,..
Patent Tr. & App. Bd.
Adhering to on Rehearing
COOLIT SYSTEMS, INC., THIRD PARTY REQUESTER,..
Patent Tr. & App. Bd.
Ruling Patentable
COOLING SYSTEM FOR A COMPUTER SYSTEM
U.S. PTO Utility
COOLING SYSTEM FOR A COMPUTER SYSTEM
U.S. PTO Utility

History (36)

Direct History (23)

1. COOLING SYSTEM FOR A COMPUTER SYSTEM Out Of Plan
US PAT 8240362 , U.S. PTO Utility , Aug. 14, 2012

Construed by

2. Asetek Holdings, Inc. v. CoolIT Systems Inc.
2013 WL 6327691 , N.D.Cal. , Dec. 03, 2013

Affirmed by

3. Asetek Danmark A/S v. CMI USA Inc.
842 F.3d 1350 , Fed.Cir.(Cal.) , Dec. 06, 2016

4. COOLING SYSTEM FOR A COMPUTER SYSTEM Out Of Plan
US PAT 8240362 , U.S. PTO Utility , Aug. 14, 2012

Ruled Valid and Infringed by

5. Asetek Danmark A/S v. CMI USA, Inc.
100 F.Supp.3d 871 , N.D.Cal. , Apr. 21, 2015

New Trial Denied by

6. Asetek Danmark A/S v. CMI USA, Inc.
2015 WL 5568360 , N.D.Cal. , Sep. 22, 2015

Affirmed in Part, Remanded in Part by

7. Asetek Danmark A/S v. CMI USA Inc.
842 F.3d 1350 , Fed.Cir.(Cal.) , Dec. 06, 2016

8. COOLING SYSTEM FOR A COMPUTER SYSTEM Out Of Pate
US PAT 8240362 , U.S. PTO Utility , Aug. 14, 2012

Construed and Ruled Infringed by

9. Asetek Danmark A/S v. CMI USA Inc.
842 F.3d 1350 , Fed.Cir.(Cal.) , Dec. 06, 2016

10. COOLING SYSTEM FOR A COMPUTER SYSTEM Out Of Pate
US PAT 8245764 , U.S. PTO Utility , Aug. 21, 2012

Construed by

11. Asetek Holdings, Inc. v. CoolIT Systems Inc.
2013 WL 6327691 , N.D.Cal. , Dec. 03, 2013

Affirmed by

12. Asetek Danmark A/S v. CMI USA Inc.
842 F.3d 1350 , Fed.Cir.(Cal.) , Dec. 06, 2016

13. COOLING SYSTEM FOR A COMPUTER SYSTEM Out Of Pate
US PAT 8245764 , U.S. PTO Utility , Aug. 21, 2012

Ruled Valid and Infringed by

14. Asetek Danmark A/S v. CMI USA, Inc.
100 F.Supp.3d 871 , N.D.Cal. , Apr. 21, 2015

New Trial Denied by

15. Asetek Danmark A/S v. CMI USA, Inc.
2015 WL 5568360 , N.D.Cal. , Sep. 22, 2015

Affirmed in Part, Remanded in Part by

16. Asetek Danmark A/S v. CMI USA Inc.
842 F.3d 1350 , Fed.Cir.(Cal.) , Dec. 06, 2016

17. COOLING SYSTEM FOR A COMPUTER SYSTEM Out Of Plan
US PAT 8245764 , U.S. PTO Utility , Aug. 21, 2012

Ruled Patentable by

18. COOLIT SYSTEMS, INC., THIRD PARTY REQUESTER, RESPONDENT, v. ASETEK A1S, PATENT OWNER, APPELLANT.
2016 WL 1752728 , Patent Tr. & App. Bd. , Apr. 29, 2016

Adhered to on Rehearing by

19. COOLIT SYSTEMS, INC., THIRD PARTY REQUESTER, RESPONDENT, v. ASETEK A1S, PATENT OWNER, APPELLANT.
2016 WL 5121225 , Patent Tr. & App. Bd. , Sep. 19, 2016

20. COOLING SYSTEM FOR A COMPUTER SYSTEM Out Of Plan
US PAT 8245764 , U.S. PTO Utility , Aug. 21, 2012

Construed and Ruled Valid and Infringed by

21. Asetek Danmark A/S v. CMI USA Inc.
842 F.3d 1350 , Fed.Cir.(Cal.) , Dec. 06, 2016

22. Asetek Danmark A/S v. CMI USA, Inc.
2014 WL 5590699 , N.D.Cal. , Nov. 03, 2014

Affirmed by

23. Asetek Danmark A/S v. CMI USA Inc.
842 F.3d 1350 , Fed.Cir.(Cal.) , Dec. 06, 2016

Related References (13)
24. Asetek Holdings, Inc. v. CoolIT Systems, Inc.
2013 WL 256522 , N.D.Cal. , Jan. 23, 2013

Redacted Opinion Issued by

25. Asetek Holdings, Inc. v. Coolit Systems, Inc.
2013 WL 12175001 , N.D.Cal. , Feb. 01, 2013

26. PUMP EXPANSION VESSEL Out Of Fees
US PAT 8382456 , U.S. PTO Utility , Feb. 26, 2013

Construed by

27. Asetek Holdings, Inc. v. CoolIT Systems, Inc.
2013 WL 6326619 , N.D.Cal. , Dec. 03, 2013

28. Asetek Holdings Inc v. CoolIT Systems Inc.
2013 WL 12175048 , N.D.Cal. , Sep. 09, 2013

29. Asetek Holdings, Inc. v. CoolIT Systems, Inc.
2013 WL 5640905 , N.D.Cal. , Oct. 11, 2013

Subsequent Determination

30. Asetek Holdings, Inc. v. Coolit Systems, Inc.
2014 WL 2735046 , N.D.Cal. , June 16, 2014

31. Asetek Holdings, Inc v. Cooler Master Co., Ltd.
2014 WL 1350813 , N.D.Cal. , Apr. 03, 2014

32. Asetek Holdings, Inc. v. CoolIT Systems, Inc.
2014 WL 4090400 , N.D.Cal. , Aug. 19, 2014

33. Asetek Danmark A/S v. CMI USA, Inc.
2014 WL 6997670 , N.D.Cal. , Dec. 09, 2014

34. Asetek Danmark A/S v. CMI USA, Inc.
2015 WL 4116738 , N.D.Cal. , July 07, 2015

35. Asetek Danmark A/S v. CMI USA, Inc.
2015 WL 4511036 , N.D.Cal. , July 23, 2015

36. Danmark v. CMI USA, Inc.
2016 WL 31674 , N.D.Cal. , Jan. 04, 2016

US District Court Civil Docket

U.S. District - California Northern
(San Francisco)

3:16cv7160

Asia Vital Components Co., Ltd. v. Asetek Danmark A/S

This case was retrieved from the court on Thursday, February 23, 2017

Date Filed:	**12/16/2016**		
Assigned To:	**Honorable Jon S. Tigar**		
Referred To:			
Nature of suit:	**Patent (830)**	Class Code:	**OPEN**
		Closed:	
Cause:		Statute:	**35:1**
Lead Docket:	**None**	Jury Demand:	**Plaintiff**
Other Docket:	**USDC, Eastern Dist. of Virginia (Alexandria Div), 1:14-cv-01293 3:13cv00457**	Demand Amount:	**$0**
		NOS Description:	**Patent**
Jurisdiction:	**Federal Question**		

Litigants	Attorneys
Asia Vital Components Co., Ltd. aTaiwan, R.O.C. corporation Plaintiff	Cameron Hajaran Tousi LEAD ATTORNEY;ATTORNEY TO BE NOTICED IP Law Leaders PLLC 7529 Standish Place, Suite 103 Rockville , MD 20855 USA 202-248-5410 Fax: 202-318-4538 Email:Chtousi@ipllfirm.Com Andrew C. Aitken ATTORNEY TO BE NOTICED IP Law Leaders PLLC 7529 Standish Place, Suite 103 Rockville , MD 20855 USA 202-248-5410 Fax: 202-318-4538 Raymond J. Ho ATTORNEY TO BE NOTICED IP Law Leaders PLLC 7529 Standish Place, Suite 103 Rockville , MD 20855 USA 202-248-5410

	Fax: 202-318-4538
Asetek Danmark A/S Defendant	Jacob Adam Schroeder LEAD ATTORNEY;ATTORNEY TO BE NOTICED Finnegan Henderson Farabow Garrett & Dunner, LLP 3300 Hillview Avenue Palo Alto , CA 94304 USA 650-849-6600 Fax: 650-849-6666 Email:Jacob.Schroeder@finnegan.Com Arpita Bhattacharyya PRO HAC VICE;ATTORNEY TO BE NOTICED Finnegan Henderson Farabow Garrett & Dunner, LLP 2 Seaport Lane, 6th Floor Boston , MA 02210-2001 USA 617-646-1676 Fax: 617-646-16666 Email:Arpita.Bhattacharyya@finnegan.Com Charles Brandon Rash ATTORNEY TO BE NOTICED Finnegan Henderson Farabow Garrett & Dunner LLP (DC) 901 New York Avenue, Nw Washington , DC 20001-4413 USA 202-408-4000 Fax: 202-408-4400 Email:Brandon.Rash@finnegan.Com Robert Francis McCauley ATTORNEY TO BE NOTICED Finnegan Henderson Farabow Garrett & Dunner, LLP Stanford Research Park 3300 Hillview Avenue Palo Alto , CA 94304-1203 USA 650-849-6600 Fax: 650-849-6666 Email:Robert.Mccauley@finnegan.Com

Date	#	Proceeding Text	Source
09/30/2014	1	COMPLAINT against Asia Vital Components Co., Ltd., (Filing Fee: $400.00, receipt number 14683046678), filed by Asia Vital Components Co., Ltd.. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Civil Cover Sheet, # 4 Letter)(gwalk,) (Additional attachment(s) added on 10/1/2014: # 5 Receipt) (gwalk,). (Entered: 10/01/2014)	
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09/30/2014	3	Report on the filing or determination of an action regarding patent and/or trademarks 8,240,362 and 8,245,764. (gwalk,) (Entered: 10/01/2014)	
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		NOTICE of Appearance by Cameron Hajaran Tousi on behalf of Asia Vital Components Co., Ltd. (gwalk,) (Entered: 10/01/2014)
01/20/2015	5	Waiver of the Service of Summons by Asetek Danmark A/S submitted by Asia Vital Components Co., Ltd. (Attachments: # 1 Exhibit Waiver of the Service of Summons)(Tousi, Cameron) (Entered: 01/20/2015)
01/20/2015	6	Motion to appear Pro Hac Vice by Andrew Charles Aitken and Certification of Local Counsel Cameron H. Tousi Filing fee $ 75, receipt number 0422-4277478. by Asia Vital Components Co., Ltd.. (Tousi, Cameron) (Entered: 01/20/2015)
01/20/2015	7	Motion to appear Pro Hac Vice by Raymond Juiwen Ho and Certification of Local Counsel Cameron H. Tousi Filing fee $ 75, receipt number 0422-4277490. by Asia Vital Components Co., Ltd.. (Tousi, Cameron) (Entered: 01/20/2015)
01/21/2015		Notice of Correction re 5 Waiver of the Service of Summons. The filing user has been notified to re-file the service returns in paper form as they are exempt from ECF. (dvanm,) (Entered: 01/21/2015)
01/22/2015	8	WAIVER OF SERVICE Returned Executed by Asia Vital Components Co., Ltd.. Asetek Danmark A/S waiver sent on 10/1/2014, answer due 11/30/2014. (Attachments: # 1 Letter)(dvanm,) (Entered: 01/26/2015)
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01/26/2015	12	Financial Interest Disclosure Statement (Local Rule 7.1) by Asetek Danmark A/S. (Rash, Charles) (Entered: 01/26/2015)
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02/03/2015	14	Memorandum in Support re 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a) filed by Asetek Danmark A/S. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F, # 7 Exhibit G, # 8 Exhibit H, # 9 Exhibit I, # 10 Exhibit J, # 11 Exhibit K, # 12 Exhibit L, # 13 Exhibit M, # 14 Exhibit N)(Rash, Charles) (Entered: 02/03/2015)
02/03/2015	15	Notice of Hearing Date set for February 27, 2015 at 10:00 a.m. re 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a) (Rash, Charles) (Entered: 02/03/2015)
02/03/2015	16	Motion to appear Pro Hac Vice by Robert Francis McCauley and Certification of Local Counsel Charles Brandon Rash Filing fee $ 75, receipt number 0422-4299660. by Asetek Danmark A/S. (Rash, Charles) (Entered: 02/03/2015)
02/04/2015		Set Deadlines as to 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C.

		1404(a). Motion Hearing set for 2/27/2015 at 10:00 AM in Alexandria Courtroom 700 before District Judge Liam O'Grady. (clar,) (Entered: 02/04/2015)
02/05/2015	18	ORDER granting 16 Motion for Pro hac vice. Signed by District Judge Liam O'Grady on 02/05/2015. (dvanm,) (Entered: 02/10/2015)
02/17/2015	19	Opposition to 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a), 14 Memorandum in Support, filed by Asia Vital Components Co., Ltd.. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F, # 7 Exhibit G, # 8 Exhibit H, # 9 Exhibit I, # 10 Exhibit J, # 11 Exhibit K, # 12 Exhibit L, # 13 Exhibit M, # 14 Exhibit N, # 15 Exhibit O)(Tousi, Cameron) (Entered: 02/17/2015)
02/18/2015	20	Opposition to 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a), 19 Opposition,, Amended (with amended Exs. D, E) filed by Asia Vital Components Co., Ltd.. (Attachments: # 1 Exhibit D, # 2 Exhibit E) (Tousi, Cameron) (Entered: 02/18/2015)
02/21/2015	21	Opposition to 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a), 19 Opposition,, 20 Opposition, Amended (Second Amendment) filed by Asia Vital Components Co., Ltd.. (Tousi, Cameron) (Entered: 02/21/2015)
02/23/2015	22	Reply to Motion re 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a) filed by Asetek Danmark A/S. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E)(Rash, Charles) (Entered: 02/23/2015)
02/27/2015	23	Minute Entry for proceedings held before District Judge Liam O'Grady: Motion Hearing held on 2/27/2015 re 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a) filed by Asetek Danmark A/S. Appearances of counsel. Motion argued and the court finds it does not have jurisdiction. The action shall be dismissed without prejudice. Order to follow. (Court Reporter N. Linnell.)(dper) (Entered: 02/27/2015)
03/11/2015	24	TRANSCRIPT of motions hearing held on 2-27-2015 before Judge Liam O'Grady. Court reporter Norman Linnell, telephone number 703-549-4626. NOTICE RE REDACTION OF TRANSCRIPTS:The parties have thirty(30) calendar days to file with the Court a Notice of Intent to Request Redaction of this transcript. If no such Notice is filed, the transcript will be made remotely electronically available to the public without redaction after 90 calendar days. The policy is located on our website at www.vaed.uscourts.gov Transcript may be viewed at the court public terminal or purchased through the court reporter before the deadline for Release of Transcript Restriction. After that date it may be obtained through PACER Redaction Request due 4/10/2015. Redacted Transcript Deadline set for 5/11/2015. Release of Transcript Restriction set for 6/9/2015.(linnell, norman) (Entered: 03/11/2015)
04/17/2015	25	ORDER, for the reasons stated during the hearing and for good cause shown, the Court finds that the MedImmune standard has not been met in this case. Plaintiff's complaint does not plead sufficient facts to show that there is a substantial controversy between the parties under the totality of the circumstances. Accordingly, it is hereby ORDERED that the motion 13 to dismiss is GRANTED and the complaint is dismissed without prejudice. The motion to transfer venue is therefore moot. Signed by District Judge Liam O'Grady on 4/17/15. (dper) (Entered: 04/17/2015)
04/24/2015	26	NOTICE OF APPEAL as to 25 Order on Motion to Dismiss,, by Asia Vital Components Co., Ltd.. Filing fee $ 505, receipt number 0422-4424770. (Tousi, Cameron) (Entered: 04/24/2015)

04/27/2015	27	Transmission of Notice of Appeal to US Federal Circuit re 26 Notice of Appeal. (dvanm,) (Entered: 04/27/2015)
04/28/2015	28	USCA Case Number 15-1597 Federal Circuit for 26 Notice of Appeal filed by Asia Vital Components Co., Ltd. (rban,) (Entered: 04/28/2015)
05/11/2015	29	Report on the filing or determination of an action regarding patent and/or trademark(s) 8,240,362 and 8,245,764. (Attachments: # 1 Order)(rban,) (Entered: 05/11/2015)
09/08/2016	30	Opinion of USCA, decided 9/8/2016 re 26 Notice of Appeal, Reversed and Remanded.(rban,) (Entered: 09/08/2016)
09/08/2016	31	USCA JUDGMENT as to 26 Notice of Appeal filed by Asia Vital Components Co., Ltd. The mandate will be issued in due course. (rban,) (Entered: 09/08/2016)
10/17/2016	32	USCA Mandate re 26 Notice of Appeal. In accordance with the judgment of this Court, entered September 08, 2016, and pursuant to Rule 41(a) of the Federal Rules of Appellate Procedure, the formal mandate is hereby issued.Costs in the amount of $1,498.32 were determined and taxed against the appellee. (dvanm,) (Entered: 10/17/2016)
10/18/2016	33	MOTION to Transfer Case by Asetek Danmark A/S. (Attachments: # 1 Proposed Order)(Rash, Charles) (Entered: 10/18/2016)
10/18/2016	34	Notice of Hearing Date set for October 28, 2016 re 33 MOTION to Transfer Case (Rash, Charles) (Entered: 10/18/2016)
10/18/2016	35	Notice of Hearing Date set for November 4, 2016 re 33 MOTION to Transfer Case (Rash, Charles) (Entered: 10/18/2016)
10/19/2016		Set Deadlines as to 33 MOTION to Transfer Case . Motion Hearing set for 10/28/2016 at 10:00 AM in Alexandria Courtroom 700 before District Judge Liam O'Grady. (clar,) (Entered: 10/19/2016)
10/19/2016		Reset Deadlines as to 33 MOTION to Transfer Case . Motion Hearing set for 11/4/2016 at 10:00 AM in Alexandria Courtroom 700 before District Judge Liam O'Grady. (clar,) (Entered: 10/19/2016)
10/31/2016	36	Opposition to 33 MOTION to Transfer Case filed by Asia Vital Components Co., Ltd.. (Tousi, Cameron) (Entered: 10/31/2016)
11/02/2016		Per LO chambers motions set for 11/4/16 on the pleadings (clar,) (Entered: 11/02/2016)
12/13/2016	37	ORDER granting 33 Motion to Transfer Case to the U.S. District Court for the Northern District of California. Signed by District Judge Liam O'Grady on 12/13/2016. (dvanm,) (Entered: 12/14/2016)
12/13/2016		Case transferred to District of Northern District of California. Original file, certified copy of transfer order, and docket sheet sent. (dvanm,) (Entered: 12/14/2016)
12/16/2016	38	Case transferred in from District of Virginia Eastern; Case Number 1:14-cv-01293. Original file certified copy of transfer order and docket sheet received. (Entered: 12/16/2016)
12/16/2016	39	Initial Case Management Scheduling Order with ADR Deadlines: Case Management Statement due by 3/14/2017. Case Management Conference set for 3/21/2017 01:30 PM in Courtroom 2, 5th Floor, San Jose. (dhmS, COURT STAFF) (Filed on 12/16/2016) (Entered: 12/16/2016)
12/23/2016	40	NOTICE of Appearance by Jacob Adam Schroeder (Schroeder, Jacob) (Filed on 12/23/2016) (Entered: 12/23/2016)
12/23/2016	41	CONSENT/DECLINATION to Proceed Before a US Magistrate Judge by Asetek Danmark A/S.. (Schroeder, Jacob) (Filed on 12/23/2016) (Entered: 12/23/2016)
12/28/2016	42	CLERK'S NOTICE OF IMPENDING REASSIGNMENT TO A U.S. DISTRICT COURT JUDGE: The Clerk of this Court will now randomly reassign this

		case to a District Judge because either (1) a party has not consented to the jurisdiction of a Magistrate Judge, or (2) time is of the essence in deciding a pending judicial action for which the necessary consents to Magistrate Judge jurisdiction have not been secured. You will be informed by separate notice of the district judge to whom this case is reassigned. ALL HEARING DATES PRESENTLY SCHEDULED BEFORE THE CURRENT MAGISTRATE JUDGE ARE VACATED AND SHOULD BE RE-NOTICED FOR HEARING BEFORE THE JUDGE TO WHOM THIS CASE IS REASSIGNED. This is a text only docket entry; there is no document associated with this notice. (pmc, COURT STAFF) (Filed on 12/28/2016) (Entered: 12/28/2016)
12/28/2016	43	ORDER REASSIGNING CASE. Case reassigned to Hon. Beth Labson Freeman for all further proceedings. This case is assigned to a judge who participates in the Cameras in the Courtroom Pilot Project. See General Order 65 and http://cand.uscourts.gov/cameras. Magistrate Judge Howard R. Lloyd no longer assigned to the case. Reassignment Order signed by Executive Committee on 12/28/2016. (Attachments: # 1 Notice of Eligibility for Video Recording)(bwS, COURT STAFF) (Filed on 12/28/2016) (Entered: 12/28/2016)
01/04/2017	44	RELATED CASE ORDER by Judge Jon S. Tigar granting (367) Motion to Relate Case in case 3:13-cv-00457-JST. (wsn, COURT STAFF) (Filed on 1/4/2017) (Entered: 01/04/2017)
01/05/2017	45	Case reassigned to Judge Hon. Jon S. Tigar 44 . Judge Hon. Beth Labson Freeman no longer assigned to the case. This case is assigned to a judge who participates in the Cameras in the Courtroom Pilot Project. See General Order 65 and http://cand.uscourts.gov/cameras. Signed by Judge Jon S. Tigar on 1/5/17. (sv, COURT STAFF) (Filed on 1/5/2017) (Additional attachment(s) added on 1/5/2017: # 1 Notice of Eligibility for Video Recording) (sv, COURT STAFF). (Entered: 01/05/2017)
01/09/2017	46	CLERK'S NOTICE SETTING CASE MANAGEMENT CONFERENCE. Case Management Statement due by 3/13/2017. Initial Case Management Conference set for 3/22/2017 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco. (Attachments: # 1 Standing Order, # 2 Standing Order for All Judges of the Northern District) (wsn, COURT STAFF) (Filed on 1/9/2017) (Entered: 01/09/2017)
02/02/2017	47	NOTICE of Appearance by Robert Francis McCauley for Defendant (McCauley, Robert) (Filed on 2/2/2017) (Entered: 02/02/2017)
02/03/2017	48	MOTION for Leave to Appear in Pro Hac Vice by Arpita Bhattacharyya for Defendant, (Filing Fee: $310.00, receipt number 0971-11127748) filed by Asetek Danmark A/S. (Attachments: #(1) Certificate of Good Standing) (Bhattacharyya, Arpita) (Filed on 2/3/2017) (Entered: 02/03/2017)
02/03/2017	49	ORDER GRANTING APPLICAITON FOR ADMISSION OF ATTORNEY ARPITA BHATTACHARYYA PRO HAC VICE by Judge Jon S. Tigar; granting 48 Motion for Pro Hac Vice. (wsn, COURT STAFF) (Filed on 2/3/2017) (Entered: 02/03/2017)

US District Court Civil Docket

U.S. District - California Northern
(San Jose)

5:16cv7160

Asia Vital Components Co., Ltd. v. Asetek Danmark A/S

This case was retrieved from the court on Friday, December 16, 2016

Date Filed:	**12/16/2016**		
Assigned To:	**Magistrate Judge Howard R. Lloyd**		
Referred To:		Class Code:	**OPEN**
Nature of suit:	**Patent (830)**	Closed:	
Cause:		Statute:	**35:1**
Lead Docket:	**None**	Jury Demand:	**Plaintiff**
Other Docket:	**Virginia Eastern, 1:14-cv-01293** **Virginia Eastern, 1:14-cv-01293**	Demand Amount:	**$0**
		NOS Description:	**Patent**
Jurisdiction:	**Federal Question**		

Litigants	Attorneys
Asia Vital Components Co., Ltd. aTaiwan, R.O.C. corporation Plaintiff	Cameron Hajaran Tousi LEAD ATTORNEY;ATTORNEY TO BE NOTICED IP Law Leaders PLLC 1701 Pennsylvania Ave Nw Suite 300 Washington , DC 20006 USA 202-248-5410 Fax: 202-318-4538 Email:Chtousi@ipllfirm.Com
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LLP
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02/17/2015	19	Opposition to 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a), 14 Memorandum in Support, filed by Asia Vital Components Co., Ltd.. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F, # 7 Exhibit G, # 8 Exhibit H, # 9 Exhibit I, # 10 Exhibit J, # 11 Exhibit K, # 12 Exhibit L, # 13 Exhibit M, # 14 Exhibit N, # 15 Exhibit O)(Tousi, Cameron) (Entered: 02/17/2015)
02/18/2015	20	Opposition to 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a), 19 Opposition,, Amended (with amended Exs. D, E) filed by Asia Vital Components Co., Ltd.. (Attachments: # 1 Exhibit D, # 2 Exhibit E) (Tousi, Cameron) (Entered: 02/18/2015)
02/21/2015	21	Opposition to 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a), 19 Opposition,, 20 Opposition, Amended (Second Amendment) filed by Asia Vital Components Co., Ltd.. (Tousi, Cameron) (Entered: 02/21/2015)
02/23/2015	22	Reply to Motion re 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a) filed by Asetek Danmark A/S. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E)(Rash, Charles) (Entered: 02/23/2015)
02/27/2015	23	Minute Entry for proceedings held before District Judge Liam O'Grady: Motion Hearing held on 2/27/2015 re 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a) filed by Asetek Danmark A/S. Appearances of counsel. Motion argued and the court finds it does not have jurisdiction. The action shall be dismissed without prejudice. Order to follow. (Court Reporter N. Linnell.)(dper) (Entered: 02/27/2015)
03/11/2015	24	TRANSCRIPT of motions hearing held on 2-27-2015 before Judge Liam O'Grady. Court reporter Norman Linnell, telephone number 703-549-4626.

		NOTICE RE REDACTION OF TRANSCRIPTS:The parties have thirty(30) calendar days to file with the Court a Notice of Intent to Request Redaction of this transcript. If no such Notice is filed, the transcript will be made remotely electronically available to the public without redaction after 90 calendar days. The policy is located on our website at www.vaed.uscourts.gov Transcript may be viewed at the court public terminal or purchased through the court reporter before the deadline for Release of Transcript Restriction. After that date it may be obtained through PACER Redaction Request due 4/10/2015. Redacted Transcript Deadline set for 5/11/2015. Release of Transcript Restriction set for 6/9/2015.(linnell, norman) (Entered: 03/11/2015)
04/17/2015	25	ORDER, for the reasons stated during the hearing and for good cause shown, the Court finds that the MedImmune standard has not been met in this case. Plaintiff's complaint does not plead sufficient facts to show that there is a substantial controversy between the parties under the totality of the circumstances. Accordingly, it is hereby ORDERED that the motion 13 to dismiss is GRANTED and the complaint is dismissed without prejudice. The motion to transfer venue is therefore moot. Signed by District Judge Liam O'Grady on 4/17/15. (dper) (Entered: 04/17/2015)
04/24/2015	26	NOTICE OF APPEAL as to 25 Order on Motion to Dismiss,, by Asia Vital Components Co., Ltd.. Filing fee $ 505, receipt number 0422-4424770. (Tousi, Cameron) (Entered: 04/24/2015)
04/27/2015	27	Transmission of Notice of Appeal to US Federal Circuit re 26 Notice of Appeal. (dvanm,) (Entered: 04/27/2015)
04/28/2015	28	USCA Case Number 15-1597 Federal Circuit for 26 Notice of Appeal filed by Asia Vital Components Co., Ltd. (rban,) (Entered: 04/28/2015)
05/11/2015	29	Report on the filing or determination of an action regarding patent and/or trademark(s) 8,240,362 and 8,245,764. (Attachments: # 1 Order)(rban,) (Entered: 05/11/2015)
09/08/2016	30	Opinion of USCA, decided 9/8/2016 re 26 Notice of Appeal, Reversed and Remanded.(rban,) (Entered: 09/08/2016)
09/08/2016	31	USCA JUDGMENT as to 26 Notice of Appeal filed by Asia Vital Components Co., Ltd. The mandate will be issued in due course. (rban,) (Entered: 09/08/2016)
10/17/2016	32	USCA Mandate re 26 Notice of Appeal. In accordance with the judgment of this Court, entered September 08, 2016, and pursuant to Rule 41(a) of the Federal Rules of Appellate Procedure, the formal mandate is hereby issued.Costs in the amount of $1,498.32 were determined and taxed against the appellee. (dvanm,) (Entered: 10/17/2016)
10/18/2016	33	MOTION to Transfer Case by Asetek Danmark A/S. (Attachments: # 1 Proposed Order)(Rash, Charles) (Entered: 10/18/2016)
10/18/2016	34	Notice of Hearing Date set for October 28, 2016 re 33 MOTION to Transfer Case (Rash, Charles) (Entered: 10/18/2016)
10/18/2016	35	Notice of Hearing Date set for November 4, 2016 re 33 MOTION to Transfer Case (Rash, Charles) (Entered: 10/18/2016)
10/19/2016		Set Deadlines as to 33 MOTION to Transfer Case . Motion Hearing set for 10/28/2016 at 10:00 AM in Alexandria Courtroom 700 before District Judge Liam O'Grady. (clar,) (Entered: 10/19/2016)
10/19/2016		Reset Deadlines as to 33 MOTION to Transfer Case . Motion Hearing set for 11/4/2016 at 10:00 AM in Alexandria Courtroom 700 before District Judge Liam O'Grady. (clar,) (Entered: 10/19/2016)
10/31/2016	36	Opposition to 33 MOTION to Transfer Case filed by Asia Vital Components Co., Ltd.. (Tousi, Cameron) (Entered: 10/31/2016)
11/02/2016		Per LO chambers motions set for 11/4/16 on the pleadings (clar,) (Entered: 11/02/2016)

12/13/2016	37	ORDER granting 33 Motion to Transfer Case to the U.S. District Court for the Northern District of California. Signed by District Judge Liam O'Grady on 12/13/2016. (dvanm,) (Entered: 12/14/2016)	
12/13/2016		Case transferred to District of Northern District of California. Original file, certified copy of transfer order, and docket sheet sent. (dvanm,) (Entered: 12/14/2016)	
12/16/2016	38	Case transferred in from District of Virginia Eastern; Case Number 1:14-cv-01293. Original file certified copy of transfer order and docket sheet received. (Entered: 12/16/2016)	Events since last full update
12/16/2016	39	Initial Case Management Scheduling Order with ADR Deadlines: Case Management Statement due by 3/14/2017. Case Management Conference set for 3/21/2017 01:30 PM in Courtroom 2, 5th Floor, San Jose. (dhmS, COURT STAFF) (Filed on 12/16/2016) (Entered: 12/16/2016)	Events since last full update
12/23/2016	40	NOTICE of Appearance by Jacob Adam Schroeder (Schroeder, Jacob) (Filed on 12/23/2016) (Entered: 12/23/2016)	Events since last full update
12/23/2016	41	CONSENT/DECLINATION to Proceed Before a US Magistrate Judge by Asetek Danmark A/S.. (Schroeder, Jacob) (Filed on 12/23/2016) (Entered: 12/23/2016)	Events since last full update
12/28/2016	42	CLERK'S NOTICE OF IMPENDING REASSIGNMENT TO A U.S. DISTRICT COURT JUDGE: The Clerk of this Court will now randomly reassign this case to a District Judge because either (1) a party has not consented to the jurisdiction of a Magistrate Judge, or (2) time is of the essence in deciding a pending judicial action for which the necessary consents to Magistrate Judge jurisdiction have not been secured. You will be informed by separate notice of the district judge to whom this case is reassigned. ALL HEARING DATES PRESENTLY SCHEDULED BEFORE THE CURRENT MAGISTRATE JUDGE ARE VACATED AND SHOULD BE RE-NOTICED FOR HEARING BEFORE THE JUDGE TO WHOM THIS CASE IS REASSIGNED. This is a text only docket entry; there is no document associated with this notice. (pmc, COURT STAFF) (Filed on 12/28/2016) (Entered: 12/28/2016)	Events since last full update
12/28/2016	43	ORDER REASSIGNING CASE. Case reassigned to Hon. Beth Labson Freeman for all further proceedings. This case is assigned to a judge who participates in the Cameras in the Courtroom Pilot Project. See General Order 65 and http://cand.uscourts.gov/cameras. Magistrate Judge Howard R. Lloyd no longer assigned to the case. Reassignment Order signed by Executive Committee on 12/28/2016. (Attachments: # 1 Notice of Eligibility for Video Recording)(bwS, COURT STAFF) (Filed on 12/28/2016) (Entered: 12/28/2016)	Events since last full update
01/04/2017	44	RELATED CASE ORDER by Judge Jon S. Tigar granting (367) Motion to Relate Case in case 3:13-cv-00457-JST. (wsn, COURT STAFF) (Filed on 1/4/2017) (Entered: 01/04/2017)	Events since last full update

US District Court Civil Docket

U.S. District - California Northern
(San Francisco)

3:16cv7068

Asetek Danmark A/S v. Newegg Inc. et al

This case was retrieved from the court on Thursday, February 23, 2017

Date Filed:	**12/09/2016**		
Assigned To:	**Honorable Jon S. Tigar**	Class Code:	**OPEN**
Referred To:		Closed:	
Nature of suit:	**Patent (830)**	Statute:	**35:271**
Cause:	**Patent Infringement**	Jury Demand:	**Both**
Lead Docket:	**None**	Demand Amount:	**$0**
Other Docket:	**3:13cv00457**	NOS Description:	**Patent**
Jurisdiction:	**Federal Question**		

Litigants	Attorneys
Asetek Danmark A/S Plaintiff	Robert Francis McCauley LEAD ATTORNEY;ATTORNEY TO BE NOTICED Finnegan Henderson Farabow Garrett & Dunner, LLP Stanford Research Park 3300 Hillview Avenue Palo Alto , CA 94304-1203 USA 650-849-6600 Fax: 650-849-6666 Email:Robert.Mccauley@finnegan.Com Arpita Bhattacharyya PRO HAC VICE;ATTORNEY TO BE NOTICED Finnegan Henderson Farabow Garrett & Dunner, LLP Two Seaport Lane, 6th Floor Boston , MA 02210 USA 617-646-1676 Fax: 617-646-1666 Email:Arpita.Bhattacharyya@finnegan.Com Erik Raymond Puknys ATTORNEY TO BE NOTICED Finnegan Henderson Farabow Garrett & Dunner, LLP 3300 Hillview Avenue Palo Alto , CA 94304 USA

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Newegg Inc. Defendant	Gordon M. Fauth , Jr. ATTORNEY TO BE NOTICED Litigation Law Group 1801 Clement Av Suite 101 Alameda , CA 94501 USA (510) 238-9610 Fax: (510) 337-1431 Email:Gmf@classlitigation.Com
Newegg North America Inc. Defendant	

Date	#	Proceeding Text	Source
12/09/2016	1	COMPLAINT for Willful Patent Infringement against Newegg Inc., Newegg North America Inc. (Filing Fee: $400.00, receipt number 0971-10997004). Filed by Asetek Danmark A/S. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Civil Cover Sheet) (McCauley, Robert) (Filed on 12/9/2016) (Entered: 12/09/2016)	
12/09/2016	2	Proposed Summons. (McCauley, Robert) (Filed on 12/9/2016) (Entered: 12/09/2016)	
12/09/2016	3	Proposed Summons. (McCauley, Robert) (Filed on 12/9/2016) (Entered: 12/09/2016)	
12/09/2016	4	Certificate of Interested Entities by Asetek Danmark A/S (McCauley, Robert) (Filed on 12/9/2016) (Entered: 12/09/2016)	
12/09/2016	7	Initial Case Management Scheduling Order with ADR Deadlines: Case Management Statement due by 3/7/2017. Case Management Conference set for 3/14/2017 10:00 AM in Courtroom E, 15th Floor, San Francisco. (ysS, COURT STAFF) (Filed on 12/9/2016) (Entered: 12/13/2016)	
12/12/2016	5	Case assigned to Magistrate Judge Elizabeth D. Laporte. Counsel for plaintiff or the removing party is responsible for serving the Complaint or Notice of Removal, Summons and the assigned judge's standing orders	

		and all other new case documents upon the opposing parties. For information, visit E-Filing A New Civil Case at http://cand.uscourts.gov/ecf/caseopening.Standing orders can be downloaded from the court's web page at www.cand.uscourts.gov/judges. Upon receipt, the summons will be issued and returned electronically. Counsel is required to send chambers a copy of the initiating documents pursuant to L.R. 5-1(e)(7). A scheduling order will be sent by Notice of Electronic Filing (NEF) within two business days. Consent/Declination due by 12/27/2016. (sv, COURT STAFF) (Filed on 12/12/2016) (Entered: 12/12/2016)
12/13/2016	6	REPORT on the filing or determination of an action regarding Patent(cc: form e-mailed to register). (ysS, COURT STAFF) (Filed on 12/13/2016) (Entered: 12/13/2016)
12/13/2016	8	Summons Issued as to Newegg Inc.. (ysS, COURT STAFF) (Filed on 12/13/2016) (Entered: 12/13/2016)
12/13/2016	9	Summons Issued as to Newegg North America Inc.. (ysS, COURT STAFF) (Filed on 12/13/2016) (Entered: 12/13/2016)
12/13/2016	10	MOTION for leave to appear in Pro Hac Vice (Filing fee $ 310, receipt number 0971-11002934.) filed by Asetek Danmark A/S. (Attachments: # 1 Attachment - Certificate of Good Standing)(Bhattacharyya, Arpita) (Filed on 12/13/2016) (Entered: 12/13/2016)
12/14/2016	11	ORDER Granting Application for Admission of Attorney Pro Hac Vice signed by Magistrate Judge Elizabeth D. Laporte: granting 10 Application. (shyS, COURT STAFF) (Filed on 12/14/2016) (Entered: 12/14/2016)
12/15/2016	12	CERTIFICATE OF SERVICE on Newegg Inc.by Asetek Danmark A/S re 5 Case Assigned by Intake, 4 Certificate of Interested Entities, 1 Complaint, 8 Summons Issued, 7 Initial Case Management Scheduling Order with ADR Deadlines (McCauley, Robert) (Filed on 12/15/2016) Modified on 12/16/2016 (ysS, COURT STAFF). (Entered: 12/15/2016)
12/15/2016	13	CERTIFICATE OF SERVICE on Newegg North America Inc. by Asetek Danmark A/S re 5 Case Assigned by Intake, 4 Certificate of Interested Entities, 1 Complaint, 9 Summons Issued, 7 Initial Case Management Scheduling Order with ADR Deadlines (McCauley, Robert) (Filed on 12/15/2016) Modified on 12/16/2016 (ysS, COURT STAFF). (Entered: 12/15/2016)
12/20/2016	14	FILED IN ERROR. PLEASE IGNORE. SEE ECF 15 .RELATED CASE ORDER by Judge Jon S. Tigar granting (363) Motion to Relate Case in case 3:13-cv-00457-JST. (wsn, COURT STAFF) (Filed on 12/20/2016) Modified on 12/20/2016 (wsn, COURT STAFF). (Entered: 12/20/2016)
12/20/2016	15	RELATED CASE ORDER. Signed by Judge Jon S. Tigar on December 20, 2016. (wsn, COURT STAFF) (Filed on 12/20/2016) (Entered: 12/20/2016)
12/21/2016	16	Case Reassigned to Judge Hon. Jon S. Tigar. Magistrate Judge Elizabeth D. Laporte no longer assigned to the case. This case is assigned to a judge who participates in the Cameras in the Courtroom Pilot Project. See General Order 65 and http://cand.uscourts.gov/cameras (as, COURT STAFF) (Filed on 12/21/2016) (Entered: 12/21/2016)
12/22/2016	17	CLERK'S NOTICE SETTING CASE MANAGEMENT CONFERENCE. Case Management Statement due by 3/6/2017. Initial Case Management Conference set for 3/15/2017 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco. (Attachments: # 1 Standing Order, # 2 Standing Order for All Judges of the Northern District) (wsn, COURT STAFF) (Filed on 12/22/2016) (Entered: 12/22/2016)
12/22/2016	18	CERTIFICATE OF SERVICE by Asetek Danmark A/S re 17 Clerk's Notice, (Puknys, Erik) (Filed on 12/22/2016) (Entered: 12/22/2016)
01/03/2017	19	

		NOTICE by Newegg Inc. NOTICE OF STIPULATION EXTENDING TIME TO ANSWER COMPLAINT (Fauth, Gordon) (Filed on 1/3/2017) (Entered: 01/03/2017)
02/07/2017	20	NOTICE filed by Newegg Inc. of Stipulation Extending Time To Answer Complaint (Fauth, Gordon) (Filed on 2/7/2017) (Entered: 02/07/2017)
02/09/2017	21	ANSWER to Complaint with Demand for Jury Trial byNewegg Inc.. (Fauth, Gordon) (Filed on 2/9/2017) (Entered: 02/09/2017)
02/16/2017	22	CLERK'S NOTICE ADVANCING TIME OF CASE MANAGEMENT CONFERENCE. The Initial Case Management Conference set for 3/15/2017 will be held at 9:00 AM in Courtroom 9, 19th Floor, San Francisco. (This is a text-only entry generated by the court. There is no document associated with this entry.) (wsn, COURT STAFF) (Filed on 2/16/2017) (Entered: 02/16/2017)
02/22/2017	23	ADR Certification (ADR L.R. 3-5 b) of discussion of ADR options (Schroeder, Jacob) (Filed on 2/22/2017) (Entered: 02/22/2017)
02/22/2017	24	NOTICE of need for ADR Phone Conference (ADR L.R. 3-5 d) (Schroeder, Jacob) (Filed on 2/22/2017) (Entered: 02/22/2017)

This case was appealed to
Federal Circuit: 15-1597

US District Court Civil Docket

U.S. District - Virginia Eastern
(Alexandria)

1:14cv1293

Asia Vital Components Co., Ltd. v. Asetek Danmark A/S

This case was retrieved from the court on Thursday, February 23, 2017

Date Filed:	**09/30/2014**	Class Code:	**CLOSED**
Assigned To:	**District Judge Liam O'Grady**	Closed:	**12/13/2016**
Referred To:	**Magistrate Judge Theresa Carroll Buchanan**	Statute:	**35:1**
Nature of suit:	**Patent (830)**	Jury Demand:	**Plaintiff**
Cause:	**Patent Non-Infringement - Declaratory Judgment**	Demand Amount:	**$0**
Lead Docket:	**None**	NOS Description:	**Patent**
Other Docket:	**Federal Circuit, 15-01597**		
Jurisdiction:	**Federal Question**		

Litigants	Attorneys
Asia Vital Components Co., Ltd. aTaiwan, R.O.C. corporation Plaintiff	Cameron Hajaran Tousi LEAD ATTORNEY;ATTORNEY TO BE NOTICED IP Law Leaders PLLC 1701 Pennsylvania Ave Nw Suite 300 Washington , DC 20006 USA 202-248-5410 Fax: 202-318-4538 Email:Chtousi@ipllfirm.Com
Asetek Danmark A/S Defendant	Charles Brandon Rash ATTORNEY TO BE NOTICED Finnegan Henderson Farabow Garrett & Dunner LLP (DC) 901 New York Ave Nw Washington , DC 20001-4413 USA 202-408-4000 Fax: 202-408-4400

Email:Brandon.Rash@finnegan.Com

Date	#	Proceeding Text	Source
09/30/2014	1	COMPLAINT against Asia Vital Components Co., Ltd. (Filing fee $ 400, receipt number 14683046678.), filed by Asia Vital Components Co., Ltd.. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Civil Cover Sheet, # 4 Letter)(gwalk,) (Additional attachment(s) added on 10/1/2014: # 5 Receipt) (gwalk,). (Entered: 10/01/2014)	
09/30/2014	2	Financial Interest Disclosure Statement (Local Rule 7.1) by Asia Vital Components Co., Ltd.. (gwalk,) (Entered: 10/01/2014)	
09/30/2014	3	Report on the filing or determination of an action regarding patent and/or trademarks 8,240,362 and 8,245,764. (gwalk,) (Entered: 10/01/2014)	
09/30/2014	4	NOTICE of Appearance by Cameron Hajaran Tousi on behalf of Asia Vital Components Co., Ltd. (gwalk,) (Entered: 10/01/2014)	
01/20/2015	5	Waiver of the Service of Summons by Asetek Danmark A/S submitted by Asia Vital Components Co., Ltd. (Attachments: # 1 Exhibit Waiver of the Service of Summons)(Tousi, Cameron) (Entered: 01/20/2015)	
01/20/2015	6	Motion to appear Pro Hac Vice by Andrew Charles Aitken and Certification of Local Counsel Cameron H. Tousi Filing fee $ 75, receipt number 0422-4277478. by Asia Vital Components Co., Ltd.. (Tousi, Cameron) (Entered: 01/20/2015)	
01/20/2015	7	Motion to appear Pro Hac Vice by Raymond Juiwen Ho and Certification of Local Counsel Cameron H. Tousi Filing fee $ 75, receipt number 0422-4277490. by Asia Vital Components Co., Ltd.. (Tousi, Cameron) (Entered: 01/20/2015)	
01/21/2015		Notice of Correction re 5 Waiver of the Service of Summons. The filing user has been notified to re-file the service returns in paper form as they are exempt from ECF. (dvanm,) (Entered: 01/21/2015)	
01/22/2015	8	WAIVER OF SERVICE Returned Executed by Asia Vital Components Co., Ltd.. Asetek Danmark A/S waiver sent on 10/1/2014, answer due 11/30/2014. (Attachments: # 1 Letter)(dvanm,) (Entered: 01/26/2015)	
01/22/2015	9	ORDER granting 6 Motion for Pro hac vice. Signed by District Judge Liam O'Grady on 1/22/15. (gwalk,) (Entered: 01/26/2015)	
01/22/2015	10	ORDER granting 7 Motion for Pro hac vice. Signed by District Judge Liam O'Grady on 1/22/15. (gwalk,) (Entered: 01/26/2015)	
01/26/2015	11	ANSWER to 1 Complaint, by Asetek Danmark A/S.(Rash, Charles) (Entered: 01/26/2015)	
01/26/2015	12	Financial Interest Disclosure Statement (Local Rule 7.1) by Asetek Danmark A/S. (Rash, Charles) (Entered: 01/26/2015)	
02/02/2015	17	SCHEDULING ORDER: Initial Pretrial Conference set for 3/11/2015 at 11:00 AM in Alexandria Courtroom 500 before Magistrate Judge Theresa Carroll Buchanan. Final Pretrial Conference set for 6/18/2015 at 10:00 AM in Alexandria Courtroom 700 before District Judge Liam O'Grady. Discovery due by 6/12/2015. Signed by District Judge Liam O'Grady on 2/2/15. (Attachments: # 1 Magistrate Consent, # 2 Pretrial Notice)(dper) (Entered: 02/03/2015)	
02/03/2015	13	MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a) by Asetek Danmark A/S. (Attachments: # 1 Proposed Order)(Rash, Charles) (Entered: 02/03/2015)	
02/03/2015	14	Memorandum in Support re 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a) filed by Asetek Danmark A/S. (Attachments: # 1 Exhibit A,	

		# 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F, # 7 Exhibit G, # 8 Exhibit H, # 9 Exhibit I, # 10 Exhibit J, # 11 Exhibit K, # 12 Exhibit L, # 13 Exhibit M, # 14 Exhibit N)(Rash, Charles) (Entered: 02/03/2015)
02/03/2015	15	Notice of Hearing Date set for February 27, 2015 at 10:00 a.m. re 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a) (Rash, Charles) (Entered: 02/03/2015)
02/03/2015	16	Motion to appear Pro Hac Vice by Robert Francis McCauley and Certification of Local Counsel Charles Brandon Rash Filing fee $ 75, receipt number 0422-4299660. by Asetek Danmark A/S. (Rash, Charles) (Entered: 02/03/2015)
02/04/2015		Set Deadlines as to 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a). Motion Hearing set for 2/27/2015 at 10:00 AM in Alexandria Courtroom 700 before District Judge Liam O'Grady. (clar,) (Entered: 02/04/2015)
02/05/2015	18	ORDER granting 16 Motion for Pro hac vice. Signed by District Judge Liam O'Grady on 02/05/2015. (dvanm,) (Entered: 02/10/2015)
02/17/2015	19	Opposition to 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a), 14 Memorandum in Support, filed by Asia Vital Components Co., Ltd.. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F, # 7 Exhibit G, # 8 Exhibit H, # 9 Exhibit I, # 10 Exhibit J, # 11 Exhibit K, # 12 Exhibit L, # 13 Exhibit M, # 14 Exhibit N, # 15 Exhibit O)(Tousi, Cameron) (Entered: 02/17/2015)
02/18/2015	20	Opposition to 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a), 19 Opposition,, Amended (with amended Exs. D, E) filed by Asia Vital Components Co., Ltd.. (Attachments: # 1 Exhibit D, # 2 Exhibit E) (Tousi, Cameron) (Entered: 02/18/2015)
02/21/2015	21	Opposition to 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a), 19 Opposition,, 20 Opposition, Amended (Second Amendment) filed by Asia Vital Components Co., Ltd.. (Tousi, Cameron) (Entered: 02/21/2015)
02/23/2015	22	Reply to Motion re 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a) filed by Asetek Danmark A/S. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E)(Rash, Charles) (Entered: 02/23/2015)
02/27/2015	23	Minute Entry for proceedings held before District Judge Liam O'Grady: Motion Hearing held on 2/27/2015 re 13 MOTION to Dismiss for Lack of Subject Matter Jurisdiction, or Alternatively, for Transfer of Venue Pursuant to 28 U.S.C. 1404(a) filed by Asetek Danmark A/S. Appearances of counsel. Motion argued and the court finds it does not have jurisdiction. The action shall be dismissed without prejudice. Order to follow. (Court Reporter N. Linnell.)(dper) (Entered: 02/27/2015)
03/11/2015	24	TRANSCRIPT of motions hearing held on 2-27-2015 before Judge Liam O'Grady. Court reporter Norman Linnell, telephone number 703-549-4626. NOTICE RE REDACTION OF TRANSCRIPTS:The parties have thirty(30) calendar days to file with the Court a Notice of Intent to Request Redaction of this transcript. If no such Notice is filed, the transcript will be made remotely electronically available to the public without redaction after 90 calendar days. The policy is located on our website at www.vaed.uscourts.gov Transcript may be viewed at the court public terminal or purchased through the court reporter before the deadline for

		Release of Transcript Restriction. After that date it may be obtained through PACER Redaction Request due 4/10/2015. Redacted Transcript Deadline set for 5/11/2015. Release of Transcript Restriction set for 6/9/2015.(linnell, norman) (Entered: 03/11/2015)
04/17/2015	25	ORDER, for the reasons stated during the hearing and for good cause shown, the Court finds that the MedImmune standard has not been met in this case. Plaintiff's complaint does not plead sufficient facts to show that there is a substantial controversy between the parties under the totality of the circumstances. Accordingly, it is hereby ORDERED that the motion 13 to dismiss is GRANTED and the complaint is dismissed without prejudice. The motion to transfer venue is therefore moot. Signed by District Judge Liam O'Grady on 4/17/15. (dper) (Entered: 04/17/2015)
04/24/2015	26	NOTICE OF APPEAL as to 25 Order on Motion to Dismiss,, by Asia Vital Components Co., Ltd.. Filing fee $ 505, receipt number 0422-4424770. (Tousi, Cameron) (Entered: 04/24/2015)
04/27/2015	27	Transmission of Notice of Appeal to US Federal Circuit re 26 Notice of Appeal. (dvanm,) (Entered: 04/27/2015)
04/28/2015	28	USCA Case Number 15-1597 Federal Circuit for 26 Notice of Appeal filed by Asia Vital Components Co., Ltd. (rban,) (Entered: 04/28/2015)
05/11/2015	29	Report on the filing or determination of an action regarding patent and/or trademark(s) 8,240,362 and 8,245,764. (Attachments: # 1 Order)(rban,) (Entered: 05/11/2015)
09/08/2016	30	Opinion of USCA, decided 9/8/2016 re 26 Notice of Appeal, Reversed and Remanded.(rban,) (Entered: 09/08/2016)
09/08/2016	31	USCA JUDGMENT as to 26 Notice of Appeal filed by Asia Vital Components Co., Ltd. The mandate will be issued in due course. (rban,) (Entered: 09/08/2016)
10/17/2016	32	USCA Mandate re 26 Notice of Appeal. In accordance with the judgment of this Court, entered September 08, 2016, and pursuant to Rule 41(a) of the Federal Rules of Appellate Procedure, the formal mandate is hereby issued.Costs in the amount of $1,498.32 were determined and taxed against the appellee. (dvanm,) (Entered: 10/17/2016)
10/18/2016	33	MOTION to Transfer Case by Asetek Danmark A/S. (Attachments: # 1 Proposed Order)(Rash, Charles) (Entered: 10/18/2016)
10/18/2016	34	Notice of Hearing Date set for October 28, 2016 re 33 MOTION to Transfer Case (Rash, Charles) (Entered: 10/18/2016)
10/18/2016	35	Notice of Hearing Date set for November 4, 2016 re 33 MOTION to Transfer Case (Rash, Charles) (Entered: 10/18/2016)
10/19/2016		Set Deadlines as to 33 MOTION to Transfer Case . Motion Hearing set for 10/28/2016 at 10:00 AM in Alexandria Courtroom 700 before District Judge Liam O'Grady. (clar,) (Entered: 10/19/2016)
10/19/2016		Reset Deadlines as to 33 MOTION to Transfer Case . Motion Hearing set for 11/4/2016 at 10:00 AM in Alexandria Courtroom 700 before District Judge Liam O'Grady. (clar,) (Entered: 10/19/2016)
10/31/2016	36	Opposition to 33 MOTION to Transfer Case filed by Asia Vital Components Co., Ltd.. (Tousi, Cameron) (Entered: 10/31/2016)
11/02/2016		Per LO chambers motions set for 11/4/16 on the pleadings (clar,) (Entered: 11/02/2016)
12/13/2016	37	ORDER granting 33 Motion to Transfer Case to the U.S. District Court for the Northern District of California. Signed by District Judge Liam O'Grady on 12/13/2016. (dvanm,) (Entered: 12/14/2016)
12/13/2016		Case transferred to District of Northern District of California. Original file, certified copy of transfer order, and docket sheet sent. (dvanm,) (Entered: 12/14/2016)

12/19/2016	Case transferred from Virginia Eastern has been opened in California Northern District as case 5:16-cv-07160, filed 12/16/2016.(ltun) (Entered: 12/19/2016)

This case was appealed to
Federal Circuit: 16-1026, 16-1183

US District Court Civil Docket

U.S. District - California Northern
(San Francisco)

3:13cv457

Asetek Danmark A/S v. Cmi USA, Inc.

This case was retrieved from the court on Thursday, February 23, 2017

Date Filed:	**01/31/2013**		
Assigned To:	**Honorable Jon S. Tigar**		
Referred To:		Class Code:	**OPEN**
Nature of suit:	**Patent (830)**	Closed:	
Cause:	**Patent Infringement**	Statute:	**35:145**
Lead Docket:	**None**	Jury Demand:	**Both**
Other Docket:	**USCA #:16-01026 USCA#:16-01183 3:16cv07068 3:16cv07160**	Demand Amount:	**$0**
		NOS Description:	**Patent**
Jurisdiction:	**Federal Question**		

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Date	#	Proceeding Text	Source
01/31/2013	1	COMPLAINT against Cooler Master Co., Ltd. & Cooler Master USA Inc., (Filing Fee: $350.00, receipt number 34611082833). Filed by Asetek Holdings, Inc, Asetek A/S. (Attachments: # 1 Civil Cover Sheet, # 2 Summons)(gaS, COURT STAFF) (Filed on 1/31/2013) (Entered: 02/01/2013)	
01/31/2013	2	Certificate of Interested Entities by Asetek A/S, Asetek Holdings, Inc re 1 Complaint, (gaS, COURT STAFF) (Filed on 1/31/2013) (Entered: 02/01/2013)	
01/31/2013	3	ADR SCHEDULING ORDER: Case Management Statement due by 5/16/2013. Case Management Conference set for 5/23/2013 01:30 PM in Courtroom F, 15th Floor, San Francisco.. Signed by Judge Jacqueline Scott Corley on 1/31/13. (Attachments: # 1 Standing Order)(gaS, COURT STAFF) (Filed on 1/31/2013) (Entered: 02/01/2013)	
02/01/2013	4	REPORT on the filing of an action regarding PATENT INFRINGEMENT (cc: form mailed to register). (gaS, COURT STAFF) (Filed on 2/1/2013) (Entered: 02/01/2013)	
02/05/2013	5	CERTIFICATE OF SERVICE by Asetek A/S, Asetek Holdings, Inc (McCauley, Robert) (Filed on 2/5/2013) (Entered: 02/05/2013)	
02/05/2013		SUMMONS Returned Executed 5 by Asetek Holdings, Inc, Asetek A/S. Cooler Master USA Inc served on 2/1/2013, answer due 2/22/2013. (gaS, COURT STAFF) (Filed on 2/5/2013) (Entered: 02/06/2013)	
02/26/2013	6	ORDER DENYING MOTION TO RELATE CASE. CASES ARE NOT RELATED.. Signed by Judge Edward M. Chen on 2/26/13. (bpf, COURT STAFF) (Filed on 2/26/2013) (Entered: 02/26/2013)	
02/28/2013	7	CONSENT/DECLINATION to Proceed Before a US Magistrate Judge by Asetek A/S, Asetek Holdings, Inc.. (McCauley, Robert) (Filed on 2/28/2013) (Entered: 02/28/2013)	
02/28/2013	8	CLERK'S NOTICE of Impending Reassignment to U.S. District Judge (ahm, COURT STAFF) (Filed on 2/28/2013) (Entered: 02/28/2013)	
02/28/2013	9	ORDER REASSIGNING CASE. Case reassigned to Judge Hon. Jon S. Tigar for all further proceedings. Magistrate Judge Jacqueline Scott Corley no longer assigned to the case.. Signed by Executive Committee on 2/28/13. (as, COURT STAFF) (Filed on 2/28/2013) (Entered: 02/28/2013)	
03/01/2013	10	CLERKS NOTICE SETTING CASE MANAGEMENT CONFERENCE. Case Management Statement due by 5/21/2013. Initial Case Management Conference set for 5/29/2013 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco. (Attachments: # 1 Standing Order, # 2 Standing Order for All	

		Judges of the Northern District) (wsn, COURT STAFF) (Filed on 3/1/2013) (Entered: 03/01/2013)
03/05/2013	11	CERTIFICATE OF SERVICE by Asetek A/S, Asetek Holdings, Inc re 10 Clerks Notice, (McCauley, Robert) (Filed on 3/5/2013) (Entered: 03/05/2013)
03/05/2013	12	STIPULATION Extending Time To Respond To Complaint filed by Cooler Master Co., Ltd.. (Rader, Elizabeth) (Filed on 3/5/2013) (Entered: 03/05/2013)
03/08/2013	13	Certification of Interested Entities filed by Cooler Master Co., Ltd., Cooler Master USA Inc (Rader, Elizabeth) (Filed on 3/8/2013) (Entered: 03/08/2013)
03/25/2013	14	Defendants Cooler Master Co. Ltd. and Cooler Master, USA Inc's ANSWER to Complaint with Jury Demand , First COUNTERCLAIM for Declaratory Judgment against All Plaintiffs byCooler Master USA Inc, Cooler Master Co., Ltd.. (Rader, Elizabeth) (Filed on 3/25/2013) (Entered: 03/25/2013)
04/08/2013	15	Amended ANSWER to Complaint with Jury Demand, and COUNTERCLAIM for Declaratory Judgment against All Plaintiffs filed by Cooler Master USA Inc & Cooler Master Co., Ltd.. (Rader, Elizabeth) (Filed on 4/8/2013) (Entered: 04/08/2013)
04/22/2013	16	ANSWER to Counterclaim; Plaintiffs Asetek Holdings, Inc. and Asetek A/S's Answer to Defendants' Amended Counterclaims byAsetek A/S, Asetek Holdings, Inc.. (McCauley, Robert) (Filed on 4/22/2013) (Entered: 04/22/2013)
05/08/2013	17	ADR Certification (ADR L.R. 3-5 b) of discussion of ADR options Asetek ADR Certification by Parties and Counsel (Hulse, Tina) (Filed on 5/8/2013) (Entered: 05/08/2013)
05/08/2013	18	NOTICE of need for ADR Phone Conference (ADR L.R. 3-5 d) (Hulse, Tina) (Filed on 5/8/2013) (Entered: 05/08/2013)
05/13/2013	19	ADR Clerk Notice Setting ADR Phone Conference on 5/23/13 at 11:30 a.m. Pacific. Please note that you must be logged into an ECF account of counsel of record in order to view this document. (sgd, COURT STAFF) (Filed on 5/13/2013) (Entered: 05/13/2013)
05/21/2013	20	CASE MANAGEMENT STATEMENT; Joint Case Management Statement and [Proposed] Order filed by Asetek A/S, Asetek Holdings, Inc., Cooler Master Co., Ltd. & Cooler Master USA Inc.. (McCauley, Robert) (Filed on 5/21/2013) (Entered: 05/21/2013)
05/24/2013		ADR Remark: ADR Phone Conference held by HAH on 5/23/13. (sgd, COURT STAFF) (Filed on 5/24/2013) (Entered: 05/24/2013)
05/24/2013		ADR Remark: A further ADR Phone Conference has been scheduled for 6/28/13 at 10:00 a.m. Pacific. Please note that the call-in information remains the same.(sgd, COURT STAFF) (Filed on 5/24/2013) (Entered: 05/24/2013)
05/29/2013	21	Minute Entry: Initial Case Management Conference held on 5/29/2013 before Judge Jon S. Tigar (Date Filed: 5/29/2013). (Court Reporter: Not reported.) (wsn, COURT STAFF) (Date Filed: 5/29/2013) (Entered: 05/29/2013)
05/29/2013	22	SCHEDULING ORDER. Amended Pleadings Motion due by 10/8/2013. Claim Construction Discovery due by 10/24/2013. Technology Tutorial Hearing set for 12/2/2013 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco. Claims Construction Hearing set for 12/16/2013 at 2:00 PM. Signed by Judge Jon S. Tigar on May 29, 2013. (wsn, COURT STAFF) (Filed on 5/29/2013) (Entered: 05/29/2013)
05/29/2013		ADR Remark: The further ADR Phone Conference scheduled for 6/28/13 is now set for 9:30 a.m. Pacific. The call-in information remains the same. (sgd, COURT STAFF) (Filed on 5/29/2013) (Entered: 05/29/2013)

07/01/2013	23	STIPULATION WITH [PROPOSED] ORDER Stipulation Regarding ADR and Proposed Order filed by Asetek A/S, Asetek Holdings, Inc., Cooler Master Co., Ltd., Cooler Master USA Inc.. (McCauley, Robert) (Filed on 7/1/2013) (Entered: 07/01/2013)
07/02/2013		ADR Remark: ADR Phone Conference held by HAH on 6/28/13 (sgd, COURT STAFF) (Filed on 7/2/2013) (Entered: 07/02/2013)
07/03/2013	24	ORDER re 23 STIPULATION WITH PROPOSED ORDER Stipulation Regarding ADR and Proposed Order filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Jon S. Tigar on July 3, 2013. (wsn, COURT STAFF) (Filed on 7/3/2013) (Entered: 07/08/2013)
07/30/2013	25	STIPULATION WITH [PROPOSED] ORDER; [Proposed] Stipulated Protective Order filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 7/30/2013) (Entered: 07/30/2013)
07/31/2013	26	ADR Clerks Notice Appointing William A. Fenwick as Mediator. (af, COURT STAFF) (Filed on 7/31/2013) (Entered: 07/31/2013)
08/09/2013	27	Order by Hon. Jon S. Tigar granting 25 Stipulation. The Court grants and hereby adopts as an order of the Court the parties' stipulated protective order, ECF No. 25.(jstlc1, COURT STAFF) (This is a text only entry.)(Filed on 8/9/2013) (Entered: 08/09/2013)
09/25/2013	28	NOTICE of Appearance by Robert Francis McCauley Notice of Appearance for Jeffrey D. Smyth and Holly Atkinson (McCauley, Robert) (Filed on 9/25/2013) (Entered: 09/25/2013)
09/25/2013	29	NOTICE of Change In Counsel by Robert Francis McCauley (McCauley, Robert) (Filed on 9/25/2013) (Entered: 09/25/2013)
10/15/2013	30	ORDER TO SHOW CAUSE WHY THE COURT SHOULD NOT IMPOSE SANCTIONS FOR FAILURE TO FILE JOINT CLAIM CONSTRUCTION AND PREHEARING STATEMENT. Show Cause Response due by 10/24/2013. Order to Show Cause Hearing set for 10/31/2013 at 2:00 PM. Signed by Judge Jon S. Tigar on October 15, 2013. (wsn, COURT STAFF) (Filed on 10/15/2013) (Entered: 10/15/2013)
10/16/2013	31	CLAIM CONSTRUCTION STATEMENT; JOINT CLAIM CONSTRUCTION AND PREHEARING STATEMENT filed by Asetek A/S, Asetek Holdings, Inc, Cooler Master Co., Ltd., Cooler Master USA Inc. (Attachments: #(1) Exhibit Ex. A)(Rader, Elizabeth) (Filed on 10/16/2013) (Entered: 10/16/2013)
10/17/2013	32	RESPONSE TO ORDER TO SHOW CAUSE filed by Asetek A/S, Asetek Holdings, Inc, Cooler Master Co., Ltd., Cooler Master USA Inc.; Parties' Joint Statement in Response to Order to Show Cause Why the Court Should Not Impose Sanctions for Failure to File Joint Claim Construction and Prehearing Statement. (Attachments: #(1) Declaration of Robert F. McCauley, #(2) Exhibit A to Declaration of Robert F. McCauley)(McCauley, Robert) (Filed on 10/17/2013) (Entered: 10/17/2013)
10/18/2013	33	Declaration of Elizabeth H. Rader in Support of re 32 Defendants Cooler Master Co. Ltd. and Cooler Master USA Inc.'s Response to the Order to Show Cause filed by Cooler Master Co., Ltd., Cooler Master USA Inc. (Rader, Elizabeth) (Filed on 10/18/2013) (Entered: 10/18/2013)
10/18/2013	34	ORDER VACATING ORDER TO SHOW CAUSE re 30 Order to Show Cause. Case Management Statement due by 6/11/2014. Further Case Management Conference set for 6/25/2014 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco. Signed by Judge Jon S. Tigar on October 18, 2013. (wsn, COURT STAFF) (Filed on 10/18/2013) (Entered: 10/18/2013)
12/03/2013	35	ORDER Re Claim Construction for Asetek's Patents. Signed by Judge Edward M. Chen on 12/3/2013. (emcsec, COURT STAFF) (Filed on 12/3/2013) (Entered: 12/03/2013)
12/05/2013	36	

		Minute Entry: Tutorial Hearing held jointly with C12-4498 EMC on 11/21/2013 before Judge Edward M. Chen (Date Filed: 12/5/2013). (Court Reporter Lydia Zinn.) (bpf, COURT STAFF) (Date Filed: 12/5/2013) Modified on 12/5/2013 (bpf, COURT STAFF). Modified on 12/5/2013 (bpf, COURT STAFF). (Entered: 12/05/2013)
12/05/2013	37	Minute Entry: Claims Construction / Markman Hearing held jointly with C12-4498 EMC on 11/26/2013 before Judge Edward M. Chen (Date Filed: 12/5/2013). (Court Reporter Lydia Zinn.) (bpf, COURT STAFF) (Date Filed: 12/5/2013) (Entered: 12/05/2013)
12/12/2013		Pre MED phone conference scheduled on December 23, 2013 at 11:00 AM. Mediator provided dial-in information to the parties. (af, COURT STAFF) (Filed on 12/12/2013) (Entered: 12/12/2013)
12/13/2013	38	CASE MANAGEMENT STATEMENT (Further) and Proposed Order filed by Cooler Master Co., Ltd.. (Rader, Elizabeth) (Filed on 12/13/2013) (Entered: 12/13/2013)
01/10/2014	39	CLERK'S NOTICE SETTING CASE MANAGEMENT CONFERENCE. A Case Management Conference is set for 1/15/2014 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco. This is a text only entry. There is no document associated with this notice. (wsn, COURT STAFF) (Filed on 1/10/2014) (Entered: 01/10/2014)
01/13/2014	40	NOTICE OF MOTION & MOTION to Stay Case with Respect to the U.S. Patent No. 8,245,764 Pending Reexamination filed by Cooler Master Co., Ltd., Cooler Master USA Inc. Motion Hearing set for 2/27/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 1/27/2014. Replies due by 2/3/2014. (Rader, Elizabeth) (Filed on 1/13/2014) (Entered: 01/13/2014)
01/13/2014	41	Declaration of Elizabeth H. Rader in Support of re 40 Defendants Cooler Master Co. Ltd. and Cooler Master USA Inc.'s Motion to Stay Case with Respect to U.S Patent No. 8,245,764 Pending Its Reexamination filed by Cooler Master Co., Ltd., Cooler Master USA Inc. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E)(Rader, Elizabeth) (Filed on 1/13/2014) (Entered: 01/13/2014)
01/13/2014	42	[Proposed] Order Granting re 40 Defendants Cooler Master Co. Ltd. and Cooler Master USA Inc.'s Motion to Stay Case with Respect to U.S. Patent No. 8,245,764 Pending Its Reexamination filed by Cooler Master Co., Ltd., Cooler Master USA Inc. (Rader, Elizabeth) (Filed on 1/13/2014) (Entered: 01/13/2014)
01/14/2014	43	CLERK'S NOTICE Continuing Motion Hearing as to 40 MOTION to Stay Case with Respect to the U.S. Patent No. 8,245,764 Pending Reexamination. The Motion having been noticed for a date when the Court is not available, the hearing is CONTINUED to 3/6/2014 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. This is a text only entry. There is no document associated with this notice. (wsn, COURT STAFF) (Filed on 1/14/2014) (Entered: 01/14/2014)
01/15/2014	44	Minute Entry: Further Case Management Conference held on 1/15/2014 before Judge Jon S. Tigar (Date Filed: 1/15/2014). (Court Reporter: Not reported.) (wsn, COURT STAFF) (Date Filed: 1/15/2014) (Entered: 01/15/2014)
01/15/2014		Set Deadlines/Hearings: Jury Trial set for 11/10/2014 at 8:30 AM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. (wsn, COURT STAFF) (Filed on 1/15/2014) (Entered: 01/15/2014)
01/15/2014	45	ORDER re: ADR DeadlineCounsel have inquired whether they may extend their ADR deadline beyond February 4, 2014. However, counsel did not propose a new deadline. The parties may file a stipulation proposing a new ADR deadline for the Court's consideration. (jstlc1, COURT STAFF) (This is a text only entry.) (Filed on 1/15/2014) (Entered: 01/15/2014)

01/15/2014	46	SCHEDULING ORDER. Amended Pleadings due by 3/27/2014. Fact Discovery due by 5/30/2014. Expert Disclosures due by 7/4/2014. Dispositive Motions due by 8/22/2014. Pretrial Conference Statement due by 11/4/2014. Final Pretrial Conference set for 11/14/2014 at 2:00 PM in Courtroom 2, 4th Floor, Oakland. Jury Trial set for 12/1/2014 - 12/11/2014 at 8:30 AM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Signed by Judge Jon S. Tigar on January 15, 2014. (wsn, COURT STAFF) (Filed on 1/15/2014) (Entered: 01/15/2014)
01/16/2014		Further Pre MED phone conference scheduled on February 11, 2014 at 11:00 AM. (af, COURT STAFF) (Filed on 1/16/2014) (Entered: 01/16/2014)
01/27/2014	47	STIPULATION WITH PROPOSED ORDER re 40 MOTION to Stay Case with Respect to the U.S. Patent No. 8,245,764 Pending Reexamination - Stipulated Request for Order Granting Extension of Time to File Motion to Stay Briefs; Proposed Order filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Jeffrey D. Smyth)(Smyth, Jeffrey) (Filed on 1/27/2014) (Entered: 01/27/2014)
01/27/2014	48	Order by Hon. Jon S. Tigar granting 47 Stipulation.The deadlines for the filing of opposition and reply briefs concerning the Motion to Stay Case with Respect to U.S. Patent No. 8,245,764 Pending its Reexamination filed by Defendants Cooler Master Co. Ltd. and Cooler Master USA Inc. are hereby continued by seven days.(jstlc1, COURT STAFF) (This is a text only entry.) (Filed on 1/27/2014) (Entered: 01/27/2014)
02/03/2014	49	Administrative Motion to File Under Seal filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Andre S. Eriksen, # 2 Proposed Order, # 3 Asetek A/Ss Opposition to Defendant s Cooler Master Co., Ltd. and Cooler Master USA Inc.s Motion to Stay Case with Respect to U.S. Patent No. 8,245,764 Pending its Reexamination, # 4 Asetek A/Ss Opposition to Defendant s Cooler Master Co., Ltd. and Cooler Master USA Inc.s Motion to Stay Case with Respect to U.S. Patent No. 8,245,764 Pending its Reexamination - Highlighted, # 5 Declaration of Andr S. Eriksen in support of Plaintiffs Asetek Holdings, Inc.s and Asetek A/Ss Opposition to Defendant s Cooler Master Co., Ltd. and Cooler Master USA Inc.s Motion to Stay Case with Respect to U.S. Patent No. 8,245,764 Pending its Reexamination - Redacted, # 6 Declaration of Andr S. Eriksen in support of Plaintiffs Asetek Holdings, Inc.s and Asetek A/Ss Opposition to Defendant s Cooler Master Co., Ltd. and Cooler Master USA Inc.s Motion to Stay Case with Respect to U.S. Patent No. 8,245,764 Pending its Reexamination - Highlighted, # 7 Certificate/Proof of Service)(McCauley, Robert) (Filed on 2/3/2014) (Entered: 02/03/2014)
02/03/2014	50	Declaration of Robert F. McCauley in Support of Plaintiffs Asetek Holdings, Inc.s and Asetek A/Ss Opposition to Defendant s Cooler Master Co., Ltd. and Cooler Master USA Inc.s Motion to Stay Case with Respect to U.S. Patent No. 8,245,764 Pending its Reexamination filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit 1, # 2 Exhibit 2, # 3 Exhibit 3, # 4 Exhibit 4)(McCauley, Robert) (Filed on 2/3/2014) (Entered: 02/03/2014)
02/10/2014	51	REPLY (re 40 MOTION to Stay Case with Respect to the U.S. Patent No. 8,245,764 Pending Reexamination) filed byCooler Master Co., Ltd., Cooler Master USA Inc. (Rader, Elizabeth) (Filed on 2/10/2014) (Entered: 02/10/2014)
02/11/2014	52	ORDER GRANTING ADMINISTRATIVE MOTION TO FILE UNDER SEAL PORTIONS OF ASETEK HOLDINGS' OPPOSITION TO MOTION TO STAY CASE by Judge Jon S. Tigar, granting 49 Administrative Motion to File Under Seal. (wsn, COURT STAFF) (Filed on 2/11/2014) (Entered: 02/11/2014)
02/12/2014	53	STIPULATION WITH [PROPOSED] ORDER; Stipulated Request for Order Granting Extension of Time to Complete Alternative Dispute Resolution;

		[Proposed Order] filed by Cooler Master Co., Ltd., Cooler Master USA Inc. (Rader, Elizabeth) (Filed on 2/12/2014) (Entered: 02/12/2014)
02/13/2014	54	STIPULATION AND ORDER re 53 STIPULATION WITH PROPOSED ORDER; Stipulated Request for Order Granting Extension of Time to Complete Alternative Dispute Resolution filed by Cooler Master USA Inc, Cooler Master Co., Ltd. Signed by Judge Jon S. Tigar on February 13, 2014. (wsn, COURT STAFF) (Filed on 2/13/2014) (Entered: 02/13/2014)
02/20/2014	55	CLERK'S NOTICE Continuing Motion Hearing as to 40 MOTION to Stay Case with Respect to the U.S. Patent No. 8,245,764 Pending Reexamination. The Motion Hearing previously set for 3/6/2014 is CONTINUED to 3/7/2014 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. This is a text only entry. There is no document associated with this notice. (wsn, COURT STAFF) (Filed on 2/20/2014) (Entered: 02/20/2014)
03/07/2014	56	STIPULATION WITH [PROPOSED] ORDER; Stipulated Request to Seal Courtroom During Motion to Stay Hearing; [Proposed] Order filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 3/7/2014) (Entered: 03/07/2014)
03/07/2014	57	Minute Entry: Motion Hearing held on 3/7/2014 before Judge Jon S. Tigar (Date Filed: 3/7/2014) re 40 MOTION to Stay Case with Respect to the U.S. Patent No. 8,245,764 Pending Reexamination filed by Cooler Master USA Inc, Cooler Master Co., Ltd. (Court Reporter: Katherine Sullivan.) (wsn, COURT STAFF) (Date Filed: 3/7/2014) (Entered: 03/07/2014)
03/27/2014		Set/Reset Hearing Mediation Hearing conducted on 3/25/2014. (af, COURT STAFF) (Filed on 3/27/2014) (Entered: 03/27/2014)
03/27/2014	58	CERTIFICATION OF MEDIATION Session 3/25/2014 case not settled, mediation complete. By Mediator, William A. Fenwick, dated 3/25/2014. (af, COURT STAFF) (Filed on 3/27/2014) (Entered: 03/27/2014)
04/03/2014	59	ORDER DENYING MOTION TO STAY ACTION AS TO '764 PATENT by Judge Jon S. Tigar, denying 40 Motion to Stay. (wsn, COURT STAFF) (Filed on 4/3/2014) (Entered: 04/04/2014)
05/06/2014	60	Letter Brief re Joint Motion to Amend Contentions; Joint Motion to Modify Case Caption filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit A)(McCauley, Robert) (Filed on 5/6/2014) (Entered: 05/06/2014)
05/06/2014	61	ORDER GRANTING JOINT MOTION FOR LEAVE TO AMEND INFRINGEMENT AND INVALIDITY CONTENTIONS AND TO AMEND CASE CAPTION re 60 Letter Brief filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Jon S. Tigar on May 6, 2014. (wsn, COURT STAFF) (Filed on 5/6/2014) (Entered: 05/07/2014)
05/30/2014	62	JOINT STIPULATION WITH [PROPOSED] ORDER to Extend Fact Discovery Deadline filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Jeffrey D. Smyth in Support)(Smyth, Jeffrey) (Filed on 5/30/2014) (Entered: 05/30/2014)
06/20/2014	63	CLERK'S NOTICE VACATING CASE MANAGEMENT CONFERENCE. The Case Mangement Conference set for 6/25/2014 is VACATED. This is a text only entry. There is no document associated with this notice. (wsn, COURT STAFF) (Filed on 6/20/2014) (Entered: 06/20/2014)
06/24/2014	64	ORDER GRANTING PARTIES' STIPULATION TO EXTEND FACT DISCOVERY DEADLINE re 62 STIPULATION WITH PROPOSED ORDER Joint Stipulation to Extend Fact Discovery Deadline filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Jon S. Tigar on June 24, 2014. (wsn, COURT STAFF) (Filed on 6/24/2014) (Entered: 06/24/2014)
07/11/2014	65	NOTICE OF MOTION & MOTION for Discovery Pursuant to Rule 36(b) for Leave to Amend its Response to Requests for Admission filed by Cooler Master Co., Ltd.. Motion Hearing set for 8/28/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by

		7/25/2014. Replies due by 8/1/2014. (Rader, Elizabeth) (Filed on 7/11/2014) (Entered: 07/11/2014)
07/11/2014	66	Declaration of Elizabeth H. Rader in Support of re 65 MOTION for Discovery Pursuant to Rule 36(b) for Leave to Amend its Response to Requests for Admission filed by Cooler Master Co., Ltd.. (Attachments: # 1 Exhibit A: Plaintiffs Asetek Holdings, Inc.'s and Asetek A/S's Requests for Admission to Defendants Cooler Master Co., Ltd. and Cooler Master USA, Inc., Set One, # 2 Exhibit B: Defendant Cooler Master Co., Ltd.'s Objections and Responses to Plaintiffs' First Set of Requests for Admission (Nos. 1-59), # 3 Exhibit C: Defendant Cooler Master Co., Ltd.'s Amended Objections and Responses to Plaintiffs First Set of Requests for Admission (Nos. 1-59), # 4 Exhibit D: Email dated June 23, 2014, from Jeffrey Smyth to Celine Liu, # 5 Exhibit E: Email dated July 11, 2014, from Jeffrey Smyth to Elizabeth Rader)(Related document(s) 65) (Rader, Elizabeth) (Filed on 7/11/2014) (Entered: 07/11/2014)
07/11/2014	67	[Proposed] Order Granting re 65 MOTION for Discovery Pursuant to Rule 36(b) for Leave to Amend its Response to Requests for Admission filed by Cooler Master Co., Ltd.. (Rader, Elizabeth) (Filed on 7/11/2014) (Entered: 07/11/2014)
07/14/2014	68	CLERK'S NOTICE Continuing Motion Hearing as to 65 MOTION for Discovery Pursuant to Rule 36(b) for Leave to Amend its Response to Requests for Admission. This Motion has been noticed for hearing on a date that is closed to further settings. The hearing noticed for 8/28/2014 is CONTINUED to 9/4/2014 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. All other deadlines remain the same. This is a text only entry. There is no document associated with this notice. (wsn, COURT STAFF) (Filed on 7/14/2014) (Entered: 07/14/2014)
07/21/2014	69	ORDER GRANTING DEFENDANT COOLER MASTER CO., LTD.'S RULE 36(B) MOTION FOR LEAVE TO AMEND ITS RESPONSE TO REQUESTS FOR ADMISSION by Judge Jon S. Tigar granting 65 Motion for Discovery. (wsn, COURT STAFF) (Filed on 7/21/2014) (Entered: 07/21/2014)
07/24/2014	70	JOINT STIPULATION WITH [PROPOSED] ORDER to Extend Expert Discovery Deadline filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: #(1) Declaration of Jeffrey D. Smyth)(Smyth, Jeffrey) (Filed on 7/24/2014) (Entered: 07/24/2014)
07/25/2014	71	STIPULATION AND ORDER re 70 JOINT STIPULATION WITH PROPOSED ORDER to Extend Expert Discovery Deadline filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Jon S. Tigar on July 25, 2014. (wsn, COURT STAFF) (Filed on 7/25/2014) (Entered: 07/25/2014)
08/18/2014	72	MOTION & [PROPOSED] ORDER for Hearing Joint Administrative Motion Requesting Telephone Conference to Discuss Scheduling Dispositive Motions Due This Friday filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Robert F. McCauley)(McCauley, Robert) (Filed on 8/18/2014) Modified on 8/19/2014 (aaaS, COURT STAFF). (Entered: 08/18/2014)
08/18/2014	73	CLERK'S NOTICE SETTING TELEPHONIC CASE MANAGEMENT CONFERENCE. The Court sets a Telephonic Case Management Conference for 8/19/2014 at 9:00 AM. The parties shall provide to the Courtroom Deputy Clerk a single conference call number for the Court to use. The Courtroom Deputy Clerk may be reached at jstcrd@cand.uscourts.gov. This is a text only entry. There is no document associated with this notice. (wsn, COURT STAFF) (Filed on 8/18/2014) (Entered: 08/18/2014)
08/19/2014	74	Minute Entry: Telephonic Case Management Conference held on 8/19/2014 before Judge Jon S. Tigar (Date Filed: 8/19/2014). (Court Reporter: Not reported.) (wsn, COURT STAFF) (Date Filed: 8/19/2014) (Entered: 08/19/2014)
08/22/2014	75	

		STIPULATION WITH PROPOSED ORDER Joint Stipulation to Amend Scheduling Order Following Telephonic Conference With Court; Proposed Order filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Robert F. McCauley)(McCauley, Robert) (Filed on 8/22/2014) (Entered: 08/22/2014)
08/27/2014	76	SCHEDULING ORDER re 75 STIPULATION WITH PROPOSED ORDER Joint Stipulation to Amend Scheduling Order Following Telephonic Conference With Court; Proposed Order filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Jon S. Tigar on August 27, 2014. (wsn, COURT STAFF) (Filed on 8/27/2014) (Entered: 08/27/2014)
08/27/2014		Set/Reset Deadlines: Motions due by 9/5/2014. Motion Hearing set for 10/15/2014 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Further Case Management Conference set for 10/15/2014 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco. (wsn, COURT STAFF) (Filed on 8/27/2014) (Entered: 08/27/2014)
08/28/2014	77	Letter from Defendants Cooler Master Co., Ltd. and CMI USA, Inc. and Plaintiffs Asetek Holdings, Inc. and Asetek A/S re: Defendants Motion Pursuant to Fed. R. Civ. P. 26 to Strike Revised Exhibit J to the Initial Expert Report of Dr. Donald E. Tilton and Exclude Testimony About Documents Not Timely Identified in the Report. (Rader, Elizabeth) (Filed on 8/28/2014) (Entered: 08/28/2014)
09/02/2014	78	ORDER re 77 Letter, filed by Cooler Master USA Inc, Cooler Master Co., Ltd. At 10:30AM on Wednesday, September 3, 2014, the Court will conduct a telephonic conference regarding the parties' joint letter, ECF No. 77. Defendant Cooler Master Co., Ltd., will provide to the Courtroom Deputy Clerk a single conference call number for the Court to use. The Courtroom Deputy Clerk may be reached at jstcrd@cand.uscourts.gov. (This is a text-only entry. No document is associated with this order.). Signed by Judge Jon S. Tigar on September 2, 2014. (jstlc1, COURT STAFF) (Filed on 9/2/2014) (Entered: 09/02/2014)
09/03/2014		Set Deadlines/Hearings: Telephonic Case Management Conference set for 9/3/2014 at 10:30 AM in Courtroom 9, 19th Floor, San Francisco. (wsn, COURT STAFF) (Filed on 9/3/2014) (Entered: 09/03/2014)
09/03/2014	79	Minute Entry: Telephonic Further Case Management Conference held on 9/3/2014 before Judge Jon S. Tigar (Date Filed: 9/3/2014). (Court Reporter: Not reported.) (wsnS, COURT STAFF) (Date Filed: 9/3/2014) (Entered: 09/03/2014)
09/03/2014	80	Proposed Order GRANTING DEFENDANTS MOTION PURSUANT TO FED. R. CIV. P. 26 TO STRIKE REVISED EXHIBIT J TO THE INITIAL EXPERT REPORT OF DR. DONALD E. TILTON AND EXCLUDE TESTIMONY ABOUT DOCUMENTS NOT TIMELY IDENTIFIED IN THE REPORT [DOCKET 77] by CMI USA, Inc., Cooler Master Co., Ltd.. (Rader, Elizabeth) (Filed on 9/3/2014) (Entered: 09/03/2014)
09/03/2014	81	Proposed Order re 77 Letter, Asetek Holdings, Inc.'s and Asetek A/S's [Proposed] Order Regarding Parties' Joint Letter [Dkt. 77] by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 9/3/2014) (Entered: 09/03/2014)
09/03/2014	82	ORDER RESOLVING DISCOVERY DISPUTEThe Court will enter Asetek's proposed order filed on the docket at ECF No. 81. The signed order itself will be filed on the docket tomorrow. (Entered by Judge Jon S. Tigar) (Filed on 9/3/2014) (Entered: 09/03/2014)
09/04/2014	83	ORDER REGARDING PARTIES' JOINT LETTER re 77 Letter, filed by Cooler Master USA Inc, Cooler Master Co., Ltd. Signed by Judge Jon S. Tigar on September 3, 2014. (wsn, COURT STAFF) (Filed on 9/4/2014) (Entered: 09/04/2014)
09/04/2014	84	

		STIPULATION WITH [PROPOSED] ORDER; -Stipulation and Dismissal and [Proposed] Order filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 9/4/2014) (Entered: 09/04/2014)
09/05/2014	85	MINUTE ORDER NOTING DISMISSAL re 84 STIPULATION WITH PROPOSED ORDER; Stipulation and Dismissal and Proposed Order filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Jon S. Tigar on September 5, 2014. (wsn, COURT STAFF) (Filed on 9/5/2014) (Entered: 09/05/2014)
09/05/2014	86	MOTION for Summary Judgment OF (1) INVALIDITY OF U.S. PATENT NOS. 8,240,362 AND 8,245,764; AND (2) NON-INFRINGEMENT OF U.S. PATENT NO. 8,240,362 filed by CMI USA, Inc.. Motion Hearing set for 10/15/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 9/19/2014. Replies due by 9/26/2014. (Rader, Elizabeth) (Filed on 9/5/2014) (Entered: 09/05/2014)
09/05/2014	87	Declaration of GREGORY P. CARMAN, Ph.D. in Support of 86 MOTION for Summary Judgment OF (1) INVALIDITY OF U.S. PATENT NOS. 8,240,362 AND 8,245,764; AND (2) NON-INFRINGEMENT OF U.S. PATENT NO. 8,240,362 filed byCMI USA, Inc.. (Attachments: # 1 Appendix A, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3 Pt. 1, # 5 Exhibit 3 Pt. 2, # 6 Exhibit 3 Pt. 3, # 7 Exhibit 4, # 8 Exhibit 5, # 9 Exhibit 6, # 10 Exhibit 7, # 11 Exhibit 8, # 12 Exhibit 9, # 13 Exhibit 10)(Related document(s) 86) (Rader, Elizabeth) (Filed on 9/5/2014) (Entered: 09/05/2014)
09/05/2014	88	Declaration of CELINE LIU in Support of 86 MOTION for Summary Judgment OF (1) INVALIDITY OF U.S. PATENT NOS. 8,240,362 AND 8,245,764; AND (2) NON-INFRINGEMENT OF U.S. PATENT NO. 8,240,362 filed byCMI USA, Inc.. (Attachments: # 1 Exhibit 11, # 2 Exhibit 12, # 3 Exhibit 13, # 4 Exhibit 14, # 5 Exhibit 15, # 6 Exhibit 16, # 7 Exhibit 17, # 8 Exhibit 18)(Related document(s) 86) (Rader, Elizabeth) (Filed on 9/5/2014) (Entered: 09/05/2014)
09/05/2014	89	[Proposed] Order Granting re 86 MOTION for Summary Judgment OF (1) INVALIDITY OF U.S. PATENT NOS. 8,240,362 AND 8,245,764; AND (2) NON-INFRINGEMENT OF U.S. PATENT NO. 8,240,362 filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 9/5/2014) (Entered: 09/05/2014)
09/05/2014	90	Administrative Motion to File Under Seal DOCUMENTS SUPPORTING ITS FED. R. CIV. P. 12(b)(1) MOTION TO DISMISS ASETEK HOLDINGS, INC. AS PLAINTIFF FOR LACK OF STANDING filed by CMI USA, Inc.. (Attachments: # 1 Declaration, # 2 Proposed Order, # 3 Exhibit, # 4 Exhibit, # 5 Exhibit, # 6 Exhibit, # 7 Exhibit, # 8 Exhibit, # 9 Exhibit, # 10 Exhibit)(Rader, Elizabeth) (Filed on 9/5/2014) Modified on 9/23/2014 (wsn, COURT STAFF). (Entered: 09/05/2014)
09/05/2014	91	MOTION to Dismiss ASETEK HOLDINGS, INC. AS PLAINTIFF FOR LACK OF STANDING filed by CMI USA, Inc.. Motion Hearing set for 10/15/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 9/19/2014. Replies due by 9/26/2014. (Attachments: # 1 Declaration, # 2 Exhibit 1 pt. 1, # 3 Exhibit 1 pt. 2, # 4 Exhibit 2, # 5 Exhibit 3, # 6 Exhibit 4, # 7 Exhibit 5, # 8 Exhibit 6, # 9 Proposed Order)(Rader, Elizabeth) (Filed on 9/5/2014) (Entered: 09/06/2014)
09/10/2014	92	MOTION to Exclude Testimony; -Plaintiffs Asetek Holdings, Inc.'s and Asetek A/S's Motion to Exclude Testimony of Defendant CMI USA, Inc.'s Expert Gregory P. Carman filed by Asetek A/S, Asetek Holdings, Inc. Motion Hearing set for 10/16/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 9/24/2014. Replies due by 10/1/2014. (Attachments: # 1 Proposed Order, # 2 Declaration of Jeffrey D. Smyth, # 3 Exhibit A, # 4 Exhibit B, # 5 Exhibit C, # 6 Exhibit D, # 7 Exhibit E, # 8 Exhibit F)(Smyth, Jeffrey) (Filed on 9/10/2014) (Entered: 09/10/2014)
09/10/2014	93	STIPULATION WITH [PROPOSED] ORDER re 92 MOTION to Exclude Testimony; -Plaintiffs Asetek Holdings, Inc.'s and Asetek A/S's Motion to

		Exclude Testimony of Defendant CMI USA, Inc.'s Expert Gregory P. Carman; -Joint Stipulated Request for Order Changing Time for Hearing Plaintiffs' Motion to Exclude Testimony of Dr. Gregory P. Carman filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Jeffrey D. Smyth)(Smyth, Jeffrey) (Filed on 9/10/2014) (Entered: 09/10/2014)
09/11/2014	94	STIPULATION AND ORDER re 93 STIPULATION WITH PROPOSED ORDER re 92 MOTION to Exclude Testimony Plaintiffs Asetek Holdings, Inc.'s and Asetek A/S's Motion to Exclude Testimony of Defendant CMI USA, Inc.'s Expert Gregory P. Carman filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Jon S. Tigar on September 11, 2014. (wsn, COURT STAFF) (Filed on 9/11/2014) (Entered: 09/11/2014)
09/11/2014		Set/Reset Deadlines as to 92 MOTION to Exclude Testimony Plaintiffs Asetek Holdings, Inc.'s and Asetek A/S's Motion to Exclude Testimony of Defendant CMI USA, Inc.'s Expert Gregory P. Carman. Motion Hearing set for 10/15/2014 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. (wsn, COURT STAFF) (Filed on 9/11/2014) (Entered: 09/11/2014)
09/12/2014	95	NOTICE of Appearance by Erik Raymond Puknys (Puknys, Erik) (Filed on 9/12/2014) (Entered: 09/12/2014)
09/15/2014	96	ORDER DENYING ADMINISTRATIVE MOTION TO FILE UNDER SEAL by Judge Jon S. Tigar; denying 90 Administrative Motion to File Under Seal. (wsn, COURT STAFF) (Filed on 9/15/2014) (Entered: 09/15/2014)
09/16/2014	97	MOTION for Leave to File; Asetek's Unopposed Administrative Motion for Leave to Submit a Declaration in Support of CMI USA, Inc.'s Administrative Motion to File Under Seal (Dkt. 90) and for an Order Granting the Motion to Seal and Vacating the Previous Denial filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: #(1) Declaration of Jeffery D. Smyth, #(2) Proposed Order) (Smyth, Jeffrey) (Filed on 9/16/2014) (Entered: 09/16/2014)
09/18/2014	98	Statement of Non-Opposition to re 91 MOTION to Dismiss ASETEK HOLDINGS, INC. AS PLAINTIFF FOR LACK OF STANDING filed by Asetek A/S, Asetek Holdings, Inc. (Related document(s) 91) (Smyth, Jeffrey) (Filed on 9/18/2014) (Entered: 09/18/2014)
09/19/2014	99	RESPONSE to (re 86 MOTION for Summary Judgment OF (1) INVALIDITY OF U.S. PATENT NOS. 8,240,362 AND 8,245,764; AND (2) NON-INFRINGEMENT OF U.S. PATENT NO. 8,240,362); -Plaintiffs Asetek Holdings, Inc.'s and Asetek A/S's Opposition to Defendant CMI USA, Inc.'s Motion for Summary Judgment of (1) Invalidity of U.S. Patent Nos. 8,240,362 and 8,245,764; and (2) Non-Infringement of U.S. Patent No. 8,240,362 filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Jeffrey D. Smyth, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F)(Smyth, Jeffrey) (Filed on 9/19/2014) (Entered: 09/19/2014)
09/23/2014	100	ORDER GRANTING LEAVE TO FILE DECLARATION IN SUPPORT OF ADMINISTRATIVE MOTION TO FILE UNDER SEAL AND GRANTING ADMINISTRATIVE MOTION TO FILE UNDER SEAL by Judge Jon S. Tigar; granting 90 Administrative Motion to File Under Seal; granting 97 Motion for Leave to File. (wsn, COURT STAFF) (Filed on 9/23/2014) (Entered: 09/23/2014)
09/24/2014	101	RESPONSE (re 92 MOTION to Exclude Testimony Plaintiffs Asetek Holdings, Inc.'s and Asetek A/S's Motion to Exclude Testimony of Defendant CMI USA, Inc.'s Expert Gregory P. Carman) filed byCMI USA, Inc.. (Rader, Elizabeth) (Filed on 9/24/2014) (Entered: 09/24/2014)
09/24/2014	102	Declaration of CELINE LIU in Support of 101 Opposition/Response to Motion, TO EXCLUDE TESTIMONY OF CMI USA, INC.S EXPERT GREGORY P. CARMAN filed byCMI USA, Inc.. (Attachments: # 1 Exhibit 1, # 2 Exhibit 2, # 3 Exhibit 3, # 4 Exhibit 4, # 5 Exhibit 5, # 6 Exhibit 6, # 7 Exhibit 7,

		# 8 Exhibit 8, # 9 Exhibit 9, # 10 Exhibit 10, # 11 Exhibit 11, # 12 Exhibit 12, # 13 Exhibit 13, # 14 Exhibit 14, # 15 Exhibit 15, # 16 Exhibit 16, # 17 Exhibit 17, # 18 Exhibit 18, # 19 Exhibit 19, # 20 Exhibit 20, # 21 Exhibit 21)(Related document(s) 101) (Rader, Elizabeth) (Filed on 9/24/2014) (Entered: 09/24/2014)
09/25/2014	103	STIPULATION WITH PROPOSED ORDER EXTENDING TIME TO FILE DEFENDANT CMI USA, INC.S REPLY IN SUPPORT OF ITS MOTION FOR SUMMARY JUDGMENT OF (1) INVALIDITY OF U.S. PATENT NOS. 8,240,362 AND 8,245,764; AND (2) NON-INFRINGEMENT OF U.S. PATENT NO. 8,240,362 filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 9/25/2014) (Entered: 09/25/2014)
09/26/2014	104	STIPULATION AND ORDER re 103 STIPULATION WITH PROPOSED ORDER EXTENDING TIME TO FILE DEFENDANT CMI USA, INC.S REPLY IN SUPPORT OF ITS MOTION FOR SUMMARY JUDGMENT OF (1) INVALIDITY OF U.S. PATENT NOS. 8,240,362 AND 8,245,764; AND (2) NON-INFRINGEMENT OF U.S. PATENT NO. 8,240,362 filed by CMI USA, Inc. Signed by Judge Jon S. Tigar on September 26, 2014. (wsn, COURT STAFF) (Filed on 9/26/2014) (Entered: 09/26/2014)
09/29/2014	105	Administrative Motion to File Under Seal filed by CMI USA, Inc.. (Attachments: # 1 Declaration, # 2 Proposed Order, # 3 Exhibit Redacted Version of Reply, # 4 Exhibit Unredacted Version of Reply, # 5 Exhibit Redacted Version of Exhibit 19, # 6 Exhibit Unredacted Version of Exhibit 19, # 7 Exhibit Redacted Version of Exhibit 20, # 8 Exhibit Unredacted Version of Exhibit 20)(Rader, Elizabeth) (Filed on 9/29/2014) (Entered: 09/29/2014)
09/29/2014	106	REPLY (re 86 MOTION for Summary Judgment OF (1) INVALIDITY OF U.S. PATENT NOS. 8,240,362 AND 8,245,764; AND (2) NON-INFRINGEMENT OF U.S. PATENT NO. 8,240,362) filed byCMI USA, Inc.. (Rader, Elizabeth) (Filed on 9/29/2014) (Entered: 09/29/2014)
09/29/2014	107	Declaration of ELIZABETH H. RADER in Support of 106 Reply to Opposition/Response to (1) MOTION FOR SUMMARY JUDGMENT OF INVALIDITY OF U.S. PATENT NOS. 8,240,362 AND 8,245,764; AND (2) MOTION FOR PARTIAL SUMMARY JUDGMENT OF NONINFRINGEMENT OF U.S. PATENT NOS. 8,240,362 AND 8,245,764 filed byCMI USA, Inc.. (Attachments: # 1 Exhibit 19, # 2 Exhibit 20, # 3 Exhibit 21, # 4 Exhibit 22)(Related document(s) 106) (Rader, Elizabeth) (Filed on 9/29/2014) (Entered: 09/29/2014)
09/30/2014	108	CASE MANAGEMENT STATEMENT FURTHER JOINT CASE MANAGEMENT STATEMENT filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 9/30/2014) (Entered: 09/30/2014)
10/01/2014	109	REPLY (re 92 MOTION to Exclude Testimony Plaintiffs Asetek Holdings, Inc.'s and Asetek A/S's Motion to Exclude Testimony of Defendant CMI USA, Inc.'s Expert Gregory P. Carman) filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Robert F. McCauley, # 2 Exhibit G, # 3 Exhibit H)(McCauley, Robert) (Filed on 10/1/2014) (Entered: 10/01/2014)
10/03/2014	110	Declaration of Jeffrey D. Smyth in Support of 105 Administrative Motion to File Under Seal filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Proposed Order)(Related document(s) 105) (McCauley, Robert) (Filed on 10/3/2014) (Entered: 10/03/2014)
10/03/2014	111	Declaration of Jeffrey D. Smyth in Support of 105 Administrative Motion to File Under Seal CORRECTION OF DOCKET # 110 filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Proposed Order)(Related document(s) 105) (Smyth, Jeffrey) (Filed on 10/3/2014) (Entered: 10/03/2014)
10/14/2014	112	ORDER GRANTING DEFENDANT'S MOTION TO DISMISS ASETEK HOLDINGS, INC. AS PLAINTIFF FOR LACK OF STANDING by Judge Jon S.

		Tigar; granting 91 Motion to Dismiss. (wsn, COURT STAFF) (Filed on 10/14/2014) (Entered: 10/14/2014)
10/14/2014	113	ORDER GRANTING ADMINISTRATIVE MOTION TO FILE UNDER SEAL by Judge Jon S. Tigar; granting 105 Administrative Motion to File Under Seal. (wsn, COURT STAFF) (Filed on 10/14/2014) (Entered: 10/14/2014)
10/14/2014	114	ORDER REGARDING FORMAT OF PENDING MOTIONSThe rules of the Court require that "[t]ypewritten text may be no less than standard pica or 12-point type in the Courier font or equivalent, spaced 10 characters per horizontal inch." Civil L.R. 3-4(c)(2). In reviewing the materials submitted in connection with tomorrow's hearing, it appears that some of the briefs may have been printed in a smaller font than is permitted by the Local Rules.Accordingly, counsel for each party are ordered to certify in writing, by 5:30 p.m. today, that all materials submitted in support of or opposition to Defendant CMI USA, Inc.'s Motion for Summary Judgment, ECF No. 86, and in support of or opposition to Plaintiffs' Motion to Exclude Testimony of Defendant CMI USA, Inc.'s Expert Gregory P. Carman, ECF No. 92, are in a font that complies with Local Rule 304(c)(2), and not, for example, in 11.5-point Times Roman.(Entered by Judge Jon S. Tigar) (Filed on 10/14/2014) (Entered: 10/14/2014)
10/14/2014	115	Brief re 114 Order - CERTIFICATION OF ELIZABETH H. RADER THAT DEFENDANT'S MATERIALS CONFORM TO LOCAL RULE 3-4(c)(2) filed by CMI USA, Inc.. (Related document(s) 114) (Rader, Elizabeth) (Filed on 10/14/2014) (Entered: 10/14/2014)
10/14/2014	116	NOTICE filed by Asetek A/S re 114 Order - Plaintiff Asetek A/S's Certification in Response to Court's Order Regarding Format of Pending Motions (Smyth, Jeffrey) (Filed on 10/14/2014) (Entered: 10/14/2014)
10/14/2014	117	STIPULATION WITH [PROPOSED] ORDER; Stipulated Request for Order re Materials for Hearing; [Proposed] Order filed by Asetek A/S. (McCauley, Robert) (Filed on 10/14/2014) (Entered: 10/14/2014)
10/14/2014	118	Unopposed Administrative Motion to Change Named Plaintiff to Asetek Danmark A/S; Supporting Declaration; [Proposed] Order filed by Asetek A/S. (McCauley, Robert) (Filed on 10/14/2014) (Entered: 10/14/2014)
10/15/2014	119	STIPULATION AND ORDER re 117 STIPULATION WITH PROPOSED ORDER; Stipulated Request for Order re Materials for Hearing; Proposed Order filed by Asetek A/S. Signed by Judge Jon S. Tigar on October 15, 2014. (wsn, COURT STAFF) (Filed on 10/15/2014) (Entered: 10/15/2014)
10/15/2014	120	Minute Entry: Motion Hearing held on 10/15/2014 before Judge Jon S. Tigar (Date Filed: 10/15/2014) re 92 MOTION to Exclude Testimony Plaintiffs Asetek Holdings, Inc.'s and Asetek A/S's Motion to Exclude Testimony of Defendant CMI USA, Inc.'s Expert Gregory P. Carman filed by Asetek Holdings, Inc, Asetek A/S; 86 MOTION for Summary Judgment OF (1) INVALIDITY OF U.S. PATENT NOS. 8,240,362 AND 8,245,764; AND (2) NON-INFRINGEMENT OF U.S. PATENT NO. 8,240,362 filed by CMI USA, Inc., Further Case Management Conference held on 10/15/2014 before Judge Jon S. Tigar (Date Filed: 10/15/2014). (Court Reporter: Belle Ball.) (wsn, COURT STAFF) (Date Filed: 10/15/2014) (Entered: 10/15/2014)
10/16/2014	121	ORDER by Judge Jon S. Tigar granting 118 Motion to Change Named Plaintiff to Asetek Danmark A/S. (wsn, COURT STAFF) (Filed on 10/16/2014) (Entered: 10/16/2014)
10/16/2014	122	TRANSCRIPT ORDER by Asetek Danmark A/S for Court Reporter Belle Ball. (McCauley, Robert) (Filed on 10/16/2014) (Entered: 10/16/2014)
10/16/2014	123	TRANSCRIPT ORDER by CMI USA, Inc. for Court Reporter Belle Ball. (Rader, Elizabeth) (Filed on 10/16/2014) (Entered: 10/16/2014)
10/16/2014	124	

		PRETRIAL ORDER RE JURY ISSUES. Signed by Judge Jon S. Tigar on October 16, 2014. (wsn, COURT STAFF) (Filed on 10/16/2014) (Entered: 10/17/2014)
10/21/2014	125	REDACTION of REPLY [DKT 106] (re 86 MOTION for Summary Judgment OF (1) INVALIDITY OF U.S. PATENT NOS. 8,240,362 AND 8,245,764; AND (2) NON-INFRINGEMENT OF U.S. PATENT NO. 8,240,362) and Exhibit 19 & Exhibit 20 to Declaration of ELIZABETH H. RADER in Support of Reply [DKT 107] per ORDER GRANTING ADMINISTRATIVE MOTION TO FILE UNDER SEAL[DKT 113] by CMI USA, Inc.. (Attachments: # 1 Exhibit 19, # 2 Exhibit 20 (Redacted))(Rader, Elizabeth) (Filed on 10/21/2014) (Entered: 10/21/2014)
11/03/2014	126	ORDER DENYING MOTION FOR SUMMARY JUDGMENT AND DENYING MOTION TO EXCLUDE EXPERT TESTIMONY by Judge Jon S. Tigar; denying 86 Motion for Summary Judgment; denying 92 Motion to Exclude Testimony. (wsn, COURT STAFF) (Filed on 11/3/2014) (Entered: 11/03/2014)
11/03/2014	127	STIPULATION WITH [PROPOSED] ORDER; Joint Stipulated Request to Continue Filing Date of Motions in limine by One Day filed by Asetek Danmark A/S. (McCauley, Robert) (Filed on 11/3/2014) (Entered: 11/03/2014)
11/03/2014	128	STIPULATION AND ORDER re 127 STIPULATION WITH PROPOSED ORDER; Joint Stipulated Request to Continue Filing Date of Motions in limine by One Day filed by Asetek Danmark A/S. Signed by Judge Jon S. Tigar on November 3, 2014. (wsn, COURT STAFF) (Filed on 11/3/2014) (Entered: 11/03/2014)
11/04/2014	129	Administrative Motion to File Under Seal filed by Asetek Danmark A/S. (Attachments: # 1 Declaration of Robert F. McCauley, # 2 Proposed Order, # 3 Exhibit B Submitted for Filing Under Seal, # 4 Exhibit C Submitted for Filing Under Seal, # 5 Exhibit D Submitted for Filing Under Seal)(McCauley, Robert) (Filed on 11/4/2014) (Entered: 11/04/2014)
11/04/2014	130	Joint Pretrial Conference Statement; [Proposed] Order filed by Asetek Danmark A/S . (Attachments: # 1 Exhibit A, # 2 Exhibit B cover page only, # 3 Exhibit C cover page only, # 4 Exhibit D cover page only) (McCauley, Robert) (Filed on 11/4/2014) (Entered: 11/04/2014)
11/05/2014	131	CERTIFICATE OF SERVICE by Asetek Danmark A/S re 129 Administrative Motion to File Under Seal (McCauley, Robert) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	132	MOTION for Leave to Appear in Pro Hac Vice, (Filing Fee: $305.00, receipt number 0971-9050197.) filed by CMI USA, Inc.. (Attachments: #(1) Exhibit Certificate of Good Standing)(Smith, Frank) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	133	MOTION in Limine NO. 2 TO PRECLUDE ARGUMENT OR TESTIMONY THAT CMI USA, INC. OR OTHERS COPIED ASETEKS PRODUCTS filed by CMI USA, Inc.. Motion Hearing set for 11/14/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 11/11/2014. (Rader, Elizabeth) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	134	MOTION in Limine NO. 3 TO PRECLUDE CERTAIN TESTIMONY BY ANDR ERIKSEN filed by CMI USA, Inc.. Motion Hearing set for 11/14/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 11/11/2014. (Rader, Elizabeth) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	135	MOTION in Limine NO. 4 TO EXCLUDE MAGAZINE ARTICLES, WEBSITES, PRESS RELEASES AND RELATED EXHIBITS filed by CMI USA, Inc.. Motion Hearing set for 11/14/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 11/11/2014. (Rader, Elizabeth) (Filed on 11/5/2014) (Entered: 11/05/2014)

11/05/2014	136	Administrative Motion to File Under Seal filed by CMI USA, Inc.. (Attachments: # 1 Declaration CELINE LIU IN SUPPORT OF DEFENDANT CMI USA, INC.S ADMINISTRATIVE MOTION TO FILE UNDER SEAL, # 2 Proposed Order, # 3 Exhibit UNREDACTED VERSION OF MOTION IN LIMINE NO. 1 TO PRECLUDE DR. NISHA M. MODYS OPINION USING LOST PROFITS AS A BASIS FOR CALCULATING REASONABLE ROYALTY, # 4 Exhibit UNREDACTED VERSION OF EXHIBIT 1 TO THE DECLARATION OF ELIZABETH H. RADER, IN SUPPORT OF DEFENDANT CMI USA, INC.S MOTIONS IN LIMINE)(Rader, Elizabeth) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	137	Declaration of ELIZABETH H. RADER IN SUPPORT OF DEFENDANT CMI USA, INC.S MOTIONS IN LIMINE (dkt nos. 133, 134, 135) filed by CMI USA, Inc.. (Attachments: # 1 Exhibit 1, # 2 Exhibit 2, # 3 Exhibit 3, # 4 Exhibit 4, # 5 Exhibit 5, # 6 Exhibit 6)(Rader, Elizabeth) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	138	[Proposed] Order Granting re 133 DEFENDANT CMI USA, INC.S MOTION IN LIMINE NO. 1 TO PRECLUDE DR. NISHA M. MODYS OPINION USING LOST PROFITS AS A BASIS FOR CALCULATING REASONABLE ROYALTY filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	139	[Proposed] Order Granting re 133 MOTION in Limine NO. 2 TO PRECLUDE ARGUMENT OR TESTIMONY THAT CMI USA, INC. OR OTHERS COPIED ASETEKS PRODUCTS filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	140	[Proposed] Order Granting re 134 MOTION in Limine NO. 3 TO PRECLUDE CERTAIN TESTIMONY BY ANDR ERIKSEN filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	141	[Proposed] Order Granting re 135 MOTION in Limine NO. 4 TO EXCLUDE MAGAZINE ARTICLES, WEBSITES, PRESS RELEASES AND RELATED EXHIBITS filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	142	MOTION in Limine - Plaintiff Asetek Danmark A/S's Motion in Limine No. 1 to Exclude Expert Testimony That Certain Claim Limitations Are Inherently Present in Ryu and That Ryu Anticipates Asetek's '362 Patent filed by Asetek Danmark A/S. Motion Hearing set for 11/14/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 11/11/2014. (Smyth, Jeffrey) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	143	MOTION in Limine No. 2 to Preclude Testimony From Witness Not Timely Disclosed filed by Asetek Danmark A/S. Motion Hearing set for 11/14/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 11/11/2014. (Smyth, Jeffrey) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	144	MOTION in Limine No. 4 Regarding the Admissibility of Articles Regarding the Accused Products filed by Asetek Danmark A/S. Motion Hearing set for 11/14/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 11/11/2014. (Smyth, Jeffrey) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	145	MOTION in Limine No. 5 Regarding the Admissibility of Emails Regarding Operation of the Accused Products filed by Asetek Danmark A/S. Motion Hearing set for 11/14/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 11/11/2014. (Smyth, Jeffrey) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	146	MOTION in Limine No. 3 to Preclude CMI USA From Asseting Simultaneous Invention as an Alleged Secondary Consideration of Obviousness filed by Asetek Danmark A/S. Motion Hearing set for 11/14/2014 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar.

		Responses due by 11/11/2001. (Smyth, Jeffrey) (Filed on 11/5/2014) (Entered: 11/05/2014)
11/05/2014	147	Declaration in Support of re 144 MOTION in Limine No. 4 Regarding the Admissibility of Articles Regarding the Accused Products, re 143 MOTION in Limine No. 2 to Preclude Testimony From Witness Not Timely Disclosed, re 145 MOTION in Limine No. 5 Regarding the Admissibility of Emails Regarding Operation of the Accused Products, re 146 MOTION in Limine No. 3 to Preclude CMI USA From Asseting Simultaneous Invention as an Alleged Secondary Consideration of Obviousness, re 142 MOTION in Limine Plaintiff Asetek Danmark A/S's Motion in Limine No. 1 to Exclude Expert Testimony That Certain Claim Limitations Are Inherently Present in Ryu and That Ryu Anticipates Asetek's '362 Patent filed by Asetek Danmark A/S. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F, # 7 Exhibit G, # 8 Exhibit H, # 9 Exhibit I, # 10 Exhibit J, # 11 Exhibit K, # 12 Exhibit L, # 13 Exhibit M) (Related document(s) 144 , 143 , 145 , 146 , 142) (Smyth, Jeffrey) (Filed on 11/5/2014) (Entered: 11/06/2014)
11/06/2014	148	[Proposed] Order Granting re 144 MOTION in Limine No. 4 Regarding the Admissibility of Articles Regarding the Accused Products, re 143 MOTION in Limine No. 2 to Preclude Testimony From Witness Not Timely Disclosed, re 142 MOTION in Limine Plaintiff Asetek Danmark A/S's Motion in Limine No. 1 to Exclude Expert Testimony That Certain Claim Limitations Are Inherently Present in Ryu and That Ryu Anticipates Asetek's '362 Patent, re 145 MOTION in Limine No. 5 Regarding the Admissibility of Emails Regarding Operation of the Accused Products, re 146 MOTION in Limine No. 3 to Preclude CMI USA From Asseting Simultaneous Invention as an Alleged Secondary Consideration of Obviousness filed by Asetek Danmark A/S. (Smyth, Jeffrey) (Filed on 11/6/2014) (Entered: 11/06/2014)
11/06/2014	149	ORDER GRANTING APPLICATION FOR ADMISSION OF ATTORNEY FRANK G. SMITH III PRO HAC VICE by Judge Jon S. Tigar; granting 132 Motion for Pro Hac Vice. (wsn, COURT STAFF) (Filed on 11/6/2014) (Entered: 11/06/2014)
11/06/2014	150	STIPULATION WITH PROPOSED ORDER; -JOINT STIPULATED REQUEST TO CONTINUE FILING DATE OF JURY VOIR DIRE QUESTIONS, PROPOSED JURY INSTRUCTIONS AND PROPOSED JURY VERDICT FORMS BY ONE DAY filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 11/6/2014) (Entered: 11/06/2014)
11/06/2014	151	STIPULATION AND ORDER re 150 STIPULATION WITH PROPOSED ORDER -JOINT STIPULATED REQUEST TO CONTINUE FILING DATE OF JURY VOIR DIRE QUESTIONS, PROPOSED JURY INSTRUCTIONS AND PROPOSED JURY VERDICT FORMS BY ONE DAY filed by CMI USA, Inc. Signed by Judge Jon S. Tigar on November 6, 2014. (wsn, COURT STAFF) (Filed on 11/6/2014) (Entered: 11/06/2014)
11/07/2014	152	Proposed Jury Instructions by Asetek Danmark A/S - Joint Proposed Jury Instructions. (McCauley, Robert) (Filed on 11/7/2014) (Entered: 11/07/2014)
11/07/2014	153	Proposed Voir Dire by Asetek Danmark A/S - Joint Proposed Jury Voir Dire Questions. (McCauley, Robert) (Filed on 11/7/2014) (Entered: 11/07/2014)
11/07/2014	154	Proposed Form of Verdict by Asetek Danmark A/S - Asetek's Proposed Verdict Form. (McCauley, Robert) (Filed on 11/7/2014) (Entered: 11/07/2014)
11/07/2014	155	Proposed Form of Verdict by CMI USA, Inc. - DEFENDANT CMI USA, INC.S PROPOSED VERDICT FORM. (Rader, Elizabeth) (Filed on 11/7/2014) (Entered: 11/07/2014)
11/10/2014	156	MOTION for Leave to Appear in Pro Hac Vice; Application for Admission of Attorney Pro Hac Vice; [Proposed] Order, (Filing Fee: $305.00, receipt

		number 0971-9061646) filed by Asetek Danmark A/S. (Attachments: #(1) Certificate of Good Standing)(Bhattacharyya, Arpita) (Filed on 11/10/2014) (Entered: 11/10/2014)
11/10/2014	157	ORDER GRANTING APPLICATION FOR ADMISSION OF ATTORNEY ARPITA BHATTACHARYYA PRO HAC VICE by Judge Jon S. Tigar; granting 156 Motion for Pro Hac Vice. (wsn, COURT STAFF) (Filed on 11/10/2014) (Entered: 11/10/2014)
11/10/2014	158	EXHIBITS re 136 Administrative Motion to File Under Seal; --Declaration of Jeffrey D. Smyth in Support of CMI USA's Administrative Motion to File Under Seal Documents Supporting Motions in Limine filed by Asetek Danmark A/S. (Attachments: # 1 Proposed Order, # 2 Confidential, Highlighted CMI USA, Inc.'s Motion in Limine No. 1, # 3 Confidential, Highlighted Ex. 1 to the Declaration of Elizabeth Rader)(Related document (s) 136) (Smyth, Jeffrey) (Filed on 11/10/2014) (Entered: 11/10/2014)
11/10/2014	159	CERTIFICATE OF SERVICE by Asetek Danmark A/S re 158 Exhibits to an Administrative Motion to File Under Seal,, (Smyth, Jeffrey) (Filed on 11/10/2014) (Entered: 11/10/2014)
11/11/2014	160	Statement of Non-Opposition re 142 MOTION in Limine Plaintiff Asetek Danmark A/S's Motion in Limine No. 1 to Exclude Expert Testimony That Certain Claim Limitations Are Inherently Present in Ryu and That Ryu Anticipates Asetek's '362 Patent filed byCMI USA, Inc.. (Related document (s) 142) (Rader, Elizabeth) (Filed on 11/11/2014) (Entered: 11/11/2014)
11/11/2014	161	RESPONSE (re 143 MOTION in Limine No. 2 to Preclude Testimony From Witness Not Timely Disclosed) filed byCMI USA, Inc.. (Rader, Elizabeth) (Filed on 11/11/2014) (Entered: 11/11/2014)
11/11/2014	162	RESPONSE (re 144 MOTION in Limine No. 4 Regarding the Admissibility of Articles Regarding the Accused Products) filed byCMI USA, Inc.. (Rader, Elizabeth) (Filed on 11/11/2014) (Entered: 11/11/2014)
11/11/2014	163	RESPONSE (re 145 MOTION in Limine No. 5 Regarding the Admissibility of Emails Regarding Operation of the Accused Products) filed byCMI USA, Inc.. (Rader, Elizabeth) (Filed on 11/11/2014) (Entered: 11/11/2014)
11/11/2014	164	RESPONSE (re 146 MOTION in Limine No. 3 to Preclude CMI USA From Asseting Simultaneous Invention as an Alleged Secondary Consideration of Obviousness) filed byCMI USA, Inc.. (Rader, Elizabeth) (Filed on 11/11/2014) (Entered: 11/11/2014)
11/11/2014	165	Administrative Motion to File Under Seal filed by Asetek Danmark A/S. (Attachments: # 1 Declaration of Robert F. McCauley, # 2 Proposed Order, # 3 Highlighted Version of Asetek's Opposition to CMI USA's MIL No. 1, # 4 REdacted Version of Asetek's Opposition to CMI USA's MIL No. 1, # 5 Highlighted Version of Ex. F, # 6 Highlighted Version of Ex. G, # 7 Redacted Version of Ex. F, # 8 Redacted Version of Ex. G)(McCauley, Robert) (Filed on 11/11/2014) (Entered: 11/11/2014)
11/11/2014	166	RESPONSE to (re 136 Administrative Motion to File Under Seal); -Asetek Danmark A/S's Opposition to Defendant CMI USA, Inc.'s Motion in Limine No. 1 to Preclude Dr. Nisha M. Mody's Opinion Using Lost Profits as a Basis for Calculating Reasonable Royalty [REDACTED VERSION] filed by Asetek Danmark A/S. (McCauley, Robert) (Filed on 11/11/2014) (Entered: 11/11/2014)
11/11/2014	167	RESPONSE (re 133 MOTION in Limine NO. 2 TO PRECLUDE ARGUMENT OR TESTIMONY THAT CMI USA, INC. OR OTHERS COPIED ASETEKS PRODUCTS) filed byAsetek Danmark A/S. (McCauley, Robert) (Filed on 11/11/2014) (Entered: 11/11/2014)
11/11/2014	168	RESPONSE (re 134 MOTION in Limine NO. 3 TO PRECLUDE CERTAIN TESTIMONY BY ANDR ERIKSEN) filed byAsetek Danmark A/S. (McCauley, Robert) (Filed on 11/11/2014) (Entered: 11/11/2014)
11/11/2014	169	

		RESPONSE (re 135 MOTION in Limine NO. 4 TO EXCLUDE MAGAZINE ARTICLES, WEBSITES, PRESS RELEASES AND RELATED EXHIBITS) filed byAsetek Danmark A/S. (McCauley, Robert) (Filed on 11/11/2014) (Entered: 11/11/2014)
11/11/2014	170	Declaration of Robert F. McCauley in Support of 167 Opposition/Response to Motion, 168 Opposition/Response to Motion, 166 Opposition/Response to Motion, 169 Opposition/Response to Motion filed byAsetek Danmark A/S. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F [REDACTED], # 7 Exhibit G [REDACTED], # 8 Exhibit H, # 9 Exhibit I)(Related document(s) 167 , 168 , 166 , 169) (McCauley, Robert) (Filed on 11/11/2014) (Entered: 11/12/2014)
11/12/2014	171	CERTIFICATE OF SERVICE by Asetek Danmark A/S re 165 Administrative Motion to File Under Seal (McCauley, Robert) (Filed on 11/12/2014) (Entered: 11/12/2014)
11/13/2014	172	JOINT STIPULATION WITH [PROPOSED] ORDER TO SUBMIT AMENDED EXHIBITS B-D TO THE PRETRIAL CONFERENCE STATEMENT AND FOR WITHDRAWAL OF RELATED MOTION TO SEAL filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 11/13/2014) (Entered: 11/13/2014)
11/14/2014	173	Minute Entry for proceedings held before Hon. Jon S. Tigar: Pretrial Conference held on 11/14/2014. (Date Filed: 11/14/2014), Motion Hearing held on 11/14/2014. (Date Filed: 11/14/2014) re 144 MOTION in Limine No. 4 Regarding the Admissibility of Articles Regarding the Accused Products filed by Asetek Danmark A/S, 134 MOTION in Limine NO. 3 TO PRECLUDE CERTAIN TESTIMONY BY ANDR ERIKSEN filed by CMI USA, Inc., 135 MOTION in Limine NO. 4 TO EXCLUDE MAGAZINE ARTICLES, WEBSITES, PRESS RELEASES AND RELATED EXHIBITS filed by CMI USA, Inc., 136 Administrative Motion to File Under Seal filed by CMI USA, Inc., 143 MOTION in Limine No. 2 to Preclude Testimony From Witness Not Timely Disclosed filed by Asetek Danmark A/S, 142 MOTION in Limine Plaintiff Asetek Danmark A/S's Motion in Limine No. 1 to Exclude Expert Testimony That Certain Claim Limitations Are Inherently Present in Ryu and That Ryu Anticipates Asetek's '362 Patent filed by Asetek Danmark A/S, 145 MOTION in Limine No. 5 Regarding the Admissibility of Emails Regarding Operation of the Accused Products filed by Asetek Danmark A/S, 133 MOTION in Limine NO. 2 TO PRECLUDE ARGUMENT OR TESTIMONY THAT CMI USA, INC. OR OTHERS COPIED ASETEKS PRODUCTS filed by CMI USA, Inc., 146 MOTION in Limine No. 3 to Preclude CMI USA From Asseting Simultaneous Invention as an Alleged Secondary Consideration of Obviousness filed by Asetek Danmark A/S Court Reporter Name: Diane Skillman. (wsn, COURT STAFF) (Entered: 11/14/2014)
11/17/2014		Set Deadlines/Hearings: First day of Jury Trial continued to 12/2/2014 at 8:30 AM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. (wsn, COURT STAFF) (Filed on 11/17/2014) (Entered: 11/17/2014)
11/17/2014	174	ORDER GRANTING ADMINISTRATIVE MOTIONS TO FILE UNDER SEAL by Judge Jon S. Tigar; finding as moot 129 Administrative Motion to File Under Seal; granting 136 Administrative Motion to File Under Seal; granting 165 Administrative Motion to File Under Seal; granting 172 Stipulation. (wsn, COURT STAFF) (Filed on 11/17/2014) (Entered: 11/17/2014)
11/17/2014	175	TRANSCRIPT ORDER for Daily Trial by Asetek Danmark A/S. (McCauley, Robert) (Filed on 11/17/2014) (Entered: 11/17/2014)
11/17/2014	176	TRANSCRIPT ORDER for Daily Trial by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 11/17/2014) (Entered: 11/17/2014)
11/17/2014	177	TRANSCRIPT ORDER by CMI USA, Inc. for Court Reporter Diane Skillman. (Rader, Elizabeth) (Filed on 11/17/2014) (Entered: 11/17/2014)
11/19/2014	178	

		ORDER DENYING DEFENDANTS MOTION IN LIMINE NOS. 3 AND 4 by Judge Jon S. Tigar denying 134 Motion in Limine; denying 135 Motion in Limine. (wsn, COURT STAFF) (Filed on 11/19/2014) (Entered: 11/19/2014)
11/21/2014	179	Transcript of Proceedings held on October 15, 2014, before Judge Jon S. Tigar. Court Reporter Belle Ball, CSR, CRR, RDR, belle_ball@cand.uscourts.gov, telephone number (415)373-2529. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter until the deadline for the Release of Transcript Restriction. After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 122 Transcript Order) Release of Transcript Restriction set for 2/19/2015. (Related documents(s) 122) (Ball, Belle) (Filed on 11/21/2014) (Entered: 11/21/2014)
11/24/2014	180	CLERK'S NOTICE SETTING TELEPHONIC CASE MANAGEMENT CONFERENCE. At the request of the parties a Telephonic Case Management Conference is set for 11/25/2014 at 9:00 AM in Courtroom 9, 19th Floor, San Francisco. The parties shall provide the Courtroom Deputy Clerk one telephone at which all counsel attending the conference can be reached. This is a text only entry. There is no document associated with this notice. (wsn, COURT STAFF) (Filed on 11/24/2014) (Entered: 11/24/2014)
11/24/2014	181	TRIAL BRIEF filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 11/24/2014) (Entered: 11/24/2014)
11/25/2014	182	CLERK'S NOTICE VACATING TELEPHONIC CASE MANAGEMENT CONFERENCE. The parties have informed the Court they no longer need a further case management conference. The telephonic case management conference set for 11/25/2014 at 9:00 a.m. is VACATED. This is a text only entry. There is no document associated with this notice. (wsn, COURT STAFF) (Filed on 11/25/2014) (Entered: 11/25/2014)
11/25/2014	183	EXHIBITS re 130 Pretrial Conference Statement; -Exhibit B with chart of designations and objections following transcript excerpt filed by Asetek Danmark A/S. (Attachments: # 1 Exhibit C with chart of designations and objections following transcript excerpt, # 2 Exhibit D with chart of designations and objections following transcript excerpt, # 3 Exhibit E - PART 1, # 4 Exhibit E - PART 2 with chart of objections and responses following transcript excerpt)(Related document(s) 130) (McCauley, Robert) (Filed on 11/25/2014) (Entered: 11/25/2014)
11/25/2014	184	TRANSCRIPT ORDER by Asetek Danmark A/S for Court Reporter Diane Skillman. (McCauley, Robert) (Filed on 11/25/2014) (Entered: 11/25/2014)
11/25/2014	185	STIPULATION WITH [PROPOSED] ORDER - Joint Stipulation Requesting Order to Permit Entry of Equipment and Materials Into Court; [Proposed] Order filed by Asetek Danmark A/S. (McCauley, Robert) (Filed on 11/25/2014) (Entered: 11/25/2014)
11/26/2014	186	STIPULATION AND ORDER re 185 STIPULATION WITH PROPOSED ORDER - Joint Stipulation Requesting Order to Permit Entry of Equipment and Materials Into Court; [Proposed] Order filed by Asetek Danmark A/S. Signed by Judge Jon S. Tigar on November 26, 2014. (wsn, COURT STAFF) (Filed on 11/26/2014) (Entered: 11/26/2014)
11/26/2014	187	Transcript of Proceedings held on November 14, 2014, before Judge Jon S. Tigar. Court Reporter Diane E. Skillman, Telephone number 510-451-2930, Diane_Skillman@cand.uscourts.gov, diane.transcripts@aol.com. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice

		of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 177 Transcript Order) Release of Transcript Restriction set for 2/24/2015. (Related documents(s) 177) (Skillman, Diane) (Filed on 11/26/2014) (Entered: 11/26/2014)
11/28/2014	188	EXHIBITS re 130 Pretrial Conference Statement, Exhibit A-1 - Addendum to Joint Trial Exhibit List filed byAsetek Danmark A/S. (Related document (s) 130) (McCauley, Robert) (Filed on 11/28/2014) (Entered: 11/28/2014)
12/02/2014	189	Minute Entry for proceedings held before Hon. Jon S. Tigar: Jury Selection held on 12/2/2014. Court Reporter Name: Lydia Zinn; Jo Ann Bryce. (wsn, COURT STAFF) (Date Filed: 12/2/2014) (Entered: 12/02/2014)
12/02/2014	190	Transcript of Proceedings held on 12/02/2014, before Judge Jon S. Tigar. Court Reporters/Transcribers Lydia Zinn and Jo Ann Bryce, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 176 Transcript Order - Daily Trial, 175 Transcript Order - Daily Trial) Release of Transcript Restriction set for 3/2/2015. (Related documents(s) 176 , 175) (Zinn, Lydia) (Filed on 12/2/2014) (Additional attachment(s) added on 3/4/2015: # 1 Master Index - Trial Transcript) (djcS,). (Entered: 12/02/2014)
12/03/2014	191	Minute Entry for proceedings held before Hon. Jon S. Tigar: Jury Trial held on 12/3/2014. Court Reporters: Lydia Zinn; Jo Ann Bryce. (wsn, COURT STAFF) (Date Filed: 12/3/2014) (Entered: 12/03/2014)
12/03/2014		Set Deadlines/Hearings: Jury Trial set for 12/15/2014 - 12/18/2014 at 8:30 AM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. This entry changes no existing hearings. (wsn, COURT STAFF) (Filed on 12/3/2014) (Entered: 12/03/2014)
12/03/2014	192	** SEE DOCKET ENTRY #241 FOR REDACTED TRANSCRIPT, PER COURT ORDER FILED AT DOCKET ETNRY #240. ** Transcript of Proceedings held on 12/03/2014, before Judge Jon S. Tigar. Court Reporters/Transcribers Lydia Zinn and Jo Ann Bryce, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 176 Transcript Order - Daily Trial, 175 Transcript Order - Daily Trial) Release of Transcript Restriction set for 3/3/2015. (Related documents(s) 176 , 175) (Zinn, Lydia) (Filed on 12/3/2014) Modified on 3/4/2015 (djcS,). (Entered: 12/03/2014)
12/04/2014	193	Minute Entry for proceedings held before Hon. Jon S. Tigar: Jury Trial held on 12/4/2014. Court Reporters: Jo Ann Bryce; Lydia Zinn. (wsn, COURT STAFF) (Date Filed: 12/4/2014) (Entered: 12/04/2014)
12/04/2014	194	Transcript of Proceedings held on 12/04/2014, before Judge Jon S. Tigar. Court Reporters/Transcribers Lydia Zinn and Jo Ann Bryce, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 176 Transcript Order - Daily Trial, 175 Transcript Order - Daily Trial) Release of Transcript Restriction set for

		3/4/2015. (Related documents(s) 176 , 175) (Zinn, Lydia) (Filed on 12/4/2014) (Entered: 12/04/2014)
12/08/2014	195	Opposition to Motion to Exclude Testimony Regarding Thermal Exchange in Koga filed by CMI USA, Inc.. (Attachments: # 1 Declaration, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C)(Rader, Elizabeth) (Filed on 12/8/2014) (Entered: 12/08/2014)
12/08/2014	196	Plaintiff Asetek Danmark A/S's Brief to Preclude Testimony Outside the Scope of Dr. Carman's Report Related to the Koga Reference filed by Asetek Danmark A/S. (Attachments: # 1 Proposed Order, # 2 Declaration of Robert F. McCauley, # 3 Exhibit 1, # 4 Exhibit 2, # 5 Exhibit 3, # 6 Exhibit 4, # 7 Exhibit 5)(McCauley, Robert) (Filed on 12/8/2014) (Entered: 12/08/2014)
12/08/2014	197	Minute Entry for proceedings held before Hon. Jon S. Tigar: Jury Trial held on 12/8/2014. Court Reporters: Lydia Zinn; Jo Ann Bryce. (wsn, COURT STAFF) (Date Filed: 12/8/2014) (Entered: 12/08/2014)
12/08/2014	198	Transcript of Proceedings held on 12/08/2014, before Judge Jon S. Tigar. Court Reporters/Transcribesr Lydia Zinn and Jo Ann Bryce, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 176 Transcript Order - Daily Trial, 175 Transcript Order - Daily Trial) Release of Transcript Restriction set for 3/9/2015. (Related documents(s) 176 , 175) (Zinn, Lydia) (Filed on 12/8/2014) (Entered: 12/08/2014)
12/09/2014	199	Minute Entry for proceedings held before Hon. Jon S. Tigar: Jury Trial held on 12/9/2014. Court Reporters: Jo Ann Bryce; Lydia Zinn. (wsn, COURT STAFF) (Date Filed: 12/9/2014) (Entered: 12/09/2014)
12/09/2014	200	** SEE DOCKET ENTRY #242 FOR REDACTED TRANSCRIPT, PER COURT ORDER FILED AT DOCKET ENTRY #240. ** Transcript of Proceedings held on 12/09/2014, before Judge Jon S. Tigar. Court Reporter/Transcriber Lydia Zinn and Jo Ann Bryce, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 176 Transcript Order - Daily Trial, 175 Transcript Order - Daily Trial) Release of Transcript Restriction set for 3/9/2015. (Related documents(s) 176 , 175) (Zinn, Lydia) (Filed on 12/9/2014) Modified on 3/4/2015 (djcS,). (Entered: 12/09/2014)
12/09/2014	201	ORDER GRANTING MOTION TO PRECLUDE TESTIMONY OUTSIDE THE SCOPE OF DR. CARMAN'S EXPERT REPORT re 196 Brief, filed by Asetek Danmark A/S. Signed by Judge Jon S. Tigar on December 9, 2014. (wsn, COURT STAFF) (Filed on 12/9/2014) (Entered: 12/10/2014)
12/10/2014	202	Minute Entry for proceedings held before Hon. Jon S. Tigar: Jury Trial held on 12/10/2014. Court Reporters: Lydia Zinn; Jo Ann Bryce. (wsn, COURT STAFF) (Date Filed: 12/10/2014) (Entered: 12/10/2014)
12/10/2014		Set Deadlines/Hearings: Charging Conference set for 12/12/2014 at 8:30 AM in Courtroom 2, 4th Floor, Oakland before Hon. Jon S. Tigar. (wsn, COURT STAFF) (Filed on 12/10/2014) (Entered: 12/10/2014)
12/10/2014		Set Deadlines/Hearings: Charging Conference set for 12/12/2014 at 8:30 AM in Courtroom 2, 4th Floor, Oakland before Hon. Jon S. Tigar.

		Correcting event type in ECF. (wsn, COURT STAFF) (Filed on 12/10/2014) (Entered: 12/10/2014)
12/11/2014	203	** SEE DOCKET ENTRY #243 FOR REDACTED TRANSCRIPT, PER COURT ORDER FILED AT DOCKET ENTRY #240. ** Transcript of Proceedings held on 12/10/2014, before Judge Jon S. Tigar. Court Reporters/Transcribers Lydia Zinn and Jo Ann Bryce, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 176 Transcript Order - Daily Trial, 175 Transcript Order - Daily Trial) Release of Transcript Restriction set for 3/11/2015. (Related documents(s) 176 , 175) (Zinn, Lydia) (Filed on 12/11/2014) Modified on 3/4/2015 (djcS,). (Entered: 12/11/2014)
12/11/2014	204	Revised Proposed Verdict Form filed by Asetek Danmark A/S . (Smyth, Jeffrey) (Filed on 12/11/2014) (Entered: 12/11/2014)
12/11/2014	207	Minute Entry for proceedings held before Hon. Jon S. Tigar: Jury Trial held on 12/11/2014.Court Reporter: Jo Ann Bryce. (wsn, COURT STAFF) (Date Filed: 12/11/2014) (Entered: 12/12/2014)
12/12/2014	205	Proposed Jury Instructions filed by Asetek Danmark A/S; -Revised Joint Proposed Final Jury Instructions. (McCauley, Robert) (Filed on 12/12/2014) (Entered: 12/12/2014)
12/12/2014	206	Proposed Verdict Form filed by CMI USA, Inc. (Rader, Elizabeth) (Filed on 12/12/2014) (Entered: 12/12/2014)
12/12/2014	208	Minute Entry for proceedings held before Hon. Jon S. Tigar: Jury Trial Charging Conference held on 12/12/2014.Court Reporter: Lydia Zinn. (wsn, COURT STAFF) (Date Filed: 12/12/2014) (Entered: 12/12/2014)
12/12/2014	209	Transcript of Proceedings held on 12/11/2014, before Judge Jon S. Tigar. Court Reporter/Transcriber Lydia Zinn, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 176 Transcript Order - Daily Trial, 175 Transcript Order - Daily Trial) Release of Transcript Restriction set for 3/12/2015. (Related documents(s) 176 , 175) (Zinn, Lydia) (Filed on 12/12/2014) (Entered: 12/12/2014)
12/12/2014	210	Transcript of Proceedings held on 12/12/2014, before Judge Jon S. Tigar. Court Reporter/Transcriber Lydia Zinn, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 176 Transcript Order - Daily Trial, 175 Transcript Order - Daily Trial) Release of Transcript Restriction set for 3/12/2015. (Related documents(s) 176 , 175) (Zinn, Lydia) (Filed on 12/12/2014) (Entered: 12/12/2014)
12/15/2014	211	ORDER ADOPTING ASETEK'S PROPOSED FINAL JURY INSTRUCTIONS 25 AND 27 re 205 Proposed Jury Instructions filed by Asetek Danmark A/S. Signed by Judge Jon S. Tigar on December 14, 2014. (wsn, COURT STAFF) (Filed on 12/15/2014) (Entered: 12/15/2014)
12/15/2014	212	

		Minute Entry for proceedings held before Hon. Jon S. Tigar: Jury Trial held on 12/15/2014.Court Reporters: Jo Ann Bryce; Lydia Zinn. (wsn, COURT STAFF) (Date Filed: 12/15/2014) (Entered: 12/15/2014)
12/15/2014	213	Transcript of Proceedings held on 12/15/2014, before Judge Jon S. Tigar. Court Reporters/Transcribers Lydia Zinn and Jo Ann Bryce, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 176 Transcript Order - Daily Trial, 175 Transcript Order - Daily Trial) Release of Transcript Restriction set for 3/16/2015. (Related documents(s) 176 , 175) (Zinn, Lydia) (Filed on 12/15/2014) (Entered: 12/15/2014)
12/16/2014	214	Minute Entry for proceedings held before Hon. Jon S. Tigar: Jury Trial held on 12/16/2014.Court Reporters: Lydia Zinn; Jo Ann Bryce. (wsn, COURT STAFF) (Date Filed: 12/16/2014) (Entered: 12/16/2014)
12/16/2014	215	Transcript of Proceedings held on 12/16/2014, before Judge Jon S. Tigar. Court Reporters/Transcribers Lydia Zinn and Jo Ann Bryce, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 176 Transcript Order - Daily Trial, 175 Transcript Order - Daily Trial) Release of Transcript Restriction set for 3/16/2015. (Related documents(s) 176 , 175) (Zinn, Lydia) (Filed on 12/16/2014) (Entered: 12/16/2014)
12/17/2014	216	ORDER DIRECTING JURY COMMISSIONER TO FURNISH LUNCH DURING DELIBERATION. Signed by Judge Jon S. Tigar on December 17, 2014. (wsn, COURT STAFF) (Filed on 12/17/2014) (Entered: 12/17/2014)
12/17/2014	217	Final Jury Instructions. (wsn, COURT STAFF) (Filed on 12/17/2014) (Entered: 12/17/2014)
12/17/2014	218	Minute Entry for proceedings held before Hon. Jon S. Tigar: Jury Trial completed on 12/17/2014.Court Reporter: Lydia Zinn. (wsn, COURT STAFF) (Date Filed: 12/17/2014) (Entered: 12/17/2014)
12/17/2014	219	JURY VERDICT. (wsn, COURT STAFF) (Filed on 12/17/2014). (Entered: 12/17/2014)
12/17/2014	220	JURY TRIAL EXHIBIT LIST. (wsn, COURT STAFF) (Filed on 12/17/2014) (Entered: 12/18/2014)
12/17/2014	222	COURT'S EXHIBIT LIST. (wsn, COURT STAFF) (Filed on 12/17/2014) (Entered: 12/18/2014)
12/17/2014	223	JURY NOTES. (wsn, COURT STAFF) (Filed on 12/17/2014) (Entered: 12/18/2014)
12/17/2014		LODGED TRIAL EXHIBITS: Exhibit A; Exhibit G; Exhibit F & Exhibit E. (tnS) (Filed on 12/17/2014) (Entered: 12/18/2014)
12/18/2014	221	Transcript of Proceedings held on 12/17/2014, before Judge Jon S. Tigar. Court Reporters/Transcribers Lydia Zinn and Jo Ann Bryce, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business

		days from date of this filing. (Re 176 Transcript Order - Daily Trial, 175 Transcript Order - Daily Trial) Release of Transcript Restriction set for 3/18/2015. (Related documents(s) 176 , 175) (Zinn, Lydia) (Filed on 12/18/2014) (Entered: 12/18/2014)
12/18/2014	224	** DISREGARD - FILED IN ERROR. MASTER INDEX WILL BE ATTACHED TO THE FIRST VOLUME OF TRIAL TRANSCRIPTS (DOCKET ENTRY #190).** Master Index for Transcript of Proceedings for trial held on 12/02/2014 - 12/17/2014, before Judge Jon S. Tigar. Court Reporter/Transcriber Lydia Zinn and Jo Ann Bryce, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 176 Transcript Order - Daily Trial, 175 Transcript Order - Daily Trial) Release of Transcript Restriction set for 3/18/2015. (Related documents(s) 176 , 175) (Zinn, Lydia) (Filed on 12/18/2014) Modified on 3/3/2015 (djc, COURT STAFF). (Entered: 12/18/2014)
12/19/2014		Set Deadlines/Hearings: Further Case Management Conference set for 1/12/2015 at 2:30 PM in Courtroom 9, 19th Floor, San Francisco. (wsn, COURT STAFF) (Filed on 12/19/2014) (Entered: 12/19/2014)
12/22/2014	225	ORDER REGARDING RETENTION OF EXHIBITS AND RETRIEVAL OF TRIAL MATERIALS. Signed by Judge Jon S. Tigar on December 22, 2014. (wsn, COURT STAFF) (Filed on 12/22/2014) (Entered: 12/22/2014)
01/05/2015	226	STIPULATION WITH [PROPOSED] ORDER; -Joint Stipulation Requesting Telephonic Conference; (Proposed) Order filed by Asetek Danmark A/S. (McCauley, Robert) (Filed on 1/5/2015) (Entered: 01/05/2015)
01/06/2015	227	STIPULATION AND ORDER re 226 STIPULATION WITH PROPOSED ORDER; Joint Stipulation Requesting Telephonic Conference; filed by Asetek Danmark A/S. Telephonic Case Management Conference set for 1/7/2015 at 4:00 PM in Courtroom 9, 19th Floor, San Francisco. Signed by Judge Jon S. Tigar on January 6, 2015. (wsn, COURT STAFF) (Filed on 1/6/2015) (Entered: 01/06/2015)
01/07/2015	228	Minute Entry for proceedings held before Hon. Jon S. Tigar: Telephonic Case Management Conference held on 1/7/2015. Court Reporter Name: Not reported. (wsn, COURT STAFF) (Date Filed: 1/7/2015) (Entered: 01/07/2015)
01/08/2015	229	STIPULATION - Parties' Proposal regarding Post-Trial Briefing Schedule filed by Asetek Danmark A/S. (McCauley, Robert) (Filed on 1/8/2015) (Entered: 01/08/2015)
01/12/2015	230	Trial Exhibit Receipt re 220 JURY TRIAL EXHIBIT LIST. (wsn, COURT STAFF) (Filed on 1/12/2015) (Entered: 01/12/2015)
01/12/2015	231	Minute Entry for proceedings held before Hon. Jon S. Tigar: Further Case Management Conference held on 1/12/2015.Court Reporter Name: Not reported. (wsn, COURT STAFF) (Date Filed: 1/12/2015) (Entered: 01/12/2015)
01/12/2015	232	ORDER DENYING MOTION FOR DIRECTED VERDICT AS TO ASETEK'S CLAIM FOR CONTRIBUTORY INFRINGEMENT. Signed by Judge Jon S. Tigar on January 12, 2015. (wsn, COURT STAFF) (Filed on 1/12/2015) (Entered: 01/12/2015)
01/12/2015	233	ORDER GRANTING the parties' proposed stipulation regarding briefing schedule, ECF No. 229. CMI USA will filed proposed findings of fact and conclusions of law, and a memorandum of points and authorities to support its allegations of obviousness, written description, and indefiniteness on January 26, 2015. Asetek will file its responsive proposed findings of fact and conclusions of law, and its memorandum in support

		thereof, on February 9, 2015. The Court will determine at that time whether to set a hearing on the parties' filings. Motions under Federal Rule of Civil Procedure 50(b) and/or for a new trial, if any, will be filed within 28 days of the Court's entry of judgment and be noticed for hearing on the first Thursday at least 35 days after filing. At the appropriate time, Asetek will also move for an accounting and for prejudgment interest. Signed by Judge Jon S. Tigar on January 12, 2015. (jstlc1S, COURT STAFF) (Filed on 1/12/2015) (Entered: 01/12/2015)
01/26/2015	234	CMI USA INC.'S MEMORANDUM OF POINTS AND AUTHORITIES RE ITS DEFENSE OF OBVIOUSNESS UNDER 28 U.S.C. § 103 AND § 112 filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 1/26/2015) (Entered: 01/26/2015)
01/26/2015	235	[Proposed] Findings of Fact and Conclusions of Law Re Its Defense of Obviousness Under 28 U.S.C. Section 103 and Section 112 filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 1/26/2015) (Entered: 01/26/2015)
02/09/2015	236	[Proposed] Findings of Fact filed by Asetek Danmark A/S; Asetek Danmark A/S's [Proposed] Findings of Fact and Conclusions of Law in Opposition to CMI USA's Obviousness, Indefiniteness, and Lack of Written Description Defenses. (Attachments: # 1 Declaration of Robert F. McCauley, # 2 Exhibit A, # 3 Exhibit B)(McCauley, Robert) (Filed on 2/9/2015) (Entered: 02/09/2015)
02/12/2015	237	*** FILED IN ERROR WITH CONFIDENTIAL INFORMATION. DOCUMENT LOCKED. DOCUMENT TO BE REFILED LATER. *** NOTICE filed by CMI USA, Inc. of LODGING TRIAL DEMONSTRATIVES (Attachments: #(1) Exhibit A, #(2) Exhibit B, #(3) Exhibit C - [document removed pursuant to Court Order, Dkt #:240], #(4) Exhibit D, #(5) Exhibit E) (Rader, Elizabeth) (Filed on 2/12/2015) Modified on 2/23/2015 (fff, COURT STAFF)...Modified on 3/5/2015 (tnS). (Entered: 02/12/2015)
02/13/2015	238	NOTICE by Asetek Danmark A/S, Asetek Holdings, Inc.; Plaintiff's Notice of Lodging of Jury Notebook Materials and Plaintiff's Trial Demonstratives (Attachments: #(1) Attachment 1, #(2) Attachment 2 (part 1), #(3) Attachment 2 (part 2), #(4) Attachment 3, *** # 5 Attachment 4 DOCUMENT LOCKED AT FILER'S REQUEST. NO NEW DOCUMENT. *** - [document removed pursuant to Court Order, Dkt #:240], #(6) Attachment 5) (Smyth, Jeffrey) (Filed on 2/13/2015) Modified on 2/20/2015 (ewn, COURT STAFF)..Modified on 3/5/2015 (tnS). (Entered: 02/13/2015)
02/25/2015	239	Administrative Motion to File Under Seal Stipulated Request Regarding Sealing Trial Exhibits and Transcripts and Removing Incorrectly Filed Documents; Proposed Order filed by Asetek Danmark A/S. (Attachments: #(1) Exhibit A - Submitted for Filing Under Seal, #(2) Declaration of Jeffrey D. Smyth, #(3) Declaration of Scott T. Chambers)(Smyth, Jeffrey) (Filed on 2/25/2015) (Entered: 02/25/2015)
03/03/2015	240	ORDER GRANTING STIPULATED REQUEST TO SEAL TRIAL EXHIBITS AND TRANSCRIPTS, AND TO REMOVE INCORRECTLY FILED DOCUMENTS FROM THE DOCKET by Judge Jon S. Tigar granting 239 Administrative Motion to File Under Seal. (wsn, COURT STAFF) (Filed on 3/3/2015) (Entered: 03/03/2015)
03/04/2015	241	Redaction of 192 12/3/2014 Volume 2 Trial Transcript, (Per Court Order ECF Docket #240). (Related documents(s) 192) (Zinn, Lydia) (Filed on 3/4/2015) (Entered: 03/04/2015)
03/04/2015	242	Redaction of 200 12/9/2014 Volume 5 Trial Transcript, (Per Court Order ECF Docket #240). (Related documents(s) 200) (Zinn, Lydia) (Filed on 3/4/2015) (Entered: 03/04/2015)
03/04/2015	243	Redaction of 203 12/10/2014 Volume 6 Trial Transcript, (Per Court Order ECF Docket #240). (Related documents(s) 203) (Zinn, Lydia) (Filed on 3/4/2015) (Entered: 03/04/2015)

04/17/2015	244	MOTION for Hearing; -Asetek's Administrative Motion Providing Post-Verdict Update and Requesting Telephonic Conference filed by Asetek Danmark A/S. (Attachments: #(1) Proposed Order, #(2) Declaration of Robert F. McCauley, #(3) Exhibit 1, #(4) Exhibit 2, #(5) Exhibit 3) (McCauley, Robert) (Filed on 4/17/2015) (Entered: 04/17/2015)
04/20/2015	245	RESPONSE to (re 244 MOTION for Hearing; -Asetek's Administrative Motion Providing Post-Verdict Update and Requesting Telephonic Conference) filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 4/20/2015) (Entered: 04/20/2015)
04/20/2015	246	DECLARATION of ELIZABETH H. RADER in Support of re 245 Opposition/Response to Administrative Motion Providing Post-Verdict Update and Requesting Telephonic Conference filed by CMI USA, Inc.. (Attachments: #(1) Exhibit A, #(2) Exhibit B, #(3) Exhibit C)(Related document(s) 245) (Rader, Elizabeth) (Filed on 4/20/2015) (Entered: 04/20/2015)
04/20/2015	247	[Proposed] Order Denying re 244 Administrative Motion Providing Post-Verdict Update and Requesting Telephonic Conference re 245 Opposition/Response to Administrative Motion filed by CMI USA, Inc.. (Rader, Elizabeth) (Filed on 4/20/2015) (Entered: 04/20/2015)
04/21/2015	248	ORDER DENYING ASETEK'S ADMINISTRATIVE MOTION REQUESTING TELEPHONIC CONFERENCEAsetek's Administrative Motion Requesting Telephonic Conference, ECF No. 244, is denied without prejudice. Based on a review of both parties' submissions, it appears that no dispute is currently ripe for resolution. Should Asetek require judicial relief in connection with third party discovery against Cooler Master Co., Ltd., AMD, or another entity, or if the parties otherwise develop a justiciable dispute, Asetek can renew its motion.(Entered by Judge Jon S. Tigar)(This is a text-only entry generated by the court. There is no document associated with this entry.) (Entered: 04/21/2015)
04/21/2015	249	FINDINGS OF FACT AND CONCLUSIONS OF LAW; ORDER ENTERING JUDGMENT IN FAVOR OF PLAINTIFF. Signed by Judge Jon S. Tigar on April 21, 2015. (wsn, COURT STAFF) (Filed on 4/21/2015) (Entered: 04/22/2015)
04/28/2015	250	NOTICE of Appearance by Kyle Dakai Chen (Chen, Kyle) (Filed on 4/28/2015) (Entered: 04/28/2015)
04/29/2015	251	NOTICE of Appearance by Reuben Ho-Yen Chen (Chen, Reuben) (Filed on 4/29/2015) (Entered: 04/29/2015)
05/01/2015	252	STIPULATION WITH [PROPOSED] ORDER; --Joint Stipulation Regarding Post-Trial Briefing Schedule; Proposed Order filed by Asetek Danmark A/S. (McCauley, Robert) (Filed on 5/1/2015) (Entered: 05/01/2015)
05/01/2015	253	[Proposed] Order re 249 Findings of Fact & Conclusions of Law; -Plaintiff Asetek Danmark A/S's Proposed Form of Judgment filed by Asetek Danmark A/S. (Attachments: #(1) Exhibit A - [Proposed] Judgment)(McCauley, Robert) (Filed on 5/1/2015) (Entered: 05/01/2015)
05/01/2015	254	NOTICE of Change In Counsel filed by Elizabeth Hannah Rader; -Request Pursuant to Local Rule 11-5 for an Order Permitting Withdrawal of Counsel and [Proposed] Order (Rader, Elizabeth) (Filed on 5/1/2015) (Entered: 05/01/2015)
05/04/2015	255	STIPULATION AND ORDER re 252 STIPULATION WITH PROPOSED ORDER; -Joint Stipulation Regarding Post-Trial Briefing Schedule; Proposed Order filed by Asetek Danmark A/S. Signed by Judge Jon S. Tigar on May 4, 2015. (wsn, COURT STAFF) (Filed on 5/4/2015) (Entered: 05/04/2015)
05/04/2015	256	ORDER re 254 Notice of Change In Counsel; Request Pursuant to Local Rule 11-5 for an Order Permitting Withdrawal of Counsel and [Proposed] Order filed by CMI USA, Inc.. Signed by Judge Jon S. Tigar on May 4, 2015. (wsn, COURT STAFF) (Filed on 5/4/2015) (Entered: 05/04/2015)

05/12/2015	257	ORDER DIRECTING DEFENDANT TO APPROVE PROPOSED JUDGMENT AS TO FORM OR TO FILE OBJECTIONS re 253 Proposed Order, filed by Asetek Danmark A/S. Signed by Judge Jon S. Tigar on May 12, 2015. (wsn, COURT STAFF) (Filed on 5/12/2015) (Entered: 05/12/2015)
05/19/2015	258	OBJECTIONS to re 257 Order, 253 Proposed Order; -CMI USA, Inc.'s Objections to Asetek Danmark A/S's Proposed Form of Judgment filed by CMI USA, Inc.. (Attachments: #(1) Exhibit A: [Proposed] Judgment) (Chen, Kyle) (Filed on 5/19/2015) (Entered: 05/19/2015)
05/27/2015	259	RESPONSE to re 258 Objection; --Plaintiff Asetek Danmark A/S's Response to CMI USA's Objections to Proposed Form of Judgment filed by Asetek Danmark A/S. (Attachments: #(1) Plaintiff Asetek Danmark A/S's Revised Proposed Form of Judgment, #(2) Exhibit A)(McCauley, Robert) (Filed on 5/27/2015) (Entered: 05/27/2015)
05/28/2015	260	OBJECTIONS to re 259 Response; -CMI USA, Inc.'s Objections to Asetek Danmark A/S's Revised Proposed Form of Judgment filed by CMI USA, Inc.. (Chen, Kyle) (Filed on 5/28/2015) (Entered: 05/28/2015)
06/01/2015	261	REVISED JUDGMENT. Signed by Judge Jon S. Tigar on June 1, 2015. (wsn, COURT STAFF) (Filed on 6/1/2015) (Entered: 06/02/2015)
06/15/2015	262	BILL OF COSTS by Asetek Danmark A/S. (Attachments: # 1 Exhibit 1, # 2 Exhibit 2, # 3 Exhibit 3, # 4 Exhibit 4, # 5 Exhibit 5, # 6 Exhibit 6, # 7 Exhibit 7, # 8 Exhibit 8, # 9 Exhibit 9, # 10 Declaration of Robert F. McCauley, # 11 Exhibit A to McCauley Decl., # 12 Exhibit B to McCauley Decl., # 13 Exhibit C to McCauley Decl., # 14 Exhibit D to McCauley Decl., # 15 Exhibit E to McCauley Decl., # 16 Exhibit F to McCauley Decl., # 17 Exhibit G to McCauley Decl., # 18 Exhibit H to McCauley Decl., # 19 Exhibit I to McCauley Decl., # 20 Exhibit J to McCauley Decl.)(McCauley, Robert) (Filed on 6/15/2015) (Entered: 06/15/2015)
06/16/2015	263	BILL OF COSTS by CMI USA, Inc.. (Attachments: # 1 Declaration of Kyle D. Chen in Support of CMI USA, Inc.'s Bill of Costs ("Chen Declaration"), # 2 Exhibit A to Chen Declaration, # 3 Exhibit B to Chen Declaration, # 4 Exhibit C to Chen Delcaration)(Chen, Kyle) (Filed on 6/16/2015) (Entered: 06/16/2015)
06/29/2015	264	Administrative Motion to File Under Seal ; Supporting Declaration of Jeffrey D. Smyth filed by Asetek Danmark A/S. (Attachments: # 1 Proposed Order, # 2 Redacted Version of Motion for Entry of a Permanent Injunction, # 3 Unredacted Redacted Version of Motion for Entry of a Permanent Injunction, # 4 Exhibit 10 to the Declaration of Jeffrey D. Smyth (submitted for filing under seal), # 5 Exhibit 24 to the Declaration of Jeffrey D. Smyth (submitted for filing under seal), # 6 Redacted Version of Motion for Supplemental Damages and Prejudgment Interest, # 7 Unredacted Version of Motion for Supplemental Damages and Prejudgment Interest, # 8 Redacted Version of Declaration of Nisha Mody in Support of Asetek Danmark A/S's Motion for Supplemental Damages and Prejudgment Interest, # 9 Unredacted Version of Declaration of Nisha Mody in Support of Asetek Danmark A/S's Motion for Supplemental Damages and Prejudgment Interest, # 10 Exhibit B to Declaration of Nisha Mody (submitted for filing under seal), # 11 Exhibit C to Declaration of Nisha Mody (submitted for filing under seal), # 12 Exhibit D to Declaration of Nisha Mody (submitted for filing under seal))(Smyth, Jeffrey) (Filed on 6/29/2015) (Entered: 06/29/2015)
06/29/2015	265	FILED IN ERROR. SEE DOCKET 269 . ATTACHMENTS 265 AND 265-5 REMOVED BY ORDER OF THE COURT AT DOCKET 274. MOTION for Entry of Judgment as a Matter of Law (RENEWED) Under Federal Rule of Civil Procedure 50(b)(3) and Motion for New Trial Under Federal Rule of Civil Procedure 50(b)(2) or 59 filed by CMI USA, Inc., CMI USA, Inc.. Motion Hearing set for 8/6/2015 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 7/13/2015. Replies due by 7/20/2015. (Attachments: # 1 Declaration of Kyle D. Chen ISO

		Renewed Motion for Entry of Judgment as a Matter of Law etc., # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5, # 7 Proposed Order)(Chen, Kyle) (Filed on 6/29/2015) Modified on 6/30/2015 (ewn, COURT STAFF). Modified on 7/2/2015 (wsn, COURT STAFF). (Entered: 06/29/2015)
06/29/2015	266	MOTION for Entry of a Permanent Injunction filed by Asetek Danmark A/S. Motion Hearing set for 8/6/2015 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 7/13/2015. Replies due by 7/20/2015. (Attachments: # 1 Proposed Order, # 2 Declaration of Jeffrey D. Smyth, # 3 Exhibit 1, # 4 Exhibit 2, # 5 Exhibit 3, # 6 Exhibit 4, # 7 Exhibit 5, # 8 Exhibit 6, # 9 Exhibit 7, # 10 Exhibit 8, # 11 Exhibit 9, # 12 Exhibit 10, # 13 Exhibit 11, # 14 Exhibit 12, # 15 Exhibit 13, # 16 Exhibit 14, # 17 Exhibit 15, # 18 Exhibit 16, # 19 Exhibit 17, # 20 Exhibit 18, # 21 Exhibit 19, # 22 Exhibit 20, # 23 Exhibit 21, # 24 Exhibit 22, # 25 Exhibit 23, # 26 Exhibit 24, # 27 Exhibit 25, # 28 Exhibit 26, # 29 Exhibit 27, # 30 Exhibit 28, # 31 Exhibit 29)(Smyth, Jeffrey) (Filed on 6/29/2015) (Entered: 06/29/2015)
06/29/2015	267	MOTION to Alter Judgment; -Plaintiff Asetek Danmark A/S's Motion for Supplemental Damages and Prejudgment Interest [Redacted Version] filed by Asetek Danmark A/S. Motion Hearing set for 8/6/2015 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 7/13/2015. Replies due by 7/20/2015. (Attachments: # (1) Proposed Order, # 2 Declaration of Robert F. McCauley, # 3 Exhibit A to McCauley Declaration, # 4 Declaration of Nisha Mody [Redacted Version], # 5 Exhibit A to Mody Declaration, # 6 Exhibit B to Mody Declaration (placeholder only), # 7 Exhibit C to Mody Declaration (placeholder only), # 8 Exhibit D to Mody Declaration (placeholder only), # 9 Exhibit E to Mody Declaration)(McCauley, Robert) (Filed on 6/29/2015) (Entered: 06/29/2015)
06/30/2015	268	OBJECTIONS to re 263 Bill of Costs, by Asetek Danmark A/S. (Attachments: # 1 Declaration of Jeffrey D. Smyth, # 2 Exhibit 1, # 3 Exhibit 2)(Smyth, Jeffrey) (Filed on 6/30/2015) (Entered: 06/30/2015)
06/30/2015	269	MOTION for Judgment as a Matter of Law; -(Corrected) RENEWED MOTION FOR ENTRY OF JUDGMENT AS A MATTER OF LAW UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(3) AND MOTION FOR A NEW TRIAL UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(2) OR 59 filed by CMI USA, Inc.. Motion Hearing set for 8/6/2015 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 7/13/2015. Replies due by 7/20/2015. (Attachments: # 1 Declaration of Kyle D. Chen in Support of (Corrected) Renewed Motion for Entry of Judgment as a Matter of Law Under FRCP 50(b)(3) and Motion for a New Trial Under FRCP 50(b)(2) or 59 ("Chen Decl."), # 2 Exhibit 1 to Chen Decl., # 3 Exhibit 2 to Chen Decl., # 4 Exhibit 3 to Chen Decl., # 5 Exhibit 4 to Chen Decl., # 6 Exhibit 5 to Chen Decl., # 7 Exhibit 6 to Chen Decl., # 8 Exhibit 7 to Chen Decl.)(Chen, Kyle) (Filed on 6/30/2015) (Entered: 06/30/2015)
07/01/2015	270	MOTION to Remove Incorrectly Filed Documents: Dkt. Nos. 265 and 265-5 filed by CMI USA, Inc.. (Chen, Kyle) (Filed on 7/1/2015) (Entered: 07/01/2015)
07/01/2015	271	[Proposed] Order Granting re 269 MOTION for Judgment as a Matter of Law; -(Corrected) RENEWED MOTION FOR ENTRY OF JUDGMENT AS A MATTER OF LAW UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(3) AND MOTION FOR A NEW TRIAL UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(2) OR 59 filed by CMI USA, Inc.. (Chen, Kyle) (Filed on 7/1/2015) (Entered: 07/01/2015)
07/01/2015	272	[Proposed] Order Granting re 270 MOTION to Remove Incorrectly Filed Documents: Dkt. Nos. 265 and 265-5 filed by CMI USA, Inc.. (Chen, Kyle) (Filed on 7/1/2015) (Entered: 07/01/2015)

07/01/2015	273	Administrative Motion to File Under Seal filed by CMI USA, Inc., CMI USA, Inc.. (Attachments: # 1 Unredacted Corrected Renewed Motion for Judgment as a Matter of Law etc., # 2 Exhibit 4, # 3 Exhibit 6, # 4 Proposed Order)(Chen, Kyle) (Filed on 7/1/2015) (Entered: 07/01/2015)
07/01/2015	274	ORDER GRANTING MOTION TO REMOVE INCORRECTLY FILED DOCUMENTDefendant CMI USA, Inc.'s motion to remove incorrectly filed documents from ECF, ECF No. 270, is GRANTED. (jstlc1, COURT STAFF) (Filed on 7/1/2015)(jstlc1, COURT STAFF) (Filed on 7/1/2015) (Entered: 07/01/2015)
07/02/2015	275	CERTIFICATE OF SERVICE by Asetek Danmark A/S re 264 Administrative Motion to File Under Seal ; Supporting Declaration of Jeffrey D. Smyth (Smyth, Jeffrey) (Filed on 7/2/2015) (Entered: 07/02/2015)
07/02/2015	276	CERTIFICATE OF SERVICE by Asetek Danmark A/S re 264 Administrative Motion to File Under Seal ; Supporting Declaration of Jeffrey D. Smyth (Smyth, Jeffrey) (Filed on 7/2/2015) (Entered: 07/02/2015)
07/02/2015	277	EXHIBITS re 269 MOTION for Judgment as a Matter of Law; -(Corrected) RENEWED MOTION FOR ENTRY OF JUDGMENT AS A MATTER OF LAW UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(3) AND MOTION FOR A NEW TRIAL UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(2) OR 59; --(Corrected) Exhibit 4 to [269-1] Declaration of Kyle D. Chen in Support of (Corrected) Renewed Motion for Entry of Judgment as a Matter of Law Under FRCP 50(b)(3) and Motion for a New Trial Under FRCP 50(b)(2) or 59 [Redacted Public Version] filed by CMI USA, Inc.. (Related document(s) 269) (Chen, Kyle) (Filed on 7/2/2015) (Entered: 07/02/2015)
07/02/2015	278	OBJECTIONS to re 262 Bill of Costs; -Defendant's Objections to Plaintiff's Bill of Costs filed by CMI USA, Inc.. (Chen, Kyle) (Filed on 7/2/2015) (Entered: 07/02/2015)
07/06/2015	279	Administrative Motion to File Under Seal Corrected Exhibit No. 4 filed by CMI USA, Inc., CMI USA, Inc.. (Attachments: # 1 Exhibit 4 (Corrected), # 2 Proposed Order)(Chen, Kyle) (Filed on 7/6/2015) (Entered: 07/06/2015)
07/06/2015	280	Declaration of Jeffrey D. Smyth in Support of 273 Administrative Motion to File Under Seal filed byAsetek Danmark A/S. (Related document(s) 273) (Smyth, Jeffrey) (Filed on 7/6/2015) (Entered: 07/06/2015)
07/06/2015	281	Declaration in Support of 264 Administrative Motion to File Under Seal ; Supporting Declaration of Jeffrey D. Smyth --- Declaration of Kyle D. Chen in Support of Plaintiff's Motion to File Under Seal filed byCMI USA, Inc.. (Related document(s) 264) (Chen, Kyle) (Filed on 7/6/2015) (Entered: 07/06/2015)
07/07/2015	282	ORDER GRANTING IN PART AND DENYING IN PART ADMINISTRATIVE MOTIONS TO FILE UNDER SEAL by Judge Jon S. Tigar granting in part and denying in part 273 Administrative Motion to File Under Seal; granting in part and denying in part 279 Administrative Motion to File Under Seal. (wsn, COURT STAFF) (Filed on 7/7/2015) (Entered: 07/07/2015)
07/07/2015	283	CERTIFICATE OF SERVICE filed by CMI USA, Inc., CMI USA, Inc. of re 277 Exhibits, re 269 MOTION for Judgment as a Matter of Law - (Corrected) RENEWED MOTION FOR ENTRY OF JUDGMENT AS A MATTER OF LAW UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(3) AND MOTION FOR A NEW TRIAL UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(2) OR 59 OF UNREDACTED VERSIONS OF (CORRECTED) RENEWED MOTION AND (CORRECTED) EXHIBIT 4 (Chen, Kyle) (Filed on 7/7/2015) (Entered: 07/07/2015)
07/07/2015	284	ORDER GRANTING ADMINISTRATIVE MOTION TO FILE UNDER SEAL by Judge Jon S. Tigar; granting 264 Administrative Motion to File Under Seal. (wsn, COURT STAFF) (Filed on 7/7/2015) (Entered: 07/07/2015)
07/10/2015	285	

		NOTICE of Appearance by Carrie J. Richey (Richey, Carrie) (Filed on 7/10/2015) (Entered: 07/10/2015)
07/13/2015	286	RESPONSE to (re 269 MOTION for Judgment as a Matter of Law; -(Corrected) RENEWED MOTION FOR ENTRY OF JUDGMENT AS A MATTER OF LAW UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(3) AND MOTION FOR A NEW TRIAL UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(2) OR 59); -Plaintiff Asetek Danmark A/S's Opposition to CMI USA, Inc.'s Renewed Motion for Entry of Judgment as a Matter of Law and Motion for a New Trial (Dkt. No. 269) filed by Asetek Danmark A/S. (Attachments: # 1 Declaration of Jeffrey D. Smyth, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D)(Smyth, Jeffrey) (Filed on 7/13/2015) (Entered: 07/13/2015)
07/13/2015	287	RESPONSE to (re 266 MOTION for Permanent Injunction); -Opposition to Plaintiff Asetek Damark A/S's Motion for Entry of Permanent Injunction filed by CMI USA, Inc.. (Attachments: # 1 Declaration of Carrie Richey in Support of CMI USA, Inc.'s Oppositions ("Richey Decl."), # 2 Exhibit 1 to Richey Decl., # 3 Exhibit 2 to Richey Decl., # 4 Exhibit 3 to Richey Decl., # 5 Exhibit 4 to Richey Decl., # 6 Exhibit 5 to Richey Decl., # 7 Exhibit 6 to Richey Decl., # 8 Exhibit 7 to Richey Decl., # 9 Exhibit 8 to Richey Decl., # 10 Exhibit 9 to Richey Decl., # 11 Exhibit 10 to Richey Decl., # 12 Exhibit 11 to Richey Decl., # 13 Exhibit 12 to Richey Decl., # 14 Exhibit 13 to Richey Decl., # 15 Exhibit 14 to Richey Decl., # 16 Exhibit 15 to Richey Decl., # 17 Exhibit 16 to Richey Decl., # 18 Declaration of Danny Chen in Support of CMI USA, Inc.'s Oppositions)(Chen, Kyle) (Filed on 7/13/2015) (Entered: 07/13/2015)
07/14/2015	288	RESPONSE to (re 267 MOTION to Alter Judgment; -Plaintiff Asetek Danmark A/S's Motion for Supplemental Damages and Prejudgment Interest [Redacted Version]) filed by CMI USA, Inc., CMI USA, Inc.. (Attachments: # 1 Declaration, # 2 Declaration, # 3 Exhibit 1, # 4 Exhibit 2, # 5 Exhibit 3, # 6 Exhibit 4, # 7 Exhibit 5, # 8 Exhibit 6, # 9 Exhibit 7, # 10 Exhibit 8, # 11 Exhibit 9, # 12 Exhibit 10, # 13 Exhibit 11, # 14 Exhibit 12, # 15 Exhibit 13, # 16 Exhibit 14, # 17 Exhibit 15, # 18 Exhibit 16, # 19 Declaration, # 20 Exhibit A, # 21 Exhibit B, # 22 Exhibit C, # 23 Exhibit D, # 24 Exhibit E, # 25 Exhibit F)(Richey, Carrie) (Filed on 7/14/2015) (Entered: 07/14/2015)
07/14/2015	289	Administrative Motion to File Under Seal filed by CMI USA, Inc., CMI USA, Inc.. (Attachments: # 1 Proposed Order, # 2 Exhibit 1 to Declaration of Carrie J. Richey ISO Def's Oppsn to Plf's Mtn for Supplemental Damages and Prejudgment Interest (Redacted), # 3 Def's Oppsn to Plf's Mtn for Supplemental Damages and Prejudgment Interest (Redacted), # 4 Declaration of James Pampinella ISO Def's Oppsn to Plf's Mtn for Supplemental Damages and Prejudgment Interest (Redacted), # 5 Def's Oppsn to Plf's Mtn for Supplemental Damages and Prejudgment Interest, # 6 Declaration of James Pampinella ISO Def's Oppsn to Plf's Mtn for Supplemental Damages and Prejudgment Interest, # 7 Exhibit B to Declaration of James Pampinella, # 8 Exhibit C to Declaration of James Pampinella, # 9 Exhibit D to Declaration of James Pampinella, # 10 Exhibit E to Declaration of James Pampinella, # 11 Exhibit F to Declaration of James Pampinella, # 12 Exhibit 1 to Declaration of Carrie J. Richey ISO Def's Oppsn to Plf's Mtn for Supplemental Damages and Prejudgment Interest)(Chen, Kyle) (Filed on 7/14/2015) (Entered: 07/14/2015)
07/14/2015	290	DOCUMENT E-FILED UNDER SEAL re 282 Order on Administrative Motion to File Under Seal - (Corrected) Exhibit 4 to Dkt No. 269 filed by CMI USA, Inc., CMI USA, Inc.. (Chen, Kyle) (Filed on 7/14/2015) (Entered: 07/14/2015)
07/14/2015	291	EXHIBIT 6 to Declaration of Kyle D. Chen in Support of re 269 MOTION for Judgment as a Matter of Law; -(Corrected) RENEWED MOTION FOR ENTRY OF JUDGMENT AS A MATTER OF LAW UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(3) AND MOTION FOR A NEW TRIAL UNDER FEDERAL

		RULE OF CIVIL PROCEDURE 50(b)(2) OR 59 filed by CMI USA, Inc., CMI USA, Inc.. (Related document(s) 269) (Chen, Kyle) (Filed on 7/14/2015) (Entered: 07/14/2015)
07/14/2015	292	DOCUMENT E-FILED UNDER SEAL re 282 Order on Administrative Motion to File Under Seal - (Corrected) Renewed Motion for Judgment as a Matter of Law and for New Trial Dkt No. 269 filed by CMI USA, Inc., CMI USA, Inc.. (Chen, Kyle) (Filed on 7/14/2015) (Entered: 07/14/2015)
07/20/2015	293	Declaration in Support of 289 Administrative Motion to File Under Seal; -Declaration of Jeffrey D. Smyth in Support of Defendant's Administrative Motion to File Under Seal filed by Asetek Danmark A/S. (Related document (s) 289) (Smyth, Jeffrey) (Filed on 7/20/2015) (Entered: 07/20/2015)
07/20/2015	294	Administrative Motion to File Under Seal ; Supporting Declaration of Robert F. McCauley filed by Asetek Danmark A/S. (Attachments: # 1 Proposed Order, # 2 Redacted Version of the Reply Declaration of Nisha Mody in Support of Asetek A/S's Reply for Supplemental Damages and Prejudgment Interest, # 3 Unredacted Version of the Reply Declaration of Nisha Mody in Support of Asetek A/S's Reply for Supplemental Damages and Prejudgment Interest)(McCauley, Robert) (Filed on 7/20/2015) (Entered: 07/20/2015)
07/20/2015	295	REPLY (re 266 MOTION for Permanent Injunction); -Plaintiff Asetek Danmark A/S's Reply in Support of its Motion for Entry of a Permanent Injunction filed by Asetek Danmark A/S. (McCauley, Robert) (Filed on 7/20/2015) (Entered: 07/20/2015)
07/20/2015	296	REPLY (re 267 MOTION to Alter Judgment; -Plaintiff Asetek Danmark A/S's Motion for Supplemental Damages and Prejudgment Interest [Redacted Version]) filed by Asetek Danmark A/S. (Attachments: # 1 Redacted Version of the Reply Declaration of Nisha Mody in Support of Asetek A/S's Reply for Supplemental Damages and Prejudgment Interest, # 2 Exhibit F to Mody Declaration, # 3 Exhibit G to Mody Declaration)(McCauley, Robert) (Filed on 7/20/2015) (Entered: 07/20/2015)
07/20/2015	297	Declaration of Robert F. McCauley in Support of 296 Reply to Opposition/Response, 295 Reply to Opposition/Response; -Declaration of Robert F. McCauley in Support of Asetek Danmark A/S's Reply Briefs Supporting its Motions for Permanent Injunction and for Supplemental Damages and Prejudgment Interest filed by Asetek Danmark A/S. (Attachments: # 1 Exhibit 1, # 2 Exhibit 2, # 3 Exhibit 3, # 4 Exhibit 4, # 5 Exhibit 5)(Related document(s) 296 , 295) (McCauley, Robert) (Filed on 7/20/2015) (Entered: 07/20/2015)
07/20/2015	298	REPLY (re 269 MOTION for Judgment as a Matter of Law; -(Corrected) RENEWED MOTION FOR ENTRY OF JUDGMENT AS A MATTER OF LAW UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(3) AND MOTION FOR A NEW TRIAL UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(2) OR 59) filed by CMI USA, Inc., CMI USA, Inc.. (Attachments: #(1) Declaration Supplemental Declaration of Kyle D. Chen, #(2) Exhibit 1, *** #(3) Exhibit 2 REDACTED DOCUMENT LOCKED AT FILER'S REQUEST. DOCUMENT TO BE REFILED LATER. --[Docket #298-3 Removed Per court Order, filed 7/22/2015, Docket #304]-- ***, #(4) Exhibit 3, #(5) Exhibit 4, #(6) Exhibit 5, #(7) Exhibit 6 REDACTED, #(8) Exhibit 7, #(9) Exhibit 8) (Chen, Kyle) (Filed on 7/20/2015) Modified on 7/21/2015 (ewn, COURT STAFF)..Modified on 7/23/2015 (tnS). (Entered: 07/20/2015)
07/21/2015	299	REPLY (re 269 MOTION for Judgment as a Matter of Law; -(Corrected) RENEWED MOTION FOR ENTRY OF JUDGMENT AS A MATTER OF LAW UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(3) AND MOTION FOR A NEW TRIAL UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(2) OR 59); -CORRECTED REPLY BRIEF filed by CMI USA, Inc., CMI USA, Inc.. (Attachments: # 1 Declaration Kyle D. Chen Supplemental Declaration ISO Corrected Renewal JMOL and New Trial Motion, # 2 Exhibit 1, # 3 Exhibit 2 Corrected Redacted, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5,

		# 7 Exhibit 6 Redacted, # 8 Exhibit 7, # 9 Exhibit 8)(Chen, Kyle) (Filed on 7/21/2015) (Entered: 07/21/2015)
07/21/2015	300	Administrative Motion to File Under Seal filed by CMI USA, Inc., CMI USA, Inc.. (Attachments: # 1 Proposed Order, # 2 Exhibit 2 UNDER SEAL, # 3 Exhibit 6 UNDER SEAL, # 4 Exhibit 2 CORRECTED REDACTED, # 5 Exhibit 6 REDACTED)(Chen, Kyle) (Filed on 7/21/2015) (Entered: 07/21/2015)
07/21/2015	301	MOTION to Remove Incorrectly Filed Document Docket No. 298-3 filed by CMI USA, Inc.. (Attachments: # 1 Proposed Order)(Chen, Kyle) (Filed on 7/21/2015) (Entered: 07/21/2015)
07/22/2015	302	CLERK'S NOTICE REGARDING DEFENDANT'S BILL OF COSTS re 263 BILL OF COSTS by CMI USA, Inc. (wsn, COURT STAFF) (Filed on 7/22/2015) (Entered: 07/22/2015)
07/22/2015	303	Costs Taxed in the amount of $57,159.18 against CMI USA, Inc. (wsn, COURT STAFF) (Filed on 7/22/2015) (Entered: 07/22/2015)
07/22/2015	304	ORDER by Judge Jon S. Tigar granting 301 Motion to Remove Incorrectly Filed Document. (wsn, COURT STAFF) (Filed on 7/22/2015) (Entered: 07/23/2015)
07/23/2015	305	ORDER GRANTING IN PART AND DENYING IN PART ADMINISTRATIVE MOTION TO FILE UNDER SEAL by Judge Jon S. Tigar; granting in part and denying in part 289 Administrative Motion to File Under Seal. (wsn, COURT STAFF) (Filed on 7/23/2015) (Entered: 07/23/2015)
07/24/2015	306	Declaration of Kyle D. Chen in Support of 294 Administrative Motion to File Under Seal; Supporting Declaration of Robert F. McCauley filed by CMI USA, Inc., CMI USA, Inc.. (Related document(s) 294) (Chen, Kyle) (Filed on 7/24/2015) (Entered: 07/24/2015)
07/24/2015	307	EXHIBITS re 288 Opposition/Response to Motion; -Exhibit C to Declaration of James Pampinella in Support of Defendant CMI's Opposition to Asetek Danmark A/S's Motion for Supplemental Damages and Prejudgment Interest (Dkt.No. 288-19) filed byCMI USA, Inc., CMI USA, Inc.. (Related document(s) 288) (Chen, Kyle) (Filed on 7/24/2015) (Entered: 07/24/2015)
07/27/2015	308	Declaration of Jeffrey D. Smyth in Support of 300 Administrative Motion to File Under Seal filed byAsetek Danmark A/S. (Related document(s) 300) (Smyth, Jeffrey) (Filed on 7/27/2015) (Entered: 07/27/2015)
07/29/2015	309	MOTION for Review of Taxation of Costs; -DEFENDANT CMI USA, INC.S MOTION TO REVIEW CLERKS DECISION NOT TO TAX COSTS UNDER FEDERAL RULE OF CIVIL PROCEDURE 26(b)(4)(E) filed by CMI USA, Inc.. Motion Hearing set for 9/3/2015 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 8/12/2015. Replies due by 8/19/2015. (Attachments: #(1) Proposed Order)(Chen, Kyle) (Filed on 7/29/2015) (Entered: 07/29/2015)
08/03/2015	310	FILED IN ERROR. PLEASE IGNOREMinute Entry for proceedings held before Hon. Jon S. Tigar: Markman Hearing held on 8/3/2015. Court Reporter: Debra Pas. (wsn, COURT STAFF) (Date Filed: 8/3/2015) Modified on 8/3/2015 (wsn, COURT STAFF). (Entered: 08/03/2015)
08/05/2015	311	ORDER GRANTING ADMINISTRATIVE MOTIONS TO FILE UNDER SEAL by Judge Jon S. Tigar; granting 294 Administrative Motion to File Under Seal; granting 300 Administrative Motion to File Under Seal. (wsn, COURT STAFF) (Filed on 8/5/2015) (Entered: 08/06/2015)
08/06/2015	312	Minute Entry for proceedings held before Hon. Jon S. Tigar: Motion Hearing held on 8/6/2015 re 269 MOTION for Judgment as a Matter of Law (Corrected) RENEWED MOTION FOR ENTRY OF JUDGMENT AS A MATTER OF LAW UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(3) AND MOTION FOR A NEW TRIAL UNDER FEDERAL RULE OF CIVIL PROCEDURE 50(b)(2) OR 59 filed by CMI USA, Inc.; 267 MOTION to Alter Judgment Plaintiff Asetek Danmark A/S's Motion for Supplemental

		Damages and Prejudgment Interest [Redacted Version] filed by Asetek Danmark A/S; 266 MOTION for Permanent Injunction filed by Asetek Danmark A/S. Court Reporter: Jo Ann Bryce. (wsn, COURT STAFF) (Date Filed: 8/6/2015) (Entered: 08/06/2015)
08/11/2015	313	OBJECTIONS to re 266 MOTION for Permanent Injunction; -CMI USA, Inc.'s Objections to Asetek Danmark A/S's Revised Proposed Form of Permanent Injunction filed by CMI USA, Inc.. (Attachments: #(1) Exhibit A)(Chen, Kyle) (Filed on 8/11/2015) (Entered: 08/11/2015)
08/12/2015	314	TRANSCRIPT ORDER by CMI USA, Inc. for Court Reporter Jo Ann Bryce. (Chen, Kyle) (Filed on 8/12/2015) (Entered: 08/12/2015)
08/12/2015	315	RESPONSE to (re 309 MOTION for Review of Taxation of Costs; -DEFENDANT CMI USA, INC.S MOTION TO REVIEW CLERKS DECISION NOT TO TAX COSTS UNDER FEDERAL RULE OF CIVIL PROCEDURE 26(b)(4)(E)); -Plaintiff's Opposition to Defendant's Motion to Review Clerk's Decision Not to Tax Costs Under Fed. R. Civ. P. 26(b)(4)(E) filed by Asetek Danmark A/S. (Attachments: #(1) Declaration of Jeffrey D. Smyth)(Smyth, Jeffrey) (Filed on 8/12/2015) (Entered: 08/12/2015)
08/17/2015	316	Sealed Transcript of Proceedings held on 8/6/15, before Judge Jon S. Tigar. Court Reporter Jo Ann Bryce, Telephone number 510-910-5888, joann_bryce@cand.uscourts.gov. Per General Order No. 59 and Judicial Conference policy,any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Bryce, Joann) (Filed on 8/17/2015) (Entered: 08/17/2015)
08/18/2015	317	ORDER REGARDING DEFENDANTS' OBJECTIONS TO PROPOSED FORM OF PERMANENT INJUNCTION re 313 Objection, filed by CMI USA, Inc. Signed by Judge Jon S. Tigar on August 18, 2015. (wsn, COURT STAFF) (Filed on 8/18/2015) (Entered: 08/19/2015)
08/19/2015	318	REPLY (re 309 MOTION for Review of Taxation of Costs; DEFENDANT CMI USA, INC.'S MOTION TO REVIEW CLERKS DECISION NOT TO TAX COSTS UNDER FEDERAL RULE OF CIVIL PROCEDURE 26(b)(4)(E)) filed by CMI USA, Inc., CMI USA, Inc.. (Chen, Kyle) (Filed on 8/19/2015) (Entered: 08/19/2015)
08/24/2015	319	ORDER VACATING HEARING re 309 MOTION for Review of Taxation of Costs; -DEFENDANT CMI USA, INC.S MOTION TO REVIEW CLERKS DECISION NOT TO TAX COSTS UNDER FEDERAL RULE OF CIVIL PROCEDURE 26(b)(4)(E) filed by CMI USA, Inc. Signed by Judge Jon S. Tigar on August 24, 2015. (wsn, COURT STAFF) (Filed on 8/24/2015) (Entered: 08/25/2015)
08/25/2015	320	RESPONSE to re 313 Objection; -Plaintiff Asetek Danmark A/S's Response to CMI's Objections to Asetek's Proposed Form of Permanent Injunction filed by Asetek Danmark A/S. (Attachments: # 1 Declaration of Robert F. McCauley, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5, # 7 Exhibit 6)(McCauley, Robert) (Filed on 8/25/2015) (Entered: 08/25/2015)
09/16/2015	321	ORDER DENYING MOTION TO REVIEW CLERK'S DECISION NOT TO TAX COSTS by Judge Jon S. Tigar; denying 309 Motion for Taxation of Costs. (wsn, COURT STAFF) (Filed on 9/16/2015) (Entered: 09/16/2015)
09/22/2015	322	ORDER DENYING DEFENDANT'S POST-TRIAL MOTIONS; GRANTING IN PART AND DENYING IN PART PLAINTIFF'S POST-TRIAL MOTIONS by Judge Jon S. Tigar; granting 266 Motion for Permanent Injunction; granting in part and denying in part 267 Motion to Alter Judgment; denying 269 Motion for Judgment as a Matter of Law. (wsn, COURT STAFF) (Filed on 9/22/2015) (Entered: 09/22/2015)
09/30/2015	323	NOTICE OF APPEAL to the United States Court of Appeals for the Federal Circuit as to re 321 Order on Motion for Taxation of Costs, re 126 Order on Motion for Summary Judgment, Order on Motion for Miscellaneous Relief, re 261 Judgment, re 232 Order, re 322 Order on Motion for Permanent

		Injunction, Order on Motion to Alter Judgment, Order on Motion for Judgment as a Matter of Law, re 35 Order filed by CMI USA, Inc., (Filing Fee: $505.00, receipt number 0971-9880033. Appeal Record due by 10/30/2015. (Chen, Kyle) (Filed on 9/30/2015) (Entered: 09/30/2015)
10/01/2015	324	Transmission of Notice of Appeal and Docket Sheet to the Federal Circuit Court of Appeals as to 323 Notice of Appeal to the Federal Circuit filed by CMI USA, Inc. (Attachments: #(1) Appeal Information Sheet, #(2) Notice of Appeal) (tnS) (Filed on 10/1/2015) (Entered: 10/01/2015)
10/07/2015	325	United States Court of Appeals for the Federal Circuit Notice of Docketing & Case Number 16-1026 for 323 Notice of Appeal to the Federal Circuit filed by CMI USA, Inc.. (tnS) (Filed on 10/7/2015) (Entered: 10/07/2015)
10/08/2015	326	Administrative Motion to File Under Seal; Supporting Declaration of Jeffrey D. Smyth filed by Asetek Danmark A/S. (Attachments: # 1 Proposed Order, # 2 Declaration of Nisha Mody Regarding Updated Damages Calculations [REDACTED VERSION], # 3 Declaration of Nisha Mody Regarding Updated Damages Calculations [UNREDACTED VERSION - SOUGHT TO BE SEALED], # 4 Exhibit 1 to the Declaration of Nisha Mody Regarding Updated Damages Calculations [SOUGHT TO BE SEALED], # 5 Exhibit 2 to the Declaration of Nisha Mody Regarding Updated Damages Calculations [SOUGHT TO BE SEALED], # 6 Exhibit 3 to the Declaration of Nisha Mody Regarding Updated Damages Calculations [SOUGHT TO BE SEALED], # 7 Exhibit 4 to the Declaration of Nisha Mody Regarding Updated Damages Calculations [SOUGHT TO BE SEALED], # 8 Exhibit 5 to the Declaration of Nisha Mody Regarding Updated Damages Calculations [SOUGHT TO BE SEALED], # 9 Exhibit 6 to the Declaration of Nisha Mody Regarding Updated Damages Calculations [SOUGHT TO BE SEALED], # 10 Exhibit 7 to the Declaration of Nisha Mody Regarding Updated Damages Calculations [SOUGHT TO BE SEALED], # 11 Exhibit 8 to the Declaration of Nisha Mody Regarding Updated Damages Calculations [SOUGHT TO BE SEALED], # 12 Exhibit 9 to the Declaration of Nisha Mody Regarding Updated Damages Calculations [SOUGHT TO BE SEALED])(Smyth, Jeffrey) (Filed on 10/8/2015) (Entered: 10/08/2015)
10/08/2015	327	[Proposed] Order re 322 Order on Motion for Permanent Injunction, Order on Motion to Alter Judgment, Order on Motion for Judgment as a Matter of Law; --[Proposed] Amended Judgment filed by Asetek Danmark A/S. (Smyth, Jeffrey) (Filed on 10/8/2015) (Entered: 10/08/2015)
10/08/2015	328	Declaration of Nisha Mody in Support of 327 [Proposed] Amended Judgment; -Declaration of Nisha Mody Regarding Updated Damages Calculations - [REDACTED VERSION] filed by Asetek Danmark A/S. (Attachments: # 1 Exhibit 1 - 9 COVER PAGES ONLY)(Related document (s) 327) (Smyth, Jeffrey) (Filed on 10/8/2015) (Entered: 10/08/2015)
10/08/2015	329	CERTIFICATE OF SERVICE filed by Asetek Danmark A/S of re 326 Administrative Motion to File Under Seal; Supporting Declaration of Jeffrey D. Smyth (Smyth, Jeffrey) (Filed on 10/8/2015) (Entered: 10/08/2015)
10/14/2015	330	Transcript of Proceedings held on 11/21/2013, (filed pursuant to modified Minutes at Docket #36) before Judge Edward M. Chen. Court Reporter/Transcriber Lydia Zinn, telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerk's Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction. After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. Redacted Transcript Deadline set for 11/16/2015. Release of Transcript Restriction set for 1/12/2016. (Zinn, Lydia) (Filed on 10/14/2015) (Entered: 10/14/2015)
10/14/2015	331	Transcript of Proceedings held on 11/26/2013, (filed pursuant to modified Minutes at Docket #37) before Judge Edward M. Chen. Court

		Reporter/Transcriber Lydia Zinn, telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerk's Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction. After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. Redacted Transcript Deadline set for 11/16/2015. Release of Transcript Restriction set for 1/12/2016. (Zinn, Lydia) (Filed on 10/14/2015) (Entered: 10/14/2015)
10/14/2015	332	Transcript Designation Form for CMI USA, Inc. (Chen, Kyle) (Filed on 10/14/2015) (Entered: 10/14/2015)
10/14/2015	333	ORDER REGARDING ADMINISTRATIVE MOTION TO FILE UNDER SEAL re 326 Administrative Motion to File Under Seal filed by Asetek Danmark A/S. Signed by Judge Jon S. Tigar on October 14, 2015. (wsn, COURT STAFF) (Filed on 10/14/2015) (Entered: 10/14/2015)
10/15/2015	334	TRANSCRIPT ORDER by CMI USA, Inc. for Court Reporter Katherine Powell. (Chen, Kyle) (Filed on 10/15/2015) (Entered: 10/15/2015)
10/16/2015	335	Declaration of Kyle D. Chen in Support of 333 Order, re 326 Administrative Motion to File Under Seal; Supporting Declaration of Jeffrey D. Smyth filed by CMI USA, Inc.. (Related document(s) 333 , 326) (Chen, Kyle) (Filed on 10/16/2015) (Entered: 10/16/2015)
10/19/2015	336	ORDER GRANTING ADMINISTRATIVE MOTION TO FILE UNDER SEAL by Judge Jon S. Tigar; granting 326 Administrative Motion to File Under Seal. (wsn, COURT STAFF) (Filed on 10/19/2015) (Entered: 10/19/2015)
10/19/2015	337	Defendant CMI, USA, Inc.'s Request for Release of Sealed Hearing Transcript filed by CMI USA, Inc.. (Attachments: #(1) Proposed Order) (Chen, Kyle) (Filed on 10/19/2015) (Entered: 10/19/2015)
10/19/2015	338	Joint Stipulation to Approve Bond and to Stay Execution of Judgment through Appeal Pursuant to FRCP 62; [Proposed] Order filed by CMI USA, Inc.. (Attachments: # 1 Declaration of Kyle D. Chen, # 2 Exhibit 1)(Chen, Kyle) (Filed on 10/19/2015) (Entered: 10/19/2015)
10/19/2015	339	AMENDED JUDGMENT. Signed by Judge Jon S. Tigar on October 19, 2015. (wsn, COURT STAFF) (Filed on 10/19/2015) (Entered: 10/20/2015)
10/21/2015	340	ORDER GRANTING DEFENDANT CMI USA, INC.'S REQUEST FOR RELEASE OF SEALED HEARING TRANSCRIPT re 337 Defendant CMI, USA, Inc.'s Request for Release of Sealed Hearing Transcript filed by CMI USA, Inc.. Signed by Judge Jon S. Tigar on October 21, 2015. (wsn, COURT STAFF) (Filed on 10/21/2015). (Entered: 10/21/2015)
10/21/2015	341	ORDER re 338 STIPULATION WITH PROPOSED ORDER - Joint Stipulation to Approve Bond and to Stay Execution of Judgment through Appeal Pursuant to FRCP 62; [Proposed] Order filed by CMI USA, Inc.. Signed by Judge Jon S. Tigar on October 21, 2015. (wsn, COURT STAFF) (Filed on 10/21/2015) (Entered: 10/21/2015)
10/21/2015	342	NOTICE of Appearance by Kyle Dakai Chen on behalf of Cooler Master Co., Ltd. (Chen, Kyle) (Filed on 10/21/2015) (Entered: 10/21/2015)
10/21/2015	343	NOTICE OF APPEAL to the United States Court of Appeals for the Federal Circuit as to 322 Order on Motion for Permanent Injunction, Order on Motion to Alter Judgment, Order on Motion for Judgment as a Matter of Law filed by Cooler Master Co., Ltd.. Filing Fee: $505.00, receipt number 0971-9934243. Appeal Record due by 11/20/2015. (Chen, Kyle) (Filed on 10/21/2015) (Entered: 10/21/2015)
10/22/2015	344	AMENDED NOTICE OF APPEAL to the United States Court of Appeals for the Federal Circuit filed by CMI USA, Inc. as to re 321 Order on Motion for Taxation of Costs, re 126 Order on Motion for Summary Judgment, Order on Motion for Miscellaneous Relief, re 261 Judgment, re 232 Order, re 322 Order on Motion for Permanent Injunction, Order on Motion to Alter

		Judgment, Order on Motion for Judgment as a Matter of Law, re 35 Order, re 339 Judgment; Appeal Record due by 11/23/2015. (Chen, Kyle) (Filed on 10/22/2015) (Entered: 10/22/2015)
10/23/2015	345	Transmission of Notice of Appeal & Amended Notice of Appeal and Docket Sheet to the Federal Circuit Court of Appeals as to 343 Notice of Appeal to the Federal Circuit & re 344 Amended Notice of Appeal to the Federal Circuit. (Attachments: #(1) Appeal Information Sheet, #(2) Notice of Appeal, #(3) Amended Notice of Appeal) (tnS) (Filed on 10/23/2015) (Entered: 10/23/2015)
10/26/2015	346	TRANSCRIPT ORDER by Asetek Danmark A/S for Court Reporter Katherine Powell. (Smyth, Jeffrey) (Filed on 10/26/2015) (Entered: 10/26/2015)
10/30/2015	347	NOTICE of "Undertaking for Appeal" filed by Asetek Danmark A/S, CMI USA, Inc. re 341 Joint Stipulation to Approve Bond and To Stay Execution of Judgment Through Appeal Pursuant to FRCP 62. (Attachments: #(1) Receipt #:34611110021, #(2) Docket #:341 - Joint Stipulation to Approve Bond & To Stay Execution of Judgment) (tnS) (Filed on 10/30/2015) (Entered: 10/30/2015)
10/30/2015	348	Sealed Transcript of Proceedings held on 3/7/14, before Judge Jon S. Tigar. Court Reporter/Transcriber Katherine Sullivan, Telephone number 415-794-6659. Per General Order No. 59 and Judicial Conference policy,any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. Redaction Request due 11/17/2015. Redacted Transcript Deadline set for 11/27/2015. (Sullivan, Katherine) (Filed on 10/30/2015) (Entered: 10/30/2015)
10/30/2015	349	MOTION to Intervene and to Suspend Injunction filed by Cooler Master Co., Ltd.. Motion Hearing set for 12/10/2015 02:00 PM in Courtroom 9, 19th Floor, San Francisco before Hon. Jon S. Tigar. Responses due by 11/13/2015. Replies due by 11/20/2015. (Attachments: # 1 Declaration of Tim Wang, # 2 Proposed Order)(Chen, Kyle) (Filed on 10/30/2015) (Entered: 10/30/2015)
11/04/2015	350	Transcript Designation Form for Cooler Master Co., Ltd. (Chen, Kyle) (Filed on 11/4/2015) (Entered: 11/04/2015)
11/10/2015	351	STIPULATION WITH [PROPOSED] ORDER re 349 MOTION to Intervene and to Suspend Injunction; -Joint Stipulated Request to Amend Briefing Schedule; [Proposed] Order filed by Asetek Danmark A/S. (Attachments: #(1) Declaration of Jeffrey D. Smyth in Support of Joint Stipulated Request to Amend Briefing Schedule)(Smyth, Jeffrey) (Filed on 11/10/2015) (Entered: 11/10/2015)
11/10/2015	352	STIPULATION AND ORDER re 351 STIPULATION WITH [PROPOSED] ORDER re 349 MOTION to Intervene and to Suspend Injunction; -Joint Stipulated Request to Amend Briefing Schedule filed by Asetek Danmark A/S. Signed by Judge Jon S. Tigar on November 10, 2015. (wsn, COURT STAFF) (Filed on 11/10/2015) (Entered: 11/10/2015)
11/10/2015	353	United States Court of Appeals for the Federal Circuit Notice of Docketing and Case Number 16-1183 for 343 Notice of Appeal to the Federal Circuit filed by Cooler Master Co., Ltd. & re 344 Amended Notice of Appeal to the Federal Circuit filed by CMI USA, Inc.. (tnS) (Filed on 11/10/2015) (Entered: 11/10/2015)
11/16/2015	354	Transcript Designation Form for Cooler Master Co., Ltd. (Chen, Kyle) (Filed on 11/16/2015) (Entered: 11/16/2015)
11/16/2015	355	RESPONSE to (re 349 MOTION to Intervene and to Suspend Injunction); -Plaintiff Asetek Danmark A/S's Opposition to Cooler Master Co., Ltd.'s Motion to Intervene and to Suspend Injunction filed by Asetek Danmark A/S. (Attachments: # 1 Declaration of Robert F. McCauley, # 2 Exhibit 1 - Part 1 to McCauley Decl., # 3 Exhibit 1 - Part 2 to McCauley Decl., # 4 Exhibit 2 to McCauley Decl.)(McCauley, Robert) (Filed on 11/16/2015) (Entered: 11/16/2015)

11/17/2015	356	United States Court of Appeals for the Federal Circuit Corrected Notice of Docketing as to 343 Notice of Appeal to the Federal Circuit filed by Cooler Master Co., Ltd., re 344 Amended Notice of Appeal filed by CMI USA, Inc.. (tnS) (Filed on 11/17/2015) (Entered: 11/17/2015)
11/24/2015	357	REPLY (re 349 MOTION to Intervene and to Suspend Injunction) filed by Cooler Master Co., Ltd.. (Attachments: #(1) Declaration (Supplemental) of Tim Wang, #(2) Declaration of Kyle D. Chen, #(3) Exhibit 1 to Chen Declaration)(Chen, Kyle) (Filed on 11/24/2015) (Entered: 11/24/2015)
11/30/2015	358	ORDER VACATING HEARING re 349 MOTION to Intervene and to Suspend Injunction filed by Cooler Master Co., Ltd. Signed by Judge Jon S. Tigar on November 30, 2015. (wsn, COURT STAFF) (Filed on 11/30/2015) (Entered: 11/30/2015)
01/04/2016	359	ORDER GRANTING MOTION TO INTERVENE AND DENYING MOTION TO SUSPEND INJUNCTION by Judge Jon S. Tigar; granting 349 Motion to Intervene; denying Motion Suspend Injunction. (wsn, COURT STAFF) (Filed on 1/4/2016) (Entered: 01/04/2016)
12/07/2016	360	United States Court of Appeals for the Federal Circuit's NOTICE of Entry of Judgment Accompanied by Opinion re 343 Notice of Appeal to the Federal Circuit filed by Cooler Master Co., Ltd., re 344 Amended Notice of Appeal filed by CMI USA, Inc. (tnS) (Filed on 12/7/2016) (Entered: 12/07/2016)
12/09/2016	361	CLERK'S NOTICE SETTING CASE MANAGEMENT CONFERENCE. A Case Management Conference set for 1/18/2017 at 2:00 PM in Courtroom 9, 19th Floor, San Francisco. A Joint Case Management Statement is due by 1/9/2017. (This is a text-only entry generated by the court. There is no document associated with this entry.) (wsn, COURT STAFF) (Filed on 12/9/2016) (Entered: 12/09/2016)
12/12/2016	362	NOTICE of Appearance by Jacob Adam Schroeder (Schroeder, Jacob) (Filed on 12/12/2016) (Entered: 12/12/2016)
12/12/2016	363	Administrative Motion to Consider Whether Cases Should be Related; Supporting Declaration filed by Asetek Danmark A/S. (Attachments: #(1) Proposed Order)(Schroeder, Jacob) (Filed on 12/12/2016) (Entered: 12/12/2016)
12/13/2016	364	CERTIFICATE OF SERVICE filed by Asetek Danmark A/S of re 363 Administrative Motion to Consider Whether Cases Should be Related; Supporting Declaration (Schroeder, Jacob) (Filed on 12/13/2016) (Entered: 12/13/2016)
12/20/2016	365	FILED IN ERROR. PLEASE IGNORE. SEE ECF 366 .RELATED CASE ORDER by Judge Jon S. Tigar granting (363) Motion to Relate Case in case 3:13-cv-00457-JST. (wsn, COURT STAFF) (Filed on 12/20/2016) Modified on 12/20/2016 (wsn, COURT STAFF). (Entered: 12/20/2016)
12/20/2016	366	RELATED CASE ORDER. Signed by Judge Jon S. Tigar on December 20, 2016. (wsn, COURT STAFF) (Filed on 12/20/2016) (Entered: 12/20/2016)
12/29/2016	367	MOTION to Relate Case Administrative Motion to Consider Whether Cases Should be Related; Supporting Declaration filed by Asetek Danmark A/S. (Attachments: # 1 Exhibit A, # 2 Proposed Order)(Bhattacharyya, Arpita) (Filed on 12/29/2016) (Entered: 12/29/2016)
12/29/2016	368	CERTIFICATE OF SERVICE by Asetek Danmark A/S re 367 MOTION to Relate Case Administrative Motion to Consider Whether Cases Should be Related; Supporting Declaration (Bhattacharyya, Arpita) (Filed on 12/29/2016) (Entered: 12/29/2016)
01/04/2017	369	RELATED CASE ORDER by Judge Jon S. Tigar granting (367) Motion to Relate Case in case 3:13-cv-00457-JST. (wsn, COURT STAFF) (Filed on 1/4/2017) (Entered: 01/04/2017)
01/09/2017	370	STIPULATION WITH PROPOSED ORDER re 361 Clerk's Notice, Joint Case Management Statement and Stipulated Request to Continue Case

		Management Conference; Proposed Order filed by Asetek Danmark A/S. (McCauley, Robert) (Filed on 1/9/2017) (Entered: 01/09/2017)
01/10/2017	371	STIPULATION AND ORDER re 370 STIPULATION WITH PROPOSED ORDER re 361 Clerk's Notice, Joint Case Management Statement and Stipulated Request to Continue Case Management Conference; Proposed Order filed by Asetek Danmark A/S. Status Report due by 3/1/2017. Signed by Judge Jon S. Tigar on January 10, 2017. (wsn, COURT STAFF) (Filed on 1/10/2017) (Entered: 01/10/2017)

US District Court Civil Docket

U.S. District - California Northern
(San Francisco)

3:12cv4498

Asetek Holdings, Inc et al v. Coolit Systems Inc

This case was retrieved from the court on Thursday, February 23, 2017

Date Filed:	**08/27/2012**	Class Code:	**CLOSED**
Assigned To:	**Honorable Edward M. Chen**	Closed:	**02/09/2015**
Referred To:	**Magistrate Judge Laurel Beeler**	Statute:	**28:1331**
Nature of suit:	**Patent (830)**	Jury Demand:	**Both**
Cause:	**Fed. Question**	Demand Amount:	**$0**
Lead Docket:	**None**	NOS Description:	**Patent**
Other Docket:	**None**		
Jurisdiction:	**Federal Question**		

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Date	#	Proceeding Text	Source
08/27/2012	1	COMPLAINT FOR PATENT INFRINGEMENT: DEMAND FOR JURY TRIAL; against Coolit Systems Inc (Filing fee $ 350.00, receipt number 34611077936.). Filed byAsetek Holdings, Inc, Asetek A/S. (aaa, COURT STAFF) (Filed on 8/27/2012) (Additional attachment(s) added on 8/28/2012: # 1 Complaint Pt.02) (aaa, COURT STAFF). (Additional attachment(s) added on 8/28/2012: # 2 Complaint Pt.03) (aaa, COURT STAFF). (Additional attachment(s) added on 8/28/2012: # 3 Complaint Pt.04, # 4 Civil Cover Sheet) (aaa, COURT STAFF). (Entered: 08/28/2012)	
08/27/2012	2	ADR SCHEDULING ORDER: Case Management Statement due by 11/21/2012. Case Management Conference set for 11/28/2012 10:00 AM. Signed by Magistrate Judge Nathanael M. Cousins on 8/27/12. (Attachments: # 1 NC Standing Order, # 2 Standing Order)(aaa, COURT STAFF) (Filed on 8/27/2012) (Entered: 08/28/2012)	
08/27/2012	3	Certificate of Interested Entities or Persons; by Asetek A/S, Asetek Holdings, Inc (aaa, COURT STAFF) (Filed on 8/27/2012) (Entered: 08/28/2012)	
08/27/2012	4	Summons Issued as to Coolit Systems Inc. (aaa, COURT STAFF) (Filed on 8/27/2012) (Entered: 08/28/2012)	
08/28/2012	5	REPORT on the filing or determination of an action regarding:PATENT INFRINGEMENT (cc: form mailed to register). (aaa, COURT STAFF) (Filed on 8/28/2012) (Entered: 08/28/2012)	
09/21/2012	6	DECLINATION to Proceed Before a US Magistrate Judge by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 9/21/2012) Modified on 9/24/2012 (mcl, COURT STAFF). (Entered: 09/21/2012)	
09/21/2012	7	CLERK'S NOTICE of Impending Reassignment to U.S. District Judge. (lmh, COURT STAFF) (Filed on 9/21/2012) (Entered: 09/21/2012)	
09/24/2012	8	ORDER, Case reassigned to Hon. Edward M. Chen. Magistrate Judge Nathanael M. Cousins no longer assigned to the case.. Signed by	

		Executive Committee on 9/24/12. (ha, COURT STAFF) (Filed on 9/24/2012) (Entered: 09/24/2012)
09/27/2012	9	CERTIFICATE OF SERVICE by Asetek A/S, Asetek Holdings, Inc (McCauley, Robert) (Filed on 9/27/2012) (Entered: 09/27/2012)
10/02/2012	10	STIPULATION for Extension of Time to Respond to Plaintiffs' Complaint filed by Coolit Systems Inc. (Keefe, Heidi) (Filed on 10/2/2012) (Entered: 10/02/2012)
10/03/2012	11	CASE MANAGEMENT CONFERENCE ORDER IN REASSIGNED CASES. Joint Case Management Statement due by 12/7/2012. Case Management Conference set for 12/14/2012 at 9:00 AM in Courtroom 5, 17th Floor, San Francisco. Signed by Judge Edward M. Chen on October 3, 2012. (Attachments: # 1 Standing Order)(wsn, COURT STAFF) (Filed on 10/3/2012) (Entered: 10/03/2012)
10/04/2012	12	CERTIFICATE OF SERVICE by Asetek A/S, Asetek Holdings, Inc (McCauley, Robert) (Filed on 10/4/2012) (Entered: 10/04/2012)
10/08/2012	13	MOTION for leave to appear in Pro Hac Vice Katherine P. Barecchia (Filing fee $ 305, receipt number 0971-7182372.) filed by Coolit Systems Inc. (Barecchia, Katherine) (Filed on 10/8/2012) (Entered: 10/08/2012)
10/09/2012	14	MOTION for leave to appear in Pro Hac Vice (Filing fee $ 305, receipt number 0971-7183876.) filed by Coolit Systems Inc. (Dion, Joel) (Filed on 10/9/2012) (Entered: 10/09/2012)
10/09/2012	15	MOTION for leave to appear in Pro Hac Vice of Dennis McCooe (Filing fee $ 305, receipt number 0971-7184032.) filed by Coolit Systems Inc. (McCooe, Dennis) (Filed on 10/9/2012) (Entered: 10/09/2012)
10/19/2012	16	ORDER by Judge Edward M. Chen granting 13 Motion for Pro Hac Vice (Barecchia) (bpf, COURT STAFF) (Filed on 10/19/2012) (Entered: 10/19/2012)
10/22/2012	17	ORDER by Judge Edward M. Chen granting 14 Motion for Pro Hac Vice (Dion) (bpf, COURT STAFF) (Filed on 10/22/2012) (Entered: 10/22/2012)
10/22/2012	18	ORDER by Judge Edward M. Chen granting 15 Motion for Pro Hac Vice (McCooe) (bpf, COURT STAFF) (Filed on 10/22/2012) (Entered: 10/22/2012)
10/24/2012	19	STANDING ORDER. Signed by Judge Edward M. Chen on 10/24/12. (bpf, COURT STAFF) (Filed on 10/24/2012) (Entered: 10/24/2012)
10/26/2012	20	MOTION to Stay Pending Outcome of Inter Partes Reexaminations filed by Coolit Systems Inc. Motion Hearing set for 1/17/2013 01:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Responses due by 11/9/2012. Replies due by 11/16/2012. (Attachments: # 1 Proposed Order)(Knauss, Daniel) (Filed on 10/26/2012) (Entered: 10/26/2012)
10/26/2012	21	Declaration of DANIEL J. KNAUSS in Support of 20 MOTION to Stay Pending Outcome of Inter Partes Reexaminations filed byCoolit Systems Inc. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C)(Related document(s) 20) (Knauss, Daniel) (Filed on 10/26/2012) (Entered: 10/26/2012)
10/26/2012	22	MOTION to Dismiss Pursuant to Fed. R. Civ. P. 12(b)(6) filed by Coolit Systems Inc. Motion Hearing set for 1/17/2013 01:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Responses due by 11/9/2012. Replies due by 11/16/2012. (Attachments: # 1 Proposed Order)(Knauss, Daniel) (Filed on 10/26/2012) (Entered: 10/26/2012)
10/26/2012	23	Declaration of Geoffrey Sean Lyon in Support of 22 MOTION to Dismiss Pursuant to Fed. R. Civ. P. 12(b)(6) filed byCoolit Systems Inc. (Attachments: # 1 Exhibit A, # 2 Exhibit B)(Related document(s) 22) (Knauss, Daniel) (Filed on 10/26/2012) (Entered: 10/26/2012)

10/26/2012	24	NOTICE by Coolit Systems Inc Disclosure Statement (FRCP 7.1) and Certficate of Interested Entities and Persons (Civ LR 3-16) (Knauss, Daniel) (Filed on 10/26/2012) (Entered: 10/26/2012)
10/26/2012	25	Administrative Motion to File Under Seal Documents Supporting CoolIT's Motion to Dismiss filed by Coolit Systems Inc. (Attachments: # 1 Declaration ISO Administrative Motion to Seal, # 2 Proposed Order) (Knauss, Daniel) (Filed on 10/26/2012) (Entered: 10/26/2012)
11/07/2012	26	NOTICE of Appearance by Tina E. Hulse (Hulse, Tina) (Filed on 11/7/2012) (Entered: 11/07/2012)
11/07/2012	27	STIPULATION WITH PROPOSED ORDER re 22 MOTION to Dismiss Pursuant to Fed. R. Civ. P. 12(b)(6), 20 MOTION to Stay Pending Outcome of Inter Partes Reexaminations filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Robert F. McCauley)(McCauley, Robert) (Filed on 11/7/2012) (Entered: 11/07/2012)
11/08/2012	28	STIPULATION AND ORDER EXTENDING BRIEFING SCHEDULE re 22 MOTION to Dismiss 20 MOTION to Stay Pending Outcome of Inter Partes Reexaminations filed by Asetek Holdings, Inc, Responses due by 11/23/2012. Replies due by 12/7/2012.. Signed by Judge Edward M. Chen on 11/8/12. (bpf, COURT STAFF) (Filed on 11/8/2012) (Entered: 11/08/2012)
11/20/2012	29	ADR Certification (ADR L.R. 3-5 b) of discussion of ADR options (McCauley, Robert) (Filed on 11/20/2012) (Entered: 11/20/2012)
11/21/2012	30	NOTICE of need for ADR Phone Conference (ADR L.R. 3-5 d) (McCauley, Robert) (Filed on 11/21/2012) (Entered: 11/21/2012)
11/21/2012	31	ADR Certification (ADR L.R. 3-5 b) of discussion of ADR options Filed by Defendant CoolIT Systems, Inc. (Knauss, Daniel) (Filed on 11/21/2012) (Entered: 11/21/2012)
11/21/2012	32	Administrative Motion to File Under Seal Plaintiffs' Administrative Motion to Partially File Under Seal filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Andre S. Eriksen, # 2 Proposed Order) (McCauley, Robert) (Filed on 11/21/2012) (Entered: 11/21/2012)
11/21/2012	33	RESPONSE (re 20 MOTION to Stay Pending Outcome of Inter Partes Reexaminations) Plaintiffs' Opposition to Defendant CoolIT Systems, Inc.'s Motion to Stay the Civil Action Pending the Outcome of the Inter Partes Reexaminations of U.S. Patent Nos. 8,240,362 and 8,245,764 [REDACTED VERSION FOR PUBLIC VIEWING] filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Proposed Order)(McCauley, Robert) (Filed on 11/21/2012) (Entered: 11/21/2012)
11/21/2012	34	Declaration of Tina E. Hulse in Support of 33 Opposition/Response to Motion, filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit 1, # 2 Exhibit 2, # 3 Exhibit 3, # 4 Exhibit 4, # 5 Exhibit 5, # 6 Exhibit 6)(Related document(s) 33) (McCauley, Robert) (Filed on 11/21/2012) (Entered: 11/21/2012)
11/21/2012	35	Declaration of Andre S. Eriksen in Support of 33 Opposition/Response to Motion, [REDACTED VERSION FOR PUBLIC VIEWING] filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit A)(Related document(s) 33) (McCauley, Robert) (Filed on 11/21/2012) (Entered: 11/21/2012)
11/21/2012	36	RESPONSE (re 22 MOTION to Dismiss Pursuant to Fed. R. Civ. P. 12(b)(6)) Plaintiffs' Opposition to Defendant CoolIT Systems, Inc.'s Motion to Dismiss Pursuant to Fed. R. Civ. P. 12(b)(6) [REDACTED VERSION FOR PUBLIC VIEWING] filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Proposed Order)(McCauley, Robert) (Filed on 11/21/2012) (Entered: 11/21/2012)
11/21/2012	37	Declaration of Tina E. Hulse in Support of 36 Opposition/Response to Motion, filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1

		Exhibit 1)(Related document(s) 36) (McCauley, Robert) (Filed on 11/21/2012) (Entered: 11/21/2012)
11/26/2012	38	NOTICE by Coolit Systems Inc STIPULATED REQUEST FOR ORDER RESCHEDULING THE DECEMBER 14, 2012 CASE MANAGEMENT CONFERENCE AND PROPOSED ORDER (Knauss, Daniel) (Filed on 11/26/2012) (Entered: 11/26/2012)
11/29/2012	39	ORDER RESETTING CMC TO 1/17/13 AT 1:30 P.M. re 38 Notice (Other) filed by Coolit Systems Inc.. Signed by Judge Edward M. Chen on 11/29/12. (bpf, COURT STAFF) (Filed on 11/29/2012) (Entered: 11/29/2012)
11/29/2012		Set Deadlines/Hearings: Case Management Statement due by 1/10/2013. Case Management Conference set for 1/17/2013 01:30 PM in Courtroom 5, 17th Floor, San Francisco. (bpf, COURT STAFF) (Filed on 11/29/2012) (Entered: 11/29/2012)
12/04/2012	40	ADR Clerk Notice Setting ADR Phone Conference on 1/14/2013 at 10:30 a.m. Pacific. Please note that you must be logged into an ECF account of counsel of record in order to view this document. (sgd, COURT STAFF) (Filed on 12/4/2012) (Entered: 12/04/2012)
12/07/2012	41	Administrative Motion to File Under Seal Documents Supporting CoolIT's Reply ISO Motions to Dismiss and Stay filed by Coolit Systems Inc. (Attachments: # 1 Declaration Daniel J. Knauss, # 2 Proposed Order) (Knauss, Daniel) (Filed on 12/7/2012) (Entered: 12/07/2012)
12/07/2012	42	REPLY (re 22 MOTION to Dismiss Pursuant to Fed. R. Civ. P. 12(b)(6)) REDACTED VERSION filed byCoolit Systems Inc. (Knauss, Daniel) (Filed on 12/7/2012) (Entered: 12/07/2012)
12/07/2012	43	REPLY (re 20 MOTION to Stay Pending Outcome of Inter Partes Reexaminations) REDACTED VERSION filed byCoolit Systems Inc. (Attachments: # 1 Declaration Geoffrey Sean Lyon ISO CoolIT's Reply ISO Motion to Stay)(Knauss, Daniel) (Filed on 12/7/2012) (Entered: 12/07/2012)
12/12/2012	44	ORDER by Judge Edward M. Chen granting 25 Administrative Motion to File Under Seal (bpf, COURT STAFF) (Filed on 12/12/2012) (Entered: 12/12/2012)
12/12/2012	45	ORDER by Judge Edward M. Chen granting 32 Administrative Motion to File Under Seal (bpf, COURT STAFF) (Filed on 12/12/2012) (Entered: 12/12/2012)
12/12/2012	46	ORDER by Judge Edward M. Chen granting 41 Administrative Motion to File Under Seal (bpf, COURT STAFF) (Filed on 12/12/2012) (Entered: 12/12/2012)
12/14/2012	47	DOCUMENT E-FILED UNDER SEAL re 45 Order on Administrative Motion to File Under Seal Plaintiff's Opposition to Defendant CoolIT Systems, Inc.'s Motion to Stay the Civil Action Pending the Outcome of the Inter Partes Reexaminations of U.S. Patent Nos. 8,240,362 adn 8,245,764 by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Andre S. Eriksen)(McCauley, Robert) (Filed on 12/14/2012) (Entered: 12/14/2012)
12/14/2012	48	DOCUMENT E-FILED UNDER SEAL re 45 Order on Administrative Motion to File Under Seal Plaintiffs' Opposition to Defendant CoolIT Systems, Inc.'s Motion to Dismiss Pursuant to Fed. R. Civ. P. 12(b)(6) by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 12/14/2012) (Entered: 12/14/2012)
12/14/2012	49	DOCUMENT E-FILED UNDER SEAL re 44 Order on Administrative Motion to File Under Seal Exs. A & B to the Declaration of Geoffrey Sean Lyon ISO Def's Motion to Dismiss by Coolit Systems Inc. (Knauss, Daniel) (Filed on 12/14/2012) (Entered: 12/14/2012)
12/14/2012	50	

		DOCUMENT E-FILED UNDER SEAL re 46 Order on Administrative Motion to File Under Seal Def's Reply ISO Motion to Dismiss by Coolit Systems Inc. (Knauss, Daniel) (Filed on 12/14/2012) (Entered: 12/14/2012)
12/14/2012	51	DOCUMENT E-FILED UNDER SEAL re 46 Order on Administrative Motion to File Under Seal Def's Reply ISO Motion to Stay by Coolit Systems Inc. (Knauss, Daniel) (Filed on 12/14/2012) (Entered: 12/14/2012)
12/14/2012	52	MOTION for Leave to File Plaintiff's Administrative Motion For Leave to File Surreply to Defendant CoolIT Systems, Inc.'s Motion to Stay the Civil Action Pending the Outcome of the Inter Partes Reexaminations of U.S. Patent Nos. 8,240,362 and 8,245764 filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Proposed Order, # 2 Declaration of Tina E. Hulse, # 3 Exhibit A)(McCauley, Robert) (Filed on 12/14/2012) (Entered: 12/14/2012)
12/18/2012	53	RESPONSE (re 52 MOTION for Leave to File Plaintiff's Administrative Motion For Leave to File Surreply to Defendant CoolIT Systems, Inc.'s Motion to Stay the Civil Action Pending the Outcome of the Inter Partes Reexaminations of U.S. Patent Nos. 8,240,362) filed byCoolit Systems Inc. (Attachments: # 1 Declaration of Daniel J. Knauss ISO Oppsn to Administrative Motion to File Surreply, # 2 Exhibit 1)(Knauss, Daniel) (Filed on 12/18/2012) (Entered: 12/18/2012)
01/10/2013	54	CASE MANAGEMENT STATEMENT Joint Case Management Statement and [Proposed] Case Management Order filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 1/10/2013) (Entered: 01/10/2013)
01/15/2013	55	STIPULATION WITH PROPOSED ORDER Stipulated Request to Seal Courtroom During Motions Hearing; [Proposed] Order filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 1/15/2013) (Entered: 01/15/2013)
01/15/2013		ADR Remark: ADR Phone Conference held by HAH on 1/14/13. (sgd, COURT STAFF) (Filed on 1/15/2013) (Entered: 01/15/2013)
01/16/2013	56	STIPULATION AND ORDER re 55 Stipulated Request to Seal Courtroom During Motions Hearing; [Proposed] Order filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Edward M. Chen on 1/16/13. (bpf, COURT STAFF) (Filed on 1/16/2013) (Entered: 01/16/2013)
01/16/2013	57	NOTICE of Appearance by Jeffrey Thomas Norberg on behalf of Defendant CoolIT Systems, Inc. (Norberg, Jeffrey) (Filed on 1/16/2013) (Entered: 01/16/2013)
01/18/2013	58	Minute Entry: Motion Hearing held on 1/17/2013 before Edward M. Chen (Date Filed: 1/18/2013) re 22 MOTION to Dismiss Pursuant to Fed. R. Civ. P. 12(b)(6) filed by Coolit Systems Inc, 20 MOTION to Stay Pending Outcome of Inter Partes Reexaminations filed by Coolit Systems Inc, Case referred to mediation. Case Management Statement due by 5/15/2013. Further Case Management Conference set for 5/23/2013 10:30 AM in Courtroom 5, 17th Floor, San Francisco. (Court Reporter Joan Columbini.) (bpf, COURT STAFF) (Date Filed: 1/18/2013) (Entered: 01/18/2013)
01/23/2013	59	ORDER by Judge Edward M. Chen granting 52 Plaintiff's Motion for Leave to File Sur-Reply; denying 20 Defendant's Motion to Stay (emclc1, COURT STAFF) (Filed on 1/23/2013) (Entered: 01/23/2013)
01/23/2013	60	*** FILED IN ERROR. DOCUMENT REMOVED. PLEASE SEE DOCKET # 61 . *** ORDER (REDACTED VERSION) by Judge Edward M. Chen Granting in Part and Denying in Part 22 Defendant's Motion to Dismiss. (Attachments: # 1 Certificate of Service). (emcsec, COURT STAFF) (Filed on 1/23/2013) (Main Document 60 replaced on 1/25/2013) (ewn, COURT STAFF). Modified on 1/25/2013 (ewn, COURT STAFF). (Entered: 01/23/2013)
01/23/2013	61	ORDER (SEALED VERSION) by Judge Edward M. Chen Granting in Part and Denying in Part 22 Defendant's Motion to Dismiss. (slh, COURT STAFF) (Filed on 1/23/2013) (Entered: 01/23/2013)

01/25/2013	62	ORDER (REDACTED VERSION) GRANTING IN PART AND DENYING IN PART DEFENDANT'S MOTION TO DISMISS . Signed by Judge Edward M. Chen on 1/23/13. (bpf, COURT STAFF) (Filed on 1/25/2013) Modified on 1/25/2013 (bpf, COURT STAFF). (Entered: 01/25/2013)
01/29/2013	63	Statement re 62 Order Parties' Joint Statement Regarding Redactions of Sealed Version of Order Granting in Part and Denying in Part Defendant's Motion to Dismiss by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 1/29/2013) (Entered: 01/29/2013)
02/01/2013	64	ORDER GRANTING IN PART AND DENYING IN PART DEFENDNANT'S MOTION TO DISMISS (Narrower redacted version of Order #62). Signed by Judge Edward M. Chen on 1/23/13. (bpf, COURT STAFF) (Filed on 2/1/2013) (Entered: 02/01/2013)
02/01/2013	65	AMENDED COMPLAINT First Amended Complaint for Patent Infringement against Coolit Systems Inc. Filed by Asetek Holdings, Inc, Asetek A/S. (Attachments: # 1 Exhibit A, # 2 Exhibit B)(McCauley, Robert) (Filed on 2/1/2013) Modified on 2/4/2013 (slhS, COURT STAFF). (Entered: 02/01/2013)
02/06/2013	66	REPORT on the amended filing of an action regarding patent infringement (cc: form mailed to register). (slhS, COURT STAFF) (Filed on 2/6/2013) (Entered: 02/06/2013)
02/07/2013	67	STIPULATION WITH PROPOSED ORDER [Proposed] Stipulated Protective Order filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 2/7/2013) (Entered: 02/07/2013)
02/08/2013	68	Stipulated Protective Order filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Edward M. Chen on 2/8/13. (bpf, COURT STAFF) (Filed on 2/8/2013) (Entered: 02/08/2013)
02/14/2013	69	MOTION to Relate Case Plaintiffs' Administrative Motion Under L.R. 3-12 to Consider Whether Cases Should be Related; Supporting Declaration; Certificate of Service filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Proposed Order)(McCauley, Robert) (Filed on 2/14/2013) (Entered: 02/14/2013)
02/19/2013	70	COOLIT SYSTEMS, INC.'S ANSWER to Amended Complaint , COUNTERCLAIM against Asetek A/S, Asetek Holdings, Inc byCoolit Systems Inc. (Knauss, Daniel) (Filed on 2/19/2013) (Entered: 02/19/2013)
02/26/2013	71	ORDER by Judge Edward M. Chen denying 69 Motion to Relate Case > Cases are not related. (bpf, COURT STAFF) (Filed on 2/26/2013) (Entered: 02/26/2013)
02/26/2013	72	AMENDED ANSWER to Amended Complaint , COUNTERCLAIM against Asetek A/S, Asetek Holdings, Inc byCoolit Systems Inc. (Attachments: # 1 Exhibit A)(Knauss, Daniel) (Filed on 2/26/2013) (Entered: 02/26/2013)
03/08/2013	73	STIPULATION WITH PROPOSED ORDER STIPULATED REQUEST FOR ORDER AMENDING CASE MANAGEMENT ORDER; PROPOSED ORDER filed by Coolit Systems Inc. (Knauss, Daniel) (Filed on 3/8/2013) (Entered: 03/08/2013)
03/12/2013	74	ANSWER to Counterclaim Plaintiffs Asetek Holdings, Inc. and Asetek A/S's Response to Defendant CoolIT Systems Inc.'s First Amended Counterclaims to Plaintiffs' First Amended Complaint byAsetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 3/12/2013) (Entered: 03/12/2013)
03/12/2013	75	STIPULATION AND ORDER re 73 STIPULATION WITH PROPOSED ORDER STIPULATED REQUEST FOR ORDER AMENDING CASE MANAGEMENT ORDER; PROPOSED ORDER filed by Coolit Systems Inc Claims Construction Hearing set for 11/4/2013 02:30 PM. Tutorial Hearing set for 10/21/2013 10:00 AM in Courtroom 5, 17th Floor, San Francisco. Claims Construction Hearing set for 11/5/2013 02:30 PM.. Signed by Judge

		Edward M. Chen on 3/12/13. (bpf, COURT STAFF) (Filed on 3/12/2013) (Entered: 03/12/2013)
05/10/2013	76	MOTION for Leave to File Plaintiffs Asetek Holdings, Inc. and Asetek A/S's Motion for Leave to File a Second Amended Complaint filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Proposed Order [Proposed] Order Granting Plaintiffs Asetek Holdings, Inc. and Asetek A/S's Motion for Leave to File a Second Amended Complaint)(McCauley, Robert) (Filed on 5/10/2013) (Entered: 05/10/2013)
05/10/2013	77	Declaration of Tina E. Hulse in Support of 76 MOTION for Leave to File Plaintiffs Asetek Holdings, Inc. and Asetek A/S's Motion for Leave to File a Second Amended Complaint filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit 1 - Asetek 2nd Amended Complaint, # 2 Exhibit 2 - Email exchange, # 3 Exhibit 3 - 362 Patent, # 4 Exhibit 4 - 764 Patent, # 5 Exhibit 5 - Fax transmission, # 6 Exhibit 6 - RFA responses, # 7 Exhibit 7 - Interrogatory responses, # 8 Exhibit 8 - Ntc of Allowance, Fees Due, # 9 Exhibit 9 - Ntc of Allowability, # 10 Exhibit 10 - Issue Notification, # 11 Exhibit 11 - Ntc of Allowance, Fees Due, # 12 Exhibit 12 - Issue Notification)(Related document(s) 76) (McCauley, Robert) (Filed on 5/10/2013) (Entered: 05/10/2013)
05/14/2013	78	CLERKS NOTICE SETTING MOTION HEARING FOR 6/20/13, Set/Reset Deadlines as to 76 MOTION for Leave to File Plaintiffs Asetek Holdings, Inc. and Asetek A/S's Motion for Leave to File a Second Amended Complaint. Responses due by 5/24/2013. Replies due by 5/31/2013. Motion Hearing set for 6/20/2013 01:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. THIS IS A TEXT ONLY DOCKET ENTRY; THERE IS NO DOCUMENT ASSOCIATED WITH THIS NOTICE. (bpf, COURT STAFF) (Filed on 5/14/2013) (Entered: 05/14/2013)
05/14/2013	79	STIPULATION WITH PROPOSED ORDER Stipulated Request to Seal Courtroom During Case Management Conference; [Proposed] Order filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 5/14/2013) (Entered: 05/14/2013)
05/15/2013	80	CASE MANAGEMENT STATEMENT Joint Case Management Statement filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 5/15/2013) (Entered: 05/15/2013)
05/16/2013	81	STIPULATION AND ORDER re 79 Stipulated Request to Seal Courtroom During Case Management Conference; [Proposed] Order filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Edward M. Chen on 5/16/13. (bpf, COURT STAFF) (Filed on 5/16/2013) (Entered: 05/16/2013)
05/24/2013	82	RESPONSE (re 76 MOTION for Leave to File Plaintiffs Asetek Holdings, Inc. and Asetek A/S's Motion for Leave to File a Second Amended Complaint) filed byCoolit Systems Inc. (Knauss, Daniel) (Filed on 5/24/2013) (Entered: 05/24/2013)
05/28/2013	83	Minute Entry: Further Case Management Conference held on 5/23/2013 before Edward M. Chen (Date Filed: 5/28/2013). Case Management Statement due by 6/13/2013. Further Case Management Conference set for 6/20/2013 10:30 AM in Courtroom 5, 17th Floor, San Francisco. (Court Reporter Connie Kuhl.) (bpf, COURT STAFF) (Date Filed: 5/28/2013) (Entered: 05/28/2013)
05/31/2013	84	REPLY (re 76 MOTION for Leave to File Plaintiffs Asetek Holdings, Inc. and Asetek A/S's Motion for Leave to File a Second Amended Complaint) filed byAsetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 5/31/2013) (Entered: 05/31/2013)
06/12/2013	85	JOINT CASE MANAGEMENT STATEMENT filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 6/12/2013) (Entered: 06/12/2013)
06/17/2013	86	REQUEST and Proposed Order by Counsel for Defendant to Appear by Telephone at Case Management Conference filed by Coolit Systems Inc

		(Knauss, Daniel) (Filed on 6/17/2013) Modified on 6/18/2013 (slhS, COURT STAFF). (Entered: 06/17/2013)
06/18/2013	87	CLERKS NOTICE resetting further CMC from 10:30 to 1:30 p.m. on 6/20/13. Further Case Management Conference set for 6/20/2013 01:30 PM in Courtroom 5, 17th Floor, San Francisco. THIS IS A TEXT ONLY DOCKET ENTRY; THERE IS NO DOCUMENT ASSOCIATED WITH THIS NOTICE.(bpf, COURT STAFF) (Filed on 6/18/2013) (Entered: 06/18/2013)
06/19/2013	88	ORDER re 86 Notice (Other) filed by Coolit Systems Inc. Signed by Judge Edward M. Chen on 6/19/13. (bpf, COURT STAFF) (Filed on 6/19/2013) (Entered: 06/19/2013)
06/24/2013	89	Minute Entry: Motion Hearing held on 6/20/2013 before EDWARD M. CHEN (Date Filed: 6/24/2013) re 76 MOTION for Leave to File Plaintiffs Asetek Holdings, Inc. and Asetek A/S's Motion for Leave to File a Second Amended Complaint filed by Asetek Holdings, Inc, Asetek A/S. Consolidating tutorial and claims construction hearing for this case and Case No. C13-0457JST Asetek v. Cooler Master will be held. Granted. (Court Reporter Connie Kuhl.) (bpf, COURT STAFF) (Date Filed: 6/24/2013) (Entered: 06/24/2013)
06/24/2013	90	SECOND AMENDED COMPLAINT against Coolit Systems Inc. Filed by Asetek A/S, Asetek Holdings, Inc. (slhS, COURT STAFF) (Filed on 6/24/2013) (Entered: 06/25/2013)
07/11/2013	91	ANSWER to Amended Complaint (Second Amended), COUNTERCLAIM (First Amended) against Coolit Systems Inc byCoolit Systems Inc. (Knauss, Daniel) (Filed on 7/11/2013) (Entered: 07/11/2013)
07/25/2013	92	ANSWER TO COUNTERCLAIM 91 Answer to Amended Complaint, Counterclaim Plaintiffs Asetek Holdings, Inc. and Asetek A/S's Response to Defendant CoolIT Systems Inc.'s First Amended Counterclaims to Plaintiffs' Second Amended Complaint byAsetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 7/25/2013) (Entered: 07/25/2013)
08/02/2013	93	MOTION for Partial Summary Judgment PUBLIC VERSION filed by Coolit Systems Inc. Motion Hearing set for 9/19/2013 01:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Responses due by 8/16/2013. Replies due by 8/23/2013. (Attachments: # 1 Declaration of Geoffrey Sean Lyon ISO Motion for Patial Summary Judgment, # 2 Exhibit A to Declaration of Geoffrey Sean Lyon, # 3 Exhibit B of Geoffrey Sean Lyon, # 4 Proposed Order)(Knauss, Daniel) (Filed on 8/2/2013) (Entered: 08/02/2013)
08/02/2013	94	Administrative Motion to File Under Seal MOTION FOR PARTIAL SUMMARY JUDGMENT, DECL OF GEOFFREY SEAN LYON, EXHS. A&B filed by Coolit Systems Inc. (Attachments: # 1 Declaration of Daniel J. Knauss ISO Motion to Seal, # 2 Exhibit, # 3 Exhibit, # 4 Exhibit, # 5 Exhibit, # 6 Proposed Order)(Knauss, Daniel) (Filed on 8/2/2013) (Entered: 08/02/2013)
08/02/2013	95	CERTIFICATE OF SERVICE by Coolit Systems Inc OF SEALED MOTION FOR PARTIAL SUMMARY JUDGMENT ETC. (Knauss, Daniel) (Filed on 8/2/2013) (Entered: 08/02/2013)
08/06/2013	96	RESPONSE (re 94 Administrative Motion to File Under Seal MOTION FOR PARTIAL SUMMARY JUDGMENT, DECL OF GEOFFREY SEAN LYON, EXHS. A&B) Plaintiffs' Response to Defendant CoolIT Systems Inc.'s Administrative Motion to File Under Seal Documents Supporting CoolIT's Motion for Partial Summary Judgment filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration Declaration of Tina E. Hulse in Support of Plaintiff's Response to Defendant CoolIT Systems Inc.'s Administrative Motino to File Under Seal Documents Supporting CoolIT's Motion for Partial Summary Judgment)(Hulse, Tina) (Filed on 8/6/2013) (Entered: 08/06/2013)
08/13/2013	97	

		STIPULATION WITH PROPOSED ORDER re 93 MOTION for Partial Summary Judgment PUBLIC VERSION Stipulated Request for Order Changing Time to Respond to Defendant CoolIT Systems Inc.'s Motion for Partial Summary Judgment [Dkt. No. 93] filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Tina E. Hulse in Support of Stipulated Request for Order Changing Time to Respond to Defendant CoolIT Systems, Inc.'s Motion for Partial Summary Judgment [Dkt. No. 93])(McCauley, Robert) (Filed on 8/13/2013) (Entered: 08/13/2013)
08/13/2013	98	STIPULATION AND ORDER re 97 re 93 MOTION for Partial Summary Judgment PUBLIC VERSION Stipulated Request for Order Changing Time to Respond to Defendant CoolIT Systems Inc.'s Motion for Partial Summary Judgment [Dkt. No. 93]</i filed by Asetek Holdings, Inc, Asetek A/S, Responses due by 8/23/2013. Replies due by 8/30/2013. Hearing set for 9/19/13. Signed by Judge Edward M. Chen on 8/13/13. (bpf, COURT STAFF) (Filed on 8/13/2013) (Entered: 08/13/2013)
08/14/2013	99	ORDER by Judge Edward M. Chen granting 94 Administrative Motion to File Under Seal (as modified) (bpf, COURT STAFF) (Filed on 8/14/2013) Modified on 8/14/2013 (bpf, COURT STAFF). (Entered: 08/14/2013)
08/16/2013	100	Declaration of GEOFFREY SEAN LYON in Support of 93 MOTION for Partial Summary Judgment PUBLIC VERSION PUBLIC VERSION OF DECLARATION AND EXHIBITS PER COURT ORDER DKT 99 filed byCoolit Systems Inc. (Attachments: # 1 Exhibit A, # 2 Exhibit B)(Related document(s) 93) (Knauss, Daniel) (Filed on 8/16/2013) (Entered: 08/16/2013)
08/16/2013	101	DOCUMENT E-FILED UNDER SEAL re 99 Order on Administrative Motion to File Under Seal MOTION FOR PARTIAL SUMMARY JUDGMENT by Coolit Systems Inc. (Attachments: # 1 Declaration OF GEOFFREY SEAN LYON ISO MOTION FOR PARTIAL SUMMARY JUDGMENT, # 2 Exhibit A, # 3 Exhibit B)(Knauss, Daniel) (Filed on 8/16/2013) (Entered: 08/16/2013)
08/19/2013	102	MOTION to Amend/Correct Plaintiffs' Notice of Motion and Motion to Amend Infringement Contentions filed by Asetek A/S, Asetek Holdings, Inc. Motion Hearing set for 9/26/2013 01:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Responses due by 9/3/2013. Replies due by 9/10/2013. (Attachments: # 1 Declaration of Tina E. Hulse in Support of Plaintiff's Motion to Amend Infringement Contentions, # 2 Exhibit Ex. 1 to Declaration of Tina E. Hulse iso Plfs' Mot to Amend Infringement Contentions, # 3 Exhibit Ex. 2 (part 1) to Declaration of Tina E. Hulse iso Plfs' Mot to Amend Infringement Contentions, # 4 Exhibit Ex. 2 (part 2) to Declaration of Tina E. Hulse iso Plfs' Mot to Amend Infringement Contentions, # 5 Exhibit Ex. 2 (part 3) to Declaration of Tina E. Hulse iso Plfs' Mot to Amend Infringement Contentions, # 6 Proposed Order [Proposed] Order Granting Plaintiffs' Motion to Amend Infringement Contentions)(Hulse, Tina) (Filed on 8/19/2013) (Entered: 08/19/2013)
08/23/2013	103	NOTICE of Appearance by Tina E. Hulse Notice of Appearance for Jeffrey D. Smyth and Holly Atkinson (Hulse, Tina) (Filed on 8/23/2013) (Entered: 08/23/2013)
08/23/2013	104	Administrative Motion to File Under Seal filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Tina E. Hulse, # 2 Proposed Order)(Hulse, Tina) (Filed on 8/23/2013) (Entered: 08/23/2013)
08/23/2013	105	RESPONSE (re 93 MOTION for Partial Summary Judgment PUBLIC VERSION) Plaintiffs' Opposition to Defendant's Motion for Partial Summary Judgment to Prevent Aseteks Double Recovery of Damages and, in the Alternative, for Patent Exhaustion [Redacted Public Version] filed byAsetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 8/23/2013) (Entered: 08/23/2013)
08/23/2013	106	Declaration of Andre S. Eriksen in Support of 105 Opposition/Response to Motion, Plaintiffs' Opposition to Defendant's Motion for Partial Summary Judgment to Prevent Aseteks Double Recovery of Damages and, in the

		Alternative, for Patent Exhaustion [Redacted Public Version] filed byAsetek A/S, Asetek Holdings, Inc. (Related document(s) 105) (McCauley, Robert) (Filed on 8/23/2013) (Entered: 08/23/2013)
08/23/2013	107	CERTIFICATE OF SERVICE by Asetek A/S, Asetek Holdings, Inc (Hulse, Tina) (Filed on 8/23/2013) (Entered: 08/23/2013)
08/26/2013	108	CLAIM CONSTRUCTION STATEMENT Joint Claim Construction and Prehearing Statement Pursuant to Patent L.R. 4-2 filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit Exhibit A to Joint Claim Construction and Prehearing Statement Pursuant to Patent L.R. 4-2) (McCauley, Robert) (Filed on 8/26/2013) (Entered: 08/26/2013)
08/27/2013	109	ORDER by Judge Edward M. Chen granting 104 Administrative Motion to File Under Seal (bpf, COURT STAFF) (Filed on 8/27/2013) (Entered: 08/27/2013)
08/27/2013	110	DOCUMENT E-FILED UNDER SEAL re 109 Order on Administrative Motion to File Under Seal Plaintiffs' Opposition to Defendant CoolIT Systems Inc.'s Motion for Partial Summary Judgment to Prevent Asetek's Double Recovery of Damages and, in the Alternative, for Patent Exhaustion by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Andre S. Eriksen, # 2 Exhibit 1 to the Declaration of Andre S. Eriksen, # 3 Exhibit 2 to the Declaration of Andre S. Eriksen)(McCauley, Robert) (Filed on 8/27/2013) (Entered: 08/27/2013)
08/27/2013	111	ORDER REFERRING CASE to Magistrate Judge for Discovery purposes. 9/26/13 motion hearing (#102) is vacated from Judge Chen's calendar. Signed by Judge Edward M. Chen on 8/27/13. (bpf, COURT STAFF) (Filed on 8/27/2013) (Entered: 08/27/2013)
08/27/2013		CASE REFERRED to Magistrate Judge Laurel Beeler for Discovery (ahm, COURT STAFF) (Filed on 8/27/2013) (Entered: 08/27/2013)
08/30/2013	112	Discovery Letter BriefJoint Letter re: Asetek's Motion to Amend Infringement Contentions filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit 1, # 2 Exhibit 2)(McCauley, Robert) (Filed on 8/30/2013) (Entered: 08/30/2013)
08/30/2013	113	REPLY (re 93 MOTION for Partial Summary Judgment PUBLIC VERSION) - Defendant Coolit Systems, Inc.'s Reply to Plaintiff's Opposition to Defendant's Motion for Partial Summary Judgment (PUBLIC VERSION) filed byCoolit Systems Inc. (Attachments: # 1 Declaration of Geoffrey Sean Lyon (PUBLIC VERSION))(Knauss, Daniel) (Filed on 8/30/2013) (Entered: 08/30/2013)
08/30/2013	114	Administrative Motion to File Under Seal - Defendant Coolit Systems, Inc.'s Administrative Motion to File Under Seal Documents Supporting Coolit's Reply Re Motion for Partial Summary Judgment filed by Coolit Systems Inc. (Attachments: # 1 Declaration of Daniel J. Knauss, # 2 Proposed Order)(Knauss, Daniel) (Filed on 8/30/2013) (Entered: 08/30/2013)
08/30/2013	115	CERTIFICATE OF SERVICE by Coolit Systems Inc OF SEALED REPLY AND LYON DECLARATION IN SUPPORT OF MOTION FOR PARTIAL SUMMARY JUDGMENT (Knauss, Daniel) (Filed on 8/30/2013) (Entered: 08/30/2013)
09/03/2013	116	FILED IN ERROR (Entered: 09/03/2013)
09/03/2013	117	ORDER GRANTING re 114 Administrative Motion to File Under Seal - Defendant Coolit Systems, Inc.'s Administrative Motion to File Under Seal Documents Supporting Coolit's Reply Re Motion for Partial Summary Judgment filed by Coolit Systems Inc. Signed by Judge Edward M. Chen on 9/3/13. (bpf, COURT STAFF) (Filed on 9/3/2013) (Entered: 09/03/2013)
09/05/2013	118	DOCUMENT E-FILED UNDER SEAL re 117 Order on Administrative Motion to File Under Seal DEF'S REPLY BRIEF ISO DEF'S MOTION FOR PARTIAL SUMMARY JUDGMENT by Coolit Systems Inc. (Attachments: # 1 Declaration Geoffrey Sean Lyon ISO Reply ISO Def's Motion for Partial

		Summary Judgment)(Knauss, Daniel) (Filed on 9/5/2013) Modified on 9/5/2013 (wv, COURT STAFF). (Entered: 09/05/2013)
09/09/2013	119	ORDER GRANTING LEAVE TO ASETEK TO AMEND ITS INFRINGEMENT CONTENTIONS by Magistrate Judge Laurel Beeler: Granting 102 Motion to Amend/Correct ; Plaintiff is required to E-FILE the amended document; Termed Pending 112 Discovery Letter Brief. (lsS, COURT STAFF) (Filed on 9/9/2013) (Additional attachment(s) added on 9/9/2013: # 1 Standing Order) (ls, COURT STAFF). (Entered: 09/09/2013)
09/09/2013	120	STIPULATION WITH PROPOSED ORDER Stipulated Request to Seal Courtroom During Summary Judgment Hearing; Proposed Order filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 9/9/2013) (Entered: 09/09/2013)
09/09/2013	121	STIPULATION AND ORDER re 120 Stipulated Request to Seal Courtroom During Summary Judgment Hearing filed by Asetek Holdings, Inc, Asetek A/S; Set/Reset Deadlines as to 120 STIPULATION WITH PROPOSED ORDER Stipulated Request to Seal Courtroom During Summary Judgment Hearing; Proposed Order, 93 MOTION for Partial Summary Judgment PUBLIC VERSION. Motion Hearing reset for 9/19/2013 01:00 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen.. Signed by Judge Edward M. Chen on 9/9/13. ***Deadlines terminated. (bpf, COURT STAFF) (Filed on 9/9/2013) Modified on 9/10/2013 (slhS, COURT STAFF). (Entered: 09/09/2013)
09/20/2013	122	Minute Entry: Motion Hearing held on 9/19/2013 before Edward M. Chen (Date Filed: 9/20/2013) re 93 MOTION for Partial Summary Judgment PUBLIC VERSION filed by Coolit Systems Inc. Under submission (Court Reporter Kathy Sullivan.) (bpf, COURT STAFF) (Date Filed: 9/20/2013) (Entered: 09/20/2013)
09/23/2013	123	CLERKS NOTICE RESCHEDULING TUTORIAL AND CLAIM CONSTRUCTION HEARING (STIPULATED BY COUNSEL) - Tutorial Hearing reset for 11/15/2013 02:30 PM. Claims Construction Hearing reset for 11/25/13 and 11/26/2013 02:30 PM before Judge Edward M. Chen. THIS IS A TEXT ONLY DOCKET ENTRY; THERE IS NO DOCUMENT ASSOCIATED WITH THIS NOTICE. (bpf, COURT STAFF) (Filed on 9/23/2013) (Entered: 09/23/2013)
09/23/2013	124	**ERRONEOUS ENTRY - PLEASE SEE DOCUMENT NO. 125 **Brief Defendant CoolIT Systems Opening Claim Construction Brief filed byCoolit Systems Inc. (Attachments: # 1 Exhibit 1, # 2 Exhibit 2, # 3 Exhibit 3, # 4 Exhibit 4, # 5 Exhibit 5)(Knauss, Daniel) (Filed on 9/23/2013) Modified on 9/24/2013 (slhS, COURT STAFF). (Entered: 09/23/2013)
09/23/2013	125	Brief Defendant CoolIT Systems Opening Claim Construction Brief, CORRECTION OF DOCKET # 124 filed byCoolit Systems Inc. (Attachments: # 1 Exhibit 1, # 2 Exhibit 2, # 3 Exhibit 3, # 4 Exhibit 4, # 5 Exhibit 5) (Dion, Joel) (Filed on 9/23/2013) (Entered: 09/23/2013)
09/23/2013	126	TRANSCRIPT ORDER by Asetek A/S, Asetek Holdings, Inc for Court Reporter Katherine Sullivan. (McCauley, Robert) (Filed on 9/23/2013) (Entered: 09/23/2013)
09/23/2013	127	Brief Plaintiffs' Opening Claim Construction Brief re: U.S. Patent Nos. 8,240,362 and 8,245,764 filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Proposed Order, # 2 Declaration of Jeffrey D. Smyth, # 3 Exhibit 1, # 4 Exhibit 2, # 5 Exhibit 3, # 6 Exhibit 4, # 7 Exhibit 5, # 8 Exhibit 6, # 9 Exhibit 7, # 10 Exhibit 8, # 11 Exhibit 9, # 12 Exhibit 10) (McCauley, Robert) (Filed on 9/23/2013) (Entered: 09/23/2013)
09/25/2013	128	NOTICE of Change In Counsel by Robert Francis McCauley (McCauley, Robert) (Filed on 9/25/2013) (Entered: 09/25/2013)
09/27/2013	129	Proposed Order re 125 Brief, Adopting Defendant's Proposed Construction for Each of the Disputed Terms of the CoolIT Patent by Coolit Systems Inc. (Knauss, Daniel) (Filed on 9/27/2013) (Entered: 09/27/2013)

10/01/2013	130	STIPULATION WITH PROPOSED ORDER for Order Changing Time to File Responsive and Reply Claim Construction Briefs filed by Coolit Systems Inc. (Attachments: # 1 Declaration of Joel L. Dion ISO Stipulated Request for Order Changing Time to File Responsive and Reply Claim Construction Briefs)(Knauss, Daniel) (Filed on 10/1/2013) (Entered: 10/01/2013)
10/02/2013	131	STIPULATION AND ORDER re 130 STIPULATION WITH PROPOSED ORDER for Order Changing Time to File Responsive and Reply Claim Construction Briefs filed by Coolit Systems Inc. Signed by Judge Edward M. Chen on 10/2/13. (bpf, COURT STAFF) (Filed on 10/2/2013) (Entered: 10/02/2013)
10/03/2013	132	NOTICE of Appearance by Elizabeth Hannah Rader of ELIZABETH H. RADER (Rader, Elizabeth) (Filed on 10/3/2013) (Entered: 10/03/2013)
10/03/2013	133	NOTICE of Appearance by Elizabeth Hannah Rader OF YITAI HU (Rader, Elizabeth) (Filed on 10/3/2013) (Entered: 10/03/2013)
10/03/2013	134	NOTICE of Appearance by Elizabeth Hannah Rader OF CELINE LIU (Rader, Elizabeth) (Filed on 10/3/2013) (Entered: 10/03/2013)
10/11/2013	135	ORDER by Judge Edward M. Chen Denying in Part and Deferring in Part 93 Defendant's Motion for Partial Summary Judgment. (emcsec, COURT STAFF) (Filed on 10/11/2013) (Entered: 10/11/2013)
10/15/2013	136	Brief Defendant CoolIT Systems, Inc.'s Responsive Claim Construction Brief for U.S. Patent Nos. 8,240,362 and 8,245,764 filed byCoolit Systems Inc. (Attachments: # 1 Exhibit 1, # 2 Exhibit 2, # 3 Exhibit 3, # 4 Exhibit 4, # 5 Exhibit 5, # 6 Exhibit 6)(Dion, Joel) (Filed on 10/15/2013) (Entered: 10/15/2013)
10/15/2013	137	Brief Defendants Cooler Master Co. Ltd. and Cooler Master USA Inc.'s Responsive Claim Construction Brief filed byCooler Master Co., Ltd., Cooler Master USA Inc.. (Attachments: # 1 Declaration Declaration of Gregory P. Carman, Ph.D. in Support of Defendants Cooler Master Co. Ltd and Cooler Master USA Inc.'s Responsive Claim Construction, # 2 Exhibit Exhibit A, # 3 Exhibit Exhibit B, # 4 Exhibit Exhibit C, # 5 Exhibit Exhibit D, # 6 Exhibit Exhibit E)(Rader, Elizabeth) (Filed on 10/15/2013) (Entered: 10/15/2013)
10/15/2013	138	Brief re 125 Brief, Plaintiffs' Responsive Claim Construction Brief Re: U.S. Patent No. 8,382,456 filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Jeffrey D. Smyth, # 2 Exhibit A to Smyth Declaration, # 3 Exhibit B to Smyth Declaration, # 4 Exhibit C to Smyth Declaration, # 5 Exhibit D to Smyth Declaration, # 6 Exhibit E to Smyth Declaration, # 7 Exhibit F to Smyth Declaration, # 8 Exhibit G to Smyth Declaration, # 9 Exhibit H to Smyth Declaration, # 10 Exhibit I to Smyth Declaration, # 11 Exhibit J to Smyth Declaration, # 12 Exhibit K to Smyth Declaration, # 13 Exhibit L to Smyth Declaration (Part 1 of 2), # 14 Exhibit L to Smyth Declaration (Part 2 of 2), # 15 Exhibit M to Smyth Declaration, # 16 Declaration of Donald E. Tilton, # 17 Exhibit 1 to Tilton Declaration)(Related document(s) 125) (McCauley, Robert) (Filed on 10/15/2013) (Entered: 10/15/2013)
10/17/2013	139	STIPULATION WITH PROPOSED ORDER Stipulation Regarding Plaintiffs' Claim Construction Reply Brief Page Limit; Proposed Order filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 10/17/2013) (Entered: 10/17/2013)
10/18/2013	140	STIPULATION AND ORDER re 139 Regarding Plaintiffs' Claim Construction Reply Brief Page Limit; Proposed Order filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Edward M. Chen on 10/18/13. (bpf, COURT STAFF) (Filed on 10/18/2013) (Entered: 10/18/2013)
10/18/2013	141	Sealed Transcript of Proceedings held on 9/19/13, before Judge Edward M. Chen. Court Reporter/Transcriber Katherine Powell Sullivan, Official Reporter, Telephone number 415-794-6659/Katherine_Sullivan@cand.uscourts.gov. Per General Order No. 59 and Judicial Conference policy,any Notice of Intent to Request Redaction,

		if required, is due no later than 5 business days from date of this filing. (Sullivan, Katherine) (Filed on 10/18/2013) (Entered: 10/18/2013)
10/21/2013	142	STIPULATION WITH PROPOSED ORDER Stipulated Request for Order Extending Time to File Reply Claim Construction Briefs filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration Jeffrey D. Smyth In Support of Stipulated Request)(Smyth, Jeffrey) (Filed on 10/21/2013) (Entered: 10/21/2013)
10/21/2013	143	Declaration of Corrected Declaration of Gregory P. Carman, Ph.D. in Support of Defendants Cooler Master Co. Ltd. and Cooler Master USA Inc.'s Responsive Claim Construction Brief filed byCooler Master Co., Ltd., Cooler Master USA Inc.. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E)(Rader, Elizabeth) (Filed on 10/21/2013) (Entered: 10/21/2013)
10/22/2013	144	STIPULATION AND ORDER re 142 STIPULATION WITH PROPOSED ORDER Stipulated Request for Order Extending Time to File Reply Claim Construction Briefs by 9:00 a.m. on 10/29/13 filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Edward M. Chen on 10/22/13. (bpf, COURT STAFF) (Filed on 10/22/2013) (Entered: 10/22/2013)
10/25/2013	145	STIPULATION WITH PROPOSED ORDER Stipulated Request to Modify the Partial Summary Judgment Supplemental Discovery and Briefing Schedule filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration Jeffrey D. Smyth In Support of Stipulated Request)(McCauley, Robert) (Filed on 10/25/2013) (Entered: 10/25/2013)
10/28/2013	146	Brief re 125 Brief, REPLY CLAIM CONSTRUCTION BRIEF FOR US PAT. 8,382,456 filed byCoolit Systems Inc. (Related document(s) 125) (Knauss, Daniel) (Filed on 10/28/2013) (Entered: 10/28/2013)
10/29/2013	147	ORDER granting 145 STIPULATION WITH PROPOSED ORDER Stipulated Request to Modify the Partial Summary Judgment Supplemental Discovery and Briefing Schedule filed by Asetek Holdings, Inc, Asetek A/S. Supplemental Discovery due 12/16/2013. Supplemental Brief due by 12/23/2013. Responsive Brief due by 1/6/2014. Signed by Judge Edward M Chen on 10/28/2013. (beS, COURT STAFF) (Filed on 10/29/2013) (Entered: 10/29/2013)
10/29/2013	148	Brief re 127 Brief, Plaintiffs' Reply Claim Construction Brief re: U.S. Patent Nos. 8,240,362 and 8,245,764 filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Robert F. McCauley, # 2 Exhibit A to Robert F. McCauley Declaration, # 3 Exhibit B to Robert F. McCauley Declaration, # 4 Declaration of Donald E. Tilton, # 5 Exhibit 1 to Donald E. Tilton Declaration)(Related document(s) 127) (McCauley, Robert) (Filed on 10/29/2013) (Entered: 10/29/2013)
10/30/2013	149	ERRATA to Plaintiffs' Reply Claim Construction Brief re: U.S. Patent Nos. 8,240,362 and 8,245,764 CORRECTION OF DOCKET # 148 by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit A [Corrected] Plaintiffs' Reply Claim Construction Brief)(McCauley, Robert) (Filed on 10/30/2013) (Entered: 10/30/2013)
11/06/2013	150	CLERKS NOTICE Rescheduling Tutorial Hearing. Tutorial Hearing reset for 11/21/2013 03:00 PM in Courtroom 5, 17th Floor, San Francisco. This is a text only docket entry. There is no document associated with this notice. (tmi, COURT STAFF) (Filed on 11/6/2013) (Entered: 11/06/2013)
11/20/2013	151	STIPULATION WITH PROPOSED ORDER STIPULATED REQUEST FOR ORDER RE MATERIALS FOR CLAIM CONSTRUCTION TUTORIAL filed by Coolit Systems Inc. (Knauss, Daniel) (Filed on 11/20/2013) (Entered: 11/20/2013)
11/21/2013	152	STIPULATION AND ORDER re 151 STIPULATION WITH PROPOSED ORDER STIPULATED REQUEST FOR ORDER RE MATERIALS FOR CLAIM CONSTRUCTION TUTORIAL filed by Coolit Systems Inc. Signed by Judge

		Edward M. Chen on 11/21/13. (bpf, COURT STAFF) (Filed on 11/21/2013) (Entered: 11/21/2013)
11/21/2013	153	Minute Entry: Tutorial Hearing held on 11/21/2013 before Judge Edward M. Chen (Date Filed: 11/21/2013). Claims Construction Hearing reset for 11/26/2013 09:30 AM. (Court Reporter Lydia Zinn.) (bpf, COURT STAFF) (Date Filed: 11/21/2013) (Entered: 11/21/2013)
11/27/2013	154	Minute Entry: Claims Construction / Markman Hearing held on 11/26/2013 before Judge Edward M. Chen (Date Filed: 11/27/2013). (Court Reporter Lydia Zinn.) (bpf, COURT STAFF) (Date Filed: 11/27/2013) (Entered: 11/27/2013)
11/27/2013		Set/Reset Deadlines:, Set/Reset Hearing Case Management Statement due by 12/20/2013. Further Telephonic Case Management Conference set for 1/2/2014 10:25 AM in Courtroom 5, 17th Floor, San Francisco. (bpf, COURT STAFF) (Filed on 11/27/2013) (Entered: 11/27/2013)
12/03/2013	155	ORDER Re Claim Construction for Asetek's Patents. Signed by Judge Edward M. Chen on 12/3/2013. (emcsec, COURT STAFF) (Filed on 12/3/2013) (Entered: 12/03/2013)
12/03/2013	156	ORDER Re Claim Construction for CoolIT's Patent. Signed by Judge Edward M. Chen on 12/3/2013. (emcsec, COURT STAFF) (Filed on 12/3/2013) (Entered: 12/03/2013)
12/03/2013	157	TRANSCRIPT ORDER by Asetek A/S, Asetek Holdings, Inc for Court Reporter Lydia Zinn. (McCauley, Robert) (Filed on 12/3/2013) (Entered: 12/03/2013)
12/10/2013	158	TRANSCRIPT ORDER by Cooler Master Co., Ltd., Cooler Master USA Inc. for Court Reporter Lydia Zinn. (Rader, Elizabeth) (Filed on 12/10/2013) (Entered: 12/10/2013)
12/16/2013	159	Transcript of Proceedings held on 11/21/2013, before Judge Edward M. Chen. Court Reporter/Transcriber Lydia Zinn, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Related documents(s) 158 , 157) (Zinn, Lydia) (Filed on 12/16/2013) (Entered: 12/16/2013)
12/16/2013	160	Transcript of Proceedings held on 11/26/2013, before Judge Edward M. Chen. Court Reporter/Transcriber Lydia Zinn, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Related documents(s) 158 , 157) (Zinn, Lydia) (Filed on 12/16/2013) (Entered: 12/16/2013)
12/20/2013	161	CASE MANAGEMENT STATEMENT Further Joint Case Management Statement; [Proposed] Order filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 12/20/2013) (Entered: 12/20/2013)
01/03/2014	162	Minute Entry: Initial Case Management Conference held on 1/2/2014 before Judge Edward M. Chen (Date Filed: 1/3/2014). Status Report due by 4/17/2014. Jury trial set for 10/6/14 at 8:30 a.m. Jury Selection set for 10/6/2014 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Status Conference set for 4/24/2014 11:00 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. (Recording #1033-1039.) (bpf, COURT STAFF) (Date Filed: 1/3/2014) (Entered: 01/03/2014)

01/06/2014		CASE REFERRED to Magistrate Judge Paul Singh Grewal for Settlement (ahm, COURT STAFF) (Filed on 1/6/2014) (Entered: 01/06/2014)
01/06/2014	163	CASE MANAGEMENT SCHEDULING ORDER: Discovery due by 4/10/2014. Jury Trial set for 10/6/2014 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Motion Hearing set for 7/24/2014 01:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Pretrial Conference set for 9/23/2014 02:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 10/7/2014 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 10/8/2014 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 10/10/2014 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 10/14/2014 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 10/15/2014 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 10/17/2014 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 10/20/2014 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen.. Signed by Judge Edward M. Chen on 1/6/14. (bpf, COURT STAFF) (Filed on 1/6/2014) (Entered: 01/06/2014)
01/06/2014	164	CLERK'S NOTICE SETTING SETTLEMENT CONFERENCE: Settlement Conference set for 1/17/2014 at 10:00 AM in Courtroom 5, 4th Floor, San Jose before Magistrate Judge Paul S. Grewal. (ofr, COURT STAFF) (Filed on 1/6/2014) (Entered: 01/06/2014)
01/17/2014	165	Minute Entry: Settlement Conference held 1/17/2014 before Magistrate Judge Paul S. Grewal. Further settlement discussions to be scheduled. (Court Reporter: Not Reported) (ofr, COURT STAFF) (Date Filed: 1/17/2014) (Entered: 01/21/2014)
02/10/2014	166	NOTICE of Change In Counsel by Joel L Dion Notice of Withdrawal of Counsel Katherine Pauley Barecchia (Dion, Joel) (Filed on 2/10/2014) (Entered: 02/10/2014)
03/11/2014	167	Letter Brief re: Asetek's and CoolIT's Stipulated Joint Motion to Amend Infringement and Invalidity Contentions filed byAsetek Holdings, Inc. (McCauley, Robert) (Filed on 3/11/2014) Modified on 3/12/2014 (Beeler, Laurel). (Entered: 03/11/2014)
03/12/2014	168	Order by Magistrate Judge Laurel Beeler granting 167 Discovery Letter Brief. Pursuant to the parties' stipulation, and for the reasons stated in their joint discovery letter brief, the court finds good cause (and no prejudice)under Patent L. R. 3-6 to grant the parties' request to amend their respective infringement and invalidity contentions. This disposes of ECF No. 167. <Beeler, Laurel)(filed on 3/12/14) (This is a text only docket entry, there is no document associated with this order) Modified on 3/18/2014 (slhS, COURT STAFF). (Entered: 03/12/2014)
03/31/2014	169	STIPULATION regarding CoolIT's Products filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 3/31/2014) (Entered: 03/31/2014)
04/08/2014	170	STIPULATION WITH PROPOSED ORDER to Extend Discovery Deadline filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Jeffrey D. Smyth)(Smyth, Jeffrey) (Filed on 4/8/2014) (Entered: 04/08/2014)
04/09/2014	171	STIPULATION AND ORDER re 170 STIPULATION WITH PROPOSED ORDER to Extend Discovery Deadline filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Edward M. Chen on 4/9/14. (bpfS, COURT STAFF) (Filed on 4/9/2014) (Entered: 04/09/2014)
04/16/2014	172	STIPULATION WITH PROPOSED ORDER to Extend Discovery Deadline filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of

		Jeffrey D. Smyth)(Smyth, Jeffrey) (Filed on 4/16/2014) (Entered: 04/16/2014)
04/17/2014	173	STIPULATION AND ORDER re 172 STIPULATION WITH PROPOSED ORDER to Extend Discovery Deadline filed by Asetek Holdings, Inc, Asetek A/S Discovery due by 4/21/2014.. Signed by Judge Edward M. Chen on 4/17/14. (bpf, COURT STAFF) (Filed on 4/17/2014) (Entered: 04/17/2014)
04/17/2014	174	STATUS REPORT Joint Status Report by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 4/17/2014) (Entered: 04/17/2014)
04/28/2014	175	Minute Entry: Further Case Management Conference held on 4/24/2014 before Judge Edward M. Chen (Date Filed: 4/28/2014). Responses due by 5/15/2014. Replies due by 5/22/2014. Def's Motion for Partial SJ Hearing set for 6/5/2014 01:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Add'l MSJ Hearing set for 7/24/2014 01:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Status Report due by 5/29/2014. Status Conference set for 6/5/2014 01:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. (Recording #11:10-11:29.) (bpf, COURT STAFF) (Date Filed: 4/28/2014) (Entered: 04/28/2014)
05/12/2014	176	CLERKS NOTICE - Status Conference reset for 6/5/2014 from 1:30 p.m. to 09:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Motion Hearing (Defendant's motion for partial SJ #93) reset for 6/5/2014 from 1:30 p.m. to 09:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. THIS IS A TEXT ONLY DOCKET ENTRY; THERE IS NO DOCUMENT ASSOCIATED WITH THIS NOTICE.(bpf, COURT STAFF) (Filed on 5/12/2014) (Entered: 05/12/2014)
05/15/2014	177	Declaration of Donald Tilton filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C)(McCauley, Robert) (Filed on 5/15/2014) (Entered: 05/16/2014)
05/16/2014	178	Declaration of Andre S. Eriksen filed byAsetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 5/16/2014) (Entered: 05/16/2014)
05/16/2014	179	Declaration of Robert F. McCauley in Support of Plaintiffs Asetek Holdings, Inc. and Asetek A/Ss (Asetek) Supplemental Brief on Defendants Motion for Partial Summary Judgment filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit 2, # 2 Exhibit 4, # 3 Exhibit 5, # 4 Exhibit 11, # 5 Exhibit 12, # 6 Exhibit 13, # 7 Certificate/Proof of Service)(McCauley, Robert) (Filed on 5/16/2014) (Entered: 05/16/2014)
05/16/2014	180	Administrative Motion to File Under Seal filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Robert F. McCauley, # 2 Proposed Order, # 3 Redacted Supplemental Brief, # 4 Highlighted Supplemental Brief, # 5 Exhibit 1, # 6 Exhibit 3, # 7 Exhibit 6, # 8 Exhibit 7, # 9 Exhibit 8, # 10 Exhibit 9, # 11 Exhibit 10, # 12 Exhibit 14) (McCauley, Robert) (Filed on 5/16/2014) (Entered: 05/16/2014)
05/16/2014	181	EXHIBITS re 179 Declaration in Support, Exhibit 5 to the McCauley Declaration in Support of Supplemental Brief CORRECTION OF DOCKET # [179-3] filed byAsetek A/S, Asetek Holdings, Inc. (Related document(s) 179) (McCauley, Robert) (Filed on 5/16/2014) (Entered: 05/16/2014)
05/22/2014	182	Supplemental Brief in Support of Motion for Partial Summary Judgment filed byCoolit Systems Inc. (Dion, Joel) (Filed on 5/22/2014) (Entered: 05/22/2014)
05/22/2014	183	Supplemental Brief ISO Motion for Partial Summary Judgment CORRECTION OF DOCKET # 182 filed byCoolit Systems Inc. (Dion, Joel) (Filed on 5/22/2014) (Entered: 05/22/2014)
05/22/2014	184	CASE MANAGEMENT STATEMENT Updated Joint Case Management Conference Statement filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 5/22/2014) (Entered: 05/22/2014)

05/27/2014	185	ORDER by Judge Edward M. Chen granting 180 Administrative Motion to File Under Seal (bpf, COURT STAFF) (Filed on 5/27/2014) (Entered: 05/27/2014)
05/30/2014	186	STIPULATION WITH PROPOSED ORDER STIPULATED REQUEST FOR ORDER RE MATERIALS FOR MOTION HEARING filed by Coolit Systems Inc. (Dion, Joel) (Filed on 5/30/2014) (Entered: 05/30/2014)
05/30/2014	187	STIPULATION AND ORDER re 186 STIPULATION WITH PROPOSED ORDER STIPULATED REQUEST FOR ORDER RE MATERIALS FOR MOTION HEARING filed by Coolit Systems Inc. Signed by Judge Edward M. Chen on 5/30/14. (bpf, COURT STAFF) (Filed on 5/30/2014) (Entered: 05/30/2014)
06/04/2014	188	CLERK'S NOTICE SETTING FURTHER SETTLEMENT CONFERENCE: Further Settlement Conference set for 7/21/2014 at 10:00 AM in Courtroom 5, 4th Floor, San Jose before Magistrate Judge Paul S. Grewal. ***This is a text only docket entry, there is no document associated with this notice.*** (ofr, COURT STAFF) (Filed on 6/4/2014) (Entered: 06/04/2014)
06/05/2014	189	Minute Entry: Motion Hearing held on 6/5/2014 before Judge Edward M. Chen (Date Filed: 6/5/2014) re 93 MOTION for Partial Summary Judgment PUBLIC VERSION filed by Coolit Systems Inc. Under submission. Expert Discovery due by 6/10/2014. (Court Reporter James Pence.) (bpf, COURT STAFF) (Date Filed: 6/5/2014) (Entered: 06/05/2014)
06/09/2014	190	CLERK'S NOTICE ADVANCING FURTHER SETTLEMENT CONFERENCE: 7/21/2014 Further Settlement Conference is advanced to 7/18/2014 at 10:00 AM in Courtroom 5, 4th Floor, San Jose before Magistrate Judge Paul S. Grewal. ***This is a text only docket entry, there is no document associated with this notice.*** (ofr, COURT STAFF) (Filed on 6/9/2014) (Entered: 06/09/2014)
06/13/2014	191	STIPULATION WITH PROPOSED ORDER to Exceed Page Limit for Motion for Summary Judgment filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 6/13/2014) (Entered: 06/13/2014)
06/13/2014	192	Declaration of Robert F. McCauley in Support of 191 STIPULATION WITH PROPOSED ORDER to Exceed Page Limit for Motion for Summary Judgment filed byAsetek A/S, Asetek Holdings, Inc. (Related document(s) 191) (McCauley, Robert) (Filed on 6/13/2014) (Entered: 06/13/2014)
06/16/2014	193	STIPULATION AND ORDER re 191 STIPULATION WITH PROPOSED ORDER to Exceed Page Limit for Motion for Summary Judgment filed by Asetek Holdings, Inc, Asetek A/S. Modified - 30 pages only. Signed by Judge Edward M. Chen on 6/16/14. (bpf, COURT STAFF) (Filed on 6/16/2014) (Entered: 06/16/2014)
06/16/2014	194	ORDER Granting in Part 93 Defendant's Motion for Partial Summary Judgment. Signed by Judge Edward M. Chen on 6/16/2014. (emcsec, COURT STAFF) (Filed on 6/16/2014) (Entered: 06/16/2014)
06/19/2014	195	MOTION for Summary Judgment of NonInfringement '362 and '764; No damages for Non-US Sales; No Lost Profits; Invalidity of '764; Infringment of '456 filed by Coolit Systems Inc. Motion Hearing set for 7/24/2014 01:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Responses due by 7/3/2014. Replies due by 7/10/2014. (Attachments: # 1 Declaration of Joel L. Dion ISO Motion for Summary Judgment, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E Part 1, # 7 Exhibit E Part 2, # 8 Exhibit E Part 3, # 9 Exhibit F, # 10 Exhibit G, # 11 Exhibit H, # 12 Exhibit I (Public Version), # 13 Exhibit J (Public Version), # 14 Exhibit K (Public Version), # 15 Exhibit L, # 16 Exhibit M Part 1, # 17 Exhibit M Part 2, # 18 Exhibit N, # 19 Proposed Order)(Dion, Joel) (Filed on 6/19/2014) (Entered: 06/19/2014)
06/19/2014	196	Consent Administrative Motion to File Under Seal DOCUMENTS SUPPORTING DEF'S MOTION FOR SUMMARY JUDGMENT filed by Coolit Systems Inc. (Attachments: # 1 Declaration of Joel L. Dion ISO Adm Motion to Seal, # 2 Proposed Order, # 3 Redacted Version of Exhibit I, #

		4 Unredacted Version of Exhibit I, # 5 Unredacted Version of Exhbit J, # 6 Unredacted Version of Exhibit K)(Dion, Joel) (Filed on 6/19/2014) (Entered: 06/19/2014)
06/19/2014	197	CERTIFICATE OF SERVICE by Coolit Systems Inc re 196 Consent Administrative Motion to File Under Seal DOCUMENTS SUPPORTING DEF'S MOTION FOR SUMMARY JUDGMENT, 195 MOTION for Summary Judgment of NonInfringement '362 and '764; No damages for Non-US Sales; No Lost Profits; Invalidity of '764; Infringment of '456 SERVICE OF SEALED VERSIONS OF EXHIBITS I J K ON OPPOSING COUNSEL (Dion, Joel) (Filed on 6/19/2014) (Entered: 06/19/2014)
06/19/2014	198	Declaration of Robert F. McCauley in Support of Plaintiffs' Motion for Summary Judgement and/or Summary Adjuducation filed byAsetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 6/19/2014) (Entered: 06/19/2014)
06/20/2014	199	EXHIBITS re 198 Declaration in Support Exhibits 1, 4, 17, 30-39 to the Declaration of Robert F. Mccauley in Support of Plaintiffs Motion for Summary Judgment and/or Summary Adjudication filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit 1, Part 1, # 2 Exhibit 1, Part 2, # 3 Exhibit 1, Part 3, # 4 Exhibit 4, # 5 Exhibit 17, # 6 Exhibit 30, # 7 Exhibit 31, # 8 Exhibit 32, # 9 Exhibit 33, # 10 Exhibit 34, # 11 Exhibit 35, # 12 Exhibit 36, # 13 Exhibit 37, # 14 Exhibit 38, # 15 Exhibit 39)(Related document(s) 198) (McCauley, Robert) (Filed on 6/20/2014) (Entered: 06/20/2014)
06/20/2014	200	Administrative Motion to File Under Seal Plaintiffs Motion for Summary Judgment and/or Summary Adjudication and related documents filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Robert F. McCauley, # 2 Proposed Order for Sealing, # 3 Redacted Motion for Summary Judgment, # 4 Sealed Motion for Summary Judgment, # 5 Declaration of Holly Atkinson, # 6 Exhibit A, Part 1, # 7 Exhibit A Part 2, # 8 Exhibit 2, # 9 Exhibit 3, # 10 Exhibit 5, # 11 Exhibit 6, # 12 Exhibit 7, # 13 Exhibit 8, # 14 Exhibit 9, # 15 Exhibit 10, # 16 Exhibit 11, # 17 Exhibit 12, # 18 Exhibit 13, # 19 Exhibit 14, # 20 Exhibit 15, # 21 Exhibit 16, # 22 Exhibit 18, # 23 Exhibit 19, # 24 Exhibit 20, # 25 Exhibit 21, # 26 Exhibit 22, # 27 Exhibit 23, # 28 Exhibit 24, # 29 Exhibit 25, # 30 Exhibit 26, # 31 Exhibit 27, # 32 Exhibit 28, # 33 Exhibit 29, # 34 Proposed Order, # 35 Certificate/Proof of Service)(McCauley, Robert) (Filed on 6/20/2014) (Entered: 06/20/2014)
06/25/2014	201	MOTION to Relate Case Plaintiffs' Administrative Motion Under Civil L.R. 3-12 to Consider Whether Cases Should be Related; Supporting Declaration; Certificate of Service; [Proposed] Order filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Proposed Order)(McCauley, Robert) (Filed on 6/25/2014) (Entered: 06/25/2014)
06/30/2014	202	ORDER by Judge Edward M. Chen granting 196 Administrative Motion to File Under Seal (bpf, COURT STAFF) (Filed on 6/30/2014) (Entered: 06/30/2014)
06/30/2014	203	ORDER by Judge Edward M. Chen granting 200 Administrative Motion to File Under Seal (bpf, COURT STAFF) (Filed on 6/30/2014) (Entered: 06/30/2014)
07/03/2014	204	Defendant's Opposition to Plaintiffs' re 198 MOTION for Summary Judgment by Coolit Systems Inc. (Attachments: # 1 Declaration Joel L. Dion ISO Def's Opposition to Plaintiffs' Motion for Summary Judgment, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Exhibit 4, # 6 Exhibit 5, # 7 Exhibit 6, # 8 Exhibit 7 Part 1, # 9 Exhibit 7 Part 2, # 10 Exhibit 7 Part 3, # 11 Proposed Order)(Dion, Joel) (Filed on 7/3/2014) Modified on 7/7/2014 (slhS, COURT STAFF). (Entered: 07/03/2014)
07/03/2014	205	Consent Administrative Motion to File Under Seal CERTAIN EXHIBITS IN OPPOSITION TO PLFS' MOTION FOR SUMMARY JUDGMENT filed by Coolit Systems Inc. (Attachments: # 1 Declaration of Joel L. Dion ISO

		Administrative Motion to Seal, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Proposed Order)(Dion, Joel) (Filed on 7/3/2014) (Entered: 07/03/2014)
07/03/2014	206	CERTIFICATE OF SERVICE by Coolit Systems Inc re 204 Notice (Other), OF UNREDACTED EXHIBITS 1, 2 AND 3 TO DECL OF JOEL L. DION ISO DEF'S OPPOSITION TO PLFS' MOTION FOR SUMMARY JUDGMENT (Dion, Joel) (Filed on 7/3/2014) (Entered: 07/03/2014)
07/03/2014	207	Declaration of Jeffrey D. Smyth in Support of Asetek's Opposition to Motion for Summary Judgment filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit 1, # 2 Exhibit 2, # 3 Exhibit 3, # 4 Exhibit 4, # 5 Exhibit 5, # 6 Exhibit 6, # 7 Exhibit 7, # 8 Exhibit 8)(Smyth, Jeffrey) (Filed on 7/3/2014) (Entered: 07/03/2014)
07/03/2014	208	Administrative Motion to File Under Seal Asetek's Opposition to Motion for Summary Judgment filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Jeffrey D. Smyth, # 2 Proposed Order Asetek's Opposition to Motion for Summ, # 3 Asetek's Opposition to Motion for Summary Judgment [Redacted Version], # 4 Asetek's Opposition to Motion for Summary Judgment [Highlighted Version], # 5 Exhibit 5 to Smyth Declaration, # 6 Exhibit 6 to Smyth Declaration, # 7 Certificate/Proof of Service)(Smyth, Jeffrey) (Filed on 7/3/2014) (Entered: 07/04/2014)
07/04/2014	209	RESPONSE (re 195 MOTION for Summary Judgment of NonInfringement '362 and '764; No damages for Non-US Sales; No Lost Profits; Invalidity of '764; Infringment of '456) Asetek's Opposition to Motion for Summary Judgment [Redacted Version] filed byAsetek A/S, Asetek Holdings, Inc. (Smyth, Jeffrey) (Filed on 7/4/2014) (Entered: 07/04/2014)
07/08/2014	210	ORDER by Judge Edward M. Chen denying 201 Motion to Relate Case (bpf, COURT STAFF) (Filed on 7/8/2014) (Entered: 07/08/2014)
07/08/2014	211	CLERKS NOTICE - Final Pretrial Conference reset from 9/23/2014 to 9/16/2014 02:30 PM in Courtroom 5, 17th Floor, San Francisco. Pretrial filings (including motions in limine) due 8/26/14. THIS IS A TEXT ONLY DOCKET ENTRY; THERE IS NO DOCUMENT ASSOCIATED WITH THIS NOTICE. (bpf, COURT STAFF) (Filed on 7/8/2014) (Entered: 07/08/2014)
07/09/2014	212	ORDER by Judge Edward M. Chen granting 205 Administrative Motion to File Under Seal (bpf, COURT STAFF) (Filed on 7/9/2014) (Entered: 07/09/2014)
07/09/2014	213	ORDER by Judge Edward M. Chen granting 208 Administrative Motion to File Under Seal (bpf, COURT STAFF) (Filed on 7/9/2014) (Entered: 07/09/2014)
07/10/2014	214	REPLY (re 195 MOTION for Summary Judgment of NonInfringement '362 and '764; No damages for Non-US Sales; No Lost Profits; Invalidity of '764; Infringment of '456) filed byCoolit Systems Inc. (Attachments: # 1 Declaration of Joel Dion ISO Reply ISO Def's Motion for Summary Judgment, # 2 Exhibit 1, # 3 Exhibit 2)(Dion, Joel) (Filed on 7/10/2014) (Entered: 07/10/2014)
07/10/2014	215	Administrative Motion to File Under Seal Reply in Support of Plaintiffs' Motion for Summary Judgment filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Jeffrey D. Smyth, # 2 Proposed Order, # 3 Redacted Reply in Support of Plaintiffs Motion for Summary Judgment, # 4 Highlighted Unredacted Reply in Support of Plaintiffs Motion for Summary Judgment)(McCauley, Robert) (Filed on 7/10/2014) (Entered: 07/10/2014)
07/10/2014	216	REPLY (re 215 Administrative Motion to File Under Seal Reply in Support of Plaintiffs' Motion for Summary Judgment) Redacted Reply in Support of Plaintiffs Motion for Summary Judgment filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Jeffrey D. Smyth, # 2

		Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Certificate/Proof of Service) (McCauley, Robert) (Filed on 7/10/2014) (Entered: 07/10/2014)
07/11/2014	217	ORDER by Judge Edward M. Chen granting 215 Administrative Motion to File Under Seal (bpf, COURT STAFF) (Filed on 7/11/2014) (Entered: 07/11/2014)
07/18/2014	218	Minute Entry: Settlement Conference held on 7/18/2014 before Magistrate Judge Paul S. Grewal. Case did not settle. No further settlement discussions to be scheduled. (Court Reporter: Not Reported) (ofr, COURT STAFF) (Date Filed: 7/18/2014) (Entered: 07/18/2014)
07/22/2014	219	STIPULATION WITH PROPOSED ORDER STIPULATED REQUEST FOR ORDER RE MATERIALS FOR MOTION HEARING filed by Coolit Systems Inc. (Dion, Joel) (Filed on 7/22/2014) (Entered: 07/22/2014)
07/24/2014	220	ORDER by Judge Edward M. Chen granting 219 Stipulation Regarding Materials for Motion Hearing (emclc1, COURT STAFF) (Filed on 7/24/2014) (Entered: 07/24/2014)
07/24/2014	221	Minute Entry: Motion Hearing held on 7/24/2014 before Edward M. Chen (Date Filed: 7/24/2014) re 200 Administrative Motion to File Under Seal Plaintiffs Motion for Summary Judgment and/or Summary Adjudication and related documents filed by Asetek Holdings, Inc, Asetek A/S, 195 MOTION for Summary Judgment of NonInfringement '362 and '764; No damages for Non-US Sales; No Lost Profits; Invalidity of '764; Infringment of '456 filed by Coolit Systems Inc. Under submission (Court Reporter Kathy Sullivan (SEALED TRANSCRIPT.) (bpfS, COURT STAFF) (Date Filed: 7/24/2014) (Entered: 07/24/2014)
07/31/2014	222	Administrative Motion to File Under Seal Plaintiffs Early Motion In Limine and Daubert Motion filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Robert F. McCauley, # 2 Proposed Order, # 3 REDACTED Plaintiffs Early Motion In Limine and Daubert Motion, # 4 HIGHLIGHTED Plaintiffs Early Motion In Limine and Daubert Motion, # 5 REDACTED Declaration of Robert F. McCauley in Support of Plaintiffs Early Motion In Limine and Daubert Motion, # 6 HIGHLIGHTED Declaration of Robert F. McCauley in Support of Plaintiffs Early Motion In Limine and Daubert Motion, # 7 Exhibit B, # 8 Exhibit C, # 9 Exhibit D, # 10 Exhibit E, # 11 Exhibit F, # 12 Exhibit G, # 13 Exhibit H, # 14 Certificate/Proof of Service)(McCauley, Robert) (Filed on 7/31/2014) (Entered: 07/31/2014)
07/31/2014	223	MOTION in Limine Plaintiffs Asetek Holdings Inc.'s and Asetek A/S's Early Motion In Limine and Daubert Motion filed by Asetek A/S, Asetek Holdings, Inc. Motion Hearing set for 9/4/2014 01:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Responses due by 8/14/2014. Replies due by 8/21/2014. (Attachments: # 1 Declaration REDACTED Declaration of Robert F. McCauley in Support, # 2 Exhibit A, # 3 Exhibit B, # 4 Exhibit C, # 5 Exhibit D, # 6 Exhibit E, # 7 Exhibit F, # 8 Exhibit G, # 9 Exhibit H, # 10 Proposed Order)(McCauley, Robert) (Filed on 7/31/2014) (Entered: 07/31/2014)
08/05/2014	224	TRANSCRIPT ORDER by Asetek A/S, Asetek Holdings, Inc for Court Reporter Katherine Sullivan. (McCauley, Robert) (Filed on 8/5/2014) (Entered: 08/05/2014)
08/11/2014	225	ORDER by Judge Edward M. Chen Granting in Part and Denying in Part 222 Plaintiffs' Administrative Motion to File Under Seal. (emcsec, COURT STAFF) (Filed on 8/11/2014) (Entered: 08/11/2014)
08/14/2014	226	Administrative Motion to File Under Seal Highlighted Portions of Exhibits B, D, and H to the Declaration of Robert F. McCauley in Support of Plaintiffs Asetek Holdings, Inc.'s and Asetek A/S's Early Motion in Limine and Daubert Motion filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Jeffrey D. Smyth, # 2 Proposed Order, # 3 Exhibit B - REDACTED, # 4 Exhibit D - REDACTED, # 5 Exhibit H - REDACTED, # 6

		Exhibit B - HIGHLIGHTED, # 7 Exhibit D - HIGHLIGHTED, # 8 Exhibit H - HIGHLIGHTED, # 9 Certificate/Proof of Service)(Smyth, Jeffrey) (Filed on 8/14/2014) (Entered: 08/14/2014)
08/14/2014	227	RESPONSE (re 223 MOTION in Limine Plaintiffs Asetek Holdings Inc.'s and Asetek A/S's Early Motion In Limine and Daubert Motion) filed byCoolit Systems Inc. (Attachments: # 1 Declaration of Joel L. Dion, # 2 Exhibit 1, # 3 Declaration of Geoffrey Lyon)(Dion, Joel) (Filed on 8/14/2014) (Entered: 08/14/2014)
08/15/2014	228	ORDER by Judge Edward M. Chen granting 226 Administrative Motion to File Under Seal (emclc1S, COURT STAFF) (Filed on 8/15/2014) (Entered: 08/15/2014)
08/18/2014	229	Declaration of Joel L. Dion in Support of 228 Order on Administrative Motion to File Under Seal filed byCoolit Systems Inc. (Related document(s) 228) (Dion, Joel) (Filed on 8/18/2014) (Entered: 08/18/2014)
08/18/2014	230	Sealed Transcript of Proceedings held on 7/24/14, before Judge Edward M. Chen. Court Reporter/Transcriber Katherine Powell Sullivan, Official Reporter, Telephone number 415-794-6659/Katherine_Sullivan@cand.uscourts.gov. Per General Order No. 59 and Judicial Conference policy,any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Sullivan, Katherine) (Filed on 8/18/2014) (Entered: 08/18/2014)
08/18/2014	231	Transcript of Proceedings held on 7/24/13, before Judge Edward M. Chen. Court Reporter/Transcriber Katherine Powell Sullivan, Official Reporter, Telephone number 415-794-6659/Katherine_Sullivan@cand.uscourts.gov. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 224 Transcript Order) Release of Transcript Restriction set for 11/17/2014. (Related documents(s) 224) (Sullivan, Katherine) (Filed on 8/18/2014) (Entered: 08/18/2014)
08/19/2014	232	ORDER - PUBLIC & REDACTED ORDER by Judge Edward M. Chen Granting in Part and Denying in Part 195 200 Defendant's and Plaintiffs' Motions for Summary Judgment. (Attachments: # 1 Certificate/Proof of Service). (emcsec, COURT STAFF) (Filed on 8/19/2014) (Entered: 08/19/2014)
08/19/2014	233	ORDER granting in part and denying in part defendant's 195 MOTION for Summary Judgment filed by Coolit Systems Inc. Signed by Judge Edward M. Chen on 8/19/14. (filed UNDER SEAL)(slhS, COURT STAFF) (Filed on 8/19/2014) (slhS, COURT STAFF). (Entered: 08/19/2014)
08/20/2014	234	STIPULATION WITH PROPOSED ORDER Stipulated Request for Order Continuing Hearing Date for Plaintiff's Early Motion in Limine and Daubert Motion; Proposed Order filed by Asetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Robert F. McCauley)(McCauley, Robert) (Filed on 8/20/2014) (Entered: 08/20/2014)
08/21/2014	235	REPLY (re 223 MOTION in Limine Plaintiffs Asetek Holdings Inc.'s and Asetek A/S's Early Motion In Limine and Daubert Motion) filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Robert F. McCauley)(McCauley, Robert) (Filed on 8/21/2014) (Entered: 08/21/2014)
08/25/2014	236	ORDER by Judge Edward M. Chen granting 234 Stipulation (emclc1, COURT STAFF) (Filed on 8/25/2014) (Entered: 08/25/2014)
08/26/2014	237	MOTION in Limine No. 1 to Preclude Argument or Testimony Related to Copying filed by Coolit Systems Inc. Motion Hearing set for 9/16/2014 02:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Responses due by 9/9/2014. Replies due by 9/16/2014.

		(Attachments: # 1 Declaration of Joel L. Dion ISO Motion In Limine No. 1, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Proposed Order)(Dion, Joel) (Filed on 8/26/2014) (Entered: 08/26/2014)
08/26/2014	238	MOTION in Limine No. 2 to Preclude Argument that Conduct Outside the U.S. Supports Infringement filed by Coolit Systems Inc. Motion Hearing set for 9/16/2014 02:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Responses due by 9/9/2014. Replies due by 9/16/2014. (Attachments: # 1 Declaration of Joel L. Dion ISO Motion in Limine No. 2, # 2 Exhibit 1, # 3 Exhibit 2, # 4 Exhibit 3, # 5 Proposed Order)(Dion, Joel) (Filed on 8/26/2014) (Entered: 08/26/2014)
08/26/2014	239	TRIAL BRIEF of Defendant CoolIT Systems, Inc. by Coolit Systems Inc. (Dion, Joel) (Filed on 8/26/2014) (Entered: 08/26/2014)
08/26/2014	240	NOTICE of Appearance by Daniel Sean Perry (Perry, Daniel) (Filed on 8/26/2014) (Entered: 08/26/2014)
08/26/2014	241	MOTION in Limine No. 1 to Preclude Defendant CoolIT Systems, Inc. From Contending That Asetek is Not Entitled to Damages From January 1 to January 21, 2013 filed by Asetek A/S, Asetek Holdings, Inc. Motion Hearing set for 9/16/2014 02:30 PM before Hon. Edward M. Chen. Responses due by 9/9/2014. Replies due by 9/16/2014. (Attachments: # 1 Proposed Order)(Perry, Daniel) (Filed on 8/26/2014) (Entered: 08/26/2014)
08/26/2014	242	MOTION in Limine No. 2 to Preclude Reexamination Evidence or Argument filed by Asetek A/S, Asetek Holdings, Inc. Motion Hearing set for 9/16/2014 02:30 PM before Hon. Edward M. Chen. Responses due by 9/9/2014. Replies due by 9/16/2014. (Attachments: # 1 Proposed Order) (Perry, Daniel) (Filed on 8/26/2014) (Entered: 08/26/2014)
08/26/2014	243	MOTION in Limine No. 3 to Preclude CoolIT From Mischaracterizing the Court's Construction of "Reservoir" filed by Asetek A/S, Asetek Holdings, Inc. Motion Hearing set for 9/16/2014 02:30 PM before Hon. Edward M. Chen. Responses due by 9/9/2014. Replies due by 9/16/2014. (Attachments: # 1 Proposed Order)(McCauley, Robert) (Filed on 8/26/2014) (Entered: 08/26/2014)
08/26/2014	244	Declaration of Daniel S. Perry in Support of 242 MOTION in Limine No. 2 to Preclude Reexamination Evidence or Argument, 241 MOTION in Limine No. 1 to Preclude Defendant CoolIT Systems, Inc. From Contending That Asetek is Not Entitled to Damages From January 1 to January 21, 2013, 243 MOTION in Limine No. 3 to Preclude CoolIT From Mischaracterizing the Court's Construction of "Reservoir" and Opposition to CoolIT's Motion in Limine No. 1 filed byAsetek A/S, Asetek Holdings, Inc. (Attachments: # 1 Exhibit A, # 2 Exhibit B, # 3 Exhibit C, # 4 Exhibit D, # 5 Exhibit E, # 6 Exhibit F, # 7 Exhibit G, # 8 Exhibit H, # 9 Exhibit I, # 10 Exhibit J) (Related document(s) 242 , 241 , 243) (Perry, Daniel) (Filed on 8/26/2014) (Entered: 08/26/2014)
08/26/2014	245	Proposed Voir Dire by Asetek A/S, Asetek Holdings, Inc Parties' Joint Preliminary Statement to the Jury and Voir Dire. (McCauley, Robert) (Filed on 8/26/2014) (Entered: 08/26/2014)
08/26/2014	246	Pretrial Conference Statement by Asetek A/S, Asetek Holdings, Inc Joint Pretrial Statement. (Attachments: # 1 Exhibit A, # 2 Exhibit A1, # 3 Exhibit A2, # 4 Exhibit A3, # 5 Exhibit A4, # 6 Exhibit B, # 7 Exhibit C) (McCauley, Robert) (Filed on 8/26/2014) (Entered: 08/26/2014)
08/26/2014	247	Proposed Form of Verdict by Asetek A/S, Asetek Holdings, Inc Joint Proposed Verdict Form. (McCauley, Robert) (Filed on 8/26/2014) (Entered: 08/26/2014)
08/26/2014	248	Proposed Jury Instructions by Asetek A/S, Asetek Holdings, Inc Joint Proposed Jury Instructions. (McCauley, Robert) (Filed on 8/26/2014) (Entered: 08/26/2014)

08/26/2014	249	TRIAL BRIEF Plaintiffs Asetek Holdings, Inc.'s and Asetek A/S's Trial Brief by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 8/26/2014) (Entered: 08/27/2014)
08/27/2014	250	MOTION for leave to appear in Pro Hac Vice on behalf of Matthew Homyk (Filing fee $ 305, receipt number 0971-8876694.) filed by Coolit Systems Inc. (Homyk, Matthew) (Filed on 8/27/2014) (Entered: 08/27/2014)
09/05/2014	251	NOTICE by Coolit Systems Inc DEFENDANT COOLIT SYSTEMS, INC.S NOTICE UNDER 35 U.S.C. § 282 (Dion, Joel) (Filed on 9/5/2014) (Entered: 09/05/2014)
09/06/2014	252	NOTICE by Asetek A/S, Asetek Holdings, Inc Plaintiffs Asetek Holdings, Inc. and Asetek A/S's Notice Under 35 U.S.C. Sect. 282 (McCauley, Robert) (Filed on 9/6/2014) (Entered: 09/06/2014)
09/10/2014	253	CLERK'S NOTICE - Parties are ordered by Judge Edward M. Chen to contact Magistrate Judge Paul S. Grewal immediately to schedule a further settlement conference to be held before the 10/6/14 jury trial. THIS IS A TEXT ONLY DOCKET ENTRY; THERE IS NO DOCUMENT ASSOCIATED WITH THIS NOTICE. (bpf, COURT STAFF) (Filed on 9/10/2014) (Entered: 09/10/2014)
09/10/2014	254	CLERK'S NOTICE SETTING SETTLEMENT CONFERENCE: Settlement Conference set for 9/19/2014 at 10:00 AM in Courtroom 5, 4th Floor, San Jose before Magistrate Judge Paul S. Grewal. (ofr, COURT STAFF) (Filed on 9/10/2014) (Entered: 09/10/2014)
09/11/2014	255	CERTIFICATE OF SERVICE by Asetek A/S, Asetek Holdings, Inc (McCauley, Robert) (Filed on 9/11/2014) (Entered: 09/11/2014)
09/12/2014	256	TRANSCRIPT ORDER for Daily Trial by Coolit Systems Inc. (Dion, Joel) (Filed on 9/12/2014) (Entered: 09/12/2014)
09/12/2014	257	ORDER by Judge Edward M. Chen granting 250 Motion for Pro Hac Vice (Homyk) (bpf, COURT STAFF) (Filed on 9/12/2014) (Entered: 09/12/2014)
09/16/2014	258	Minute Entry: Motions In Limine Hearing/Status held on 9/16/2014 before Judge Edward M. Chen. 8 day jury trial reset from 10/6/14 to 6/15/15 at 8:30 a.m. Court to issue order (Date Filed: 9/18/2014). (Court Reporter Lydiz Zinn.) (bpf, COURT STAFF) (Date Filed: 9/18/2014) (Entered: 09/18/2014)
09/18/2014		Set/Reset Hearing, Set/Reset Deadlines:, ***Deadlines terminated. Further Status Conference set for 1/29/2015 10:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Status Report due by 1/22/2015. (bpf, COURT STAFF) (Filed on 9/18/2014) (Entered: 09/18/2014)
09/18/2014	259	TRANSCRIPT ORDER by Asetek A/S, Asetek Holdings, Inc for Court Reporter Lydia Zinn. (McCauley, Robert) (Filed on 9/18/2014) (Entered: 09/18/2014)
09/18/2014	260	CASE MANAGEMENT SCHEDULING ORDER: 8 court day Jury Trial reset for 6/15/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Pretrial Conference set for 5/19/2015 02:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 6/16/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 6/17/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 6/19/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 6/22/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 6/23/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 6/24/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 6/26/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Selection

		set for 6/15/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen.. Signed by Judge Edward M. Chen on 9/18/14. (bpf, COURT STAFF) (Filed on 9/18/2014) (Entered: 09/18/2014)
09/19/2014	261	Minute Entry: Settlement Conference held on 9/19/2014 before Magistrate Judge Paul S. Grewal. Case settled. (Court Reporter: Not Reported) (ofr, COURT STAFF) (Date Filed: 9/19/2014) (Entered: 09/19/2014)
09/30/2014	262	STIPULATION WITH PROPOSED ORDER STIPULATED REQUEST TO EXTEND DEADLINE FOR SUBMISSION OF DISCOVERY PLAN filed by Coolit Systems Inc. (Knauss, Daniel) (Filed on 9/30/2014) (Entered: 09/30/2014)
10/01/2014	263	ORDER by Judge Edward M. Chen granting 262 Stipulation (emclc3, COURT STAFF) (Filed on 10/1/2014) (Entered: 10/01/2014)
10/01/2014	264	Transcript of Proceedings held on 9/16/2014, before Judge Edward M. Chen. Court Reporter/Transcriber Lydia Zinn, Telephone number (415) 531-6587. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 259 Transcript Order) Release of Transcript Restriction set for 12/30/2014. (Related documents(s) 259) (Zinn, Lydia) (Filed on 10/1/2014) (Entered: 10/01/2014)
10/14/2014	265	STIPULATION WITH PROPOSED ORDER re 263 Order on Stipulation Stipulated Request to Extend Deadline for Submission of Discovery Plan; Proposed Order filed by Asetek A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 10/14/2014) (Entered: 10/14/2014)
10/15/2014	266	STIPULATION AND ORDER re 265 STIPULATION WITH PROPOSED ORDER re 263 Order on Stipulation Stipulated Request to Extend Deadline for Submission of Discovery Plan; Proposed Order filed by Asetek Holdings, Inc, Asetek A/S. Signed by Judge Edward M. Chen on 10/15/14. (bpf, COURT STAFF) (Filed on 10/15/2014) (Entered: 10/15/2014)
10/28/2014	267	STIPULATION WITH PROPOSED ORDER RE DISCOVERY PLAN filed by Coolit Systems Inc. (Knauss, Daniel) (Filed on 10/28/2014) (Entered: 10/28/2014)
11/03/2014	268	STIPULATION AND ORDER re 267 STIPULATION WITH PROPOSED ORDER RE DISCOVERY PLAN filed by Coolit Systems Inc Status Report due by 2/5/2015. Status Conference reset for 2/12/2015 10:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Signed by Judge Edward M. Chen on 11/3/14. (bpf, COURT STAFF) (Filed on 11/3/2014) Modified on 11/3/2014 (bpf, COURT STAFF). (Entered: 11/03/2014)
01/06/2015	269	CLERK'S NOTICE advancing status from 2/12/15 to 1/22/2015. Status Report due by 1/15/2015. Status Conference set for 1/22/2015 10:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. THIS IS A TEXT ONLY DOCKET ENTRY; THERE IS NO DOCUMENT ASSOCIATED WITH THIS NOTICE.(bpf, COURT STAFF) (Filed on 1/6/2015) (Entered: 01/06/2015)
01/14/2015	270	STIPULATION WITH PROPOSED ORDER Stipulation to Continue CMC One Week; Proposed Order filed by Asetek Danmark A/S, Asetek Holdings, Inc. (Attachments: # 1 Declaration of Robert F. McCauley)(McCauley, Robert) (Filed on 1/14/2015) (Entered: 01/14/2015)
01/20/2015	271	STIPULATION AND ORDER re 270 to Continue CMC One Week; Proposed Order filed by Asetek Holdings, Inc, Asetek Danmark A/S Status Report due by 1/22/2015. Status Conference set for 1/29/2015 03:00 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen..

		Signed by Judge Edward M. Chen on 1/20/15. (bpf, COURT STAFF) (Filed on 1/20/2015) (Entered: 01/20/2015)
01/21/2015	272	CLERK'S NOTICE SETTING FURTHER SETTLEMENT CONFERENCE: Settlement Conference set for 2/4/2015 at 10:00 AM in Courtroom 5, 4th Floor, San Jose before Magistrate Judge Paul S. Grewal. (ofr, COURT STAFF) (Filed on 1/21/2015) (Entered: 01/21/2015)
01/22/2015	273	STATUS REPORT Joint Status Report by Asetek Danmark A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 1/22/2015) (Entered: 01/22/2015)
01/30/2015	274	TRANSCRIPT ORDER by Coolit Systems Inc for Court Reporter Lori Stokes. (Knauss, Daniel) (Filed on 1/30/2015) (Entered: 01/30/2015)
01/30/2015	275	Minute Entry for proceedings held before Hon. Edward M. Chen: Status Conference held on 1/29/2015. 7-day jury trial reset from 6/15/15 to 4/6/15 at 8:30 a.m.Court Reporter Name Lori Stokes. (bpf, COURT STAFF) (Date Filed: 1/30/2015) (Entered: 01/30/2015)
01/30/2015	276	CASE MANAGEMENT SCHEDULING ORDER: 7 day Jury Trial advanced from 6/15/2015 to 4/6/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Pretrial Conference set for 3/10/2015 02:30 PM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 4/7/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 4/8/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 4/10/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 4/13/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 4/14/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. Jury Trial set for 4/15/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen.. Signed by Judge Edward M. Chen on 1/30/15. (bpf, COURT STAFF) (Filed on 1/30/2015) (Entered: 01/30/2015)
01/30/2015		Set Deadlines/Hearings: Jury Selection set for 4/6/2015 08:30 AM in Courtroom 5, 17th Floor, San Francisco before Hon. Edward M. Chen. (bpf, COURT STAFF) (Filed on 1/30/2015) (Entered: 01/30/2015)
02/03/2015	277	TRANSCRIPT ORDER by Asetek Danmark A/S, Asetek Holdings, Inc for Court Reporter Lori Stokes. (McCauley, Robert) (Filed on 2/3/2015) (Entered: 02/03/2015)
02/04/2015	278	Minute Entry for proceedings held before Magistrate Judge Paul Singh Grewal: Settlement Conference held on 2/4/2015. Case settled. Confidential settlement terms placed on the record. FTR Time: (9:12 to 9:20) Plaintiff Attorney(s) present: Robert McCauley. Also present: Peter Madsen, Andre Eriksen & Eric Raciti. Defendant Attorney(s) present: Dennis McCooe, Heidi Keefe & Daniel Knauss. Also present: Geoff Lyon. This is a text only Minute Entry. (ofr, COURT STAFF) (Date Filed: 2/4/2015) (Entered: 02/04/2015)
02/05/2015	279	Transcript of Proceedings held on 01/29/2015, before Judge Chen. Court Reporter/Transcriber Lori Stokes, Telephone number 925-330-2149 LoriStokesCSR@gmail.com. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 274 Transcript Order, 277 Transcript Order) Release of Transcript Restriction set for 5/6/2015. (Related documents(s) 274 , 277) (Stokes, Lori) (Filed on 2/5/2015) (Entered: 02/05/2015)
02/06/2015	280	

		STIPULATION WITH PROPOSED ORDER Stipulated Dismissal of Action With Prejudice; Proposed Order filed by Asetek Danmark A/S, Asetek Holdings, Inc. (McCauley, Robert) (Filed on 2/6/2015) (Entered: 02/06/2015)
02/09/2015	281	STIPULATION AND ORDER OF DISMISSAL. Motions terminated as moot: 241 MOTION in Limine No. 1 to Preclude Defendant CoolIT Systems, Inc. From Contending That Asetek is Not Entitled to Damages From January 1 to January 21, 2013 filed by Asetek Holdings, Inc, Asetek Danmark A/S, 237 MOTION in Limine No. 1 to Preclude Argument or Testimony Related to Copying filed by Coolit Systems Inc, 242 MOTION in Limine No. 2 to Preclude Reexamination Evidence or Argument filed by Asetek Holdings, Inc, Asetek Danmark A/S, 238 MOTION in Limine No. 2 to Preclude Argument that Conduct Outside the U.S. Supports Infringement filed by Coolit Systems Inc, 223 MOTION in Limine Plaintiffs Asetek Holdings Inc.'s and Asetek A/S's Early Motion In Limine and Daubert Motion filed by Asetek Holdings, Inc, Asetek Danmark A/S, 280 STIPULATION WITH PROPOSED ORDER Stipulated Dismissal of Action With Prejudice; Proposed Order filed by Asetek Holdings, Inc, Asetek Danmark A/S, 243 MOTION in Limine No. 3 to Preclude CoolIT From Mischaracterizing the Court's Construction of "Reservoir" filed by Asetek Holdings, Inc, Asetek Danmark A/S. Signed by Judge Edward M. Chen on 2/9/15. (bpf, COURT STAFF) (Filed on 2/9/2015) (Entered: 02/09/2015)
02/11/2015	282	REPORT on the determination of an action regarding patent infringement (cc: form mailed to register). (slhS, COURT STAFF) (Filed on 2/11/2015) (Entered: 02/11/2015)
02/18/2015		Remark: Audio CD mailed re: ECF No. 278 (return envelope): Cooley LLP. Attn: Daniel Knauss. 3175 Hanover Street, Palo Alto, CA 94304-1130. (ofr, COURT STAFF) (Filed on 2/18/2015) (Entered: 02/18/2015)
04/16/2015	283	TRANSCRIPT ORDER for 2/4/2015 hearing by Asetek Danmark A/S, Asetek Holdings, Inc for Court Reporter FTR - San Jose. (McCauley, Robert) (Filed on 4/16/2015) (TRANSCRIBER: ECHO REPORTING) **4/23/15 - ORDER UPDATED TO BE A DAILY RUSH** Modified on 4/23/2015 (sms, COURT STAFF). (Entered: 04/16/2015)
04/24/2015	284	Transcript of Proceedings of the official sound recording held on 02/04/15, before Magistrate Judge Paul S. Grewal. FTR/Transcriber Echo Reporting, Inc., Telephone number (858) 453-7590.;echoreporting@yahoo.com. Tape Number: FTR 9:12 - 9:20. Per General Order No. 59 and Judicial Conference policy, this transcript may be viewed only at the Clerks Office public terminal or may be purchased through the Court Reporter/Transcriber until the deadline for the Release of Transcript Restriction.After that date it may be obtained through PACER. Any Notice of Intent to Request Redaction, if required, is due no later than 5 business days from date of this filing. (Re 283 Transcript Order,) Redaction Request due 5/15/2015. Redacted Transcript Deadline set for 5/26/2015. Release of Transcript Restriction set for 7/23/2015. (Related documents(s) 283) (tgb, COURT STAFF) (Filed on 4/24/2015) (Entered: 04/24/2015)
06/12/2015	285	DOCUMENT E-FILED UNDER SEAL. ORDER by Judge Paul S. Grewal. (psglc2, COURT STAFF) (Filed on 6/12/2015) (Entered: 06/12/2015)

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269234 (13) 8245764 August 21, 2012

UNITED STATES PATENT AND TRADEMARK OFFICE GRANTED PATENT

8245764

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August 21, 2012

Cooling system for a computer system

INVENTOR: Eriksen, André Sloth - Aalborg C, Kingdom of Denmark (DK), Kingdom of Denmark ()

APPL-NO: 269234 (13)

FILED-DATE: October 7, 2011

GRANTED-DATE: August 21, 2012

CORE TERMS: heat, reservoir, cooling, pump, processing, exchanging, electrical, computer system, cooling system, impeller, pumping, housing, interface, sink, thermal, voltage, rotor, channels, inlet, outlet, radiator, inside, fan, aperture, driving, segments, fastening, intermediate, generating, alternatively

ENGLISH-ABST:

The invention relates to a cooling system for a computer system, said computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid. The cooling system has a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, Different embodiments of the heat exchanging system as well as means for establishing and controlling a flow of cooling liquid and a cooling strategy constitutes the invention of the cooling system.

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1. Danmark v. CMI USA, Inc., 2016-1026, 2016-1183, UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT, 842 F.3d 1350; 2016 U.S. App. LEXIS 21672; 120 U.S.P.Q.2D (BNA) 1857, December 6, 2016, Decided

   OVERVIEW: Infringement was properly found of patents describing methods for cooling a processing unit of a computer using cooling liquid since the evidence permitted the inference that heat exchanging interfaces in accused products were removably attached or removably coupled.

   CORE TERMS: injunction, chamber, patent, infringement, heat, concert, infringing, removably, thermal, non-party ...

   ... of two of Asetek's patents, U.S. Patent Nos. 8,240,362 and **8,245,764**. All of the accused products are branded "Cooler Master." A ...

2. Asia Vital Components Co. v. Asetek Danmark A/S, 2015-1597, UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT, 837 F.3d 1249; 2016 U.S. App. LEXIS 16476; 119 U.S.P.Q.2D (BNA) 1745, September 8, 2016, Decided

   OVERVIEW: Question of jurisdiction in this matter pertaining to the Declaratory Judgment Act, 28 U.S.C.S. § 2201, turned on whether, under all the circumstances, appellee's actions could be reasonably inferred as demonstrating intent to enforce a patent; appellee's conduct demonstrated just that. Appellant also met the real and immediate test.

   CORE TERMS: patent, infringement, declaration, customers, infringing, substantial controversy, actual controversy, license, declaratory judgment, apprehension ...

   ... did not infringe U.S. Patent Nos. 8,240,362 ("'362 patent") and **8,245,764** ("'764 patent") (collectively, "the asserted patents") and that those patents ...

3. Asetek Danmark A/S v. CMI USA, Inc., Case No. 13-cv-00457-JST, UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF CALIFORNIA, 2016 U.S. Dist. LEXIS 795, January 4, 2016, Decided, January 4, 2016, Filed

   CORE TERMS: injunction, infringing, intervene, patent, infringement, concert, written notice, suspend, infringed, imported ...

   ... claims 1-15, 17, and 18 of U.S. Patent No. **8,245,764** ("'764 patent). Asetek asserted that the following products infringed its ...
   ... product or its use infringes U.S. Patent Nos. 8,240,362 and **8,245,764**, which are assigned to Asetek Danmark A/S. Accordingly, certain ...

4. Asetek Danmark A/S v. CMI USA, Inc., Case No. 13-cv-00457-JST, UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF CALIFORNIA, 2015 U.S. Dist. LEXIS 127832, September 22, 2015, Decided, September 22, 2015, Filed, Motion granted by, Motion denied by Asetek Danmark A/S v. CMI USA, Inc., 2016 U.S. Dist. LEXIS 795 (N.D. Cal., Jan. 4, 2016)Affirmed in part and remanded in part by Danmark v. CMI USA, Inc., 2016 U.S. App. LEXIS 21672 (Fed. Cir., Dec. 6, 2016)

CORE TERMS: injunction, infringement, infringing, cooler, patent, removably, invention, royalty rate, patentee, infringe ...

... CMI")'s products infringed United States Patents Nos. 8,240,362 and **8,245,764** ("'362 patent" and "'764 patent"). ECF Nos. 218, 219. Now ...
... one or more of United States Patents Nos. 8,240,362 and **8,245,764**. Asetek requests that the injunction take the following form: (1) ...
... product or its use infringes U.S. Patent Nos. 8,240,362 and **8,245,764**, which are assigned to Asetek Danmark A/S. Accordingly, certain ...
... product or its use infringes U.S. Patent Nos. 8,240,362 and **8,245,764**, which are assigned to Asetek Danmark A/S. Accordingly, certain ...
... in effect until both of U.S. Patent Nos. 8,240,362 and **8,245,764** have expired. Should either patent be finally adjudged invalid in ...

5. Asetek Danmark A/S v. CMI United States, Inc., Case No. 13-cv-00457-JST, UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF CALIFORNIA, 100 F. Supp. 3d 871; 2015 U.S. Dist. LEXIS 52989, April 21, 2015, Decided, April 21, 2015, Filed, Motion granted by, in part, Motion denied by, in part Asetek Danmark A/S v. CMI USA, Inc., 2015 U.S. Dist. LEXIS 88090 (N.D. Cal., July 7, 2015)

OVERVIEW: In this patent infringement action, judgment was entered for plaintiff because defendant failed to show by clear and convincing evidence that the '764 and '362 patents were invalid for obviousness, lack of written description, or indefiniteness.

CORE TERMS: invention, chamber, reservoir, prior art, pump, liquid, cooling, indefiniteness, patent, heat ...

... CMI USA, Inc.'s products infringed United States Patents No. **8,245,764** and 8,240,362 ("'764 patent" and "'362 patent"). ECF Nos. 218, ...

6. Asetek Danmark A/S v. CMI USA, Inc., Case No. 13-cv-00457-JST, UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF CALIFORNIA, 2014 U.S. Dist. LEXIS 155452, November 2, 2014, Decided, November 3, 2014, Filed, Motion granted by Danmark v. CMI USA, Inc., 2014 U.S. Dist. LEXIS 171056 (N.D. Cal., Dec. 9, 2014)

CORE TERMS: chamber, summary judgment, reservoir, prior art, disclose, skill, thermal, patent, removably, genuine ...

... Judgment of (1) Invalidity of U.S. Patent Nos. 8,240,362 and **8,245,764**; and (2) Non-Infringement of U.S. Patent No. 8,240,362. ECF ...
... alleging infringement of U.S. Patent Nos. 8,240,362 ("'362 Patent"), and **8,245,764** ("'764 Patent"). The patents, both of which are titled "Cooling ...

7. Asetek Holdings, Inc. v. CoolIT Sys., No. C-12-4498 EMC, UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF CALIFORNIA, 2014 U.S. Dist. LEXIS 115495, August 19, 2014, Decided, August 19, 2014, Filed, Summary judgment denied by, Patent interpreted by Asetek Danmark A/S v. CMI USA, Inc., 2014 U.S.

Dist. LEXIS 155452 (N.D. Cal., Nov. 2, 2014)

CORE TERMS: reservoir, chamber, summary judgment, impeller, pump, port, patent, infringement, fluid, cap ...

... U.S. Patent No. 8,240,362 (the '362 patent) and U.S. Patent No. **8,245,764** (the '764 patent). CoolIT counterclaimed, alleging that the '362 and '764 patents ...

8. Asetek Holdings, Inc. v. Cooler Master Co., Case No. 13-cv-00457-JST, UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF CALIFORNIA, 2014 U.S. Dist. LEXIS 47134, April 3, 2014, Decided, April 3, 2014, Filed

CORE TERMS: patent, reexamination, discovery, undue prejudice, competitor, simplification, overlap, liquid, heat, inter partes ...

... patent infringement action asserting its U.S. Patent Nos. 8,240,362 and **8,245,764** against Defendants Cooler Master Co., Ltd., Cooler Master USA, Inc. (...

9. CoolIT SYSTEMS, INC., Third Party Requester, Respondent, v. ASETEK A/S, Patent Owner, Appellant., Appeal 2015-007934 Reexamination Control 95/002,386 Patent US 8,245,764 B2 n1 n1 Issued to André Sloth Eriksen on August 21, 2012 (hereinafter the '764 patent). Technology Center 3900, Patent Trial and Appeal Board, 2016 Pat. App. LEXIS 8615, September 19, 2016, Decided

CORE TERMS: declaration, thermal, chamber, channel, sucking, judicial review, modify, reexamination, concurrent

10. CoolIT SYSTEMS, INC., Third Party Requester, Respondent, v. ASETEK A/S, Patent Owner, Appellant., Appeal 2015-007934 Reexamination Control 95/002,386 Patent US 8,245,764 B2 n1 n1 Issued to André Sloth Eriksen on August 21, 2012 (hereinafter the '764 patent). Technology Center 3900, Patent Trial and Appeal Board, 2016 Pat. App. LEXIS 1939, April 29, 2016, Decided

CORE TERMS: chamber, thermal, channel, pump, configured, impeller, heat, heat exchange, coolant, sucking ...

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1. Law360, 6 December 2016 Tuesday, 674 words, Fed. Circ. Says No New Trial For CMI In Cooling Patent Rowhttps://www.law360.com/appellate/articles/869641Fed. Circ. Says No New Trial For CMI In Cooling Patent Row Law360, New York (December 6, 2016, 9:34 PM EST) -- The Federal Circuit Monday affirmed a district court's decision that CMI's Cool Master computer cooling systems infringed an Asetek patent, along...PATENTS (90%); PATENT INFRINGEMENT (90%); LAW COURTS & TRIBUNALS (90%); JURY TRIALS (89%); JUDGES (89%); INJUNCTIONS (89%); VERDICTS (89%); DAMAGES (88%); PRIOR ART (78%); ROYALTIES (78%); LITIGATION (78%) SHARON PROST (79%)CALIFORNIA, USA (91%)UNITED STATES (92%)

2. Mondaq Business Briefing, January 13, 2016 Wednesday, 996 words, United States: Don't Bury Your Head In The Sand, Siddhartha Venkatesan

   CORE TERMS: Cooler, Master, injunction, Tigar, Asetek, CMI, UNITED STATES, infringing, patent, defendant, infringe, argument, orrick, permanent injunction, notice requirement, Additive, Danmark, concluded, intervene, notice, entities, com, Federal Circuit, jury verdict, written notice, bill of sale, underlying litigation, intervention, litigation, dismissal

   ... JST (copy enclosed). This product or its use infringes U.S. Patent Nos. 8,240,362 and **8,245,764,** which are assigned to Asetek Danmark A/S. Accordingly, certain acts associated with this product are ...

3. EXTREMETECH.com, December 7, 2015 Monday 06:47 PM, , 474 words, Asetek demands AMD suspend sales of Fury X, goes after Gigabyte, Joel Hruska

   CORE TERMS: Asetek, cooler, Master, AMD, patent, CoolerMaster, Seidon, Gigabyte, Fury, injunction, jury, Nepton, CMI, cease-and-desist, infringement, infringing, lawsuit, cooling, awarded, damages, sued

   ... Master's US affiliate) for infringement of Asetek's US Patent Nos. 8,240,362 and **8,245,764,** and the jury found that the Cooler Master products at issue infringe Asetek's patents and ...

4. Business Wire, December 18, 2014 Thursday 8:18 AM GMT, , 387 words, Asetek Announces Significant Victory in Intellectual Property Lawsuit, OSLO, Norway

   CORE TERMS: asetek, CMI, patents, cooling, liquid, jury, patent infringement, infringement, infringing, patented, cision, http, com

   ... After trial began, CMI stipulated to infringement of Asetek's U.S Patent No. **8,245,764.** The jury awarded Asetek damages of $404,941 (a royalty of 14.5%) based ...

☐ 5. Pivotal Sources, December 18, 2014 Thursday, 152 words, Asetek Announces Significant Victory in Intellectual Property Lawsuit, United States

CORE TERMS: Asetek's, CMI, patent, jury, United States, infringement, infringing

... After trial began, CMI stipulated to infringement of Asetek's U.S Patent No. **8,245,764.** The jury awarded Asetek damages of $404,941 (a royalty of 14.5%) based ...

☐ 6. US Fed News, August 27, 2012 Monday 11:19 PM EST, , 263 words, US Patent Issued to Asetek on Aug. 21 for "Cooling System for a Computer System" (Danish Inventor), ALEXANDRIA, Va.

CORE TERMS: cooling, liquid, cooling system, computer system, thermal, patent, heat, Denmark, comprising, exchanging, invention, intended, please

ALEXANDRIA, Va., Aug. 27 -- United States Patent no. **8,245,764,** issued on Aug. 21, was assigned to Asetek A/S (Bronderslev, Denmark). " ...
... r=1&f=G&l=50&co1=AND&d=PTXT&s1=**8245764**&OS=**8245764**&RS=**8245764**
For any query with respect to this article or any other content requirement, please ...

☐ 7. GlobalAdSource (English), December 10, 2009 Thursday, 29 words, VACATION MORE OFTEN.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 09/19/2016
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
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MAIL DATE	DELIVERY MODE
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The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CoolIT SYSTEMS, INC.,
Third Party Requester, Respondent,

v.

ASETEK A/S,
Patent Owner, Appellant.

Appeal 2015-007934
Reexamination Control 95/002,386
Patent US 8,245,764 B2[1]
Technology Center 3900

Before STEVEN D.A. McCARTHY, BRETT C. MARTIN,
JON M. JURGOVAN, *Administrative Patent Judges*.

MARTIN, *Administrative Patent Judge*.

DECISION ON REQUEST FOR REHEARING

---

[1] Issued to André Sloth Eriksen on August 21, 2012 (hereinafter the ’764 patent).

The Requester filed REQUESTER'S REQUEST FOR REHEARING on May 31, 2016 (hereinafter "Rehearing Request" or "Reh'g. Req.").") under 37 C.F.R. § 41.79 seeking rehearing of our Decision mailed April 29, 2016 (hereinafter "Decision" or "Dec."), which reversed various final rejections of the claims made by the Examiner. The Patent Owner submitted its Opposition to Request for Rehearing (hereinafter "Opposition" or "Opp.") on June 28, 2016. We grant the Rehearing Request to the extent that we consider the Requester's arguments, but DENY the request to modify the Decision.

The Requester's first argument is that the Board overlooked evidence in this appeal by not considering the expert testimony of Dr. Carman. Reh'g. Req. 3. The Requester asserts that Dr. Carman's testimony was of record via the required submissions of concurrent proceedings, which occurred after the issues in this reexamination were briefed. Reh'g. Req. 1. As the Patent Owner correctly notes, however, "notices of concurrent proceedings are to be made without comment or discussion of the issues." Opp. 2. Furthermore, as the Patent Owner also points out, the Requester attempts to rely on Dr. Carman's testimony because "it failed to properly submit its declaration of Seri Lee," a declaration that "purported to stand for the identical proposition as the Carman declaration." *Id.* Furthermore, the Lee declaration issue notwithstanding, the Requester has provided no explanation why it could not or did not submit a timely declaration during the reexamination proceedings, which the Patent Owner did. We did not overlook the testimony of Dr. Carman, but properly excluded it from consideration, except to the extent that we heard oral argument regarding its content, as not properly being timely filed and before us for consideration.

The Requester also asserts that the Board misapprehended aspects of Koga suggesting that it should have properly been considered a thermal exchange chamber as claimed. Reh'g. Req. 3–7. Much of this argument relies on Dr. Carman's testimony, but even considering Dr. Carman's testimony would not change our Decision. What the Requester apparently fails to accept is that the mere fact of thermal exchange does not turn a chamber into a thermal exchange chamber as claimed. We have already considered at length the Requester's position that the "sucking channel" be considered a thermal exchange chamber and have rejected it. Even without declaration evidence submitted by either side, we would reject this argument. As the Patent Owner points out "[t]he Board devoted nearly four pages of its eight-page opinion to findings of fact and analysis of [Koga's] 'sucking channel.'" Opp. 5 (citing Dec. 4–7).

Although we have already explained this in detail, Koga's sucking channel, by its very name, is merely a conduit to carry fluid from one place to another. The fact that it may be made of material or have other properties that cause some amount of thermal exchange is irrelevant given our construction. As presented by the Patent Owner, we also agree with Judge Tigar's assessment of the Requester's argument "that to afford the claim term 'thermal exchange chamber' the breadth required to read on Koga's 'sucking channel" . . . would result in an unreasonable construction – i.e., it would 'defy common sense.'" Opp. 8 (citing the Notice of Concurrent Proceedings pp. 17–18).

DECISION

While we have considered the Decision in light of the Rehearing Request, we decline to modify it in any respect.

Pursuant to 37 C.F.R. § 41.79(d), this decision is final for the purpose of judicial review. A party seeking judicial review must timely serve notice on the Director of the United States Patent and Trademark Office. *See* 37 C.F.R. §§ 90.1 and 1.983.

DENIED

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re *Inter Partes* Reexamination of:	)	
	)	
André Sloth ERIKSEN	)	Group Art Unit: 3993
	)	
U.S. Patent No.: 8,245,764 B2	)	Examiner: Joseph A. KAUFMAN
Filed: October 7, 2011	)	
Issued: August 21, 2012	)	
	)	
For: COOLING SYSTEM FOR A COMPUTER	)	Confirmation No.: 7254
SYSTEM	)	
	)	
Reexamination Proceeding	)	
Control No. 95/002,386	)	
Filed: September 15, 2012	)	

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OPPOSITION TO REQUEST FOR REHEARING UNDER 37 C.F.R. § 41.79(c)

The Board's decision of April 29, 2016 reversing the examiner ("Decision") carefully reviewed Respondent/Requester CoolIT System's ("CoolIT") arguments regarding the claims of U.S. 8,245,764 ("the '764 patent"), the prior art, and the record. CoolIT's Request for Rehearing ("Request") attempts to relitigate issues that this Board has already heard and attempts to selectively supplement the record here to include cherry-picked evidence – the Carman declaration – from a concurrent federal district court litigation involving another party. CoolIT does not mention that it failed to properly submit its declaration of Seri Lee under the inter partes reexamination rules. Decision on Petition (12/22/2014). The Lee declaration purported to stand for the identical proposition as the Carman declaration. Requester now attempts to bootstrap support for its failed argument from the Carman declaration, an expert report filed in the concurrent district court proceedings, and which was never of record in the *inter partes* reexamination.[1]

The Request should be denied. The regulations of 37 C.F.R. set forth the rules for the submission of evidence which govern the course of inter partes reexaminations and PTAB Appeals. In circumstances not involving a new ground of rejection such as here, the rules specifically preclude new arguments or evidence not previously relied upon except by the showing of good cause. 37 C.F.R. § 41.79(b). CoolIT cannot show good cause, because the new evidence it attempts to introduce here, a declaration filed in a concurrent proceeding, was never of record here. The rules specifically limit the notification provided to the Office of concurrent proceedings to the existence and results of that proceeding. 37 C.F.R. § 1.985(b). As discussed by the Chief Administrative Patent Judge in this case, notices of concurrent proceedings are to be made without comment or discussion of the issues. Reexam Petition Decision at 6 (4/12/2016). Accordingly, a discussion of the

[1] The BPAI confronted an analogous situation arising during an interference in the unpublished decision *Human Genome Sciences, Inc. v. Immunex Corp,* 82 USPQ2d 1597 (BPAI 2006), stating that "A request for rehearing is not an opportunity to submit a revised motion relying on new evidence or argument and intending to cure the deficiencies of an initial motion, but an opportunity to identify points made by the movant which have been misapprehended or overlookedin the decision." *Id.* at 1598.

issues or evidence attached to the concurrent proceedings *per se* would be inappropriate under the rules, as explained below in Section III.

CoolIT nevertheless implies that this Board overlooked or failed to consider Dr. Carman's opinion provided in the district court litigation. *See, e.g.,* Request at pp. 4 and 5. This is a misrepresentation of the record in this proceeding. Dr. Carman's testimony was never of record in the reexamination and should not now be entered into the record. Therefore, this Board did not "overlook" Dr. Carman's opinion as argued by CoolIT. Asetek's expert, Dr. Tilton, on the other hand, provided a declaration in this *inter partes* reexamination, and this Board properly considered and gave weight to Dr. Tilton's opinion. Decision at pp. 5, 7 (citing Tilton Dec. ¶12). As this Board noted, Dr. Tilton's opinion in this reexamination proceeding stands unrebutted. *Id.* at 7.

CoolIT also argues that the BRI claim interpretation standard would render the "sucking channel" of Koga a "thermal exchange chamber" as claimed, or that the "sucking channel" can include the features of Koga's "pump room 15A." These arguments are identical to those argued at length in CoolIT's papers, and and at the Oral Hearing on April 13, 2016. CoolIT's further arguments regarding the difference between the BRI standard and the district court's *Phillips* standard is a strawman, because CoolIT has presented no evidence or argument that the Board failed to perform its own proper analysis under the BRI standard on the record before it on appeal.

CoolIT appears to believe that an expert opinion of any form supporting its theory that a "sucking channel" is a "thermal exchange chamber" is their silver bullet, but this belief is based on a myopic preoccupation. The entire record, including the Board's thoughtful analysis in its Decision, more than adequately reflects the conclusion that Koga's "sucking channel" cannot reasonably be considered a "thermal exchange chamber" as claimed. Judge Tigar in the concurrent proceeding, in fact, agreed.

The Board's Decision reversing the examiner's rejection of claims 1-30 was correct and should stand, and CoolIT's Request should be denied.

I. BACKGROUND

On April 29, 2015, the Board issued a Decision reversing the examiner's rejection of claims 1-30 following an Oral Hearing held on April 14, 2016 in Dallas, Texas. CoolIT filed a Request for Rehearing on May 31, 2016. Patent Owner files this Response under 37 CFR § 41.79(c).

The subject patent of this appeal, the '764 Patent, was asserted in 2012 and 2013 against two separate parties in two separate lawsuits in the Northern District of California. The first party was the petitioner for the *inter partes* reexamination giving rise to this appeal, CoolIT (Case No. 4:14-cv-02713). The second party was CMI USA, Inc. ("CMI"), a US-based subsidiary of Cooler Master of Taiwan (Case No. 3:13-cv-00457). On September 15, 2012, CoolIT filed a request for inter partes reexamination of the'764 patent, alleging, *inter alia*, that prior art patent U.S. Patent No. 7,554,049 to Koga et al. ("Koga") taught each limitation of the '764 Patent's claims. *Inter partes* reexamination was declared on a single ground, based on Koga. The *inter partes* reexamination matured into a right of appeal notice (RAN), containing rejections based on Koga, which were the subject of this appeal. Asetek and CoolIT settled their litigation.

The CMI case proceeded to trial, where Asetek prevailed, *inter alia*, on all questions of infringement and validity of the '764 Patent. CMI appealed to the FederalCircuit and the case is pending.

II. THE BOARD'S DECISION OVERLOOKED NOTHING

The Board's decision reflected careful review of Requester's arguments presented throughout the inter partes reexam and the appeal. In addition, CoolIT asked for and received the Board's permission during the Oral Hearing to discuss the content of the Carman declaration, notwithstanding the fact that this declaration was not of record.[2]

The Board devoted nearly four pages of its eight-page opinion to findings of fact and analysis of the "sucking channel." Decision 4-7. Included in the Board's analysis is the appreciation that there may be some incidental heat exchange from Koga's "sucking channel," but that "the mere fact of heat exchange does not make a chamber a heat exchange chamber …." Decision at 7.

For at least this reason, the Board's Decision reversing the examiner's rejection of claims 1-30 was correct and should stand, and CoolIT's Request should be denied.

III. COOLIT HAS NOT SHOWN GOOD CAUSE FOR PRESENTING NEW EVIDENCE

Patent Owner Asetek submitted Notices of Concurrent Proceedings in the subject *inter partes* reexamination and later appeal. Request at 1. Each of the Notices cited by CoolIT in its Request presented decisions in favor of Patent Owner in the concurrent CMI district court litigation. Submission of the decisions does not make every piece of evidence in the district court litigation part of the reexamination record.

Importantly, the Carman declaration would never have been properly available here. The citation of concurrent proceedings is governed by 37 C.F.R. § 1.985, and with respect to any paper filed thereunder, § 1.985(b) specified that:

> Such paper must be limited to merely providing notice of the other proceeding **without discussion of issues** of the current inter partes reexamination proceeding.

(emphasis added). As clarified by M.P.E.P. § 2686, papers qualifying under "include final court decisions (even if the decision is still appealable), decisions to vacate, decisions to remand, and

[2] In fact, Patent Owner's Notice of Concurrent Proceedings upon which CoolIT's Request is based was submitted via a Rule 41.3 Petition to the Chief Administrative Patent Judge that was decided on April 12, 2016, the day before the Oral Hearing. The Carman declaration, which appeared in the trial record of the concurrent proceeding, was never specifically made of record, but was of course available to the Board during its deliberations.

decisions as to the merits of the patent claims." Declarations of experts are not mentioned, and in fact would not be entered into the record:

> Non-merit decisions on motions such as for a new venue, a new trial/discovery date, or sanctions will not be entered into the patent file, and will be expunged from the patent file by closing the appropriate paper if they were entered before discovery of their nature. Further, papers filed in the court from litigations or other proceedings involving the patent <u>will not be entered into the record (and will be expunged if already entered) if they provide a party's arguments</u>, such as a memorandum in support of summary judgment. <u>If the argument has an entry right in the reexamination proceeding, it must be submitted via the vehicle (provision(s) of the rules) that provides for that entry right</u>. … Any submission that is not permitted entry will be returned, expunged, or discarded, at the sole discretion of the Office.

M.P.E.P. § 2686 (emphasis added).

As a document including arguments, the Carman Declaration would be subject to expungement. It therefore would defy Patent Office policy and the provisions of 37 C.F.R. and the MPEP to allow CoolIT to rely on the Carman declaration, as it has done in its Request.[3]

If CoolIT had a right to enter an expert declaration, it was during the course of the reexamination and was required to use "the vehicle (provision(s) of the rules) that provides for that entry right." *Id.* This entry right extends to judicial decisions, because such are ordinarily entitled to deference. *Ex parte Anderson,* 21 USPQ2d 1241, 1245 (Bd. Pat. App. & Int. 1991). Otherwise, providing notice of concurrent proceedings allows the USPTO to handle inter partes reexamination cases involved in litigation with special dispatch. M.P.E.P. § 2661, 35 U.S.C. 314(c).

The fact that CoolIT unsuccessfully attempted to enter the declaration of Seri Lee cannot now be cured by importing another expert's opinion to support the same argument. CoolIT failed to

[3] CoolIT's reliance on the Carman declaration is in any event misguided, given that Judge Tigar specifically found that Dr. Carman's qualifications in computer liquid cooling system technology and the level of ordinary skill of a practitioner in the art entitled his testimony to less weight than that of Dr. Tilton, and at times that Dr. Carman's experience in the field of liquid cooling systems for computers is a consideration that goes to the weight ofhis testimony. FINDINGS OF FACT AND CONCLUSIONS O.F LAW; ORDER ENTERING JUDGMENT IN FAVOR OF PLAINTIFF at 17 (Second Notice of Concurrent Proceedings (4/30/2015)).

make the point it now wishes to advance. A point not made in the first instance cannot have been misapprehended or overlooked. *Keebler Co. v. Murray Bakery Products,* 866 F.2d 1386, 1388 (Fed. Cir. 1989). In this case, CoolIT's arguments involving the Carman declaration, which are essentially those made involving the Seri Lee declaration, are not entitled to be now considered on rehearing.

At bottom, Dr. Carman's opinion provided in the district court litigation was never of record in this reexamination proceeding and should not now be made of record.

For at least this reason, the Board's Decision reversing the examiner's rejection of claims 1-30 was correct and should stand, and CoolIT's Request should be denied.

IV. CARMAN'S DECLARATION WAS NOT EFFECTIVE IN THE CONCURRENT PROCEEDING WHICH IT WAS A PART

Had Carman's declaration been available for consideration by the Board, *arguendo*, CoolIT's arguments in the Request would still fail. The invalidity arguments based upon Koga in the district court were the same in relevant regard as that in the present appeal. It is clear that the PTO is not bound by the district court's decision that CMI had not sustained its burden of proof in establishing the invalidity of the asserted claims. *Ex parte Anderson,* 21 USPQ2d at 1245. However, the findings of fact made by the district court based upon the evidence and testimony presented during the trial are "ordinarily entitled to deference." *Id.*

Judge Tigar's Order Denying CoolIT's Post-Trial Motions ("Order") stated that:

> At bottom, the biggest problem with CMI's argument is that it defies common sense. Under CMI's theory, any kind of liquid container would be a thermal exchange chamber, since – as Asetek expert Dr. Tilton explained – "heat transfer will always happen between any two bodies that are at—at different temperatures." Tr. at 1558:10-11. To take the colorful example in Asetek's brief, even an insulated beer cooler would qualify as a "thermal exchange chamber" under CMI's construction, because its insulation, being imperfect, will transfer some amount of heat from the outside air to the beer inside the cooler. The jury was within its rights to reject this theory.

Notice of Concurrent Proceedings (dated October 5, 2015) at p. 18, ll. 6-13.

Notwithstanding Carman's declaration to the contrary, the court found that to afford the claim term "thermal exchange chamber" the breadth required to read on Koga's "sucking channel," as does the Request and CoolIT's numerous prior arguments, would result in an unreasonable construction – i.e., it would "defy common sense." *Id.* at pp. 17-18; *see also* Notice of Concurrent Proceedings providing the district court's Findings of Fact and Conclusion of Law (dated April 30, 2015) at p. 18-19.

The Order and the Findings of Fact and Conclusion of Law are extraordinary not because they reflect a judicial construction of the '764 claims. Patent Owner acknowledges that the Board is not, according to current law, required to interpret claims in the same manner as courts. During these proceedings, "the PTO gives claims their 'broadest reasonable interpretation.'" *Ex parte Rodriguez*, 92 USPQ2d 1395 (Bd. Pat. App. & Int. 2009) (citations omitted). Instead, the Order and Findings of Fact and Conclusion of Law are extraordinary because they opine on the reasonableness of the argument that the claimed "thermal exchange chamber" can read on the prior art "sucking channel" of Koga.

Thus, even if Dr. Carman's opinion is made of record in this reexamination proceeding—which it should not be—it would nevertheless not support CoolIT's argument that sucking channel 19 of Koga is a "thermal exchange chamber." For at least this additional reason, the Request should be denied.

V. CONCLUSION

The Board should maintain the reversal of the examiner's rejection of claims 1-30 and deny CoolIT's Request for Rehearing.

If there are any additional fees due in connection with the filing of this paper, please charge the required fees to our deposit account 06-0916.

Respectfully submitted,

Dated: June 28, 2016

By: /Eric P. Raciti/

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Electronic Acknowledgement Receipt

EFS ID:	26195473
Application Number:	95002386
International Application Number:	
Confirmation Number:	7254
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Customer Number:	22852
Filer:	Eric Paul Raciti/Jennifer Gomes
Filer Authorized By:	Eric Paul Raciti
Attorney Docket Number:	COOL-1.012
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Application Type:	inter partes reexam

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Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam Certificate of Service	Certificate_of_Service.pdf	52907 0a92e6022daea3b8bd7fbe2c76c0245ad0c3bc93	no	1

Warnings:

Information:					
2	Patent Owner Comments on Req for Rehearing timely	Opposition_Request_Rehearing.pdf	131934 b07e6eb8119e9073343c776209751c66e49bf07f	no	9
Warnings:					
Information:					
		Total Files Size (in bytes):	184841		

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<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re Appeal of *Inter Partes* Reexamination of: U.S. Patent No.: 8,245,764 **Issued:** August 21, 2012 **Applicant:** Andre Sloth Eriksen **Title:** COOLING SYSTEM FOR A COMPUTER SYSTEM	**Appeal No.** 2015-007934 **R.C.N.:** 95/002,386 **Confirmation No.:** 7254 **Art Unit:** 3993 **Examiner:** Joseph A. Kaufman

FILED VIA EFS ON MAY 31, 2016

Patent Trial and Appeal Board
U.S. Patent and Trademark Office
PO Box 1450
Alexandria, Virginia 22313-1450

RESPONDENT'S / REQUESTER'S REQUEST FOR REHEARING PURSUANT TO 37 C.F.R. § 41.79

TABLE OF CONTENTS

INTRODUCTION

Respondent / Requester CoolIT Systems, Inc. respectfully requests rehearing by the Board under 37 C.F.R. § 41.79. The Board's original decision issued April 29, 2016, making the deadline for filing this Request May 31, 2016, as May 29, 2016, falls on Sunday, and Memorial Day falls on May 30, 2016. *See*, 37 C.F.R. §§ 1.7, 41.79(a)(1). Thus, this Request for Rehearing is timely filed. The Request contains fewer than 15 pages and, thus, complies with 37 C.F.R. § 1.943. A $1,000 fee under 37 C.F.R. § 41.20(b)(2)(ii) is concurrently submitted herewith.

Please charge any deficient or additional fees, or refund any excess payments, to Deposit Account No. 50-1001.

REAL PARTY IN INTEREST

Respondent, CoolIT Systems, Inc., having a principal place of business at #10, 2928 Sunridge Way NE, Calgary, AB Canada T1Y 7H9, remains the real party in interest in this Request for Rehearing.

RELATED APPEALS, INTERFERENCES, AND TRIALS

Neither Respondent nor the undersigned representative of Respondent is aware of any related appeals or interferences before the Patent Trial and Appeal Board.

U.S. Patent No. 8,245,764 (Exhibit 1, the "'764 Patent") was involved in the following litigations: (I) *Asetek Holdings, Inc. v. CoolIT Systems, Inc.*, Civil Action No. 3:12-cv-04498-EMC (the "*CoolIT* Litigation); and (II) *Asetek Holdings, Inc. v. CMI USA, Inc.*, Civil Action No. 3:13-cv-00457-JST (the "*CMI* Litigation), both in the U.S. District Court for the Northern District of California. The *CoolIT* Litigation settled, and the District Court's decision in the *CMI* Litigation is on appeal before the Court of Appeals for the Federal Circuit in Appeal Nos. 2016-1026 and 2016-1183, which have been consolidated.

GOOD CAUSE EXISTS TO CONSIDER GROUNDS OF ARGUMENT FIRST APPEARING IN WRITING IN THIS REQUEST FOR REHEARING GIVEN APPELLANT / PATENT OWNER'S SUBMISSION OF SEVERAL DISTRICT COURT OPINIONS RELEVANT TO THE OUTCOME IN THIS APPEAL AFTER THE DEADLINE FOR BRIEFING HAD PASSED IN THIS APPEAL

Pursuant to 37 C.F.R. § 41.79(b)(2), a Request for Rehearing can present an argument not previously presented in a brief based on a recent relevant decision of either the Board or a Federal Court, on good cause shown.

Appellant / Patent Owner filed three Notices of Concurrent Proceedings on December 19, 2014, April 30, 2015, and October 5, 2015, respectively. Each Notice concerned a decision in the U.S. District Court for the Northern District of California for a co-pending litigation involving the challenged '764 Patent. The April 30 and October 5 Notices included written decisions of the District Court for the Northern District of California. Each discussed expert-witness testimony of Dr. Carman opining that Koga's sucking channel 19 constitutes a claimed "thermal exchange chamber" and refuting Dr. Tilton's opposite opinion, which the outstanding Decision in this appeal states is unrebutted. *Decision*, p. 7:3-6.

Those Decisions issued after Respondent / Requester submitted its final appeal brief on October 24, 2014, and after the Examiner's Answer was filed May 22, 2015. Therefore, none of Respondent / Requester, Appellant / Patent Owner, and Examiner has previously had an opportunity to brief the Board regarding the significance of those Federal Court decisions.

Apparently recognizing that the record was still being developed after final briefing had been submitted in this appeal, the Board granted Respondent / Requester an opportunity to present arguments along the lines set forth herein during the oral argument held April 13, 2016. That being said, this Request for Rehearing is Respondent / Requester's first opportunity in this appeal to present such arguments in writing.

To the extent arguments herein relying on expert testimony of Dr. Carman could be considered as being "new," Respondent / Requester notes that evidence of Dr. Carman's testimony was made of record by Appellant / Patent Owner after the last of the parties' briefs in this appeal was filed. Accordingly, Respondent / Requester respectfully submits that good cause exists for the Board to permit briefing of those decisions and the evidence on which they rely, including expert-witness testimony of Dr. Carman, in this Request for Rehearing.

On that basis, Respondent / Requester respectfully requests that the Board consider the entirety of this Request for Rehearing on the merits, and further, to reissue a decision affirming the Examiner's rejections of all claims in light of evidence Respondent believes was misapprehended or overlooked, as set forth below.

POINTS BELIEVED TO HAVE BEEN MISAPPREHENDED OR OVERLOOKED

The Board reversed the Examiner's rejection of all claims (i.e., claims 1-30) as being anticipated by or obvious from U.S. Patent No. 7,544,049 on a single finding, i.e., that Koga's sucking channel 19 does not constitute a thermal exchange chamber. The Board concluded that "the mere fact of thermal exchange does not make a chamber a heat exchange chamber and the evidence in this case supports the conclusion that in order for one of ordinary skill in the art to reasonably conclude that a chamber is a 'thermal exchange chamber,' the chamber must be configured to perform heat exchange, such as in Koga's chamber 15." Decision, p. 7:10-15.

More fully, the Board stated

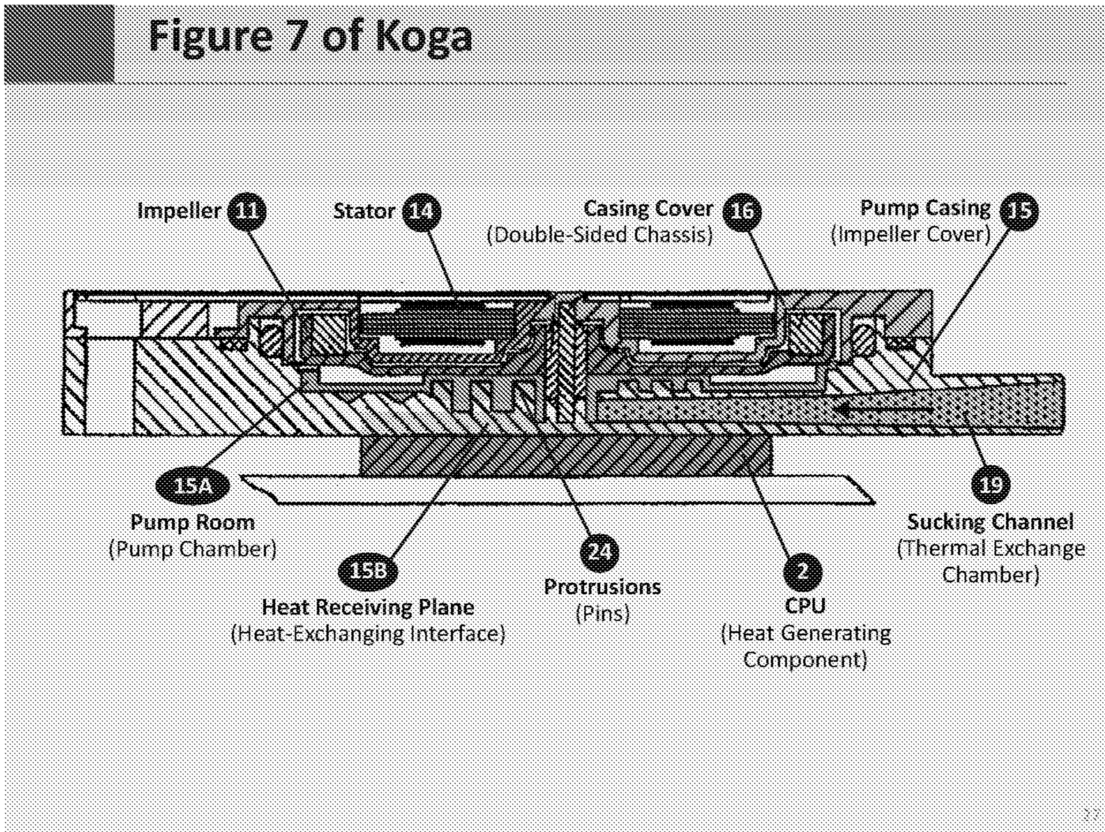
> Channel 19 … is not specifically described as being intended to perform any cooling function. As stated above, we do not deny that some heat exchange may occur in channel 19, but it is clear from Koga that the purpose of the channel 19 is to direct fluid into chamber 15 where the heat exchange is specifically designed to occur.
>
> ***Further, the Patent Owner has provided unrebutted evidence in its favor in the form of a Declaration of Donald Tilton stating that***

> ***"the sucking channel cannot be reasonably said to function as a heat exchanging chamber."*** Tilton Dec. ¶ 12. Additionally, we note that the Examiner does not address the issue of thermal exchange in the Remarks portion of the RAN and merely explains that channel 19 is a chamber without explaining how channel 19 is configured so as to perform thermal exchange. *See, e.g.*, RAN 6-7. ***We conclude that the mere fact of thermal exchange does not make a chamber a heat exchange chamber and that the evidence in this case supports the conclusion that in order for one of ordinary skill in the art to reasonably conclude that a chamber is a "thermal exchange chamber," the chamber must be configured to perform heat exchange, such as in Koga's chamber 15.*** Because all of the claim rejections rely on the Examiner's faulty interpretation and application "thermal exchange chamber," we do not sustain any of the rejections of claims 1-30 over Koga.
>
> Decision, pp. 6:21-7:15 (emphasis added).

I. DR. CARMAN'S EXPERT TESTIMONY ESTABLISHES KOGA'S SUCKING CHANNEL 19 AS A CHAMBER INHERENTLY CONFIGURED TO PERFORM HEAT EXCHANGE

Respondent CoolIT believes the Board misapprehended or overlooked evidence in this appeal, submitted by Appellant / Patent Owner after the parties' briefing was complete, that Dr. Carman's expert opinion establishes Koga's sucking channel 19 as being configured inherently to provide heat transfer from the heat generating component 2 to incoming cold fluid, thus constituting a "thermal exchange chamber". *See, e.g., Not. Concurrent Proc.* (April 30, 2015), Findings of Fact and Concl. of Law (Doc. 249), p. 9:10-22 (acknowledging Dr. Carman's expert opinion that Koga's sucking channel 19 constitutes a "thermal exchange chamber"); *Not. Concurrent Proc.* (April 21, 2016) (*CMI USA Inc.'s Opposition to Motion to Exclude Expert Testimony* (Doc. 195), pp. 2:19-3:2; *Decl. Liu* (Doc. 195-1), 2:8-14; *Decl. Liu Ex. A* (Doc. 195-2), p. 2; *Decl. Liu, Ex. B* (Doc. 195-3), p. 3:5-20; *Decl. Liu, Ex. C* (Doc. 195-4), pp. 3:20-4:1, 5:8-13, 6:2-9; 7:25-8:24).

The following, annotated version of Koga's FIG. 7 succinctly summarizes Dr. Carman's opinion that the sucking channel 19 constitutes a "thermal exchange chamber." *Decl. Liu Ex. A* (Doc. 195-2), p. 2. *See*, *Not. Concurrent Proc.* (April 21, 2016) (*Dec. Liu, Ex. C* (Doc. 195-4), pp. 3:20-4:1, 5:8-13, 6:2-9; 7:25-8:24).



Not. Concurrent Proc. (April 21, 2016), Decl. Liu Ex. A (Doc. 195-2), p. 2.

Dr. Carman's opinion, of record but apparently overlooked in this appeal, rebuts Dr. Tilton's opinion. For example, the District Court noted "Dr. Carman testified that Koga discloses … a thermal exchange chamber labeled sucking channel 19." *Not. Concurrent Proc.* (April 30, 2015) (*Findings of Fact and Concl. of Law* (Doc. 249), p. 9:10-22); *Not. Concurrent Proc.* (April 21, 2016) (*CMI USA Inc.'s Opposition to Motion to Exclude Expert Testimony* (Doc. 195), pp. 2:19-3:2; *Decl. Liu*

(Doc. 195-1), 2:8-14; *Decl. Liu Ex. A* (Doc. 195-2), p. 2; *Decl. Liu, Ex. B* (Doc. 195-3), p. 3:5-20; *Decl. Liu, Ex. C* (Doc. 195-4), pp. 3:20-4:1, 5:8-13, 6:2-9; 7:25-8:24).

More particularly, Dr. Carman testified that Koga's sucking channel 19 is "a conduit, and it's also part of – in the context of the – let's see, the '794 [*sic:* '764], the thermal exchange chamber." *Not. Concurrent Proc.* (April 21, 2016) (*Decl. Liu, Ex. C* (Doc. 195-4), pp. 3:20-4:1). In support of that view, Dr. Carman explained that the "sucking channel (19) is adjacent to the thermal exchange surface. I believe that's (15B). So that as fluid passed through there, it is absorbing heat." *Id.* at 6:2-9. Dr. Carman explained further, "Since – well, the second sentence where it says 'sucking channel (19) is disposed between heat receiving plane (15B) and inner wall face (50),' I believe implies that someone who's skilled in the art would know it's absorbing heat." *Id.* at 7:25-8:4. Still further, Dr. Carman acknowledged, "[Koga] does not specifically state that the fluid is absorbing heat there, but I think it's – anyone who is skilled in the art would know that it is." *Id.* at 8:7-10.

Thus, Respondent respectfully submits the Board erred in basing the outstanding Decision on the premise that "the Patent Owner has provided unrebutted evidence in its favor in the form of a Declaration of Donald Tilton." *Decision*, 7:3-6. Rather, the record in this appeal merely demonstrates a disagreement between Drs. Carman and Tilton over whether Koga's sucking channel 19 is configured to perform heat exchange and thus constitutes a "thermal exchange chamber."

However, Dr. Carman's opinion that Koga's sucking channel constitutes a "thermal exchange chamber," as that term woud be understood by a person of ordinary skill in the art following a review of the '764 Patent, is based on Koga's expressly described device configuration. First, Koga states that heat transfer occurs "everywhere". *Koga*, 10:5-6. Regardless, the configuration of Koga's sucking channel 19 inherently performs heat exchange between the walls of the sucking channel and the fluid passing therethrough. *Not. Concurrent Proc.* (April 21, 2016) (*Decl. Liu, Ex. C* (Doc. 195-4), pp. 3:20-4:1, 5:8-13, 6:2-9; 7:25-8:24).

Thus, Dr. Carman's interpretation of the sucking channel 19 as a "thermal exchange chamber" is manifestly reasonable and supported by substantial evidence, including express disclosure in Koga as discussed in the following Section III.

II. <u>KOGA EXPRESSLY DESCRIBES A CONFIGURATION OF THE SUCKING CHANNEL 19 THAT INHERENTLY PERFORMS HEAT EXCHANGE</u>

Respondent CoolIT respectfully believes the Board misapprehended or overlooked aspects of Koga's expressly described device configuration, including aspects of the sucking channel 19 that inherently perform heat exchange from the heat generating component 2 (e.g., a CPU) to a coolant passing through the sucking channel.

For example, the outstanding Decision in this appeal does not address Koga's description of the case 15 as being formed of "material having a high thermal conductivity and an excellent heat dissipating property, e.g., copper or aluminum, of which thermal conductivity is 380-400 W/mK and ca. 230 W/mK, respecitively. It is preferable to use the [*sic*: a] material having at least the foregoing specific thermal conductivity." *Koga*, 5:11-18.

As another example, Koga describes the outer surface 15B of the casing wall 15 as being in contact with the heat dissipating component 2. *Koga*, 4:38-43, FIG. 7. In fact, *Koga* states that heat "travels everywhere" in the conductive casing 15. *Id.* at 10:5-6. The portion of the casing wall 15 between the coolant 41 and the outer surface 15B in the region of the chamber 19 necessarily has a high temperature by virtue of its contact with the component 2. *Not. Concurrent Proc.* (April 21, 2016) (*Decl. Liu, Ex. C* (Doc. 195-4), p. 6:2-9). By virtue of that contact, conduction heat transfer occurs through the contact surface 15B, and the casing 15 absorbs heat dissipated by the component 2, spreading the heat "everywhere," including to walls surrounding the chamber 19. *Id.*; *Koga,* 8:23-24, 10:5-21, FIG. 7.

Still further, a portion of the channel 19 extends directly over the heat dissipating component 2, providing a direct and short conduction path between the outer surface 15B of the casing wall 15 and the coolant 41 in the chamber 19. *Id.* The high-temperature casing wall adjacent the channel 19 is exposed to the lowest-temperature coolant 41 of any portion of the casing 15. *Koga*, 10:18-22.

The outstanding Decision states, "Channel 19 … is not specifically described as being intended to perform any cooling function. As stated above, we do not deny that some heat exchange may occur in channel 19, but it is clear from Koga that the purpose of the channel 19 is to direct fluid into chamber 15 where the heat exchange is specifically designed to occur." *Decision*, p. 6, 21-23. However, the law of inherency acknowledges that a reference can be anticipatory even when a component is not "specifically described as being intended to perform" a claimed function. *ClearValue, Inc. v. Pearl River Polymers, Inc.*, 668 F. 3d 1340, 1344 (Fed. Cir. 2012) (citing *American Calcar, Inc. v. American Honda Motor Co.*, 651 F. 3d 1318, 1341 (Fed. Cir. 2011); *In re Gleave*, 560 F.3d 1331, 1334 (Fed.Cir.2009)).

Based on the configuration of Koga's device as a whole, and the sucking channel 19 in particular, the incoming cold coolant 41 <u>*necessarily and inevitably*</u> absorbs heat from the casing wall as the coolant 41 passes through Koga's channel 19 since energy in the form of heat <u>*necessarily and inevitably*</u> moves from higher temperature regions to lower temperature regions. *Not. Concurrent Proc.* (April 21, 2016) (*Decl. Liu, Ex. C* (Doc. 195-4), pp. 3:20-4:1, 5:8-13, 6:2-9; 7:25-8:24). By virtue of Koga's arrangement of the chamber 19 in relation to the component 2, thermal exchange <u>*necessarily and inevitably*</u> occurs from the casing 15 to the cold coolant 41 because energy in the form of heat <u>*necessarily and inevitably*</u> flows from regions of higher temperature to regions of lower temperature. *Id.* The large temperature difference between the coolant 41 and the casing wall surrounding the channel 19 <u>necessarily and inevitably</u> promotes high per-surface-area heat transfer from the casing wall 15 to the coolant. Inherent aspects of the prior art need not be expressly mentioned in a reference for that reference to qualify as invalidating prior art under § 102. *Schering Corp. v. Geneva Pharm. Inc.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003).

Substantial evidence filed after the parties' briefs were filed establish Koga's sucking channel 19 as inherently being "configured to perform heat exchange." Thus, that structure constitutes a "thermal exchange chamber" in context of the '764 Patent.

The outstanding decision in this appeal understandably appears to misapprehend or to overlook evidence submitted after the parties' briefing establishing inherent aspects of Koga's device configured to perform heat exchange in the sucking channel 19 (e.g., "everywhere"). *See, Not. Concurrent Proc.* (April 21, 2016) (*Decl. Liu, Ex. C* (Doc. 195-4), pp. 3:20-4:1, 5:8-13, 6:2-9; 7:25-8:24); *Koga*, at 8:23-24, 10:5-21.

III. THE INTERPRETATION OF "THERMAL EXCHANGE CHAMBER" UNDER THE BRI STANDARD ENSNARES KOGA'S SUCKING CHANNEL WHEN THE APPARENTLY OVERLOOKED OR MISAPPREHENDED EVIDENCE IS PROPERLY CONSIDERED

Respondent / Requester acknowledges claim interpretation under the BRI standard must still be reasonable in light of the disclosure in the challenged patent. *PPC Broadband, Inc. v. Corning Optical Commc'ns RF, LLC,* No. 2015-1364, 2016 WL 692369, at *5 (Fed. Cir. Feb. 22, 2016). And, as the Federal Circuit recently explained, the broadest reasonable interpretation cannot include that which is *expressly* disclaimed in the specification of the challenged patent. *In re: Man Mach. Interface Techs. LLC,* Case No. 15-1562, Slip Op. 6-8 (Fed. Cir., Apr. 19, 2016). However, "The standards for finding lexicography and disavowal are exacting. To act as its own lexicographer, a patentee must clearly set forth a definition of the disputed claim term, and clearly express an intent to define the term. Similarly, disavowal requires that the specification or prosecution history make clear that the invention does not include a particular feature." *GE Lighting Solutions, LLC v. AgiLight, Inc.*, 750 F.3d 1304,1309 (Fed. Cir. 2014) (internal quotations and citations omitted).

The ‘764 Patent lacks any range, measure, or degree of heat exchange that must occur in a given chamber for that chamber to constitute a “thermal exchange chamber.” That being said, the ‘764 Patent’s specification describes a “thermal exchange chamber” that has a network of fluid channels to facilitate heat dissipation from the heat-generating component to liquid flowing over the heat exchanging interface. ‘764, 22:60-23:8. As well, at least one disclosed embodiment of the “thermal exchange chamber” has a heat exchanging surface with a plane outer surface for abutting a free surface of a heat generating component, as well as a plane (e.g., smooth) inner surface, similar to Koga’s sucking channel 19. ‘764, 12:34-40, 19:62-67, 23:9-10, FIGS. 4, 6, 15.

Indeed, the ‘764 Patent describes an advantage of a “thermal exchange chamber” having a smooth inner surface like Koga’s sucking channel 19: to avoid machining (e.g., milling) of the inner surface. *Id.* at 12:40-44, 19:67-20:5. And, like Koga’s casing, the ‘764 Patent explains that “the heat exchanging interface 4 is preferably made from a copper plate having a plane outer surface … intended for abutting the free surface of the heat generating component ….” *Id.* at 22:60-64.

Respondent / Requester understands the Decision, based on the following except, to construe the term “thermal exchange chamber” based (improperly) at least in part on <u>Koga’s</u> disclosure of heat transfer occurring in the “pump room 15” (i.e., in contrast to disclosure in the ‘764 Patent, as would be proper):

> We conclude that the mere fact of thermal exchange does not make a chamber a heat exchange chamber and that the evidence in this case supports the conclusion that in order for one of ordinary skill in the art to reasonably conclude that a chamber is a “thermal exchange chamber,” the chamber must be configured to perform heat exchange, ***such as in Koga’s chamber 15***.

Decision, 7:10-15 (emphasis added).

However, even if the reference to Koga's pump chamber 15 in the foregoing excerpt is merely used to illustrate that Koga contemplates heat exchange to occur within the pump chamber, that does not preclude another part of Koga's device from also being "configured to perform heat exchange" in context of the '764 Patent's disclosure. For example, the '764 Patent expressly contemplates (and does not foreclose) heat exchange occuring in the pump chamber, as occurs also in Koga's device. '764, 19:52-61, FIG. 15.

Thus, the '764 Patent does not disavow or otherwise prevent the broadest reasonable interpretation of "thermal exchange chamber" from ensnaring Koga's "sucking channel 19," as Dr. Carman's opinion testimony and the above-identified portions of the Koga reference establish in light of the disclosure in the '764 Patent.

IV. THE OUTCOME OF THIS APPEAL CAN DIFFER FROM THE DISTRICT COURT DECISIONS BECAUSE THE STANDARD OF CLAIM CONSTRUCTION ON A MOTION FOR JUDGMENT AS A MATTER OF LAW DIFFERS FROM THE STANDARDS APPLICABLE IN AN *INTER PARTES* REEXAMINATION

The broadest-reasonable-construction approach differs from the interpretive method that a district court uses to construe disputed patent claims in the context of an infringement suit. When confronted with an ambiguity in a patent claim, rather than apply the broadest reasonable construction, a court must, if possible, resolve an "ambiguity in the claim language … in a manner that would preserve the patent's validity." *Phillips* v. *AWH Corp.*, 415 F.3d 1303, 1327 (Fed. Cir. 2005) (en banc), cert. denied, 546 U.S. 1170 (2006).

As well, the Distric Court Order submitted by Appellant / Patent Owner on October 5, 2015, followed a jury verdict at trial, and thus the Court was obliged to uphold all issues of fact resolved by the jury, provided those findings of fact are supported by "substantial evidence" and notwithstanding that the record in those proceedings might also contain substantial evidence rebutting or otherwise contradicting the facts found by the jury. *Not. Concurrent Proc.* (October 5, 2015)

(*Order*, p. 5:1-28). "Substantial evidence is evidence adequate to support the jury's conclusion, even if it is also possible to draw a contrary conclusion from the same evidence." (internal citations omitted). All evidence must be viewed in light most favorable to nonmoving party, draw all reasonable inferences in favor of nonmover, and disregard all evidence favorable to moving party that the jury is not required to believe. *Id.*

It is well settled that the Board is not bound by the District Court's opinion upholding the validity of the claims in the '764 Patent over Koga. *In re Trans Texas Holdings Corp.*, 498 F.3d 1290, 83 USPQ2d 1835 (Fed. Cir. 2007) and *In re Translogic Technology, Inc.*, 504 F.3d 1249, 84 USPQ2d 1929 (Fed. Cir. 2007). For example, in deciding the motion, the Court could not overturn the lay jury's finding regarding Koga's sucking channel in relation to a thermal exchange chamber unless the record in that litigation lacked "substantial evidence" on the point. Thus, in light of Dr. Tilton's testimony, the Court upheld the jury's finding as being supported by evidence. In contrast, the Board may reasonably conclude, based on evidence discussed above, that Koga's sucking channel constitutes a "thermal exchange chamber," notwithstanding the District Court upheld a lay jury's conclusion otherwise.

Indeed, Respondent / Requester respectfully submits the BRI standard, in light of the evidence of record in this appeal, namely Dr. Carman's testimony and Koga's description of the sucking channel 19 inherently configured to perform heat exchange, requires a result opposite that of the District Court.

CONCLUSION

For at least the reasons set forth above, the Board is respectfully requested to withdraw its outstanding Decision and to affirm the Examiner's findings and conclusions set forth in the RAN.

Respectfully submitted,

GANZ POLLARD LLC

Date: May 31, 2016

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a complete copy of this RESPONDENT'S / REQUESTER'S REQUEST FOR REHEARING PURSUANT TO 37 C.F.R. § 41.79, with all concurrently filed papers, was served on counsel for the patent owner, at the following address:

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via first class mail, with sufficient postage affixed thereto, on May 31, 2016.

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Electronic Patent Application Fee Transmittal

Application Number:	95002386
Filing Date:	15-Sep-2012
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Filer:	Lloyd L. Pollard II
Attorney Docket Number:	COOL-1.012

Filed as Small Entity

Filing Fees for **inter partes reexam**

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
filing appeal brief inter partes reexam	2404	1	1000	1000
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1000**

Electronic Acknowledgement Receipt

EFS ID:	25928309
Application Number:	95002386
International Application Number:	
Confirmation Number:	7254
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Customer Number:	22852
Filer:	Lloyd L. Pollard II
Filer Authorized By:	
Attorney Docket Number:	COOL-1.012
Receipt Date:	31-MAY-2016
Filing Date:	15-SEP-2012
Time Stamp:	23:40:52
Application Type:	inter partes reexam

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1000
RAM confirmation Number	8113
Deposit Account	501001
Authorized User	POLLARD, LLOYD L.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 CFR 1.16 (National application filing, search, and examination fees)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Affidavit/Dec/Exhibit after Notice of Appeal	Notice_final.pdf	33768 c24ee386eb340a37be18449b7f4efb1664cc3cc3	no	3
Warnings:					
Information:					
2	Non Patent Literature	final_appx.pdf	2583695 3be135c6d4a198e83ca3bf6e8419f5d76badb727	no	27
Warnings:					
Information:					
3	Request for Rehearing of Patent Board Decision	Request_final.pdf	487012 86aa89d36db5931aa2e4de14aa53783ec40c2d3b	no	16
Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	30068 8a15f78c520a4639121f9852e48b07b4696879a7	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3134543		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re Appeal of *Inter Partes* Reexamination of:	**Appeal No.** 2015-007934
U.S. Patent No.: 8,245,764	**R.C.N.:** 95/002,386
Issued: August 21, 2012	**Confirmation No.:** 7254
Applicant: Andre Sloth Eriksen	**Art Unit:** 3993
Title: COOLING SYSTEM FOR A COMPUTER SYSTEM	**Examiner:** Joseph A. Kaufman

FILED VIA EFS ON MAY 31, 2016

Patent Trial and Appeal Board
U.S. Patent and Trademark Office
PO Box 1450
Alexandria, Virginia 22313-1450

NOTICE OF CONCURRENT PROCEEDINGS PURSUANT TO 37 C.F.R. § 1.985(B)

CoolIT Systems, Inc. ("CoolIT"), the Third-Party Requester in the underlying *Inter Partes* Reexamination, respectfully notifies the Patent Office of the NON-CONFIDENTIAL JOINT APPENDIX, vol. I of II (pages A00001 to A05966) and vol. II of II (pages A06012 to A12036) ("CMI's Motion") entered on April 14, 2016, as Documents 51-1 and 51-2, respectively, in a co-pending appeal before the Federal Circuit involving U.S. Patent No. 8,245,764 and styled as *Asetek Danmark A/S v. CMI USA, et al.*, (Fed. Cir.), No. 2016-1026, 1183.

Copies of pages A00019-A00033, A06944-A06945, A06963-A06965, A06970-A06972, and A07352-A07353 are attached.

CoolIT qualifies to pay reduced fees as a small entity. Thus, to the extent any fees become due in connection with this filing, please calculate such fees on the basis of CoolIT being a small entity and charge such small entity fees to Deposit Account No. 50-1001.

Respectfully submitted,
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ATTORNEY DOCKET NO. COOL-1.012

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re Appeal of *Inter Partes* Reexamination of:	**Appeal No.** 2015-007934
U.S. Patent No.: 8,245,764	**R.C.N.:** 95/002,386
Issued: August 21, 2012	**Confirmation No.:** 7254
Applicant: Andre Sloth Eriksen	**Art Unit:** 3993
Title: COOLING SYSTEM FOR A COMPUTER SYSTEM	**Examiner:** Joseph A. Kaufman

SUBMITTED VIA ELECTRONIC FILING SYSTEM ON MAY 31, 2016

Patent Trial and Appeal Board
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CERTIFICATE OF SERVICE

The undersigned hereby certifies that, on May 31, 2016, a true and correct copy of CoolIT Systems, Inc.'s NOTICE OF CONCURRENT PROCEEDINGS, together with documents listed therein, were served on counsel for patent owner by certified U.S. mail at the following address:

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with sufficient postage affixed thereto and delivery confirmation requeseted.

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Dated: May 31, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 04/29/2016
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
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EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
04/29/2016	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CoolIT SYSTEMS, INC.,
Third Party Requester, Respondent,

v.

ASETEK A/S,
Patent Owner, Appellant.

Appeal 2015-007934
Reexamination Control 95/002,386
Patent US 8,245,764 B2[1]
Technology Center 3900

Before STEVEN D.A. McCARTHY, BRETT C. MARTIN,
JON M. JURGOVAN, *Administrative Patent Judges*.

MARTIN, *Administrative Patent Judge*.

DECISION ON APPEAL

---

[1] Issued to André Sloth Eriksen on August 21, 2012 (hereinafter the '764 patent).

STATEMENT OF THE CASE

Appellant appeals under 35 U.S.C. § 134(b) from a rejection of claims 1–30. We have jurisdiction under 35 U.S.C. §§ 134(b) and 315(a). Oral arguments were heard in this matter on April 13, 2016.

We are informed that the ’764 patent is currently involved in the following litigations: 1) Asetek Holdings, Inc. v. CoolIT Systems, Inc., Civil Action No. 3:12-CV-04498-EMC, and 2) Asetek Holdings, Inc. v. CMI USA, Inc., Civil Action No. 3:13-CV-00457-JST. Both the litigations are pending in the U.S. District Court for the Northern District of California.

We REVERSE.

CLAIMED SUBJECT MATTER

The claims are directed to “a cooling system for a central processing unit (CPU) or other processing unit of a computer system.” Spec. col. 1, ll. 11–13. Claims 1, 10, and 15 are independent. Claim 1, reproduced below, is illustrative of the claimed subject matter:

> 1. A cooling system for a heat-generating component, comprising:
>
> a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator and an impeller, the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;
>
> a reservoir adapted to pass the cooling liquid therethrough, the reservoir including:
>
> > a pump chamber including the impeller and formed below the chassis, the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through;

a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and

a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component; and

a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.

REFERENCES

The prior art relied upon by the Examiner in rejecting the claims on appeal is:

Koga	US 7,544,049	Jun. 9, 2009

REJECTIONS

Claims 1–19, 21–23, 25–27, 29, and 30 stand rejected under 35 U.S.C § 102(b) as being anticipated by Koga. RAN 3–4.

Claims 20, 24, and 28 stand rejected under 35 U.S.C § 103(a) as being unpatentable over Koga. RAN 5.

ISSUE

The issues in this appeal can be narrowed to one dispositive issue, namely whether or not Koga teaches a "thermal exchange chamber" as claimed. All of the claims rejected over Koga require such a thermal exchange chamber and thus resolution of this issue will affect all pending rejections.

FINDINGS OF FACT

Koga describes a centrifugal pump 1 for cooling an electronic component such as an integrated circuit chip configured as a central processing unit 2. Col. 4, ll. 3–7. Centrifugal pump 1 is enclosed in a pump casing 15 that rests on a top surface of chip 2. Pump casing 15 defines a pump room 15A enclosing an impeller 11. When energized, a ring magnet 13 and a stator 14 induce impeller 11 to rotate in a horizontal plane about a vertical axis. When rotating, impeller 11 draws liquid coolant 41 into pump room 15A through a sucking channel 19 and discharges the coolant from the pump room through a tangential discharging channel 20. Col. 4, ll. 27–37, 51–58 and 61–67; col. 7, ll. 39–42; col. 8, ll. 4–11; *see also* Figs. 3 and 5.

Referring to Figures 3 and 5, Koga describes the lower surface of pump room 15A as follows:

> On radially outer wall surface 15C of the pump room 15A, a large number of dimples 21 are formed. A recess (recessed area) 15E defines a radially inner wall surface on a bottom of the pump room 15A that faces toward impeller 11, and has a large number of protrusions 24 projected from the radially outer wall surface and toward impeller 11. Recess 15E, slope 27, and radially outer wall 15C together define an inner wall face 50 of casing 15. Col. 4, ll. 43–51.

The portion of Koga's pump casing 15 contacting the top surface of chip 2 defines a heat-receiving plane 15B. Heat-receiving plane 15B collects heat evolved by chip 2. Col. 4, ll. 38–43. Koga states that "[s]ucking channel 19 is disposed between heat-receiving plane 15B and inner wall face 50." Col. 4, ll. 58–60; *see also* Fig. 3. Koga teaches that "the heat generated from component 2 travels to casing 15 and is transferred to protrusions 24 projected from recess 15E [on the inner wall face 50 defining the lower boundary of the pump room 15A], so that the coolant 41 collects the heat when [the coolant] hits against protrusions 24." Col. 8, ll. 11–15. In other words, "the heat generated from component 2, i.e. the heat stored in protrusions 24 and casing 15, is collected by coolant 41, and discharged through discharging channel 20 together with coolant 41 by spinning blades 12 [of impeller 11]." Col. 8, ll. 32–36.

Koga also teaches that:

> The shape of heat-receiving plane 15B and the shape of an upper surface of component 2 complement each other three-dimensionally, so that sucking channel 19 does not extend over component 2. This structure allows heat-receiving plane 15B and the upper surface of component 2 to solidly contact with each other, so that heat can be transferred efficiently. Col. 8, ll. 47–53.

Koga does not appear to describe any significant heat exchange between chip 2 and coolant 41 flowing through the sucking channel 19. *See* Tilton Dec. ¶ 12.

ANALYSIS

According to the Examiner, Koga teaches the recited "thermal exchange chamber" receiving coolant via "sucking channel" 19. RAN 6. The Patent Owner argues that, "even if sucking channel 19 is considered a 'chamber,' [the sucking channel] still cannot be equated to a 'thermal exchange chamber' because Koga does not disclose or suggest that sucking chamber 19 is configured or intended to perform any heat transfer function." App. Br. 10 (italics suppressed).

The parties' main disagreement lies with whether and to what extent thermal exchange must occur in channel 19 in order to qualify as the claimed "thermal exchange chamber." The Requester argues that the broadest reasonable interpretation would allow for channel 19 to meet this limitation because it allegedly "is clearly configured to perform thermal exchange" due to the fact that the walls surrounding the chamber are made of a "highly conductive casing." Resp. Br. 5. We do not disagree that some thermal exchange may occur in channel 19, but we disagree with the Requester's characterization that the channel is configured to perform thermal exchange.

As the Patent Owner points out, "the USPTO, in applying the broadest reasonable interpretation of claim elements, is bounded by what would be reasonable from the perspective of one of ordinary skill in the art." App. Br. 12 (citing *In re Buszard*, 504 F.3d 1365, 1365–66 (Fed. Cir. 2007)). Both parties appear to agree that, in order to be reasonably considered a thermal exchange chamber, channel 19 must be configured to perform thermal exchange. *See* Resp. Br. 5, App. Br. 12. We agree with the Patent Owner that the mere fact of thermal exchange occurring does not cause any chamber or channel where some small amount of thermal exchange occurs to be considered configured to perform thermal exchange. App. Br. 12.

Koga teaches a combined pump and heat exchange chamber 15. Chamber 15 is clearly designed to be a heat exchange chamber having specific features, namely protrusions 24, to enhance the heat exchange from component 2 to chamber 15. Channel 19, however, is merely a conduit to supply cooling liquid to chamber 15 and is not specifically described as being intended to perform any cooling function. As stated above, we do not deny that some heat exchange may occur in channel 19, but it is clear from

Koga that the purpose of channel 19 is to direct fluid into chamber 15 where the heat exchange is specifically designed to occur.

Further, the Patent Owner has provided unrebutted evidence in its favor in the form of a Declaration of Donald Tilton stating that "the sucking channel cannot be reasonably said to function as a heat exchanging chamber." Tilton Dec. ¶ 12. Additionally, we note that the Examiner does not address the issue of thermal exchange in the Remarks portion of the RAN and merely explains that channel 19 is a chamber without explaining how channel 19 is configured so as to perform thermal exchange. *See, e.g.*, RAN 6–7. We conclude that the mere fact of thermal exchange does not make a chamber a heat exchange chamber and that the evidence in this case supports the conclusion that in order for one of ordinary skill in the art to reasonably conclude that a chamber is a "thermal exchange chamber," the chamber must be configured to perform heat exchange, such as in Koga's chamber 15. Because all of the claim rejections rely on the Examiner's faulty interpretation and application of "thermal exchange chamber," we do not sustain any of the rejections of claims 1–30 over Koga.

The Patent Owner further raises the issue of the priority date of the present application. This issue is moot in light of our finding that Koga does not anticipate claims 1–19, 21–23, 25–27, 29, and 30; and, as such, does not include adequate teachings to serve as a primary reference in rejecting claims 20, 24, and 28. For this reason, we do not reach the issue of priority in this appeal.

DECISION

The Examiner's rejections of claims 1-30 are reversed. More specifically, we reverse the Examiner's decision rejecting claims 1–19, 21–23, 25–27, 29, and 30 under 35 U.S.C § 102(b) as being anticipated by Koga; and the Examiner's decision rejecting claims 20, 24, and 28 under 35 U.S.C § 103(a) as being unpatentable over Koga.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv). In the event neither party files a request for rehearing within the time provided in 37 C.F.R. § 41.79, and this decision becomes final and appealable under 37 C.F.R. § 41.81, a party seeking judicial review must timely serve notice on the Director of the United States Patent and Trademark Office. *See* 37 C.F.R. §§ 90.1 and 1.983.

REVERSED

Ssc

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re Appeal of *Inter Partes* Reexamination of:	**Appeal No.** 2015-007934
U.S. Patent No.: 8,245,764	**R.C.N.:** 95/002,386
Issued: August 21, 2012	**Confirmation No.:** 7254
Applicant: Andre Sloth Eriksen	**Art Unit:** 3993
Title: COOLING SYSTEM FOR A COMPUTER SYSTEM	**Examiner:** Joseph A. Kaufman

FILED VIA EFS ON APRIL 21, 2016

Patent Trial and Appeal Board
U.S. Patent and Trademark Office
PO Box 1450
Alexandria, Virginia 22313-1450

NOTICE OF PROCEEDINGS PURSUANT TO 37 C.F.R. § 1.985(B)

CoolIT Systems, Inc. ("CoolIT"), the Third-Party Requester in the underlying *Inter Partes* Reexamination, respectfully notifies the Patent Office of CMI USA INC.'S OPPOSITION TO MOTION TO EXCLUDE EXPERT TESTIMONY RE EXTENT OF THERMAL EXCHANGE CHAMBER IN KOGA ("CMI's Motion") entered as Document 195 in a litigation involving U.S. Patent No. 8,245,764 and styled as *Asetek Danmark A/S v. CMI USA, Inc.*, (N. D. Cal.), No. 3:13-cv-00457-JST. Under 37 C.F.R. § 1.985(b), and "[n]otwithstanding any provision of the rules, any person at any time may file a paper in an *inter partes* reexamination proceeding notifying the Office of a prior or concurrent proceedings in which the same patent is or was involved, including but not limited to interference, reissue, reexamination, or litigation and the results of such proceedings."

A copy of CMI's Motion, accompanied by the documents entered by the Court in support thereof, is attached.

Should a petition to set aside any rule or to enter this Notice be required, please consider this as a petition therefor. CoolIT qualifies to pay reduced fees as a small entity. Thus, to the extent any fees become due in connection with this filing, please calculate such fees on the basis of CoolIT being a small entity and charge such small entity fees to Deposit Account No. 50-1001.

Respectfully submitted,
GANZ POLLARD LLC

Date: April 21, 2016

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UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

ASETEK DANMARK A/S Plaintiff, vs. CMI USA, INC., fka COOLER MASTER USA, INC. Defendant.	Case No: 3:13-cv-00457 JST **CMI USA INC.'S OPPOSITION TO MOTION TO EXCLUDE EXPERT TESTIMONY RE EXTENT OF THERMAL EXCHANGE CHAMBER IN KOGA** DATE: December 8, 2014 TIME: 8:00 a.m. JUDGE: Jon S. Tigar CRTRM: Courtroom 9, 19th Floor

I. INTRODUCTION

On December 3, 2014, Asetek orally moved, pursuant to Rule Fed. R. Civ. P 26(a)(2) and 37(c)(1), to exclude CMI USA's slide reproducing Figure 7 of U.S. Patent No. 7,544,049 to Koga et al. ("Koga") colored to illustrate where certain claim elements are disclosed[1], and to exclude testimony by CMI's expert, Dr. Gregory Carman, that the recesses shown on the left side of Figure 7 are part of the "thermal exchange chamber" disclosed by Koga. The motion should be denied. First, Dr. Carman's July 3, 2014 expert report sufficiently disclosed his opinions regarding where Koga discloses the required thermal exchange chamber. Second, to the extent that the opening expert report failed to disclose every part of Koga's Figure 7 that Dr. Carman opines is part of its thermal exchange chamber, Asetek has suffered no prejudice. Dr. Carman's report disclosed the proposed testimony with sufficient specificity for Dr. Donald Tilton, Asetek's expert to prepare his rebuttal to it. Third, Asetek chose to explore Dr. Carman's opinions in response to Dr. Tilton's opinions in Dr. Carman's deposition. In that way, Asetek was able to explore Dr. Carman's opinions over three months before the beginning of trial. Under these circumstances, to grant Asetek's motion would result in fundamental unfairness in the trial.

II. ARGUMENT

A. The Relevant Opinion Was Disclosed

CMI timely served Dr. Carman's invalidity report on July 3, 2014. With respect to Koga's disclosure of the required thermal exchange chamber in the asserted claims of the '764 patent, Dr. Carman opined: "Koga also discloses a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages. *Id.* at Col. 4:57-6:10; Figs. 3-5, 7." He continued: "Additionally, Koga discloses a heat-exchanging interface which forms a boundary wall of the thermal exchange chamber is

[1] The slide is provided as Exhibit A to the Declaration of Celine Liu in Support of CMI USA's Opposition, contemporaneously submitted.

configured to be placed in thermal contact with a surface of the heat-generating component. *Id.* at Col. 4:38-60; 5:30-34; 6:50-57; Fig. 7." Liu Decl., Exhibit B at 56, ¶¶ 184-185.

Asetek served its invalidity rebuttal report of Dr. Tilton on July 25, 2014. Docket No. 99-2. In his rebuttal report, Dr. Tilton stated and explained the reasons for his opinion that in Koga, the "pump room," not the sucking channel 19, serves as the thermal exchange chamber.

> It is evident that pump room 15A serves as a heat [i.e. thermal] exchange chamber of sorts in the Koga device because inner wall face 50 of pump room 15A comprises dimples or protrusions to facilitate heat transfer from heat-generating component 2 to the coolant in the pump room. For example, the inner wall 50 of pump room 15A comprises a recess 15F, which comprises protrusions 24 extending towards impeller 11. (Koga, col. 10, 11-24-26 (describing that "protrusions 24 extend from the bottom face of recess 15F towards impeller 11.").

Docket No. 99-2 at 52, ¶ 163.

Asetek took Dr. Carman's deposition on August 12, 2014. During that deposition, Asetek confronted Dr. Carman with the same arguments expressed in Dr. Tilton's invalidity report about Koga's disclosures of a thermal exchange chamber. See Liu Decl. Exhibit C (relevant pages from Carman deposition transcript) at 209-221.

> Q. Well, Koga does refer to the pump room and the various recesses, dimples, etc. as being involved in heat exchange, doesn't it?
>
> A. Oh, yes, he does. And, you know, there's also exchange going on that lower level as the fluid goes toward the center, which is below the pumping chamber, which is still the thermal exchange chamber. So you'll see a recess in there, but you still have those features extending down into the thermal exchange chamber where sucking channel (19) is impinging on.

Id. at 214 lines 11-22. Asetek continued to elicit testimony about the relationship between recess 15F and sucking channel 19:

> Q. *Koga discloses pump room (15A) as the heat exchange chamber. Agreed?*
>
> A. *Do you know, there's heat exchange chamber going on there, but you need to look at element 15(F), which is below the pumping chamber. It's down at the level which is more along the lines of a thermal exchange chamber*, which is vertically spaced apart. And if you have that top view there, if you remember the accused Cooler Master devices, where we were talking about those fan-shaped regions or passages, you'll see these three regions there. And those three regions are actually offset downward and along the plane of (19), the sucking channel. Now, what you're talking about as pump room (15A) is that's actually elevated above that lower portion of the region.

Id. at 215:14-216:7 (emphasis added).

Asetek's counsel repeatedly questioned Dr. Carman about whether recess 15 F in Figure 7 is part of the pump room. *Id.* at 216-219. Dr. Carman repeatedly offered the opinion that the region labelled 15 F is part of the thermal exchange chamber he believes Koga discloses.

> Q. Did you say earlier that you think 15(F) is part of the sucking channel?
>
> A. No, no. The sucking channel brings in fluid. *And the way I look at this is that region of (15F) is construed as part of the thermal exchange chamber*, because it's below the pumping chamber which is above it. And, really, there's a circular passageway between those two. And that circular passageway is defined by, if you take that three pizza regions and you just draw a circle around it, that is actually down beneath that upper region which is, let's say, labeled (15C). And, once again, you can see that in Figure 7. And there, you need to look at where the bottom boundary of – let's say where (15F) is pointing to and where (15A) is pointing to. There are two heights there. One is above the other."

Id. at 220:15-221:7 (emphasis added). Thus, CMI USA has complied with the disclosure requirements of Rule 26(a)(2). By disclosing Dr. Carman's opinion that Koga discloses the required thermal exchange chamber, and citing to specific sections of Koga's specification and to Figure 7, CMI USA provided ample information for Dr. Tilton to prepare his rebuttal report and for Asetek to question Dr. Carman at his deposition and confirm his opinion that the three recesses shown to the left of Figure 7 -- colored blue in CMI's proposed demonstrative slide -- are, in Dr. Carman's opinion, part of the disclosed thermal exchange chamber.

B. Any Late Disclosure Was Harmless and Resulted in No Prejudice to Asetek

Rule 37(c) (1) provides:

> If a party fails to provide information or identify a witness as required by Rule 26(a) or (e), the party is not allowed to use that information or witness to supply evidence on a motion, at a hearing, or at trial, unless the failure was substantially justified or is harmless.

The information may be introduced, however, if the party can show that its failure to disclose the required information is substantially justified or harmless. *Yeti by Molly Ltd. v. Deckers Outdoor Corp.*, 259 F.3d 1101, 1106-7 (9th Cir. 2001). Whether to exclude information as a sanction requires consideration of five factors: 1) the public's interest in expeditious resolution of litigation; 2) the court's need to manage its docket; 3) the risk of prejudice to the defendants; 4) the public policy favoring disposition of cases on their merits; and 5) the availability of less drastic sanctions. *Wendt v. Host Int'l, Inc.*, 125 F.3d 806, 814 (9th Cir. 1997) (preclusion order no longer proper where both parties had the opportunity to begin expert disclosures anew), citing *Wanderer v. Johnston*, 910 F.2d 652, 656 (9th Cir. 1990). Most recently, the Ninth Circuit has focused on considering whether the failure to disclose the information earlier prejudiced the opposing party. *Yeti by Molly*, 259 F.3d at 1107. District courts in the Ninth Circuit have followed *Wendt* and *Yeti*. *See Galentine v. Holland America Line-Westours, Inc.*, 333 F. Supp. 2d 991, 993-94 (W.D. Wash 2004) (Because defendant would have an opportunity to depose expert witness and have the Court consider any relevant evidence from the deposition, admission of a late filed declaration would not be so prejudicial as to warrant exclusion); *Park v. Cas Enters, Inc.*, 2010 WL 55888, *5 (S.D. Cal. Jan. 4, 2010) (defendant was substantially justified in supplementing its evidence with respect to a previously disclosed prior art machine in response to the plaintiff's accusation that the machine never existed, and the late disclosure was harmless because defendant already knew of the prior art machine).

Here, Dr. Carman's expert report on invalidity set out his opinion that Koga discloses the thermal exchange chamber required by the asserted claims of the '764 patent. His deposition testimony as to specific opinions about the location and extent of the thermal exchange chamber that Koga discloses is consistent with his expert report, and responds to the opinions in Dr. Tilton's subsequent rebuttal report on validity. CMI USA's presenting the more detailed opinions elicited by Asetek's deposition questions is justified to respond to Dr. Tilton's theories just as the alleged infringer in *Park* was justified in supplementing its evidence that a prior art machine invalidated a patent after the patentee took the position that the machine never existed.

Furthermore, there is no prejudice to Asetek. Asetek chose to confront Dr. Carman with Dr. Tilton's rebuttal opinions in Dr. Carman's deposition and elicit his responses. Accordingly, Asetek has known Dr. Carman's opinions about which portions of Koga Figure 7 constitute part of the thermal exchange chamber since at least August 12, 2014. As a result, it has had over three months to assimilate this information, prepare Dr. Tilton's direct testimony and prepare to cross examine Dr. Carman on his opinions with respect to Koga's disclosures. The deposition of Dr. Carman served exactly the purpose that expert depositions are intended to serve: it allowed Asetek to explore the details of the opinions set out in CMI's expert reports so that Asetek would not to be surprised at trial. *See Blue Cross v. Philip Morris, Inc.*, 199 F.R.D. 484, 487 (E.D.N.Y. 2001) (Weinstein, J) (expert reports are served before expert depositions to provide parties with adequate notice of the opponent's line of testimony); *Medical Instr. and Diagnostics Corp., v. Elekta AB*, 2002 WL 34714563, *7 (S.D. Cal. Jan 14, 2002) (deficiencies in expert's report were mitigated by the substantial testimony in his deposition); *nCube Corp. v. SeaChange Int'l., Inc.*, 809 F. Supp 2d 337, 347 (D. Del. 2011) *aff'd*, 732 F.3d 1346 ("A key consideration when determining whether testimony is beyond the scope of an expert report is whether the objecting party had notice of the subject matter of the testimony based on the contents of the report and elaborations made during any deposition testimony") citing *Power Integrations Inc. v. Fairchild Semiconductor, Int'l., Inc.*, 585 F. Supp. 2d 568, 581 (D. Del. 2008) (expert's testimony need not be verbatim consistent with the written report where it is consistent and is "a reasonable synthesis *and/or elaboration* of the opinions contained in the expert's report") (emphasis added). Accordingly, Asetek has suffered no prejudice, and will suffer no prejudice, if Dr. Carman is permitted to present the opinions articulated at his deposition and illustrate those with a colorized, enlarged copy of Figure 7 of Koga.

III. CONCLUSION

Defendant CMI USA respectfully requests that Asetek's invitation to exclude the relevant testimony be rejected to avoid fundamental unfairness to CMI USA.

DATED: December 8, 2014

Respectfully submitted,

ALSTON & BIRD LLP

/s/
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CMI USA, INC.

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

ASETEK DANMARK A/S,

Plaintiff,

vs.

CMI USA, INC., fka COOLER MASTER USA, INC.

Defendant.

Case No: 3:13-cv-00457 JST

DECLARATION OF CELINE LIU IN SUPPORT OF CMI USA, INC.'S OPPOSITION TO MOTION TO EXCLUDE EXPERT TESTIMONY RE EXTENT OF THERMAL EXCHANGE CHAMBER IN KOGA

DATE: December 8, 2014
TIME: 8:00 a.m.
JUDGE: Jon S. Tigar

CRTRM: Courtroom 9, 19th Floor

I, Celine (Jennifer) Liu, declare as follows:

1. I am an attorney with the law firm of Alston & Bird LLP, counsel to Defendant CMI USA, Inc. ("CMI USA") in this action. I am a member in good standing of the State Bar of California and the bar of this Court. I submit this declaration in support of CMI USA, Inc.'s Opposition to Motion to Exclude Expert Testimony Re: Extent of Thermal Exchange Chamber in Koga. I have personal knowledge of the following facts and, if called to testify, I could and would testify competently to the matters stated herein.

2. A true and correct copy of CMI USA, Inc.'s colorized slide reproducing Figure 7 of U.S. Patent No. 7,544,049 to Koga et al. is attached as **Exhibit A.**

3. A true and correct copy of a cited page of the Expert Report of Gregory P. Carman, Ph.D. on Invalidity of U.S. Patent Nos. 8,240,362 and 8,245,764 dated July 3, 2014 is attached as **Exhibit B.**

4. True and correct copies of cited pages of Dr. Gregory Carman's August 12, 2014 Deposition Transcript are attached as **Exhibit C.**

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct.

Executed on this 8th day of December, 2014, in East Palo Alto, California.

<u>/s/ Celine (Jennifer) Liu</u>
Celine (Jennifer) Liu

Filer's Attestation

Pursuant to Civil Local Rule 5-1(i)(3) regarding signatures, I attest under penalty of perjury that concurrence in the filing of this document has been obtained from Celine (Jennifer) Liu.

Alston & Bird LLP

/s/

Elizabeth H. Rader

EXHIBIT A

Figure 7 of Koga

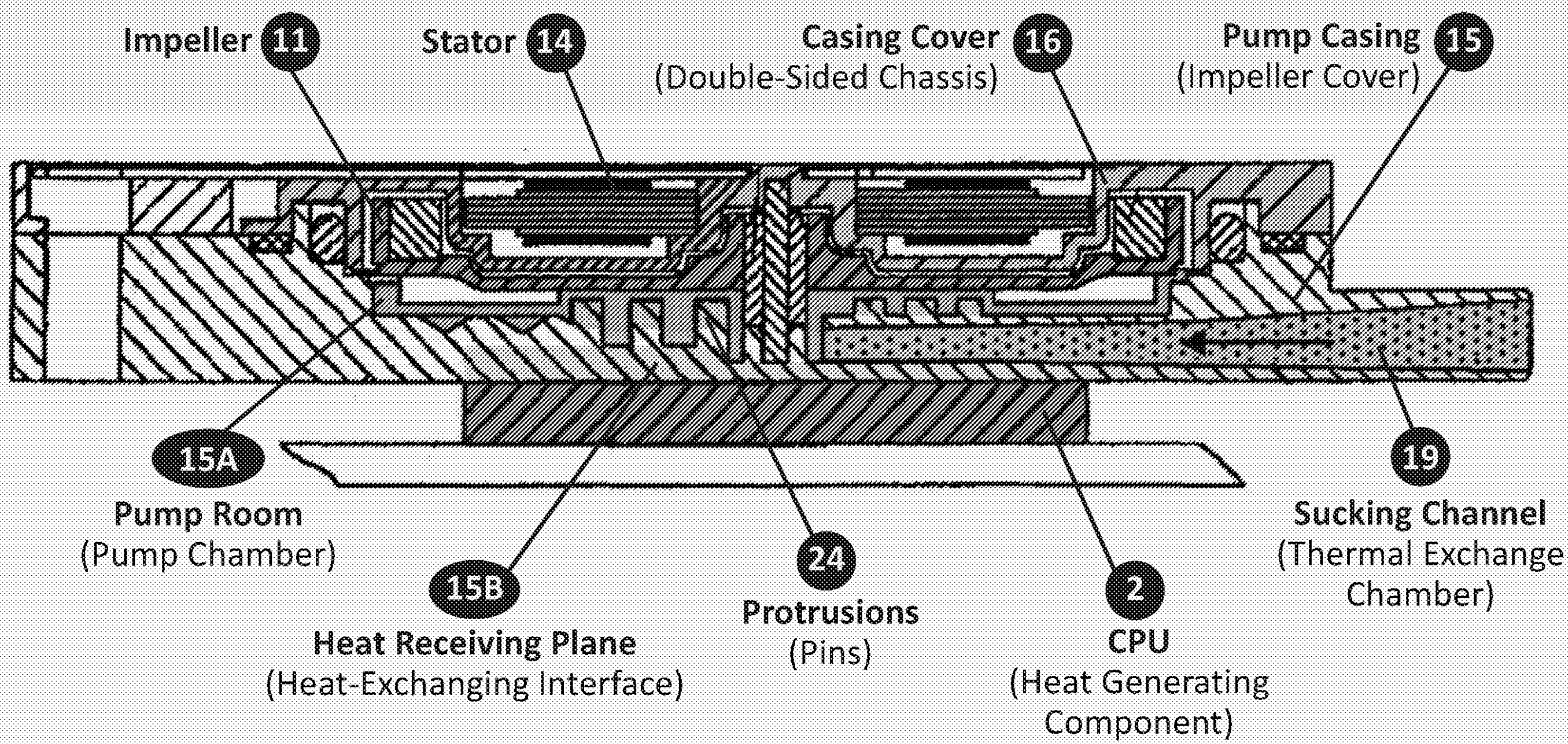

EXHIBIT B

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CMI USA, INC.

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

SAN FRANCISCO DIVISION

ASETEK HOLDINGS, INC. and ASETEK A/S,

Plaintiffs,

vs.

COOLER MASTER CO., LTD. and CMI USA, INC. fka COOLER MASTER USA INC.,

Defendants.

Case No: 3:13-cv-00457 JST

EXPERT REPORT OF GREGORY P. CARMAN, Ph.D. ON INVALIDITY OF U.S. PATENT NOS. 8,240,362 AND 8,245,764

DATE: July 3, 2014

Greg P. Carman

Gregory P. Carman

Koga. I have compared the asserted claims with Koga and find that they are disclosed or taught, expressly or inherently in Koga. The detailed bases and analysis for my opinions are set forth in the attached '764 patent invalidity claim chart (Exhibit C6).

a) Claim 1-9

184. In my opinion, Koga discloses every element and limitation of independent claim 1. Koga discloses a cooling system for a heat-generating component, comprising a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid. Ex. 9 (Koga) at Col. 1:6-9; 4:38-5:18; 9:48-54; Fig. 7. Koga discloses the pump comprising a stator and an impeller, the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid. *Id.* at Col. 4:38-5:57; Fig. 7. Koga discloses a reservoir adapted to pass the cooling liquid therethrough, the reservoir including a pump chamber including the impeller and formed below the chassis, the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through. *Id.* at Col. 4:38-5:57; 8:4-9; 9:48-54; Fig. 7. Koga also discloses a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages. *Id.* at Col. 4:57-6:10; Figs. 3-5, 7.

185. Additionally, Koga discloses a heat-exchanging interface which forms a boundary wall of the thermal exchange chamber is configured to be placed in thermal contact with a surface of the heat-generating component. *Id.* at Col. 4:38-60; 5:30-34; 6:50-57; Fig. 7. Koga also discloses a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid. *Id.* at Col. 4:10-14; 8:36-39; Fig. 1.

186. In my opinion, Koga likewise discloses every element and limitation of dependent claims 2 through 9. Koga discloses the cooling system of claim 1, wherein the chassis shields the stator from the cooling liquid in the reservoir. *Id.* at Col. 5:38-57; Fig. 7. Koga discloses the cooling system of claim 1, wherein the heat-exchanging interface includes a first side and a second side opposite the first side, the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side, and the heat-exchanging interface is configured to be in thermal

EXHIBIT C

THE UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

San Francisco Division

ASETEK HOLDING, INC., and ASETEK A/S,

CASE NUMBER: 3:12-cv-00457 JST

Plaintiffs,

vs.

COOLER MASTER CO., LTD. and CMI USA, INC.,

Defendants.

_______________________________/

HIGHLY CONFIDENTIAL

VIDEOTAPED DEPOSITION OF

GREG CARMAN, PhD

AUGUST 12, 2014

REPORTED BY JENNY L. GRIFFIN, RMR, CSR, CRR, CLR

(Exhibit 90 is marked.)

BY MR. McCAULEY:

Q. I'm handing you what's been marked as Exhibit 90. This is the Koga reference which you marked as Exhibit 9 to your invalidity report.

A. Okay.

Q. The first question is, do you recognize that as such?

A. Yes, I do.

Q. Would you please refer to Koga, Column 4, line 57 to 67.

A. Column 4, line 57?

Q. 57 to 67.

A. I do see that.

Q. Have you reviewed those?

A. Just give me --

Q. Oh, sure. I don't mean to rush you.

A. No, no, no, no, no. Good question.

Okay.

Q. After reviewing that section of Koga, do you agree that sucking channel (19) is a conduit to deliver coolant to the rotational center of the impeller?

A. It's a conduit, and it's also part of -- in the context of the -- let's see, the '794, the

thermal exchange chamber.

Q. Do you agree that Koga nowhere refers to sucking channel (19) as a heat exchange chamber?

A. No. I'd have to read the whole document, but I believe you're probably correct there. My understanding is informed by counsel. It doesn't have to say this is thermal exchange chamber for someone looking at it and saying, yes, it's performing thermal exchange chamber properties, as presented in the '794 patent.

Q. So you agree that the text of Koga doesn't specifically refer to sucking channel (19) as a heat exchange chamber or anything like that, but it's your review of the drawings that leads you to that opinion?

MS. RADER: Objection. Vague as to "anything like that."

THE WITNESS: You know, my understanding of looking at a document is that if I'm skilled in the art, I can take a look at this and determine without being told -- reading the specifications and asking myself, if I'm skilled in the art, if this is performing the functions of a thermal exchange chamber, as presented in the '794.

///

BY MR. McCAULEY:

Q. Well, let me ask this a different way.

Referring to your invalidity report and the discussion there and in Koga, you don't cite any text from Koga that refers to the sucking channel (19) as a heat exchange chamber or anything similar?

A. So in my invalidity report, I never state that Koga says this is the thermal exchange chamber. My interpretation, as told to me by counsel, they don't have to call that a thermal exchange chamber for it to be a thermal exchange chamber.

Q. But you don't cite any text from Koga that -- strike that.

I don't want to get hung up on the terminology "thermal exchange chamber," but I want to talk about the fact that Koga, in its written disclosure, never refers to the sucking channel (19) as exchanging heat or anything similar.

A. I would have to go through the entire document to make sure. If you want to give me my Koga reference just to make sure.

When I say "the Koga reference," the claim chart.

Q. Sure.

A. While she's getting that for me, I will partially answer the question that sucking chamber (19) --

Q. Sucking channel?

A. -- sucking channel (19) is adjacent to the thermal exchange surface. I believe that's (15B).

So that as fluid passed through there, it is absorbing heat.

Q. Well, let's get an answer to my first question. My colleague is about to hand you Exhibit C-6 to your invalidity report, which has been marked as Exhibit 91.

(Exhibit 91 is marked.)

BY MR. McCAULEY:

Q. My question again is, please confirm that the Koga reference does not in the text refer to sucking channel (19) as having thermal exchange or anything similar.

A. So I'm going to read what was in my claim chart. And it's on Column 4, lines 57 through Column 5, line 4.

"Sucking channel (19) sucks coolant (41), and discharging channel (20) discharges coolant (41). Sucking channel (19) is disposed between

heat receiving plane (15B) and inner wall face (50).

"Sucking groove (26) is provided together with sucking channel (19) unitarily along a direction common to channel (19) and groove (26), and extends toward the rotational center of impeller (11). Sucking groove (26) is formed as a step down from recess (15E) and communicates with recess (15E). Sucking groove (26) guides coolant (41) sucked through sucking channel (19) to near the rotational center of impeller (11). Slope (27) gradually goes uphill to radially outer wall surface (15C), which is sloped step up from recess (15E). O-ring (25) seals the engagement between cover (16) and casing (15), and packing (25A) functions similar to O-ring (25)."

Q I didn't hear anything in that excerpt -- well, first of all, that is an excerpt of the Koga reference that you just read into the record.

Agreed?

A. That is correct.

Q. I didn't hear anything in there that referred to sucking channel (19) as exchanging heat.

A. Since -- well, the second sentence, where it says "sucking channel (19) is disposed between heat receiving plane (15B) and inner wall face (50)," I believe implies that someone who's skilled in the art would know it's absorbing heat.

Q. But it doesn't specifically say that, does it?

A. It does not specifically state that the fluid is absorbing heat there, but I think it's -- anyone who is skilled in the art would know that it is.

Q. Well, Koga does refer to the pump room and the various recesses, dimples, etc., as being involved in heat exchange, doesn't it?

A. Oh, yes, he does. And, you know, there's also exchange going on that lower level as the fluid goes toward the center, which is below the pumping chamber, which is still the thermal exchange chamber.

So you'll see a recess in there, but you still have those features extending down into the thermal exchange chamber where sucking channel (19) is impinging upon.

Q. Have you looked at Koga recently?

A. Yes, I have.

Q. Good. That might speed up some of these questions.

Would you please turn to Figure 8 of Koga.

A. Yes.

Q. Do you recognize the designation of (15A) there as being the pump room?

A. Oh, yes, yes, yes.

Q. And do you see that the pump room is comprised of what Koga refers to as dimples and recesses?

A. Yes, I do.

Q. And the specific purpose of those is for heat exchange?

A. Yes, I do.

Q. Koga discloses pump room (15A) as the heat exchange chamber.

Agreed?

A. Do you know, there's heat exchange chamber going on there, but you need to look at element (15F), which is below the pumping chamber. It's down at the level which is more along the lines of a thermal exchange chamber, which is vertically spaced apart.

And if you have that top view there, if you remember the accused Cooler Master devices, where we were talking about these fan-shaped

regions or passages, you'll see these three regions there. And those three regions are actually offset downward and along the plane of (19), the sucking channel.

Now, what you're talking about as pump room (15A) is that's actually elevated above that lower portion of the region.

Q. Can you turn to Column 9 of Koga, starting at about line 3.

A. Okay.

Q. This is just one example. It says "recess (15F) of the pump room," and then it goes on.

Do you see that?

A. I do see that.

Q. (15F) is part of the pump room; it's not something below the pump room.

Do you agree with that?

A. Just because he calls it a pump room, where there's two levels to that pump room. When I see it, it looks like what we have -- like I said, the Cooler Master product. We have a region which is recessed down, which is the thermal exchange chamber, which is part (19) and part those regions there.

And then up above, we have a pump room

which he has labeled (15A), which is actually at a taller level.

Q. Koga discloses recess (15F) as part of the pump room (15A).

Agreed?

A. Just because he --

Q. Yes or no?

A. He states in his --

Q. You're skipping the answer and you're jumping to some explanation. I just want you to confirm that, as exemplified in the text that I just read to you, Koga discloses recess (15F) as part of pump room (15A).

Agreed?

A. So in Koga, he says --

Q. Yes or no?

A. I was going to read your sentence that you --

Q. Okay.

A. It says, "Recess (15F) of the pump room." So he does say (15F) is the pump room, but that doesn't mean I can't look at it from a skilled in the art and say, well, that's another chamber.

Q. You're saying recess (15F) is a chamber?

A. It's part of this lower boundary system

that's part of (19) that feeds into this lower boundary.

So if you have this top view here, you'll see these three fan-shaped regions which are recessed down.

Q. Fan-shaped regions?

A. Pie shape. Pizza pie.

Q. Which figure are you pointing at?

A. So we're looking at Figure 8. So what you have here is you have a circle up above, and then down below, and then you have these three ribs that we were talking about on the Cooler Master product.

Q. You know, I'm sorry. I was asking you about Figure 7. I think I may have inadvertently called it Figure 8.

A. I apologize. I went to Figure 8.

Q. No need to apologize.

If you look at Figure 7 --

A. Yep --

Q. -- it shows (15A) to the left.

Do you see that?

A. I do.

Q. And you understand that to be the pump room as disclosed in Koga; right?

A. And that's the upper portion, which is on

the same level as (20). Down below, you have another level, which is on the plane of (19), which is those pie-shaped regions there.

And you can see that also in Figure 7, where, if you look at where you're pointing to (15A), that bottom wall is elevated than if you go over to where (15F) is.

Q. Can I ask you a question?

A. Sure. All right.

Q (15A) is the pump room. Right?

A. Yes.

Q. And (15A) has dimples and recesses in it.
Agreed?

A. (15A) has dimples and recesses. Well, it has dimples.

Q. And the purpose of those dimples and recesses is to facilitate heat transfer.
Agreed?

A. Yes.

Q. There are no dimples or recesses in sucking channel (19) in Koga. Right?

A. Inside (19) there aren't any sucking channels.

Q. Inside (19) there aren't any dimples or recesses. Is that what you meant to say?

A. If I said something else, I apologize. But what I meant to say, in sucking channel (19), there aren't any dimples or recesses inside sucking channel (19).

Q. And if there were dimples and recesses in sucking channel (19), it would impede the flow and be detrimental to the operation of the device in Koga. Right?

A. No.

MS. RADER: Objection. Calls for speculation.

BY MR. McCAULEY:

Q. You disagree with that?

A. Yes, I disagree with that.

Q. Did you say earlier that you think (15F) is part of the sucking channel?

A. No, no. The sucking channel brings in fluid. And the way I look at this is that region of (15F) is construed as part of the thermal exchange chamber, because it's below the pumping chamber which is up above it.

And, really, there's a circular passageway between those two. And that circular passageway is defined by, if you take that three pizza regions and you just draw a circle around it, that is

actually down beneath that upper region which is, let's say, labeled (15C).

And, once again, you can see that in Figure 7. And there, you need to look at where the bottom boundary of -- let's say where (15F) is pointing to and where (15A) is pointing to. There are two heights there. One is above the other.

Q. In Koga, pump room (15A) also houses the impeller.

Agreed?

A. That is correct.

Q. And Koga is a single-chamber device.

Agreed?

A. No.

Q. Now, referring to Figure 8 of Koga --

A. Okay.

Q. -- which we have marked as 168. That shows sucking channel (19) to be a narrow conduit compared to the rest of the structure there. Right?

A. Yes. So sucking channel (19) is a conduit. "Narrow" is, I guess, a relative word.

Q. Well, it's much narrower than everything else.

A. Well, not compared to (20).

ACKNOWLEDGMENT OF DEPONENT

I, Greg Carman do hereby acknowledge that I have read and examined the foregoing testimony, and the same is a true, correct and complete transcription of the testimony given by me, and any corrections appear on the attached Errata Sheet signed by me.

8/25/14 Greg P. Carman

(DATE) (SIGNATURE)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re Appeal of *Inter Partes* Reexamination of:	**Appeal No.** 2015-007934
U.S. Patent No.: 8,245,764	**R.C.N.:** 95/002,386
Issued: August 21, 2012	**Confirmation No.:** 7254
Applicant: Andre Sloth Eriksen	**Art Unit:** 3993
Title: COOLING SYSTEM FOR A COMPUTER SYSTEM	**Examiner:** Joseph A. Kaufman

SUBMITTED VIA ELECTRONIC FILING SYSTEM ON APRIL 21, 2016

Patent Trial and Appeal Board
U.S. Patent and Trademark Office
PO Box 1450
Alexandria, Virginia 22313-1450

CERTIFICATE OF SERVICE

The undersigned hereby certifies that, on April 21, 2016, a true and correct copy of CoolIT Systems, Inc.'s NOTICE OF PROCEEDINGS PURSUANT TO 37 C.F.R. § 1.985(B), together with documents listed therein, were served on counsel for patent owner by certified U.S. mail at the following address:

Finnegan, Henderson, Farabow, Garrett & Dunner LLP
901 New York Avenue, NW
Washington, D.C. 20001-4413

with sufficient postage affixed thereto and delivery confirmation requeseted.

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By: */Lloyd L. Pollard II/*
Lloyd L. Pollard, II
Registration No. 64,793

Dated: April 21, 2016

Electronic Acknowledgement Receipt

EFS ID:	25565018
Application Number:	95002386
International Application Number:	
Confirmation Number:	7254
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Customer Number:	22852
Filer:	Bradley M. Ganz/Bridgett Barrett
Filer Authorized By:	Bradley M. Ganz
Attorney Docket Number:	COOL-1.012
Receipt Date:	21-APR-2016
Filing Date:	15-SEP-2012
Time Stamp:	18:53:43
Application Type:	inter partes reexam

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Notice of concurrent proceeding(s)	Notice_of_Concurrent_Proceedings.pdf	1352296 e8f5f0b84fd2ddb55fd0d4429880ca3fec2e378f	no	33

Warnings:

Information:

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 04/12/2016
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
04/12/2016	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE
PATENT TRIAL AND APPEAL BOARD

CoolIT Systems, Inc.,
Requester,

v.

Asetek Danmark A/S,
Patent Owner.

Appeal 2015-007934
Inter Partes Reexamination Control 95/002,386
Patent 8,245,764 B2
Technology Center 3900

DECISION ON PETITION

This is a decision dismissing Patent Owner's "PETITION SEEKING WAIVER OF 37 C.F.R. § 41.35(d) AND § 41.63(c) AS NECESSARY TO ENTER UPDATED NOTICE OF CONCURRENT PROCEEDINGS," filed October 5, 2015 ("Petition"). In its petition filed pursuant to 37 C.F.R. § 1.183, Patent Owner requests that the Chief Administrative Patent Judge enter an Updated Notice of Concurrent Proceeding(s) notifying the Office of a District Court Order issued September 22, 2015, concerning U.S. Patent

8,245,764 B2. The petition fee of $1,940, in accordance with 37 C.F.R. § 1.20(c)(6) was paid, with $400 charged to Patent Owner's credit card on October 6, 2015, and the balance of $1,540 charged to Patent Owner's deposit account on April 11, 2016, as authorized on page 2 of the petition.

This is also a decision dismissing Requester's request for authorization to file an opposition of December 7, 2015, and a decision dismissing Requester's opposition of December 7, 2015.

FINDINGS

1. Requester filed a request for *inter partes* reexamination of the '764 patent on September 15, 2012, which was assigned Control No. 95/002,386.
2. On October 26, 2012, reexamination was ordered, and a non-final Office action was mailed.
3. Prosecution continued and on June 30, 2014, a Right of Appeal Notice was mailed.
4. Patent Owner filed a Notice of Appeal on July 24, 2014.
5. Briefing was completed and an Appeal Docketing Notice was mailed on September 10, 2015.
6. Patent Owner filed a Notice of Concurrent Proceeding(s) on October 5, 2015, accompanied by the present petition.
7. Requester filed an opposition to Patent Owner's petition, accompanied by a request for authorization to file an opposition, on December 7, 2015.

DISCUSSION

In its petition pursuant to 37 C.F.R. § 1.183, Patent Owner requests that the Chief Administrative Patent Judge waive any requirement of 37 C.F.R. §§ 41.35(d) and 41.63(c) that prohibits or holds in abeyance consideration of any information disclosure statement or petition or other evidence filed while the Board possesses jurisdiction over the proceeding until the Board's jurisdiction ends. Petition 1. Specifically, Patent Owner requests that the Board accept and enter into the appeal record the Updated Notice of Concurrent Proceedings filed on October 5, 2015, notifying the Office of a District Court Order issued September 22, 2015, concerning U.S. Patent 8,245,764 B2.

In its opposition, Requester requests that the Chief Administrative Patent Judge deny entry of Patent Owner's Updated Notice of Concurrent Proceedings.

RELEVANT AUTHORITY

37 C.F.R. § 1.183 provides:

> In an extraordinary situation, when justice requires, any requirement of the regulations in this part which is not a requirement of the statutes may be suspended or waived by the Director or the Director's designee, sua sponte, or on petition of the interested party, subject to such other requirements as may be imposed. Any petition under this section must be accompanied by the petition fee set forth in § 1.17(f).

37 C.F.R. § 41.35(d) provides:

> Documents filed during Board's jurisdiction. Except for petitions authorized by this part, consideration of any information disclosure statement or petition filed while the Board possesses jurisdiction over the proceeding will be held in abeyance until the Board's jurisdiction ends.

37 C.F.R. § 41.63(c) provides:

> Affidavits or other evidence filed after the date of filing an appeal pursuant to § 41.61 will not be admitted except as permitted by reopening prosecution under § 41.77(b)(1).

37 C.F.R. § 41.3 provides:

> (a) *Deciding official*. Petitions must be addressed to the Chief Administrative Patent Judge. A panel or an administrative patent judge may certify a question of policy to the Chief Administrative Patent Judge for decision. The Chief Administrative Patent Judge may delegate authority to decide petitions.
>
> (b) *Scope*. This section covers petitions on matters pending before the Board (§§ 41.35, 41.64, 41.103, and 41.205); otherwise, see §§ 1.181 to 1.183 of this title. The following matters are not subject to petition:
>
> (1) Issues committed by statute to a panel, and
>
> (2) In pending contested cases, procedural issues. See § 41.121(a)(3) and § 41.125(c).
>
> (c) *Petition fee*. The fee set in § 41.20(a) must accompany any petition under this section except no fee is required for a petition under this section seeking supervisory review.
>
> (d) *Effect on proceeding*. The filing of a petition does not stay the time for any other action in a Board proceeding.

> (e) *Time for action.*
>
> (1) Except as otherwise provided in this part or as the Board may authorize in writing, a party may:
>
> > (i) File the petition within 14 days from the date of the action from which the party is requesting relief, and
> >
> > (ii) File any request for reconsideration of a petition decision within 14 days of the decision on petition or such other time as the Board may set.
>
> (2) A party may not file an opposition or a reply to a petition without Board authorization.

37 C.F.R. § 1.985(b) provides:

> Notwithstanding any provision of the rules, any person at any time may file a paper in an inter partes reexamination proceeding notifying the Office of a prior or concurrent proceeding in which the same patent is or was involved, including but not limited to interference or trial before the Patent Trial and Appeal Board, reissue, reexamination, or litigation and the results of such proceedings. Such paper must be limited to merely providing notice of the other proceeding without discussion of issues of the current inter partes reexamination proceeding.

ANALYSIS

Patent Owner's petition has been considered fully. The USPTO has the discretion to waive the applicable rules under 37 C.F.R. § 1.183 in an extraordinary situation when justice requires waiver. Patent Owner requests waiver of "any requirement of 37 C.F.R. §§ 41.35(d), 41.63(c) that prohibits or holds in abeyance consideration of any 'information disclosure statement or petition' 'or other evidence' filed while the Board possesses jurisdiction over the proceeding until the Board's jurisdiction ends." Petition 1. Patent Owner seeks entry of the Updated Notice of Concurrent Proceeding(s) filed on October 5, 2015, to notify the Office of the District Court Order of September 22, 2015, concerning U.S. Patent 8,245,764 B2. Patent Owner asserts that notification of the existence of concurrent proceedings is required during *inter partes* reexamination in accordance with 37 C.F.R. § 1.985(b). Petition 3.

Pursuant to § 1.985(b), "any person at any time may file a paper in an *inter partes* reexamination proceeding notifying the Office of a prior or concurrent proceeding in which the same patent is or was involved." A review of the Updated Notice of Concurrent Proceeding(s) of October 5, 2015, reveals that the 43-page document includes a 2-page cover letter and a District Court Order of September 22, 2015, concerning the instant patent, U.S. Patent 8,245,764 B2. Because the Notice of Concurrent Proceeding(s) filed by Patent Owner is limited to merely providing notice of a prior or concurrent proceeding in which the same patent is or was involved without discussion of the issues of the current *inter partes* reexamination, it is a proper submission in compliance with § 1.985(b).

Accordingly, Patent Owner's petition pursuant to 37 C.F.R. § 1.183, requesting waiver of the regulations to permit entry of the Notice is **dismissed** as not necessary. The submission of a Notice of Concurrent Proceedings is specifically provided for in § 1.985(b). Therefore, the Updated Notice of Concurrent Proceeding(s) of October 5, 2015, is **entered**.

Requester's request for authorization to file an opposition of December 7, 2015, is **dismissed** as not filed timely because it was not filed within 2 weeks of the certificate of service date of Patent Owner's petition.

Requester's opposition was not authorized prior to the filing in accordance with § 41.3(e)(2). Also, an opposition to a petition requesting entry of a document is only appropriate if the document is not in compliance with the Office's regulations. In this case, the opposition is **dismissed** as moot, improper, as well as not authorized, and will be **expunged** by closing it from the record in the image file wrapper (IFW) system with the mailing of this petition decision.

DECISION

In view of the foregoing, Patent Owner's petition is DISMISSED, and Requester's request for authorization and opposition are DISMISSED.

The Updated Notice of Concurrent Proceeding(s) of October 5, 2015, is entered, and a Decision on the appeal will be issued in due course.

Nathan K. Kelley
Acting Chief Administrative Patent Judge

<u>Counsel for Patent Owner:</u>
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

<u>Counsel for Third Party Requester:</u>
GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

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TO

Name: ATTN: Patent Trial and Appeal Board
Company: United States Patent and Trademark Office
Fax Number: USPTO Central
571-273-8300

PTAB Hearing
571-273-9797

Subject: Appeal No: 2015-007,934
Appellant: ASETEK A/S, et al.
Reexam Control No: 95/002,386
Hearing Date: Wednesday, April 13, 2016 at 10:00 a.m. in Dallas, TX

Date: April 4, 2016
Phone Number: 571-272-9797
Total Pages (including cover): 4
Confirmation Copy to Follow: No

FROM

Name: Eric P. Raciti, Partner
Phone Number: 617-646-1675
Verified by: Jenna Ruggirio, Assistant
Our File No.: 10494.8000

MESSAGE

Dear Sir/Madam:

Attached please find an amended confirmation of attendance as required by the USPTO Patent and Trial Appeal Board with respect to the above-referenced matter. Please note the names of persons participating in the oral hearing on behalf of Patent Owner.

Upon receipt and review, please feel free to contact our office with any questions you may have.

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WASHINGTON, DC 20001-4413

Appeal No:	2015-007,934
Appellant:	ASETEK A/S, et al.
Reexam Control No:	95/002,386
Hearing Room:	E
Hearing Docket:	B
Hearing Date:	Wednesday, April 13, 2016
Hearing Time:	10:00 AM
Location:	**USPTO** **Hearing Room 155** **207 South Houston Street** **Dallas, Texas75242**

NOTICE OF HEARING - DALLAS, TEXAS
RESPONSE REQUIRED WITHIN 21 DAYS

Your attention is directed to 37 CFR § 41.73. The above identified appeal will be heard by the Patent Trial and Appeal Board on the date indicated. Hearings will commence at the time set, and as soon as the argument in one appeal is concluded, the succeeding appeal will be taken up. **The time allowed for argument is 30 minutes** for each appellant or respondent who has requested an oral hearing, unless additional time is requested and approved before the argument commences. **As the hearing relates to an appeal of a reexamination, the hearing will be open to the public.**

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   http://www.uspto.gov/patents/process/file/efs/

2. *PREFERRED*: Facsimile transmitted to: The USPTO Central fax number (official copy): **(571) 273-8300** ***and*** the PTAB Hearing fax number (courtesy copy): **(571) 273-9797.**

3. By mail at the PTAB mailing address: Patent Trial and Appeal Board
   United States Patent and Trademark Office
   P.O. BOX 1450
   Alexandria, Virginia 22313-1450

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CHECK ONE:

(✓) I previously filed my oral hearing request pursuant to 37 C.F.R. § 41.73(b).

( ) I am now filing my initial request to participate in the oral hearing pursuant to 37 C.F. R. § 41.73(d). A request for oral hearing and the fee set forth in 37 C.F.R. § 41.20(b)(3) are either attached to this hearing communication or have already been submitted.

PLEASE ELECT ONE OF THE OPTIONS BELOW:

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( ) I ELECT A VIDEO HEARING - ATTENDANCE CONFIRMED *(EFS-Web selection: Confirmation of Hearing by Appellant)*

( ) I ELECT TO WAIVE HEARING ATTENDANCE *(EFS-Web selection: Waiver of Hearing by Appellant)*

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To aid the judges in determining whether any conflicts exist that may require a recusal, please list in the 'Comments' section the names of any additional person(s) who will be participating in the oral hearing. (Upon arrival at the **USPTO Hearing Room 155, Dallas, Texas**, all persons presenting arguments must sign in at the Usher's desk.)

Comments/Special Requests:

PROJECTOR FOR POWERPOINT SLIDES

PERSONS PARTICIPATING IN ORAL HEARING: ERIC P. RACITI (REG. No. 41,475) & ARPITA BHATTACHARYYA (REG. No. 63,681)

ERIC P. RACITI — Typed or Printed Name of Attorney/Agent/Appellant

41,475 — Registration No.

(✓) PATENT OWNER ( ) THIRD PARTY REQUESTER

Signature of Attorney/Agent/Appellant

4/4/16 — Date

The 'Hearings' tab of the PTAB webpage http://www.uspto.gov/patents-application-process/patent-trial-and-appeal-board/hearings provides additional information about oral hearings.

Please direct other inquiries to the PTAB Hearings Clerk at 571-272-9797.

cc: Third Party Requester

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HILLSBORO, OR 97123

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To: USPTO Central

Fax: (571) 273-8300

RE: Appeal No. 2015-007,934

Date: March 18, 2016

__4__ Pages including cover sheet.

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GARRETT & DUNNER, LLP
901 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20001-4413

Appeal No:	2015-007,934
Appellant:	ASETEK A/S, et al.
Reexam Control No:	95/002,386
Hearing Room:	E
Hearing Docket:	B
Hearing Date:	Wednesday, April 13, 2016
Hearing Time:	10:00 AM
Location:	**USPTO** **Hearing Room 155** **207 South Houston Street** **Dallas, Texas75242**

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Comments/Special Requests:

Please provide a projector for displaying presentation materials

from a laptop computer.

Lloyd L. Pollard II on behalf of Appellee

Typed or Printed Name of Attorney/Agent/Appellant

64,793

Registration No.

( ) PATENT OWNER XXXHIRD PARTY REQUESTER

Signature of Attorney/Agent/Appellant

March 18, 2016

Date

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Name: ATTN: Patent Trial and Appeal Board

Company: United States Patent and Trademark Office

Fax Number: USPTO Central
571-273-8300

PTAB Hearing
571-273-9797

Subject: Appeal No: 2015-007,934
Appellant: ASETEK A/S, et al.
Reexam Control No: 95/002,386
Hearing Date: Wednesday, April 13, 2016 at 10:00 a.m. in Dallas, TX

Date: March 8, 2016

Phone Number: 571-272-9797

Total Pages (including cover): 4

Confirmation Copy to Follow: No

FROM

Name: Eric P. Raciti, Partner

Phone Number: 617-646-1675

Verified by: Jenna Ruggirio, Assistant

Our File No.: 10494.8000

MESSAGE

Dear Sir/Madam:

Attached please find the executed Notice of Hearing Response as required by the USPTO Patent and Trial Appeal Board with respect to the above-referenced matter.

Upon receipt and review, please feel free to contact our office with any questions you may have.

If there is a problem with this transmission, notify the sender at the number above.

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PHONE: +1 617 646 1600 | FAX: +1 617 646 1666

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PATENT TRIAL AND APPEAL BOARD

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, LLP
901 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20001-4413

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( ) I ELECT A VIDEO HEARING - ATTENDANCE CONFIRMED *(EFS-Web selection: Confirmation of Hearing by Appellant)*

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Comments/Special Requests:

PROJECTOR FOR POWERPOINT SLIDES

ERIC P. RACITI

Typed or Printed Name of Attorney/Agent/Appellant

41,475

Registration No.

(✓) PATENT OWNER ( ) THIRD PARTY REQUESTER

Signature of ~~Attorney~~/Agent/Appellant

3/7/16

Date

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cc: Third Party Requester

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 03/01/2016

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
03/01/2016	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

The United States Patent and Trademark Office
PATENT TRIAL AND APPEAL BOARD

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, LLP
901 NEW YORK AVENUE, N.W.
WASHINGTON, DC 20001-4413

Appeal No:	2015-007,934
Appellant:	ASETEK A/S, et al.
Reexam Control No:	95/002,386
Hearing Room:	E
Hearing Docket:	B
Hearing Date:	Wednesday, April 13, 2016
Hearing Time:	10:00 AM
Location:	**USPTO** **Hearing Room 155** **207 South Houston Street** **Dallas, Texas75242**

NOTICE OF HEARING - DALLAS, TEXAS
RESPONSE REQUIRED WITHIN 21 DAYS

Your attention is directed to 37 CFR § 41.73. The above identified appeal will be heard by the Patent Trial and Appeal Board on the date indicated. Hearings will commence at the time set, and as soon as the argument in one appeal is concluded, the succeeding appeal will be taken up. **The time allowed for argument is 30 minutes** for each appellant or respondent who has requested an oral hearing, unless additional time is requested and approved before the argument commences. **As the hearing relates to an appeal of a reexamination, the hearing will be open to the public.**

Pursuant to § 41.73(d), if any other party to the appeal desires to participate in the oral hearing, but did not request an oral hearing pursuant to § 41.73(d), i.e., within two months after the mailing date of the Examiner's Answer, then this other party will be permitted to participate in the hearing by filing a separate request for oral hearing and the fee set forth in 37 C.F.R. § 41.20(b)(3) within 21 DAYS of the mailing date of this Notice, as well as a confirmation of attendance at the oral hearing.

CONFIRMATION OF ATTENDANCE OR WAIVER OF THE HEARING IS REQUIRED WITHIN **21 DAYS** OF THE MAILING DATE OF THIS NOTICE. Failure to respond will be treated as a waiver of your request to participate in the oral hearing. If you are no longer interested in participating in the oral hearing, you must still file a waiver of oral hearing with the Board. This allows the panel to promptly act on the appeal without waiting for the oral hearing date.

Confirmation or waiver of the hearing should be indicated by completing the form below and returning it to the Board. This form may be filed with the Board by any one of the following three alternative methods:

1. Via the USPTO Electronic Filing System (EFS) at
   http://www.uspto.gov/patents/process/file/efs/
2. ***PREFERRED***: Facsimile transmitted to: The USPTO Central fax number (official copy): **(571) 273-8300** ***and*** the PTAB Hearing fax number (courtesy copy): **(571) 273-9797.**
3. By mail at the PTAB mailing address: Patent Trial and Appeal Board
   United States Patent and Trademark Office
   P.O. BOX 1450
   Alexandria, Virginia 22313-1450

In all communications relating to this appeal, please identify the appeal by its number.

CHECK ONE:

( ) I previously filed my oral hearing request pursuant to 37 C.F.R. § 41.73(b).

( ) I am now filing my initial request to participate in the oral hearing pursuant to 37 C.F. R. § 41.73(d). A request for oral hearing and the fee set forth in 37 C.F.R. § 41.20(b)(3) are either attached to this hearing communication or have already been submitted.

PLEASE ELECT ONE OF THE OPTIONS BELOW:

( ) I ELECT AN IN-PERSON HEARING AND CONFIRM ATTENDANCE IN **DALLAS, TEXAS** *(EFS-Web selection: Confirmation of Hearing by Appellant)*

( ) I ELECT A TELEPHONIC HEARING - ATTENDANCE CONFIRMED *(EFS-Web selection: Confirmation of Hearing by Appellant)*

( ) I ELECT A VIDEO HEARING - ATTENDANCE CONFIRMED *(EFS-Web selection: Confirmation of Hearing by Appellant)*

( ) I ELECT TO WAIVE HEARING ATTENDANCE *(EFS-Web selection: Waiver of Hearing by Appellant)*

To aid the oral hearings staff in scheduling hearing rooms, please indicate the total number of participating and observing attendees if more than three are expected: ____
To aid the judges in determining whether any conflicts exist that may require a recusal, please list in the 'Comments' section the names of any additional person(s) who will be participating in the oral hearing. (Upon arrival at the **USPTO Hearing Room 155, Dallas, Texas**, all persons presenting arguments must sign in at the Usher's desk.)

Comments/Special Requests:

____

____

Typed or Printed Name of Attorney/Agent/Appellant   Registration No.

( ) PATENT OWNER   ( ) THIRD PARTY REQUESTER

Signature of Attorney/Agent/Appellant   Date

The 'Hearings' tab of the PTAB webpage http://www.uspto.gov/patents-application-process/patent-trial-and-appeal-board/hearings provides additional information about oral hearings.

Please direct other inquiries to the PTAB Hearings Clerk at 571-272-9797.

cc: Third Party Requester

GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

PATENT
Customer No. 22,852
Attorney Docket Nos. 10494.8000

BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re Appeal of *Inter Partes* Reexamination of:	)	
	)	
André Sloth ERIKSEN	)	Appeal No. 2015-007934
	)	
U. S. Patent No. 8,245,764	)	Control No.: 95/002,386
	)	
Issued: August 21, 2012	)	Group Art Unit: 3993
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	Examiner: Joseph A. Kaufman
	)	
	)	

Patent Trial and Appeal Board
Attn: Chief Administrative Patent Judge
US Patent and Trademark Office
PO Box 1450
Alexandria, Virginia 22313-1450

Sir:

PETITION SEEKING WAIVER OF 37 C.F.R. § 41.35(d) AND § 41.63(c) AS NECESSARY TO ENTER UPDATED NOTICE OF CONCURRENT PROCEEDINGS

Pursuant to 37 C.F.R. § 1.183, Asetek Danmark A/S ("Asetek"), the owner of U.S. Patent No. 8,245,764 ("the '764 patent"), requests the Chief Administrative Patent Judge to waive any requirement of 37 C.F.R. §§ 41.35(d), 41.63(c) that prohibits or holds in abeyance consideration of any "information disclosure statement or petition" "or other evidence" filed while the Board possesses jurisdiction over the proceeding until the Board's jurisdiction ends. Specifically, Asetek requests that the Board accept and enter into the appeal record the accompanying Updated Notice of Concurrent Proceedings ("Notice") containing a recent ORDER DENYING DEFENDANT'S POST-TRIAL MOTIONS; GRANTING IN PART AND DENYING IN PART PLAINTIFF'S POST-TRIAL MOTIONS ("Order") in a proceeding involving the '764 patent.

To the extent that entry and consideration of the Notice and Order requires suspension of any rules, suspension is requested pursuant to 37 C.F.R. § 1.183. In addition, a petition fee of $400 is being submitted herewith. If there is any other fee due in connection with the filing of this petition, please charge the fee to Deposit Account 06-0916.

I. BACKGROUND

On September 10, 2015, the Board issued a Docketing Notice for the above-captioned appeal, assigning appeal number 2015-007934. Jurisdiction with the Board is therefore proper under 37 CFR § 41.35 to decide this petition.

The subject patent of this appeal, the '764 Patent, was asserted in 2013 against CMI USA, Inc. (CMI), a US-based subsidiary of Cooler Master of Taiwan in the Northern District of California (Case No. 3:13-cv-00457). The CMI case proceeded to trial, where Asetek prevailed, *inter alia*, on all questions of infringement and validity of the '764 Patent. Post-trial motions were filed: (1) CMI's motions for entry of judgment as a matter of law ("JMOL") under Federal Rule of Civil Procedure 50(b)(3) and for a new trial under Federal Rule of Civil Procedure 50(b)(2) or 59; (2) Asetek's motion for entry of a permanent injunction; and (3) Asetek's motion for supplemental damages and prejudgment interest. On September 22, 2015, Judge Tigar issued the Order.

Asetek requests the Chief Administrative Patent Judge to accept the accompanying Notice, listing Judge' Tigar's Order, and enter it into the record of this Appeal. To the extent the Chief Administrative Patent Judge deems the accompanying Notice to fall under the ambit of 37 C.F.R. § 41.35(d) or § 41.63(c), suspension thereof is respectfully requested.

II. ARGUMENT

Under 37 C.F.R. § 1.183, "In an extraordinary situation, when justice requires, any requirement of the regulations in this part which is not a requirement of the statutes may be suspended or waived by the Director or the Director's designee ..." This petition requests the entry of a paper into the record during the pendency of an appeal. Specifically, to the extent that the Notice is deemed either: (i) an "information disclosure statement" or otherwise to fall under the scope of Rule 41.35(d); or (ii) an affidavit "or other evidence" or otherwise to fall under the scope of Rule 41.63(c), waiver thereof is requested. Entry into the appeal record of the Notice or any waiver required to do so does not conflict with a requirement of 35 U.S.C. or any other statute.

Entry of the Notice, and waiver of any rules prohibiting entry, is appropriate here because of extraordinary circumstances. Notification of the existence of concurrent proceedings is required during *inter partes* reexamination. 37 C.F.R. § 1.985. Further, the USPTO has stated its basis for this policy is that "[i]t is important for the Office to be aware of any prior or concurrent proceedings in which a patent undergoing inter partes reexamination is or was involved, such as ... litigations, and any results of such proceedings." M.P.E.P. § 2686.

There is no other avenue to obtain relief. The present appeal is of an *inter partes* reexamination, which terminates upon the Board entering a final decision. 37 C.F.R. § 41.77. For the Board to be aware of the Order, suspension of the rules is appropriate, otherwise the USPTO's important policy basis for requiring citation of concurrent proceedings will be contravened.

It is therefore respectfully submitted that an unjust result may occur within the meaning of 37 C.F.R. § 1.183 unless the Order enters the record. Further, grant of this petition would assist the statutory requirement for special dispatch in *inter partes* reexaminations and appeals thereof[1] by providing a full record to the Board during the pending appeal.

It is therefore respectfully submitted that entry and consideration of the Notice would advance administrative and judicial economy as well as enhance the special dispatch due this appeal.

III. CONCLUSION

Asetek requests that the Office grant this petition and accept the accompanying Updated Notice of Concurrent Proceedings and enter same into the record of the current appeal.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P.

Dated: October 5, 2015

By: ______________________
Eric P. Raciti
Reg. No. 41,475

[1] 35 U.S.C. § 314(c).

Customer No. 22,852
Attorney Docket No. 10494.8000

BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re Appeal of *Inter Partes* Reexamination of:	)	
	)	
André Sloth ERIKSEN	)	Appeal No. 2015-007934
	)	
U. S. Patent No. 8,245,764	)	Control No.: 95/002,386
	)	
Issued: August 21, 2012	)	Group Art Unit: 3993
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	Examiner: Joseph A. Kaufman
	)	

Patent Trial and Appeal Board
US Patent and Trademark Office
PO Box 1450
Alexandria, Virginia 22313-1450

Sir:

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and correct copy of the Updated Notice of Concurrent Proceedings and Judge Tigar's Order cited therein have been served via certified U.S. mail on October 5, 2015, on counsel for the third-party requesters at the following address, with sufficient postage affixed and delivery confirmation requested:

Ganz Law P.C.
163 Southeast 2nd Avenue,
Hillsboro, OR 97123

Dated: October 5, 2015

By: ______________________
Eric P. Raciti
Reg. No. 41,475

Customer No. 22,852
Attorney Docket No. 10494.8000

BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re Appeal of *Inter Partes* Reexamination of:	
André Sloth ERIKSEN	Appeal No. 2015-007934
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For: COOLING SYSTEM FOR A COMPUTER SYSTEM	Examiner: Joseph A. Kaufman

Patent Trial and Appeal Board
US Patent and Trademark Office
PO Box 1450
Alexandria, Virginia 22313-1450

Sir:

UPDATED NOTICE OF CONCURRENT PROCEEDINGS

Patent Owner notifies the Patent Office that on September 22, 2015, Judge Tigar of the U.S. District Court for the Northern District of California entered an ORDER DENYING DEFENDANT'S POST-TRIAL MOTIONS; GRANTING IN PART AND DENYING IN PART PLAINTIFF'S POST-TRIAL MOTIONS on questions of infringement and validity in *Asetek Danmark A/S v. CMI USA, Inc., (*N. D. Cal.), No. 3:13-cv-00457-JST. The court disposed of post-trial motions challenging the court's finding claims 1-15, 17 and 18 of the patent in this appeal, U.S. Patent No. 8,245,764 B2 (the '764 Patent), not invalid for obviousness, lack of written description or indefiniteness.

A copy of the aforementioned Order is attached.

If there is any fee due in connection with the filing of this Statement, please charge the fee to Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: October 5, 2015

By: ______________________
Eric P. Raciti
Reg. No. 41,475

Electronic Patent Application Fee Transmittal

Application Number:	95002386
Filing Date:	15-Sep-2012
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Filer:	Eric Paul Raciti/Karen Crespo
Attorney Docket Number:	COOL-1.012

Filed as Large Entity

Filing Fees for **inter partes reexam**

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Petitions to the Chief	1405	1	400	400
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
	Total in USD ($)			**400**

Electronic Acknowledgement Receipt

EFS ID:	23690001
Application Number:	95002386
International Application Number:	
Confirmation Number:	7254
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Customer Number:	22852
Filer:	Eric Paul Raciti/Karen Crespo
Filer Authorized By:	Eric Paul Raciti
Attorney Docket Number:	COOL-1.012
Receipt Date:	05-OCT-2015
Filing Date:	15-SEP-2012
Time Stamp:	14:11:25
Application Type:	inter partes reexam

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$400
RAM confirmation Number	450
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	Certificate_of_Service_Petition.pdf	319424 5c8cbed9ce9b61825bb8031e4d0db1a669ca600b	no	1
Warnings:					
Information:					
2	Petition under Rule 41.3 to Chief Admin Patent Judge	Petition_under_Rule_183.pdf	629346 5ecea128acc41bf90e7ace5abbddd9ba86521c03	no	4
Warnings:					
Information:					
3	Miscellaneous Incoming Letter	Certificate_of_Service_Updated_Notice_of_Concurrent_Proceedings.pdf	223333 40ab6146e3e1c71adb00014d648ee036295bf605	no	1
Warnings:					
Information:					
4	Notice of concurrent proceedings / decisions	Updated_Notice_of_Concurrent_Proceedings.pdf	292831 edce4af7215cc30adf49630371ba2b3cfc5b838e	no	2
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	30072 0a05c384f7a6f2e1edcdc8546e9326898b521c0f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1495006		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT
Customer No. 22,852
Attorney Docket Nos. 10494.8000

BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re Appeal of *Inter Partes* Reexamination of:	)
	)
André Sloth ERIKSEN	) Appeal No. 2015-007934
	)
U. S. Patent No. 8,245,764	) Control No.: 95/002,386
	)
Issued: August 21, 2012	) Group Art Unit: 3993
	)
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	) Examiner: Joseph A. Kaufman
	)

Patent Trial and Appeal Board
US Patent and Trademark Office
PO Box 1450
Alexandria, Virginia 22313-1450

Sir:

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 1.248 the undersigned attorney for the patent owner certifies that a true and complete copy of the Petition Seeking Waiver of 37 C.F.R. § 41.35(d) and § 41.63(c) As Necessary To Enter Updated Notice Of Concurrent Proceedings was served by certified U.S. mail on October 5, 2015, on counsel for the third-party requesters at the following address, with sufficient postage affixed and delivery confirmation requested:

Ganz Law, P.C.
P.O. Box 2200
Hillsboro, Oregon 97123

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: October 5, 2015

By:________________
Eric P. Raciti
Reg. No. 41,475

Customer No. 22,852
Attorney Docket No. 10494.8000

BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re Appeal of *Inter Partes* Reexamination of:	)	
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Patent Trial and Appeal Board
US Patent and Trademark Office
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Alexandria, Virginia 22313-1450

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CERTIFICATE OF SERVICE

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Ganz Law P.C.
163 Southeast 2nd Avenue,
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Dated: October 5, 2015

By: ______________________
Eric P. Raciti
Reg. No. 41,475

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Attorney Docket No. 10494.8000

BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re Appeal of *Inter Partes* Reexamination of:	)	
André Sloth ERIKSEN	)	Appeal No. 2015-007934
U. S. Patent No. 8,245,764	)	Control No.: 95/002,386
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Patent Trial and Appeal Board
US Patent and Trademark Office
PO Box 1450
Alexandria, Virginia 22313-1450

Sir:

UPDATED NOTICE OF CONCURRENT PROCEEDINGS

Patent Owner notifies the Patent Office that on September 22, 2015, Judge Tigar of the U.S. District Court for the Northern District of California entered an ORDER DENYING DEFENDANT'S POST-TRIAL MOTIONS; GRANTING IN PART AND DENYING IN PART PLAINTIFF'S POST-TRIAL MOTIONS on questions of infringement and validity in *Asetek Danmark A/S v. CMI USA, Inc.,* (N. D. Cal.), No. 3:13-cv-00457-JST. The court disposed of post-trial motions challenging the court's finding claims 1-15, 17 and 18 of the patent in this appeal, U.S. Patent No. 8,245,764 B2 (the '764 Patent), not invalid for obviousness, lack of written description or indefiniteness.

A copy of the aforementioned Order is attached.

If there is any fee due in connection with the filing of this Statement, please charge the fee to Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: October 5, 2015

By: ____________________
Eric P. Raciti
Reg. No. 41,475

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

ASETEK DANMARK A/S,
Plaintiff,

v.

CMI USA, INC.,
Defendant.

Case No. 13-cv-00457-JST

ORDER DENYING DEFENDANT'S POST-TRIAL MOTIONS; GRANTING IN PART AND DENYING IN PART PLAINTIFF'S POST-TRIAL MOTIONS

Re: ECF Nos. 266, 267, 269

This patent infringement case was tried to a jury in December 2014. ECF No. 189. On December 17, 2014, the jury returned a verdict in favor of Plaintiff Asetek Danmark A/S ("Asetek"), finding that Defendant CMI USA, Inc. ("CMI")'s products infringed United States Patents Nos. 8,240,362 and 8,245,764 ("'362 patent" and "'764 patent"). ECF Nos. 218, 219.

Now before the Court are three sets of post-judgment motions: (1) CMI's motions for entry of judgment as a matter of law under Federal Rule of Civil Procedure 50(b)(3) and for a new trial under Federal Rule of Civil Procedure 50(b)(2) or 59 (ECF No. 269); (2) Asetek's motion for entry of a permanent injunction (ECF No. 266); and (3) Asetek's motion for supplemental damages and prejudgment interest (ECF No. 267). For the reasons set forth below, the motion for entry of judgment as a matter of law is denied, the motion for a new trial is denied, the motion for entry of permanent injunction is granted, and the motion to alter the judgment is granted in part and denied in part.

I. BACKGROUND

Asetek is a Denmark-based corporation that sells liquid cooling systems for data centers, servers, workstations, and personal computers. ECF No. 1, ¶¶ 1, 11, 12. It owns the '764 and '362 patents by assignment. ECF No. 118 at 1. The patents relate to devices that use liquid to cool computer components. See ECF No. 1, Exs. A, B.

On January 31, 2013, Asetek filed suit against CMI for infringement of claims 14, 15, and 17-19 of the '362 patent, and claims 1-15, 17, and 18 of the '764 patent, by the following CMI products: (1) Cooler Master Seidon 120M, 120XL, and 240M; (2) Cooler Master Seidon 120V and 120V Plus; (3) Cooler Master Glacer 240L; and (4) Cooler Master Nepton 140XL and 280L. ECF No. 1; ECF No. 130 at 1. In its complaint, Asetek "demand[ed] a jury trial on all matters triable to a jury." ECF No. 1 at 7.

A. Claim construction

This case was consolidated for claim construction with another patent-infringement suit brought by Asetek involving the '362 and '764 patents. See ECF No. 35 at 1 & n.1. Judge Edward M. Chen presided over the joint claim construction proceeding. Id. Judge Chen's claim construction order addressed several terms relating to the claims in dispute at trial. See id. Judge Chen declined to construe the term "substantially circular passages," and instead adopted the plain and ordinary meaning of that term. Id. at 12-14. The parties did not include the term "removably attached" or "removably coupled" in their joint claim construction statement, and Judge Chen did not construe them. See ECF Nos. 31, 35.

B. Summary judgment

CMI then moved for summary judgment of invalidity of the '362 and '764 patents and non-infringement of the '362 patent. ECF No. 86. CMI argued that the '362 and '764 patents were invalid as both anticipated and obvious. See ECF Nos. 86, 106. Genuine issues of material fact prevented the Court from determining whether CMI's products met the "reasonably attached/coupled" limitation. ECF No. 126 at 14. The Court also determined that the terms "removably coupled" and "removably attached" did not require construction, because they would not be unfamiliar or confusing to a jury. Id. at 14 n.6. The Court denied CMI's motion for summary judgment in full.

C. Pre-trial and trial

The matter then proceeded to trial. In the parties' joint pre-trial statement, CMI stated that it contested infringement only of the '362 patent, and not of the '764 patent. See ECF No. 130 at

United States District Court
Northern District of California

4-5. CMI also asserted that the '764 and '362 patents were invalid as anticipated, obvious, and indefinite, and because they lacked adequate written descriptions. See id.

Jury selection began on December 2, 2014. On December 17, 2014, the jury returned a verdict in Asetek's favor. ECF No. 219. The jury found that all of the accused products infringed the claims of the '362 patent, and that CMI's products contributorily infringed the asserted method claims of the '362 patent. Id. at 1-2. The jury also found that the '764 patent was not invalid as anticipated by the Koga prior art reference.[1] Id. at 2. The jury also rendered several decisions related to the question of obviousness. First, the jury found that a person of ordinary skill in the field of liquid cooling at the time of the inventions claimed in the '764 and '362 patents was:

> [S]omeone who has completed college level course work in thermodynamics, fluid mechanics, and heat transfer, and would have two or more years of experience in designing liquid cooling systems for computers or very similar technology or one with a more advanced degree in the above fields [who] may have had less practical experience.

Id. at 3. Second, the jury described the scope and content of the prior art at the time of the claimed invention as follows:

> The prior art devices included a pump, a single-chamber reservoir (as that term was used in the prior art), and a cold plate as separate components that were connected using tubing or attached together with clips or screws or perm[an]ently coupled. Certain prior art devices had a pump and a cold plate incorporated into a single swirl chamber, which provided no separation between the pumping and the heat exchange functionalities of the liquid cooling device.

Id. Third, the jury determined the differences that existed between the claimed invention and the prior art at the time of the invention. The differences included:

> Asetek's patented invention is directed to a closed loop liquid cooling system in which cooling liquid is pumped continuously between a pump head and a heat radiator (positioned remote from the pump head). Rather than connecting together multiple separate components (as in the prior art), Asetek's patented pump head design combines, into a single unit, a pump and the claimed "reservoir" that has, among other things, dual chambers and is

[1] The parties do not dispute that U.S. Patent No. 7,554,049 to Koga et al. ("Koga"), Korean Patent No. 20-0314041 to Ryu ("Ryu"), and U.S. Publication No. 2004/0052663 to Laing et al. ("Laing") are prior art to Asetek's patents. ECF No. 235 at 4; ECF No. 236 ¶¶ 19-27.

> bounded by a removable cold plate. Also, the claimed "reservoir" in Asetek's invention is a single receptacle that is divided into an upper chamber and a lower chamber, with the upper chamber providing the pumping function and the lower chamber providing the thermal exchange function. In addition to providing efficient heat removal, Asetek's patented invention includes at least one of the following benefits over each example of prior art: a compact (narrow) profile, cost-effective manufacturing, and reduced risk of fluid leakage.

Id. at 4. Finally, the jury found that Asetek established all objective indicia of non-obviousness that Asetek sought to prove at trial, including: (1) "commercial success of [the] product[s] due to the merits of the claimed invention"; (2) "a long-felt need for the solution that is provided by the claimed invention"; (3) "unsuccessful attempts by others to find the solution that is provided by the claimed invention"; (4) "copying of the claimed invention by others"; (5) "unexpected and superior results from the claimed invention"; and (6) "acceptance by others of the claimed invention as shown by praise from others in the field or from the licensing of the claimed invention." Id.

The jury also determined that Asetek was entitled to $404,941 in damages, representing a 14.5% royalty rate on CMI's sales of infringing products. ECF No. 219 at 5.

D. Post-trial

On January 26, 2015, CMI filed its proposed findings of fact and conclusions of law, as well as its memorandum of points and authorities in support of its defenses. ECF Nos. 234, 235. On February 9, 2015, Asetek filed its responsive proposed findings of fact and conclusions of law. ECF No. 236.

On April 21, 2015, the Court issued its findings of fact and conclusions of law, ECF No. 249. The Court concluded that CMI failed to show by clear and convincing evidence that the '362 and '764 patents were invalid for obviousness, lack of written description, or indefiniteness. CMI, in a post-trial brief, argued that the term "substantially circular passages" was indefinite. See ECF No. 234 at 15-16. But the Court found that CMI waived its indefiniteness defense by not pursuing it at trial. ECF No. 249 at 28. The Court also noted that CMI did not raise the argument that the term "removably attached" was indefinite in its post-trial briefing, and that CMI could not properly pursue the issue at trial. Id.

The parties have now filed various post-trial motions, including CMI's renewed motion for judgment as a matter of law and motion for a new trial, and Asetek's motion for a permanent injunction and motion for supplemental damages.

II. CMI'S MOTION FOR ENTRY OF JUDGMENT AS A MATTER OF LAW

On June 30, 2015, CMI filed its renewed motion for judgment as a matter of law and motion for a new trial. ECF No. 269. CMI argues that the non-infringement should be granted as a matter of law because the accused products do not infringe the '362 patent as a matter of law and consequently, do not contributorily infringe, and that substantial evidence does not support the jury's finding of a 14.5% royalty rate. See id.

A. Legal standard

Under Federal Rule of Civil Procedure 50, "a party must make a Rule 50(a) motion for judgment as a matter of law before a case is submitted to the jury. If the judge denies or defers ruling on the motion, and if the jury then returns a verdict against the moving party, the party may renew its motion under Rule 50(b)." E.E.O.C. v. Go Daddy Software, Inc., 581 F.3d 951, 961 (9th Cir. 2009). In considering a renewed motion for judgment as a matter of law, under Rule 50(b)(3), the court must uphold the jury's verdict if "substantial evidence" supports the jury's conclusion. Johnson v. Paradise Valley Unified Sch. Dist., 251 F.3d 1222, 1227 (9th Cir. 2001).[2] "Substantial evidence is evidence adequate to support the jury's conclusion, even if it is also possible to draw a contrary conclusion from the same evidence." Id. The court must "view all the evidence in the light most favorable to the nonmoving party, draw all reasonable inferences in the favor of the nonmover, and disregard all evidence favorable to the moving party that the jury is not required to believe." Castro v. Cnty. of Los Angeles, 785 F.3d 336 (9th Cir. 2015); see also Reeves v. Sanderson Plumbing Prods., Inc., 530 U.S. 133, 151 (2000). Judgment as a matter of law "is appropriate when the jury could have relied only on speculation to reach its verdict." Lakeside-Scott v. Multnomah Cnty., 556 F.3d 797, 803 (9th Cir. 2009).

[2] In reviewing motions for judgment as a matter of law, the Federal Circuit applies the law of the regional circuit in which the district court is located. See, e.g., Enovsys LLC v. Nextel Commc'ns, Inc., 614 F.3d 1333, 1341 (Fed. Cir. 2010).

B. Analysis

1. The jury's determination that CMI's products meet the "removably attached" limitation

CMI contends that the accused products do not infringe the '362 patent as a matter of law because the products do not meet the "reasonably attached" or "reasonably coupled"[3] limitations. ECF No. 269 at 3. Claim 14 requires "the heat exchanging interface" to be "removably attached to the reservoir," while claim 17 requires "the heat exchanging interface" to be "removably coupled to the reservoir." All of the asserted claims of the '362 patent contain the structural limitation between the heat exchanging interface and the reservoir because Claim 15 depends on Claim 14 and Claims 18 and 19 depend on Claim 17. The jury found that the Seidon, Seidon 120V, Nepton, and Glacer 240L infringed all claims of the '362 patent, including claims 14 and 17. See ECF No. 219 at 1.

a. Standard of review

CMI and Asetek disagree as to the legal standard the Court should apply in reviewing the jury's finding of infringement. CMI argues that the Court should review the jury's verdict *de novo*, because "there is no material dispute regarding the operation of the accused products" and "[i]nfringement instead turned on applying the ordinary meaning of the 'removably attached' and 'substantial circular passageway' limitations." ECF No. 269 at 9 (citing MyMail, Ltd. v. Am. Online, Inc., 476 F.3d 1372 (Fed. Cir. 2007) and K-2 Corp. v. Salomon S.A., 191 F.3d 1356 (Fed. Cir. 1999)). Asetek argues that the question of CMI's infringement is a factual question that must be reviewed "for substantial evidence." ECF No. 286 at 10 (quoting Uniloc USA, Inc. v. Microsoft Corp., 632 F.3d 1292, 1301 (Fed. Cir. 2011)).

MyMail and K-2 do not assist the Court. In those cases, the trial courts had construed disputed patent terms and granted summary judgment of non-infringement, requiring the Federal Circuit to resolve issues of claim interpretation on appeal. See MyMail, 476 F.3d at 1375; K-2

[3] Both parties use the terms "removably attached" and "removably coupled" interchangeably. See ECF No. 269 at 2 n.2; ECF No. 286 at 5 n.3.

Corp., 191 F.3d at 1362. Here, the term "removably attached" was not disputed during claim construction,[4] and it was not until its reply brief in support of summary judgment that CMI suggested to the Court that the term be construed.[5] CMI made no mention of the term in its pretrial filings and did not seek to construe the term in its proposed jury instructions. ECF No. 205 at 4; see Hewlett-Packard Co. v. Mustek Sys., Inc., 340 F.3d 1314, 1320-21 (Fed. Cir. 2003) (where the parties and district court elect to provide the jury only with the claim language itself, "it is too late at the JMOL stage to argue for or adopt a new and more detailed interpretation of the claim language and test the jury verdict by that new and more detailed interpretation"). Thus, this Court tests the jury's verdict under the plain meaning of "removably attached," see id. at 1320 ("On JMOL, the issue here should [be] limited to the question of whether substantial evidence supported the verdict under the agreed instruction"), and examines whether substantial evidence supports the jury's conclusion that CMI's products infringe the '362 patent under the plain meaning of the "removably attached" limitation.

b. Ordinary meaning of the terms

CMI argues that the jury erred in applying the "removably coupled" and "removably attached" limitations, because whatever plain meaning the jury applied was at odds with the definition given to the term "removably attached" in another case involving children's car seats. Dorel Juvenile Group, Inc. v. Graco Children's Prods., 429 F.3d 1043 (Fed. Cir. 2005).

In Dorel, the Federal Circuit vacated a grant of summary judgment of non-infringement and remanded the case to the district court to determine, as a matter of fact, whether the accused child's car seat met the limitations of the asserted claims. Id. at 1047. The accused product consisted of two plastic parts: the top portion where the child sat and the bottom base upon which

[4] Although CMI originally requested that the Court construe the term "removably coupled," ECF No. 107 at 2, 107-3 at 3, it dropped that request in the parties' Joint Claim Construction and Prehearing Statement filed with the Court. ECF No. 31. Thereafter, CMI did not request construction of the term "removably attached" at all.

[5] CMI suggested in its reply brief that the Court should construe the "removably attached" limitation so as not to cover the accused products secured with security screws with triangular heads. See ECF No. 106 at 14-15.

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the seat fit. Id. at 1045. The base was "removably attached and arranged to support the seat," and the pieces were held together by screws, either "of the ordinary variety" or "one-way screws." Id. In giving the ordinary meaning to the terms "removably attached" and "removably secured," the district court concluded that the "claimed product is designed to come apart." Id. And the seat and base did not need to come apart during normal usage or be easily removed. Id. at 1045. To the district court, the "removable" limitations therefore meant that "[t]he seat and base can be separated 'in a manner that contemplates that the seat may be removed from the base such that the seat remains functional.'" Id. at 1046. The Federal Circuit held that the district court correctly interpreted the contested "removable" limitations as understood through the plain meaning of the claim language and "as tested by information in the specification." Id.

CMI argues that the Court should have construed the "removably" limitations of Asetek's patents to require that the product "remain functional," just as the Dorel court did, and having not done so, should now correct what it perceives to be the jury's error. CMI argues that its products are not designed to come apart during the products' lifetime and doing so would render the products unusable; thus, no reasonable jury could think the "removably attached" limitation applied. ECF No. 269 at 8-10.

CMI's argument[6] rests on a faulty premise: that a term that has a plain meaning in one context has the same plain meaning in all others. In fact, however, the opposite is true – the words of a claim are construed in the context of *that claim* and *that patent* as a whole. World Class Tech. Corp. v. Ormco Corp., 769 F.3d 1120, 1123 (Fed. Cir. 2014). "We apply . . . the principle that '[t]he construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction.'" In re Papst Licensing Digital Camera Patent Litig., 778 F.3d 1255, 1261 (Fed. Cir. 2015) (quoting Renishaw PLC v. Marposs Societa' per Azioni, 158 F.3d 1243, 1250 (Fed. Cir. 1998). Thus, our courts have been careful to construe the terms of a patent in the context of that patent. E.g., In re Katz Interactive Call Processing Patent, No. 07-CV-2134, 2012 WL 10997174, at *2 (C.D. Cal. Apr. 26, 2012);

[6] CMI never cited Dorel at any time prior to entry of judgment.

I-Flow Corp. v. Apex Med. Technologies, Inc., No. 07CV1200 DMS (NLS), 2008 WL 2899822, at *4 (S.D. Cal. July 25, 2008); Hilleby v. FMC Corp., No. C-91-568 FMS, 1992 WL 455435, at *4 (N.D. Cal. July 28, 1992). And a word that has a certain plain meaning in one context can have a different plain meaning in another context.[7] A child's car seat works differently from a liquid cooling device for a computer.

CMI points to nothing in the language of the patent requiring that the product be functional once the cooling plate is removed, and there is nothing in the words "removably attached" that themselves remotely suggest such a construction. Even Dorel explains that the ordinary meaning term "removably attached" is that the two joining parts are "capable of separation" or "designed at some time or another to come apart." See id. at 1045-46. The Court will continue to apply the plain and ordinary meaning of the term. The plain language of the claim counsels against the narrow interpretations proposed by CMI. See Phillips v. AWH Corp., 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (*en banc*) ("[T]he words of a claim 'are generally given their ordinary and customary meaning' . . . that the term would have to a person of ordinary skill in the art in question at the time of the invention.").

c. Substantial evidence supports the jury's verdict

The Court concludes that substantial evidence supports the jury's conclusion that the accused products infringed the '362 patent with the "removably attached" limitation. At trial, Asetek's expert, Dr. David Tilton testified that the thermal-exchange interface was attached to the reservoir in a way that is removable. ECF No. 198 (Transcript 12/08/2014) 646:7-10. Dr. Tilton stated that for each product, the thermal exchange interface could be removed by taking out the

[7] There is nothing groundbreaking about the observation that meaning depends on context. When Raymond Chandler and J.D. Salinger each use the word "grand," its meaning is plain to the reader, even though it means something very different in each context. Compare Raymond Chandler, "Blackmailers Don't Shoot," Black Mask, Dec. 1933 ("The letters will cost you ten grand, Miss Farr.") with J.D. Salinger, The Catcher In The Rye 9 (1951) ("Then he said, 'I had the privilege of meeting your mother and dad when they had their little chat with Dr. Thurmer some weeks ago. They're grand people.'"). A claim term's ordinary meaning also depends on context. See Biogen Idec, Inc. v. GlaxoSmithKline LLC, 713 F.3d 1090, 1095 (Fed. Cir. 2013) ("[A] term's ordinary meaning must be considered in the context of all the intrinsic evidence, including the claims, specification, and prosecution history.").

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screws, thus concluding that the "removably attached" limitation applied to all of the accused products. See Tr. 622:19-22 (narrating the removal of the interface on the Seidon 120M), 627:24-25 (narrating the removal of the interface on the Seidon 120V), 629:5-10 (narrating the removal of the interface on the Glacer 240L), and 631:21-25 (narrating the removal of the interface on the Nepton 140XL). As Dr. Tilton testified with regard to CMI's Seidon 120M product:

> **Q.** So here we see the screw being removed. Is that right?
>
> **A.** Yeah. You just taken the last screw out so that we can take the thing apart. And you can see the interior features. So this is the thermal-exchange interface. And it's removable, as required by the claims. It's coming off of the device.

Tr. 622:18-623:22. Dr. Tilton went on to explain that he had also personally removed screws from the accused products, including products using triangular-head screws, using commercially available screwdrivers. Tr. 646:22-647:19. Dr. Tilton then concluded that the Seidon products and the Glacer 240L infringed on Claim 14 of the '362 patent. See Tr. 658:3-6. Dr. Tilton also concluded that the Seidon 120V and the Nepton products met the limitation of Claim 17. See Tr. 666:3-17.

CMI's expert, Dr. Gregory Carman, disagreed that the "removably attached" limitation was met by all of CMI's products. However, during cross-examination, Dr. Carman agreed that he was able to remove the thermal exchange interfaces from the accused products. See ECF No. 200 (Transcript 12/09/2014) 819:10-24. For example, he testified:

> **Q.** Okay. The claim doesn't say anything about the means by which the cold plate can be removed. It simply says "removable"; right?
>
> **A.** That is correct.
>
> **Q.** And you were able to remove all the cold plates; right?
>
> **A.** That is correct.

Tr. 820:23-821:3.

The jury considered this testimony, and credited it. The Court concludes that substantial evidence supports the jury's findings that the accused products meet the "removably attached" and "removably coupled" limitations.

2. The jury's determination that CMI's products meet the "substantially circular passageway" limitation

Next, CMI contends that its products do not infringe the '362 patent as a matter of law because the products do not meet the "substantially circular passageway" limitation. Claim 14 recites that the upper and lower chamber of the reservoir be "fluidly coupled together by one or more passageways, at least one of the one or more passageways being a *substantially circular passageway* positioned on the horizontal wall . . . ." (emphasis added). Claim 15 depends on Claim 14. During claim construction, the Court adopted the plain and ordinary meaning of the term. See ECF No. 35 at 12-13. At trial, the jury found that the Seidon products and the Glacer 240L infringed Claims 14 and 15. See ECF No. 219 at 1.

CMI contends that because Asetek alleged only literal infringement, and not infringement under the doctrine of equivalents, the limitation must read exactly on CMI's products. See DeMarini Sports, Inc. v. Worth, Inc., 239 F.3d 1314, 1331 (Fed. Cir. 2001) ("Literal infringement of a claim occurs when every limitation recited in the claim appears in the accused device, i.e., when 'the properly construed claim reads on the accused device exactly.'"). CMI points out that its products have "fan-shaped" passageways, none of which by itself is "substantially circular." ECF No. 269 at 11. CMI contends that because none of its accused devices have at least *one* singular passageway that is "substantially circular," no reasonable jury could find that the CMI products literally met the "substantially circular passageway" limitation. Id.

At trial, however, the jury heard Dr. Tilton testify that the passageway was still substantially circular, even though the ribs divide it into several "sections" or "segments":

> **Q.** So is it fair to say that in your opinion, those are three different segments of a substantially -- a single, substantially circular passageway?
>
> **A.** Well, yeah. There's one passage there. It's the passage where the fluid goes from this chamber up into the impeller.

ECF No. 198 (Transcript 12/08/2014) 643:18-22. Dr. Tilton testified that the passageway was "obviously substantially circular" with only "a couple of ribs dividing." Tr. 642:11-12. He also explained that the fluid could only enter properly through a substantially circular passageway, otherwise the pump would not function properly. Tr. 642:20-13. Specific to the Glacer 240L, Dr. Tilton agreed that in the product had a "perfectly circular . . . lower half, but . . . does have the ribs in . . . the exit point in the upper half." Tr. 645:13-16.

CMI's motion must be denied, because there is sufficient evidence that supports the jury's verdict of infringement. See Johnson, 251 F.3d at 1227 (9th Cir. 2001).

3. The jury's determination that CMI was liable for contributory infringement

Next, CMI argues that the evidence was insufficient to support the jury's finding that it contributorily infringed the '362 patent.[8] CMI now makes the same motion again.

"In order to succeed on a claim of contributory infringement, in addition to proving an act of direct infringement, plaintiff must show that defendant 'knew that the combination for which its components were especially made was both patented and infringing' and that defendant's components have 'no substantial non-infringing uses.'" Cross Med. Prods., Inc. v. Medtronic Sofamor Danek, Inc., 424 F.3d 1293, 1312 (Fed. Cir. 2005) (quoting Golden Blount, Inc. v. Robert H. Peterson Co., 365 F.3d 1054, 1061 (Fed. Cir. 2004)). Once the plaintiff makes a prima facie showing that defendant's product is not suitable for substantial non-infringing use, the burden of demonstrating a non-infringing use shifts to the defendant. Golden Blount, 438 F.3d at 1363.

CMI first argues that because CMI products did not directly infringe the '362 patent, CMI could not contributorily infringe. ECF No. 269 at 13. CMI also argues that it did not commit contributory infringement because no reasonable jury could find that CMI had knowledge that its products infringed Asetek's patents. Id.

As discussed previously, substantial evidence supports the jury's conclusion that CMI directly infringed the '362 patent. As to CMI's knowledge of Asetek's patents and CMI's own

[8] CMI orally moved at trial for a directed verdict on Asetek's contributory infringement claim. See ECF No. 213 (Transcript 12/15/2014) 1482:16-1485:25. The Court denied CMI's motion, finding that Asetek submitted sufficient evidence on its contributory infringement claim from which a reasonable jury could find in Asetek's favor. ECF No. 232 at 4.

infringement of them, Asetek sent a case-and-desist letter to CMI on November 28th, 2012 accusing CMI's products of infringing Asetek's patents. See Tr. 1490:3-12 (Trial Exhibit 372). A reasonable jury could conclude that CMI had knowledge of its infringement from that day forward. As to whether defendant's components have no substantial non-infringing use, Dr. Tilton testified that CMI's products infringed Asetek's patents and that the products had no non-infringing uses. ECF No. 198 (Transcript 12/8/14) 669:4-7, 672:5-9. CMI's General Manager, Danny Chen, also testified that CMI sells its products with instruction manuals showing purchasers how to install CMI products so as to provide liquid cooling for computers, i.e., in a manner that infringes on Asetek's patents. See ECF No. 203 (Transcript 12/11/14) 1078:11-14, 1094:7-1095:16. The "instructions packaged with each device teach the infringing configuration and nothing in the record suggests that . . . any end-user ignored the instructions or assembled the [products] in a manner contrary to the instructions so as to form a non-infringing configuration." Golden Blount, 438 F.3d at 1363.

Substantial evidence supports the jury's conclusion that CMI is liable for contributory infringement.

4. The 14.5% royalty rate

Finally, CMI argues evidence does not support the jury's finding of a 14.5% royalty rate and the damages award of $404,941 based on that award. ECF No. 269 at 13. CMI and Asetek dispute whether Asetek's expert, Dr. Nisha Mody, performed a proper reasonable royalty analysis.

Upon a finding of infringement, the patentee is entitled to "damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer." 35 U.S.C. § 284; see also Rite-Hite Corp. v. Kelley Co., 56 F.3d 1538, 1554 (Fed. Cir. 1995) (*en banc*). When a patentee is unable to prove entitlement to lost profits or an established royalty rate, "it is entitled to 'reasonable royalty' damages based upon a hypothetical negotiation between the patentee and the infringer when the infringement began." Unisplay, S.A. v. Am. Elec. Sign Co., 69 F.3d 512, 517 (Fed. Cir. 1995). "This hypothetical construct seeks the percentage of sales or profit likely to have induced the hypothetical negotiators

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to license use of the invention." Minco, Inc. v. Combustion Eng'g, Inc., 95 F.3d 1109, 1119 (Fed.Cir.1996). A reasonable royalty is determined by examining the factors set forth in Georgia-Pacific Corp. v. United States Plywood Corp., 318 F. Supp. 1116 (S.D.N.Y. 1970), which are: (1) royalties the patentee receives for licensing the patent in suit, (2) rates the licensee pays for other comparable patents, (3) the exclusivity and restriction terms, (4) the Licensor's policy to maintain patent monopoly by not licensing the invention to others, (5) the commercial relationship between the two parties, (6) effect of selling the patented specialty in promoting sales of other products, (7) duration of patent and term of license, (8) established profitability of the products made under the patent, (9) advantages of the patented component over old components, (10) the nature of the patented invention, (11) the extent to which the infringer has used the invention, (12) the portion of profit customarily allowed for use of the invention, (13) the portion of profit attributable to the invention, (14) expert testimony, and (15) outcome from hypothetical arm's length negotiation at the time of infringement. Id. at 1119-20.

Although this analysis "necessarily involves an element of approximation and uncertainty, a trier of fact must have some factual basis for a determination of a reasonable royalty."[9] Unisplay, 69 F.3d at 517. The amount of damages based on a reasonably royalty is an issue of fact, and the jury's damages award is reviewed under the substantial evidence standard. See Micro Chemical, Inc. v. Lextron, Inc., 317 F.3d 1387.

Asetek's expert, Dr. Mody, calculated a reasonable royalty rate of 16% but found the effective rate to be between 10% and 19%. ECF No. 200 (Transcript 12/09/2014) Tr. 854:8-12, 862:24-863:2. Dr. Mody testified that she used the Georgia-Pacific factors in determining the reasonable royalty rate, and identified to the jury how the various factors applied to the products and patents at issue. Tr. 854:13-863:6. Dr. Mody started by looking at the patent license

[9] Not all Georgia-Pacific factors are relevant to any particular hypothetical negotiation. Gargoyles, Inc. v. United States, 37 Fed. Cl. 95, 103 aff'd, 113 F.3d 1572 (Fed. Cir. 1997); Damien Geradin, The Meaning of "Fair and Reasonable" in the Context of Third-Party Determination of FRAND Terms, 21 Geo. Mason L. Rev. 919, 949 (2014) ("not all of the Georgia-Pacific factors will be relevant to every question regarding the fairness and reasonableness of proffered license terms"). These factors are not prioritized and may overlap. See ResQNet.com, Inc. v. Lansa, Inc., 594 F.3d 860, 869 (Fed. Cir. 2010).

agreement between Asetek and Corsair and took into account the value Asetek attributed to its intellectual property through the license. Tr. 856:21-858:5. Dr. Mody also looked at the benefits incorporated into the agreement, which included not only a royalty on products covered by Asetek's patents, but also purchases from Asetek directly. Based on that analysis, she concluded that a reasonable royalty would be in the range of 10% to 19%. Tr. 858:15-859:5; 865:24-866:4. Dr. Mody then testified that 14.5% is the middle of the range, and that certain Georgia-Pacific factors would pull the royalty rate below or above the midpoint, such as whether Asetek held a patent monopoly and the competitive relationship between Asetek and CMI. Tr. 866:8-869:1 (discussing Georgia-Pacific factors 3, 4, and 5). Dr. Mody also discussed how Asetek and CMI's commercial success affected her analysis. Tr. 872:3-873:5.

Dr. Mody also testified that it would not be practical to make Asetek's business relationship with Corsair equivalent to Asetek's business relationship with CMI because CMI competes with Asetek, whereas Corsair does not. Tr. 857:10-871:21. Dr. Mody then testified that a reasonable royalty rate would be higher at the hypothetical negotiation between Asetek and CMI because of this competitive relationship. Tr. 882:2-16. Overall, Dr. Mody concluded that a reasonable royalty rate would be 16%. Tr. 854:8-12.

CMI argues that instead of properly applying the Georgia-Pacific factors, Dr. Mody computed a "pseudo lost profits analysis." ECF No. 269 at 10. CMI's expert, James Pampinella, testified that Dr. Mody misapplied the Georgia-Pacific factors and made faulty assumptions in arriving at her royalty rate figure. See, e.g., Tr. 972:19-973:6 ("She's basically implicitly assuming a lost-profits claim in that analysis."). Mr. Pampinella also described his own analysis for the reasonable royalty rate he calculated starting with the Corsair license and applying the Georgia-Pacific factors. Tr. 933:14-939:8. Mr. Pampinella concluded that Asetek would have agreed to license with a 4.5% royalty rate. Tr. 923:14-15.

The jury weighed both experts and found that Asetek proved it was entitled to a reasonable royalty rate of 14.5%. Dr. Mody's testimony, and her discussion of the application of the Georgia-Pacific factors, provided sufficient evidence to support the jury's royalty rate.

The Court denies CMI's motion for entry of judgment as a matter of law.

III. CMI'S MOTION FOR A NEW TRIAL

CMI also argues that a new trial is warranted because the Court made several clearly erroneous findings of fact predicate to rejecting CMI's invalidity defenses, and because certain jury instructions unfairly prejudiced CMI.

A. Legal standard

Under Federal Rule of Civil Procedure 50(b)(2) a new trial may be granted if there is not a "legally sufficient evidentiary basis" for the verdict. The district court has discretion to order a new trial rather than grant judgment as a matter of law. See Cone v. West Virginia Pulp & Paper Co., 330 U.S. 212, 215 (1947).

Under Federal Rule of Civil Procedure 59(a)(1), a court "may, on motion, grant a new trial on all or some of the issues." A court may grant a new trial "if the verdict is contrary to the clear weight of the evidence, is based upon false or perjurious evidence, or to prevent a miscarriage of justice." Molski v. M.J. Cable, Inc., 481 F.3d 724, 729 (9th Cir. 2007). A judge should not grant a new trial unless she "is left with the definite and firm conviction that a mistake has been committed." Landes Constr. Co. v. Royal Bank of Canada, 833 F.2d 1365, 1371-72 (9th Cir. 1987) (internal citations omitted). In considering a Rule 59(a) motion for a new trial, the Court "is not required to view the trial evidence in the light most favorable to the verdict. Instead, the district court can weigh the evidence and assess the credibility of the witnesses. Experience Hendrix L.L.C. v. Hendrixlicensing.com Ltd, 762 F.3d 829, 842 (9th Cir. 2014)

B. Analysis

CMI argues that the Court should grant a new trial pursuant to Rule 50 because the evidence was insufficient to support the jury's verdict. The motion must be denied on this ground for the same reason the Court denied CMI's motion for judgment as a matter of law.

CMI also advances additional arguments in support of its motion for new trial, however, that the Court addresses below.

///

1. Clearly erroneous findings of fact

CMI contends that a new trial on the invalidity of the '764 patent is warranted under Rule 59 because several findings of fact predicate to rejecting CMI's invalidity defenses are clearly erroneous. ECF No. 269 at 16. CMI challenges the factual finding that a "sucking channel" in the Koga prior art reference does not meet the "thermal exchange chamber" limitation in the '764 patent.[10] CMI argues, as it did at trial, that so long as the sucking channel exchanges *some* heat, which Dr. Tilton admits the sucking channel does, it meets the "thermal exchange" limitation. Id. at 17-18.

The Court, in its Order Entering Judgment in Favor of Asetek, accepted "the jury's implicit and explicit factual findings regarding the scope and content of the prior art, and the differences between the claimed invention and the prior art" because they were supported by substantial evidence. ECF No. 249 at 18. With respect to the Koga prior art reference, the Court concluded that CMI had not shown that a person of ordinary skill in the art would understand Koga's sucking channel to constitute a thermal exchange chamber. Id. The Court set forth several reasons supported by Dr. Tilton's testimony: the sucking channel's purpose was as a conduit delivering cooling fluid, the heat drawn off in the sucking channel was inconsequential, Koga teaches away from having the sucking channel sit on top of the thermal contact for effective heat transfer and cooling, and Koga did not disclose or suggest that the sucking channel exhibit heat-exchange features. Id. at 18-19.

While the Koga sucking channel may exchange some heat, CMI has not demonstrated how this meets the "thermal exchange chamber" limitation. First, both Dr. Tilton and Dr. Carman testified that the primary purpose of the sucking channel was to serve as a conduit in delivering fluid. See ECF No. 213 (Transcript 12/15/2014) 1417:1-4 (Dr. Tilton testifying, "It's a fluid passage. . . . It only has one purpose, and that's to deliver fluid to the rotational center of the impeller."); ECF No. 215 (Transcript 12/16/2015) 1645:9 (Dr. Carman responding to a jury

[10] CMI also argues that the finding that the "water jacket" in the Ryu prior art reference does not meet the "thermal exchange chamber" limitation as similarly flawed. See ECF No. 269 at 18 n.9.

question: "The primary purpose [of the sucking channel] is to pass fluid to the pump room."). Second, while the fluid may pick up heat, Dr. Tilton also testified that this is an inconsequential amount; and that this would occur anytime the surface was hotter than fluid flowing from that surface. Tr. 1418:5-25. Third, Dr. Tilton also testified that the Koga sucking channel is not a chamber, but rather, a conduit. Tr. 1417:5-25.

At bottom, the biggest problem with CMI's argument is that it defies common sense. Under CMI's theory, any kind of liquid container would be a thermal exchange chamber, since – as Asetek expert Dr. Tilton explained – "heat transfer will always happen between any two bodies that are at—at different temperatures." Tr. at 1558:10-11. To take the colorful example in Asetek's brief, even an insulated beer cooler would qualify as a "thermal exchange chamber" under CMI's construction, because its insulation, being imperfect, will transfer some amount of heat from the outside air to the beer inside the cooler. The jury was within its rights to reject this theory.

CMI also cites Abbott Labs v. Sandoz, Inc., 566 F.3d 1282, 1299 (Fed. Cir. 2009) and Embrex Inc. v. Serv. Eng'g Corp., 216 F.3d 1343, 1352-53 (Fed. Cir. 2000). Abbott Labs and Embrex do not assist CMI's contention. Those cases stand for the proposition that *de minimis* infringement is still infringement. Abbott Labs, 566 F.3d at 1299; Embrex, 216 F.3d at 1352-53. But infringement is not at issue here. Neither Abbott Labs nor Embrex addresses the question of the extent to which an item of prior art must meet the structural limitations of a claim before that art is relevant to the question of obviousness. And to the extent CMI is proceeding by way of analogy, the analogy is inapt.

The Court finds that sufficient evidence supports the jury's finding that the sucking channel is not a thermal-exchange chamber. The Court declines to adopt CMI's argument that the sucking channel meets the "thermal exchange chamber" as a matter of law.

2. Clear weight of trial evidence

CMI next argues that because Koga's sucking channel meets the thermal exchange chamber limitation as a matter of law, a new trial on the invalidity of the '764 patent is warranted

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under Rule 59. However, the Court concludes that CMI has not shown that rejection of CMI's invalidity defenses was against the clear weight of the evidence at trial.

Next, CMI asserts that the clear weight of trial evidence shows that the asserted claims of the '362 patent and the '764 patent are anticipated or rendered obvious over the prior art presented at trial, but makes no argument in support of this claim. Instead, CMI merely incorporates by reference 38 pages of its prior briefs. See ECF No. 269 at 19 (incorporating by reference ECF No. 234 at 1-14 and ECF No. 235 at 2-23). CMI having made no argument, the Court will not address these claims further. "Issues raised in a brief which are not supported by argument are deemed abandoned." Kohler v. Inter-Tel Technologies, 244 F.3d 1167, 1182 (9th Cir. 2001); see also Civil L.R. 7-4(a) ("[A] brief or memorandum of points and authorities filed in support, opposition or reply to a motion must contain: . . . [a]rgument by the party, citing pertinent authorities.").

3. Erroneous and prejudicial jury instructions

"A jury verdict will be set aside, based on erroneous jury instructions, if the party seeking to set aside the verdict can establish that those instructions were legally erroneous, and that the errors had prejudicial effect." Bettcher Indus., Inc. v. Bunzl USA, Inc., 661 F.3d 629, 641 (Fed. Cir. 2011).

CMI argues that a new trial under Rule 59 is warranted because the Court's jury instructions were prejudicial in two respects: the jury instructions did not contain a construction for the "removably attached" limitation, and the instructions on deciding the royalty erroneously created the impression that the Court preferred Dr. Mody's analysis to Mr. Pampinella's analysis. See ECF No. 269 at 19-20.

CMI first argues that it was prejudiced with respect to the non-infringement defense on the '362 patent because the jury instructions contained no construction for the "removably attached" limitation and because the Court declined to construe the term. The parties, however, did not dispute this term during their claim construction hearing, and it was not until CMI's reply brief in support of its motion for summary judgment that it raised the issue. ECF No. 106 at 14-15. After oral argument on that motion, the Court determined that the term did not require construction.

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ECF No. 126 at 14 n.6. Moreover, CMI never requested a jury instruction on the point. The parties submitted two sets of proposed jury instructions, but CMI never requested an instruction construing "removably attached" and never mentioned the issue during the hearing on jury instructions. ECF No. 152 at 25, ECF No. 205 at 4.

CMI also argues that a trial is warranted under Rule 59 because jury instruction number 24, on the reasonably royalty rate, gave the impression to the jurors that the Court favored Dr. Mody's analysis over Mr. Pampinella's analysis. See ECF No. 269 at 20. The paragraph in question read as follows:

> This is just an example of how a reasonable royalty might be determined. Whatever methodology is employed to calculate damages, the reasonable royalty must reflect business realities to ensure that the damages awarded are adequate to compensate the patent owner for the infringement. Accordingly, a reasonable royalty rate need not be based solely on sales revenue. Instead, depending on the circumstances, the parties to the hypothetical negotiation may base a reasonable royalty in whole or part on other measures of value, including profits or non-monetary benefits. The testimony of experts may assist you in determining not only the amount of damages that are adequate to compensate for the infringement, but also how those damages should be estimated. But it is up to you, based on the evidence, to decide the royalty that is appropriate in this case.

ECF No. 217 at 25-26. CMI objects that the instruction improperly emphasizes the words "profits" and "non-monetary benefits," thereby favoring Asetek expert Dr. Mody, who presented an effective royalty rate based on lost profits and discussed a non-monetary benefit that justified the rate. See ECF No. 269 at 20.

The instruction was not in error. It provides only that, *depending on the circumstances*, the royalty rate *may* be based on other measures of value. The Court did not instruct the jury specifically to consider profits or non-monetary benefits or to give Dr. Mody's analysis more weight than Mr. Pampinella's. The Court simply listed many of the factors, taken from the case law, which the jury could consider in evaluating the reasonable royalty evidence. The jury instruction did not dissuade or preclude the jury from fairly considering CMI's evidence.

The Court concludes that CMI is not entitled to a new trial.

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IV. ASETEK'S MOTION FOR ENTRY OF A PERMANENT INJUNCTION

Asetek filed a motion for entry of a permanent injunction on June 29, 2015. ECF No. 266. Asetek asks the Court to prohibit CMI, and others acting in concert with CMI, such as Cooler Master Co., Ltd. of Taiwan ("Cooler Master"), from continuing to infringe the '362 and the '764 patents.

A. Legal standard

A patentee may seek entry of a permanent injunction after a finding of infringement. See 35 U.S.C. § 283 ("[A court] may grant injunctions in accordance with the principles of equity to prevent the violation of any right secured by patent, on such terms as the court deems reasonable."). However, there is no presumption in favor of an injunction in patent infringement cases. See eBay, Inc. v. MercExchange, LLC, 547 U.S. 388, 392-93 (2006). The patentee bears the burden of showing that four traditional equitable factors support entry of a permanent injunction: (1) that the patentee has suffered irreparable harm; (2) that "remedies available at law are inadequate to compensate for that injury"; (3) that "considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted"; and (4) that "the public interest would not be 'disserved' by a permanent injunction." i4i Ltd. P'ship v. Microsoft Corp., 598 F.3d 831, 861 (Fed. Cir. 2010) (citing eBay, 547 U.S. at 391).

B. Analysis

Asetek asks the Court to enter a permanent injunction to prohibit CMI's infringing sales of Cooler Master products. ECF No. 266. It argues that, along with establishing the equitable factors that support entry of a permanent injunction, a permanent injunction is warranted because Asetek has invested substantial resources to developing the market for liquid-cooling devices, refuses to grant licenses to competitors, and CMI continues to infringe despite an adverse jury verdict. ECF No. 266.

1. The equitable factors

a. Irreparable harm

To demonstrate irreparable harm in a patent infringement suit, a patentee must establish:

"1) that absent an injunction, it will suffer irreparable harm, and 2) that a sufficiently strong causal nexus relates the alleged harm to the alleged infringement." Apple Inc. v. Samsung Electronics Co., 695 F.3d 1370, 1374 (Fed. Cir. 2012) ("Apple II"). Asetek argues that irreparable harm is shown by the following: Asetek and CMI are direct competitors; CMI's continuing infringement interferes with Asetek's right to exclusively practice its inventions; CMI's infringement harms Asetek's reputation; and permitting CMI to continue will encourage other infringers to enter the market. Asetek also argues that there is a sufficient causal nexus between the Asetek-patented features of CMI's products and sales of those products.

(1) Causal nexus

Because the harm to be avoided is the sale of infringing products, a patentee must show that consumers purchase those products for their patented features. The patent owner is not "necessarily required to show that a patented feature is the sole reason" for consumers' purchases, but rather must "show that the infringing feature drives consumer demand for the accused product." Apple Inc. v. Samsung Electronics Co., 735 F.3d 1352, 1364 (Fed. Cir. 2013) ("Apple III") (citations omitted). "[T]he relevant inquiry focuses on the objective reasons as to why the patentee lost sales," Apple, Inc. v. Samsung Electronics Co., 678 F.3d 1314, 1328 (Fed. Cir. 2012) ("Apple I"), and "should focus on the importance of the claimed invention in the context of the accused product, and not just the importance, in general, of features of the same type as the claimed invention." Apple III, 735 F.3d at 1364.

Here, there was ample evidence that the patented features of the cooling devices at issue drove demand for those products, and CMI does not contest that the requisite nexus is present.

(2) Direct competition

"Direct competition in the same market is certainly one factor suggesting strongly the potential for irreparable harm without enforcement of the right to exclude." Presideo Components, Inc. v. Am. Technical Ceramics Corp., 702 F.3d 1351, 1363 (Fed. Cir. 2012) (citations omitted). Facts "relating to the nature of the competition between the parties" are

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therefore "undoubtedly are relevant to the irreparable harm" inquiry. Robert Bosch LLC v. Pylon Mfg. Corp., 659 F.3d 1142, 1150 (Fed. Cir. 2011).

Here, the Court easily concludes that the parties are direct competitors. For one thing, Asetek and CMI have already stipulated that CMI competes with Asetek and Corsair in the liquid-cooling market. See ECF No. 198 (Transcript 12/08/2014) 561:16-17. The parties have also stipulated that CMI competes with Asetek for sales and that CMI priced its products with intent to capture market share from Asetek.[11] See Tr. at 561:16-562:5. Indeed, as to some CMI products, the *only* competitive products are ones manufactured by Asetek. ECF No. 130 at 4.

Notwithstanding this stipulation, CMI now argues that Asetek and CMI are not direct competitors because they distribute into different markets. ECF No. 287 at 3. CMI characterizes Asetek as a manufacturer and supplier of liquid cooling systems that sells to resellers and characterizes CMI as a reseller that sells computer peripherals to consumer channels. Id. CMI points out that, unlike Asetek, it does not participate at all in the original equipment manufacturer market. Id. at 3-4. And within the consumer market, CMI argues that the competition "is at best indirect," because Asetek sells to other resellers and CMI is a reseller that sells to consumer channels. Id. at 4.

CMI's arguments are misplaced. CMI and Asetek have already stipulated to material facts regarding the competitive relationship between the parties, and the jury was instructed to treat those facts as having been proved. See ECF No. 217 at 14; see also United States v. Mikaelian,168 F.3d 380, 389 (9th Cir.1999) ("When parties enter into stipulations as to material facts, those facts will be deemed to have been conclusively proved, and the jury may be so instructed."). Additionally, while CMI operates as a reseller of Cooler Master products, CMI also collaborates with Cooler Master in designing, selling, and setting prices for the liquid-cooling products. See ECF No. 198 (Transcript 12/08/2014) 560:14-561:2.

The Court concludes that Asetek and CMI are direct competitors.

[11] Asetek, however, has not provided sufficient evidence that it actually lost market share as a result of CMI's infringement.

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(3) Core business and exclusivity

That a patented product is at the "core" of a business is another salient, though not dispositive, factor courts consider when granting an injunction. See Robert Bosch, 659 F.3d at 1152.

Asetek's CEO, André Eriksen, testified at trial that Asetek's sole business centers around developing and selling liquid-cooling products and that the patents-in-suit are the foundation of all of Asetek's products. See ECF No. 192 (Transcript 12/03/2014) 318:23-319:3. Further, Asetek has invested over $75 million dollars and countless hours developing and selling these products and attests that it is seen as an innovator of these products. See Tr. 297:21-298:4. Finally, Asetek has received numerous requests to license its technology but has consistently refused. Tr. 432:22-434:14, 435:22-437:17. Asetek has engaged in multiple lawsuits to enforce its patent rights. See, e.g., Asetek Holdings, Inc. et al v. CoolIT Systems, Inc., Case No. 3:12-cv-04498-EMC. These factors all weigh in favor of finding that Asetek would be irreparably harmed if the Court did not issue a permanent injunction. See, e.g., Power Integrations, Inc. v. Fairchild Semiconductor Int'l, Inc., No. CV 08-309-LPS, 2014 WL 2960035, at *1 (D. Del. June 30, 2014) (finding irreparable harm where the patentee had practiced the patents-in-suit, sales of the embodiments constituted the core of the business, and had never licensed the patents-in-suit to any of its competitors).

(4) Harm to reputation

The possibility that the patentee will suffer "erosion in reputation and brand distinction" is relevant to a showing of irreparable harm. Douglas Dynamics, LLC v. Buyers Products Co., 717 F.3d 1336, 1344 (Fed. Cir. 2013); see also Celsis In Vitro, Inc. v. CellzDirect, Inc., 664 F.3d 922, 930–31 (Fed. Cir. 2012) ("Price erosion, loss of goodwill, damage to reputation, and loss of business opportunities are all valid grounds for finding irreparable harm."). That is because when infringing products are on the market, a patentee's products "lose some of [their] distinctiveness and market lure" because competitors can contend that they have similar features without acknowledging that those features infringe on the patentee's intellectual property. Douglas Dynamics, 717 F.3d at 1344.

Asetek contends that "CMI's infringement irreparably harms Asetek's reputation as an innovator by allowing CMI to misrepresent Asetek's inventions as its own." ECF No. 264-3 at 17. CMI responds that Asetek has allowed infringing products to remain in the market by granting a license to Corsair, a reseller, who sold infringing products made by a company other than Asetek. ECF No. 287 at 5. The license was coupled with a covenant not to sue. Id. at 4-5. CMI argues that Asetek's reputation could not truly be harmed by the sales of infringing products if it was willing to allow Corsair to purchase such products from others and resell them. Id. at 5. CMI also points out that it could have been a reseller of Asetek products but for a disagreement about the appropriate royalty rate. Id.

"While the fact that a patentee has previously chosen to license the patent may indicate that a reasonable royalty does compensate for an infringement, that is but one factor for the district court to consider. The fact of the grant of previous licenses, the identity of the past licensees, the experience in the market since the licenses were granted, and the identity of the new infringer all may affect the district court's discretionary decision concerning whether a reasonable royalty from an infringer constitutes damages adequate to compensate for the infringement." Acumed LLC v. Stryker Corp., 551 F.3d 1323, 1328 (Fed. Cir. 2008). A patentee's past willingness to license its patent is not sufficient *per se* to establish a lack of irreparable harm if a new infringer were not enjoined. Id. at 1328. Here, the evidence showed that Asetek gave a license to Corsair in part because Corsair was Asetek's customer, not its competitor, and a license would encourage additional purchases of Asetek's products. Also, Asetek agreed to the license during a difficult financial period. Finally, the license, which has since expired, was "short-lived." ECF No. 295 at 4. On these facts, the Court finds that the Corsair license was not representative of Asetek's position in the market, and that Asetek would suffer reputational harm in the market without the issuance of an injunction.

In sum, the Court concludes that Asetek has shown that it would suffer irreparable harm in the absence of an injunction.

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b. Inadequate remedies at law

The second factor in the Court's analysis requires the patentee to demonstrate that "remedies available at law, such as monetary damages, are inadequate to compensate" the patentee for the irreparable harm it has suffered. eBay, 547 U.S. at 391. The analysis for this factor overlaps with that for the first factor. MercExchange, L.L.C. v. eBay, Inc., 500 F. Supp. 2d 556, 582 (E.D. Va. 2007). Where there "is no reason to believe" that infringement or the irreparable harm resulting from infringement will otherwise cease absent an injunction, money damages are inadequate. Robert Bosch, 659 F.3d at 1155.

Money damages are inadequate to remedy the harm to Asetek from CMI's continuing infringement. Even after the jury's verdict, CMI continued to sell the infringing products in the United States through May 2015. ECF No. 266 at 7; ECF No. 266-2, Decl. of Jeffrey Smyth, Ex. 24.

Money damages would also be inadequate to compensate Asetek for difficult-to-calculate injuries such as harm to its reputation and inability to exclude others from practicing its patents. See Douglas Dynamics, 717 F.3d at 1345 (discussing how remedies at law are inadequate for reputational loss). Injunctive relief is the traditional remedy for loss of exclusivity, because the payment of money does not repair that injury. Brocade Commc'ns Sys., Inc. v. A10 Networks, Inc., No. C 10-3428 PSG, 2013 WL 140039, at *4 (N.D. Cal. Jan. 10, 2013). "As the Federal Circuit instructs, 'the axiomatic remedy for trespass on property rights is removal of the trespasser.'" Id. (quoting Presidio Components, Inc. v. Am. Technical Ceramics Corp., 702 F.3d 1351, 1362 (Fed. Cir. 2012)).

The Court finds that Asetek has shown that remedies at law are inadequate.

c. Balance of the hardships

The balance of hardships factor "assesses the relative effect of granting or denying an injunction on the parties." i4i Ltd. P'ship, 598 F.3d at 862.

The balance of hardships weighs in Asetek's favor. Denying an injunction would force Asetek to compete against its own patented technology. See Robert Bosch, 659 F.3d at 1156 (finding that the balance of hardships favored the patentee because requiring the patentee to compete against its own patented technology, along with the irreparable harms, places a substantial hardship on the patentee). As previously discussed, Asetek's sole business is developing and selling liquid-cooling products. By comparison, CMI sells other products, with less than 10% of its revenue coming from liquid-cooling products. ECF No. 266 at 18; ECF No. 203 (Transcript 12/11/2014) 1068:6-7.

CMI argues that "[t]he issuance of an injunction against CMI might erode consumer confidence in CMI in light of the negative public connotations often associated with an injunction." ECF No. 287 at 13. This argument adds very little to CMI's side of the ledger. The public will already know that a jury found that CMI infringes Asetek's patents. It is difficult to see what additional harm CMI would suffer in consumers' eyes from the issuance of an injunction.

Asetek has shown that it will suffer greater harm from the absence of an injunction than CMI would suffer from the issuance of one.

d. Public interest

The final factor of the injunction test asks whether a permanent injunction would disserve the public interest. The public interest generally favors protecting the rights of patentees and enforcing the patent system. See ActiveVideo Networks, Inc. v. Verizon Commc'ns, 694 F.3d 1312, 1341 (Fed. Cir. 2012).

Asetek argues that the public interest would be served with a permanent injunction because the public has an interest in the protection of property rights. ECF No. 269 at 19. CMI counters that the public interest would not be served because it would have unintended anti-competitive effects. ECF No. 287 at 10.

The Court concludes that Asetek has shown that the public interest favors entry of a permanent injunction. The Court "agrees with the general premise that competition serves the public interest" because it advances innovation and enables competitive pricing. Douglas Dynamics, 717 F.3d at 1346. In the present case, however, permitting CMI to compete in the marketplace using Asetek's patented technology would "have the effect of inhibiting innovation and incentive." Id. Accordingly, the Court concludes that the public has a greater interest in "the judicial protection of property rights in inventive technology" outweighs the interest in any of the alleged anti-competitive effects the injunction may have on CMI. Id.

The Court concludes that Asetek has satisfied all four factors in the injunction analysis.

2. Entry of an injunction would not be premature

CMI argues that entry of a permanent injunction would be premature because all of the asserted claims under the '764 patent were rejected at the U.S. Patent and Trademark Office ("PTO") in a post-issuance proceeding, and there is a good chance that some parts of this Court's judgment will be overturned. ECF No. 287 at 11.

This is not a persuasive reason to delay issuing an injunction. The '362 patent is currently not subject to reexamination, and the jury found that all of CMI's accused products infringe the '362 patent. See ECF No. 219. Because CMI's products infringe Asetek's valid patent rights regardless of the outcome of the '764 reexamination proceeding, entry of an injunction is appropriate. Should patent '764 be finally adjudged invalid in another proceeding, CMI can petition the Court to modify the injunction.

3. Application of the injunction to Cooler Master

Asetek asks that the injunction apply not only to CMI, but also to Cooler Master Co., Ltd. of Taiwan. It argues that Cooler Master "continues to play an active role in CMI's infringement." ECF No. 264-3 at 12.[12]

An injunction pursuant to Rule 65 of the Federal Rules of Civil Procedure binds not only the parties, but also "the parties' officers, agents, servants, employees, and attorneys" and "other persons who are in active concert or participation with" them. FED. R. CIV. P. 65(d)(2)(A)-(C). The phrase "active concert or participation" includes both aiders and abettors of, and privies of, an enjoined party. See Golden State Bottling Co., v. NLRB, 414 U.S. 168, 179-80 (1973) (citing

[12] Cooler Master was originally named as a defendant, but the parties filed a stipulation of dismissal as to all claims between Asetek and Cooler Master. ECF No. 85. CMI and Asetek stipulated that CMI is authorized by Cooler Master to sell Cooler Master-branded liquid-cooling devices in the United States. CMI also collaborates with Cooler Master, in designing and selling Cooler Master-branded liquid-cooling products. ECF No. 198 (Transcript 12/08/2014) 560:9-16.

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Regal Knitwear Co. v. N.L.R.B., 324 U.S. 9, 14 (1930)).

Although Cooler Master is not a party in this action, Asetek argues that Cooler Master is subject to an injunction because it acts in concert with CMI. ECF No. 266 at 22. CMI does not seriously dispute this, but argues that an injunction against non-party Cooler Master would be inappropriate since Asetek previously voluntarily dismissed Cooler Master with prejudice from the litigation. See ECF Nos. 85; 287 at 11-12.

The Court finds that Cooler Master is appropriately subject to an injunction. The parties agree that CMI is authorized by third party Cooler Master to sell Cooler Master-branded liquid-cooling devices in the United States. ECF No. 198 (Transcript 12/08/2014) 560:14-561:2. CMI and Cooler Master have an exclusivity agreement where CMI is Cooler Master's exclusive U.S. distributor. See ECF No. 203 (Transcript 12/11/2014) 1106:25-1107:3. At least as importantly, the parties have stipulated that CMI and Cooler Master jointly developed the infringing products at issue. ECF No. 198 (Transcript 12/08/2014) 561:23-562:9.

These facts are sufficient to show that there is a "significant history and contractual relationship" between CMI and Cooler Master "bearing directly on the conduct to be enjoined" See Netlist Inc. v. Diablo Techs, Inc., No. 13-CV-05962-YGR, 2015 WL 163434, at *2 (N.D. Cal. Jan. 12, 2015). For example, in Netlist, the court found that it was appropriate to name third parties in a preliminary injunction order as entities who acted in concert with the alleged infringer. Id. The third parties had worked with the defendant to develop an infringing product. Id. The defendant also announced that it had entered into an exclusive relationship with one of the third parties to design and manufacture the product. Id. At the time of the court's decision, the third parties also had multiple fulfilled and unfulfilled purchase orders. Id. In sum, the court found that "the particular nature of the relationship here establishes an identity of interests, and lack of independence" between the defendant and the third parties to consider them in privity for the preliminary injunction. Id.

Similarly, in Aevoe Corp v. AE Tech. Co., 727 F.3d 1375, 1384 (Fed. Cir. 2013), the Federal Circuit affirmed the enforcement of an injunction against a reseller of products because it was acting in concert with the accused patent infringer defendant. Id. The contractual relationship between the defendant and the reseller made the reseller a privy of the defendant, and therefore bound by the terms of the injunction. Id. Although the district court later amended the injunction to name the reseller, the order only confirmed that contracting partners of the defendant could not sell the infringing products. Id.

Because of Cooler Master's past history in developing the infringing products and its contractual relationship with CMI, the Court finds that Cooler Master is an appropriate subject of the injunction under Rule 65(d)(2).

4. Scope of the injunction

Under Federal Rule of Civil Procedure 65, "every order granting an injunction and every restraining order shall set forth the reasons for its issuance; shall be specific in terms; shall describe in reasonable detail, and not by reference to the complaint or other document, the act or acts sought to be restrained." FED. R. CIV. P. 65(d). An injunction "cannot impose unnecessary restraints on lawful activity." Riles v. Shell Exploration & Prod. Co., 298 F.3d 1302, 1311 (Fed. Cir. 2002); see also Johns Hopkins Univ. v. CellPro, Inc., 152 F.3d 1342, 1365 (Fed. Cir. 1998) ("judicial restraint of lawful non-infringing activities must be avoided.").

Asetek is entitled to an injunction directed toward Defendants' activities which cause domestic infringement as well as the activities of those persons or companies acting in concert with CMI. The Court will issue an injunction that enjoins CMI, as well as Cooler Master, from making, using, offering for sale or selling in the United States, or importing into the United States any of the accused products as well as from otherwise infringing or inducing others to infringe the claims of the one or more of United States Patents Nos. 8,240,362 and 8,245,764.

Asetek requests that the injunction take the following form:

> (1) As used herein, "Infringing Products" shall mean the following Cooler Master products: Seidon 120M, Seidon 120XL, Seidon 240M, Seidon 120V, Seidon 120V Plus, Nepton 140XL, [Nepton 280L], Glacer 240L, and products not more than colorably different from them.
>
> (2) CMI USA, Inc. and its subsidiaries and affiliated companies (collectively defined as "CMI"), as well as CMI's successors,

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assigns, officers, directors, agents, servants, employees, representatives and attorneys, and those persons in active concert or participation with them who receive notice of the order are hereby immediately and permanently restrained and enjoined, pursuant to 35 U.S.C. § 283 and Fed. R. Civ. P. 65(d), from making, using, offering for sale or selling in the United States, or importing into the United States, or causing to be made, used, offered for sale, or sold in the United States, or imported into the United States, the Infringing Products.

(3) Cooler Master Co., Ltd. and its subsidiaries and affiliated companies (collectively defined as "Cooler Master"), as well as Cooler Master's successors, assigns, officers, directors, agents, servants, employees, representatives and attorneys, and those persons in active concert or participation with them who receive notice of the order are hereby immediately and permanently restrained and enjoined, pursuant to 35 U.S.C. § 283 and Fed. R. Civ. P. 65(d), from making, using, offering for sale or selling in the United States, or importing into the United States, or causing to be made, used, offered for sale, or sold in the United States, or imported into the United States, the Infringing Products.

(4) CMI and Cooler Master shall provide written notice of this judgment and order, and the injunction ordered herein, to: their officers, directors, agents, servants, representatives, attorneys, employees, subsidiaries and affiliates, and those persons in active concert or participation with them, including any and all manufacturers, distributors, retailers, and service providers who have been involved in the making, using, selling, offering for sale or importing of any Infringing Products; and to all other persons or entities involved in any way with the making, using, selling, offering for sale or importing of any Infringing Products. CMI and Cooler Master shall take whatever means are necessary or appropriate to ensure that this order is properly complied with.

(5) CMI and Cooler Master shall include a copy of this Order and the written notice in paragraph (7) below along with every bill of sale for the Infringing Products and in the boxes in which the Infringing Products are shipped or sold, regardless of where they are sold, indicating that they infringe the patents-in-suit, are subject to an injunction in the United States, and thus cannot be sold, offered for sale, imported, or used in the United States.

(6) CMI and Cooler Master shall also require any manufacturer of the Infringing Products to include a copy of this Order and the written notice in paragraph (7) below along with every bill of sale for the Infringing Products and in the boxes in which the Infringing Products are shipped or sold, regardless of where they are sold, indicating that they infringe the patents-in-suit, are subject to an injunction in the United States, and thus cannot be sold, offered for sale, imported, or used in the United States.

(7) The written notice to be provided along with every bill of sale and in the boxes in which the Infringing Products are shipped or sold shall state:

> **This product is affected by a Permanent Injunction entered by the United States District Court for the Northern District of California in Civil Action No. 3:13-CV-00457-JST (copy enclosed). This product or its use infringes U.S. Patent Nos. 8,240,362 and 8,245,764, which are assigned to Asetek Danmark A/S. Accordingly, certain acts associated with this product are prohibited.**
>
> **<u>This product may not be sold, offered for sale, or used in the United States. Nor can this product be imported into the United States.</u>**

CMI makes several objections to Asetek's proposed language. First, CMI argues that the Seidon 120V Plus should not be identified as an infringing product, because the jury did not specifically find that the Seidon 120V Plus infringed. ECF No. 313 at 2. The parties stipulated, however, that the Seidon 120V Plus has the same pump head design as the Seidon 120V, which does infringe. <u>See</u> ECF No. 130 at 4; ECF No. 198 (Transcript 12/08/2014) 562:10-11. Because the Seidon 120V Plus is not colorably different from the Seidon 120V, the Court finds that it should be included in the injunction.

CMI also contends that Paragraph (4) of Asetek's form of injunction "is overreaching and is abusive, and seeks to impose a[n unfair] competitive disadvantage on CMI." The Court finds that the language in Asetek's proposed form of injunction is appropriate in light of the evidence at trial.

CMI argues that it cannot "require" its manufacturers to include a copy of the injunction with the bill of sale for, or in the boxes of, the infringing products, as Asetek's form of order requires. ECF No. 313 at 3. Asetek responds that the notice requirement and language of paragraphs (5)-(7) are based on the injunction in <u>SynQor, Inc. v. Asrtesyn Techs., Inc.</u>, No. 2:07-CV-497-TJW-CE, 2011 WL 238645 (E.D. Tex. Jan. 24, 2011), <u>aff'd</u> 709 F.3d 1365 (Fed. Cir. 2013). The district court in <u>SynQor</u>, however, expressly grounded its language on the jury's finding of induced infringement. <u>Id.</u> at *7 ("Given the jury's finding of induced infringement . . ."). Asetek did not pursue an induced infringement theory at trial. The Court will not order CMI and Cooler Master to notify its manufacturers of its infringement or require the order of infringement to be included in all future sales to its manufacturers.

For the foregoing reasons, the Court orders that the injunction take the following form:

> (1) As used herein, "Infringing Products" shall mean the following Cooler Master products: Seidon 120M, Seidon 120XL, Seidon 240M, Seidon 120V, Seidon 120V Plus, Nepton 140XL, Nepton 280L, Glacer 240L, and products not more than colorably different from them.
>
> (2) CMI USA, Inc. and its subsidiaries and affiliated companies (collectively defined as "CMI"), as well as CMI's successors, assigns, officers, directors, agents, servants, employees, representatives and attorneys, and those persons in active concert or participation with them who receive notice of the order are hereby immediately and permanently restrained and enjoined, pursuant to 35 U.S.C. § 283 and Fed. R. Civ. P. 65(d), from making, using, offering for sale or selling in the United States, or importing into the United States, or causing to be made, used, offered for sale, or sold in the United States, or imported into the United States, the Infringing Products.
>
> (3) Cooler Master Co., Ltd. and its subsidiaries and affiliated companies (collectively defined as "Cooler Master"), as well as Cooler Master's successors, assigns, officers, directors, agents, servants, employees, representatives and attorneys, and those persons in active concert or participation with them who receive notice of the order are hereby immediately and permanently restrained and enjoined, pursuant to 35 U.S.C. § 283 and Fed. R. Civ. P. 65(d), from making, using, offering for sale or selling in the United States, or importing into the United States, or causing to be made, used, offered for sale, or sold in the United States, or imported into the United States, the Infringing Products.
>
> (4) Within 14 days of issuance of this order, CMI and Cooler Master shall provide written notice of this judgment and order, and the injunction ordered herein, to: their officers, directors, agents, servants, representatives, attorneys, employees, subsidiaries and affiliates, and those persons in active concert or participation with them. CMI and Cooler Master shall take whatever means are necessary or appropriate to ensure that this order is properly complied with.
>
> (5) CMI and Cooler Master shall include a copy of this Order and the written notice in paragraph (6) below along with every bill of sale for the Infringing Products and in the boxes in which the Infringing Products are shipped or sold, regardless of where they are sold, indicating that they infringe the patents-in-suit, are subject to an injunction in the United States, and thus cannot be sold, offered for sale, imported, or used in the United States.
>
> (6) The written notice to be provided along with every bill of sale and in the boxes in which the Infringing Products are shipped to or sold in the United States shall state:

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Northern District of California

> **This product is affected by a Permanent Injunction entered by the United States District Court for the Northern District of California in Civil Action No. 3:13-CV-00457-JST (copy enclosed). This product or its use infringes U.S. Patent Nos. 8,240,362 and 8,245,764, which are assigned to Asetek Danmark A/S. Accordingly, certain acts associated with this product are prohibited.**
>
> **This product may not be sold, offered for sale, or used in the United States. Nor can this product be imported into the United States.**

(7) This injunction order shall remain in effect until both of U.S. Patent Nos. 8,240,362 and 8,245,764 have expired. Should either patent be finally adjudged invalid in another proceeding, either party may petition the Court to request a modification of the injunction.

V. ASETEK'S MOTION TO ALTER JUDGMENT

The jury's award of $404,941 was based on a reasonably royalty rate of 14.5% for infringing sales from November 28, 2012 through September 30, 2014. See ECF No. 219 at 5. In Asetek's motion to alter judgment, Asetek requests that the Court amend the judgment to award Asetek supplemental damages, enhanced damages, and pre-and post-judgment interest. See ECF No. 267. Asetek also requests that the Court order an accounting and order CMI to produce updated sales and revenue information through the date of the injunction, so that the judgment may be amended to account for CMI's infringing sales through the injunction. See id.

A. Legal standard

Section 284 of the Patent Act provides: "[u]pon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer, together with interest and costs as fixed by the court." 35 U.S.C. § 284.

B. Analysis

1. Supplemental damages

Patentees are entitled to supplemental damage awards for infringing sales that a jury does not consider and precedes entry of a permanent injunction. See Finjan, Inc. v. Secure Computing Corp., 626 F.3d 1197, 1212-13 (Fed. Cir. 2010). The amount of supplemental damages is within the sound discretion of the court. Amado v. Microsoft Corp., 517 F.3d 1353, 1362 n. 2 (Fed. Cir. 2008).

In the present case, the jury's damages award was limited to CMI's infringing sales through September 30, 2014, although the verdict was entered on December 17, 2014. Asetek requests the Court award supplemental damages by applying the jury's 14.5% reasonable royalty rate to the infringing sales made during this time period. The Court concludes that Asetek is entitled to supplemental damages to cover this period of infringing activity at the jury's 14.5% rate.

2. Accounting

Asetek requests that the Court order an accounting and order CMI to produce updated sales and revenue information through the date of the injunction, so that the judgment may be amended to account for CMI's infringing sales through the injunction. Courts may also grant motions for further accounting to consider certain periods of infringing activity. See, e.g., Metso Minerals, Inc. v. Powerscreen Int'l Distribution Ltd., 833 F. Supp. 2d 333, 347 (E.D.N.Y. 2011); Mikohn Gaming Corp. v. Acres Gaming, Inc., No. CV-S-97-1383-EJW, 2011 WL 34778689, at *22 (D. Nev. Aug. 2, 2001). Asetek does not contest this request. Accordingly, as set forth below, the Court will order one if necessary after the parties have met and conferred.

3. Enhanced damages

Asetek requests that the Court award enhanced damages for sales occurring after the jury's verdict. See ECF No. 267 at 5. Under section 284, the court may enhance damages awards up to three times the amount found or assessed. 35 U.S.C. § 284. An award of enhanced damages for infringement, as well as the extent of the enhancement, is committed to the discretion of the trial court. Read Corp. v. Portec, Inc., 970 F.2d 816, 826 (Fed. Cir. 1992), abrogated on other grounds by Markman v. Westview Instruments, Inc., 52 F.3d 967, 975 (Fed Cir. 1995).

Before a court enhances damages, the court must find willfulness. Spectralytics, Inc. v. Cordis Corp., 649 F.3d 1336, 1349 (Fed. Cir. 2011). However, even a finding of willfulness "does not mandate that damages be enhanced." Read Corp., 970 F.2d at 826. "The paramount determination in deciding to grant enhancement and the amount thereof is the egregiousness of the defendant's conduct based on all the facts and circumstances." Id.[13]

CMI first objects that Asetek stipulated before trial that it would not assert willful infringement, see ECF No. 130 at 6, and cannot now seek to avoid its stipulation to make a distinction between pre- and post-verdict sales. CMI further argues that its actions were not willful. See ECF No. 288 at 8. Finally, CMI contends that this was a "close" case. Id. at 15.

This Court was previously called upon to enforce another of the parties' stipulations when it sustained Asetek's objection to CMI raising the topic of the '764 patent reexamination during trial. See ECF No. 130 at 6; ECF No. 213 (Transcript 12/15/2014) 1480:7-1481:17. The Court decided that permitting CMI to impeach Asetek's expert with evidence of the reexamination proceedings would be "violative of the parties' stipulation" which is entitled to be "enforced by its terms." Tr. 1480:7-1481:17.

The circumstances here are different. Asetek did not violate the parties' stipulation. It did not assert willful infringement during trial. ECF No. 130 at 6. Asetek prevailed at the trial, however, and the jury found that CMI was infringing Asetek's patents. Following that verdict, CMI continued to sell its infringing products into the market. As the court noted in SynQor, there is no reason why a patentee's decision not to argue "*pre-verdict* willful infringement at trial should preclude the district court from finding willful infringement for *post-verdict* sales." 709 F.3d at 1385 (emphasis in original).

Turning to the merits, the Court finds that CMI's conduct in selling infringing products after an adverse jury verdict constituted willful infringement. Although CMI's sales of infringing

[13] Courts may properly consider the following factors in determining whether to award enhanced damages and in what amount: (1) whether the infringer deliberately copied the ideas or design of another; (2) whether the infringer, when he knew of the other's patent protection, investigated the scope of the patent and formed a good-faith belief that it was invalid or that it was not infringed; (3) the infringer's behavior as a party to the litigation; (4) the defendant's size and financial condition; (5) the closeness of the case; (6) the duration of defendant's misconduct; (7) remedial action by the defendant, if any; (8) the defendant's motivation for harm; and (9) whether the defendant attempted to conceal its misconduct. Read Corp., 970 F.2d at 827-28. The parties do not discuss most of these factors, and so neither does the Court.

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products began to drop in April 2014 and ceased in June 2014, sales actually *increased* in the three months following the jury's verdict. See ECF No. 267-6, Mody Decl. Ex. B. CMI asserts that it has phased out these products but does not explain why sales increased in the months following entry of the jury's verdict. See ECF No. 287 at 9.

CMI insists that it acted in good faith because it holds a good faith belief that its products do not infringe and cites to the reexamination of the'764 patent and appeal at the PTO. Id. at 3-4. CMI states that it has an objectionably reasonable belief that the'764 patent is invalid in light of the reexamination. Id. at 8. CMI cannot use this as a basis to disregard the jury's findings of infringement of the '362 patent.

Finally, the Court rejects the contention that this was a close case. CMI's products were direct copies of Asetek's products. Although CMI contests the continuing validity of the '764 patent, it conceded that it infringed that patent. ECF No. 130 at 6. CMI and Cooler Master had Asetek Generation III products in their possession when they collaborated to design the infringing Seidon products, ECF No. 198 (Transcript 12/08/2014) 562:6-9, and they copied Asetek's Generation III pump for the infringing Seidon 120M/120XU240M products, as the jury and the Court so found. ECF No. 249 at 11 ("Cooler Master Co., Ltd./CMI USA and Zalman copied Asetek's Generation III and Generation IV commercial products, respectively."); ECF No. 219 at 4 (finding copying of the claimed invention by others).

On these facts, the Court concludes that an enhancement for post-verdict damages is warranted. See SynQor, 709 F.3d at 1385 (upholding the district court's enhancement by a factor of 1.75 where the district court found the infringer's conduct egregious in continuing and increase in sales in face of an infringement verdict). Asetek requests that the Court double the jury's reasonable royalty rate because of CMI's willful infringement and "deliberate copying and litigation behavior." See ECF No. 268 at 5 (citing Stryker Corp. v. Davol Inc., 234 F.3d 1252, 1259-60 (Fed. Cir. 2000)).

The Court will enhance damages for post-verdict sales by 1.75, as the SynQor court did, for an effective royalty rate of 25.375%. This amount reflects the degree of CMI's willfulness, as described above, but does not unduly penalize CMI or generate a windfall for Asetek. CMI's profit margins are comparable to this royalty rate. See ECF No. 267-4 (Mody Decl.) at 4. This enhanced royalty rate will apply from the date of the verdict until the date the permanent injunction goes into effect and the infringement ceases. TransPerfect Global, Inc. v. MotionPoint Corp., No. C 10-2590 CW, 2014 WL 6068384, at *5 (N.D. Cal. Nov. 13, 2014).

4. Prejudgment interest

A prevailing patentee is also entitled to prejudgment interest, absent extraordinary circumstances. See 35 U.S.C. § 284; Gen. Motors Corp. v. Devex Corp., 461 U.S. 648, 657 (1983) ("We hold only that prejudgment interest should be awarded under § 284 absent some justification for withholding such an award."). Such interest is ordinarily awarded "from the date of the infringement to the date of judgment." Junker v. HDC Corp., Case No. 3:07-cv-05094, 2008 WL 3385819, at *6 (N.D. Cal. July 28, 2008) (citing Informatica Corp. v. Bus. Objects Data Integration, Inc., 489 F.Supp.2d 1075, 1087 (N.D. Cal. 2007). The purpose of awarding prejudgment interest is to fully compensate the patent holder for the infringement. Gen. Motors, 461 U.S. at 653. The court is afforded wide latitude in the selection of interest rates in order to ensure this purpose is met. Uniroyal, Inc. v. RudkinWiley Corp., 939 F.2d 1540, 1545 (Fed. Cir. 1991) (citations omitted); see also Junker, 2008 WL 3385819, at *6 (stating that the court may use the prime rate, the prime rate plus a percentage, the U.S. Treasury rate, state statutory rate, corporate bond rate, or any other rate the court deems appropriate). The court may also assess compound interest to fully compensate the patentee. Fresenius Med. Care Holdings, Inc. v. Baxter Int'l, Inc., No. C 03-1431 SBA, 2008 WL 928535, at *2 (N.D. Cal. Apr. 4, 2008).

Asetek requests that the court award prejudgment interest at the prime rate of 3.25%, compounded monthly. ECF No. 269 at 9. It contends that it was required to borrow money during the period of infringement at a much higher rate of 10 percent. ECF No. 296 at 15. CMI does not dispute Asetek's entitlement to prejudgment interest, but requests that the Court apply the Treasury Bill rate compounded annually because Asetek "has offered no evidence that it needed to

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borrow money *because* it was deprived of the damages award." ECF No. 287 at 16 (emphasis in original).

The Court finds it reasonable to award Asetek prejudgment interest at the prime rate, compounded monthly. A patentee need not offer proof of borrowing at or above the prime rate "to be entitled to an award of prejudgment in interest at the prime rate." Studiengesellschaft Kohle, m.b.H. v. Dart Indus., Inc., 862 F.2d 1564, 1579-80 (Fed. Cir. 1988); see also Uniroyal, 939 F.2d at 1545 (Fed. Cir. 1991), but there is evidence of such borrowing here. The Court considers this borrowing history, along with Asetek's prior assertions that it has not yet reached profitability. See ECF No. 194, Tr. 426:2-4; ECF No. 266 at 18. The Court also concludes that the prime rate "more nearly approximates the position Asetek would have been in had CMI entered into a reasonable royalty agreement" with CMI. A&L Tech. v. Resound Corp., No. C 93-00107 CW, 1995 WL 415146, at *5 (N.D. Cal. June 29, 1995).

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5. Post-judgment interest

Section 1961 provides that post-judgment interest "shall be calculated from the date of the entry of the judgment, at a rate equal to the weekly average 1-year constant maturity Treasury yield, as published by the Board of Governors of the Federal Reserve System, for the calendar week preceding." 28 U.S.C. § 1961.

Asetek moves the Court for post-judgment interest. ECF No. 267 at 3. The Court orders CMI to pay post-judgment interest at the statutorily-mandated rate.

6. Returned sales

Despite calculating damages at trial that offset CMI's sales revenues, Asetek now contends that it should receive a royalty for infringing products that were sold but returned, ECF No. 267 at 9, although it provides no basis for its position. CMI points out that Dr. Mody previously treated negative sales as offsets to total revenue in determining CMI's relevant sales. See ECF No. 288 at 15. CMI also notes that Asetek's own license with Corsair contemplates that manufactures bear the risk of the return. See ECF No. 288 at 15.

Asetek's position is not commercially reasonable. The Court agrees with CMI that consistent with the damages calculated by Asetek at trial, returned sales of accused products should offset sales revenues.

7. Ongoing royalty

Because the Court enters a permanent injunction in favor of Asetek, it need not impose an ongoing royalty rate.

CONCLUSION

For the reasons set for above, CMI's motion for entry of judgment as a matter of law and motion for a new trial are both denied. Asetek's motion for entry of a permanent injunction is granted. Asetek's motion for supplemental damages and prejudgment interest granted in part and denied in part.

CMI is ordered to produce to Asetek's counsel, within five court days of the date of this Order, a spreadsheet similar to CMIUSA-ASE00013784 that completely and accurately reflects all of CMI USA's revenues for sales of the Infringing Products in the United States since October 1, 2014, through the date of this Order, including product returns that offset.

Asetek is ordered to submit revised calculations for supplemental damages, and pre- and post-judgment interest consistent with this Order, and a revised form of judgment reflecting the same, within seven court days of receipt of CMI's updated revenues as ordered in the preceding paragraph. For the reasons set forth elsewhere in this Order, Asetek's updated calculations may include enhanced damages, i.e., a 25.375% royalty rate, on CMI's revenues for sales of infringing products beginning January 1, 2015. Asetek shall bear in mind that "prejudgment interest can only be applied to the primary or actual damage portion and not to the punitive or enhanced portion" of the damages award. Underwater Devices Inc. v. Morrison-Knudsen Co., 717 F.2d 1380, 1389 (Fed. Cir. 1983), overruled on other grounds by In re Seagate Tech., LLC, 497 F.3d 1360 (Fed. Cir. 2007).

CMI may submit it objections, if any, to Asetek's revised form of judgment, within five court days after the judgment is submitted. CMI may only interpose objections it has not already made. Asetek may reply within five court days thereafter. The matter will then stand submitted

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unless the Court schedules a hearing.

IT IS SO ORDERED.

Dated: September 22, 2015

JON S. TIGAR
United States District Judge

United States District Court
Northern District of California

Electronic Acknowledgement Receipt

EFS ID:	23692713
Application Number:	95002386
International Application Number:	
Confirmation Number:	7254
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Customer Number:	22852
Filer:	Eric Paul Raciti/Karen Crespo
Filer Authorized By:	Eric Paul Raciti
Attorney Docket Number:	COOL-1.012
Receipt Date:	05-OCT-2015
Filing Date:	15-SEP-2012
Time Stamp:	15:50:37
Application Type:	inter partes reexam

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	Certificate_of_Service_Updated_Notice_of_Concurrent_Proceedings.pdf	223333 40ab6146e3e1c71adb00014d648ee036295bf605	no	1

Warnings:

Information:

2	Notice of concurrent proceedings / decisions	Updated_Notice_of_Concurrent_Proceedings.pdf	8579515 4ea676469138231c0c159a802e18d1168f3c1259	no	43
Warnings:					
Information:					
			Total Files Size (in bytes):	8802848	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Document code: WFEE

United States Patent and Trademark Office
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		01	FC : 1824	1,540.00 DA		

Document code: WFEE

United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 09/10/2015
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
09/10/2015	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

United States Patent and Trademark Office

Under Secretary of Commerce for Intellectual Property and
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FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

Appeal No: 2015-007934
Inter Partes Reexamination
Control No: 95/002,386
Appellant: 8245764 et al.

Patent Trial and Appeal Board Docketing Notice

Inter Partes Reexamination Control No. 95/002,386 was received from the Technology Center at the Board on August 26, 2015 and has been assigned Appeal No: 2015-007934.

In all future communications regarding this appeal, please include both the Inter Partes Reexamination Control Number and the appeal number.

The mailing address for the Board is:

PATENT TRIAL and APPEAL BOARD
UNITED STATES PATENT AND TRADEMARK OFFICE
P.O. BOX 1450
ALEXANDRIA, VIRGINIA 22313-1450

Telephone inquiries can be made by calling 571-272-9797 and referencing the appeal number listed above.

By order of the Patent Trial and Appeal Board.

JAG

cc: Third Party Requester

GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re U.S. Patent No.: 8,245,764 **Applicant:** Andre Sloth Eriksen **Issued:** August 21, 2012 **Filed:** October 7, 2011 **Title:** COOLING SYSTEM FOR A COMPUTER SYSTEM	**Art Unit:** 3993 **Examiner:** Joseph A. Kaufman **Confirmation No.:** 7254

Reexamination Proceeding
Control No. 95/002,386
Filed: September 15, 2012

Mail Stop *Inter Partes* Reexam
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

REQUEST FOR ORAL HEARING

Although Respondent Third-Party Requester believes an oral hearing to be unnecessary in view of the comprehensive briefing submitted by the parties, Respondent hereby requests an opportunity to participate in any oral hearing the Board might schedule in view of Appellant's Request for Oral Hearing dated July 16, 2015. This Request is timely, having been filed within two months after the date the Examiner's Answer was mailed. The small-entity fee of $650 under 37 C.F.R. § 41.20(b) has been charged to a credit card. Please charge any additional required fees to Deposit Account No. 50-1001.

Respectfully submitted,

Ganz Pollard LLC

Date: July 21, 2015

/Lloyd L. Pollard II

Lloyd L. Pollard II
Registration No. 64,793

P.O. Box 2200
Hillsboro, OR 97123
Telephone: (503) 844-9009
Facsimile: (503) 296-2172
email: mail@ganzlaw.com

<u>CERTIFICATE OF SERVICE</u>

The undersigned hereby certifies that a complete copy of this REQUEST FOR ORAL HEARING, was served on counsel for the patent owner, at the following address:

Finnegan, Henderson, Farabow, Garrett & Dunner LLP
901 New York Avenue, NW
Washington, D.C. 20001-4413

via first class mail, with sufficient postage affixed thereto, on July 21, 2015.

Respectfully submitted,
GANZ POLLARD LLC

By: *\/Lloyd L. Pollard II/*
Lloyd L. Pollard, II
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Electronic Patent Application Fee Transmittal

Application Number:	95002386
Filing Date:	15-Sep-2012
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Filer:	Lloyd L. Pollard II
Attorney Docket Number:	COOL-1.012

Filed as Small Entity

Filing Fees for **inter partes reexam**

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Request For Oral Hearing	2403	1	650	650
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**650**

Electronic Acknowledgement Receipt

EFS ID:	22981634
Application Number:	95002386
International Application Number:	
Confirmation Number:	7254
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Customer Number:	22852
Filer:	Lloyd L. Pollard II
Filer Authorized By:	
Attorney Docket Number:	COOL-1.012
Receipt Date:	21-JUL-2015
Filing Date:	15-SEP-2012
Time Stamp:	18:13:28
Application Type:	inter partes reexam

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$650
RAM confirmation Number	5386
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Oral Hearing	Request_for_Oral_Hearing.pdf	24992 a4514940b8276aa61eb94cef449348dc19681a1d	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30185 bf2aed19277416ce8f8881ff88fb2972fa9c2559	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	55177	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Inter Partes* Reexamination of:	)	
U.S. Patent No. 8,245,764 B2	)	
Issue Date: August 21, 2012	)	Group Art Unit: 3993
Reexam Control No.: 95/002,386	)	
Inventors: André Sloth ERIKSEN	)	Examiner: KAUFMAN, Joseph
Issued from Appl. No.: 13/269,234	)	
Filing Date: October 7, 2011	)	Confirmation No.: 7254
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	

Mail Stop *Inter Partes* Reexam
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

REQUEST FOR ORAL HEARING

Pursuant to 37 C.F.R. § 41.73(b), Appellant Patent Owner requests an oral hearing. This request is timely, being made within two-months of the Examiner's Answer's mailing date. A certificate of service is attached. The 37 C.F.R. § 41.20(b) fee of $1,300.00 has been charged to a credit card. Please charge any additional required fees to Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, LLP

Dated: July 16, 2015

By: /Eric P. Raciti/
Eric P. Raciti
Reg. No. 41,475
(617) 646-1675

CERTIFICATE OF SERVICE

The undersigned certifies that on this 16th day of July 2015, service of a true and complete copy of the "REQUEST FOR ORAL HEARING" was served in its entirety via certified U.S. mail on counsel for the third party requester, at the following address:

Ganz Law P.C.
P.O. Box 2200
Hillsboro, OR 97123

with sufficient postage affixed, and with delivery confirmation requested.

Respectfully submitted,

FINNEGAN, HENDERSON,
FARABOW, GARRETT & DUNNER,
L.L.P.

Dated: July 16, 2015

By: */Eric P. Raciti/*
Eric P. Raciti

Electronic Patent Application Fee Transmittal

Application Number:	95002386
Filing Date:	15-Sep-2012
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Filer:	Eric Paul Raciti/Karen Crespo
Attorney Docket Number:	COOL-1.012

Filed as Large Entity

Filing Fees for inter partes reexam

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Request for Oral Hearing	1403	1	1300	1300
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1300**

Electronic Acknowledgement Receipt

EFS ID:	22937735
Application Number:	95002386
International Application Number:	
Confirmation Number:	7254
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Customer Number:	22852
Filer:	Eric Paul Raciti/Karen Crespo
Filer Authorized By:	Eric Paul Raciti
Attorney Docket Number:	COOL-1.012
Receipt Date:	16-JUL-2015
Filing Date:	15-SEP-2012
Time Stamp:	14:27:22
Application Type:	inter partes reexam

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1300
RAM confirmation Number	667
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oral Hearing Request-Owner	Request_for_Oral_Hearing.pdf	63688 89a20b7fc5ae5a3a178120f230756a8eef78eadc	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30221 f03fc98e8c0d17f70ca949b426842dfe1b70cd2f	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	93909	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
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National Stage of an International Application under 35 U.S.C. 371
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New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 05/22/2015

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
05/22/2015	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Transmittal of Communication to Third Party Requester *Inter Partes* Reexamination	Control No. 95/002,386	Patent Under Reexamination 8245764	
	Examiner JOSEPH KAUFMAN	Art Unit 3993	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above-identified reexamination prceeding. 37 CFR 1.903.

Prior to the filing of a Notice of Appeal, each time the patent owner responds to this communication, the third party requester of the *inter partes* reexamination may once file written comments within a period of 30 days from the date of service of the patent owner's response. This 30-day time period is statutory (35 U.S.C. 314(b)(2)), and, as such, it cannot be extended. See also 37 CFR 1.947.

If an *ex parte* reexamination has been merged with the *inter partes* reexamination, no responsive submission by any *ex parte* third party requester is permitted.

All correspondence relating to this inter partes reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of the communication enclosed with this transmittal.

Inter Partes Reexamination Examiner's Answer	Application No. 95/002,386	Applicant(s) 8245764	
	Examiner JOSEPH KAUFMAN	Art Unit 3993	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

Incorporation by Reference of the Right of Appeal Notice
The Right of Appeal Notice (RAN) mailed on 30 June 2014, including all of the grounds of rejection, determinations of patentability, and explanations set forth in the RAN is incorporated by reference. Every ground of rejection and every determination not to make a proposed rejection set forth in the RAN are being maintained by the examiner.

This examiner's answer does not contain any new ground of rejection and any new determination not to make a proposed rejection.

Status of Amendment After Action Closing Prosecution
The amendment(s) filed on _____ has/have been entered.
The amendment(s) filed on _____ has/have not been entered.

Period for providing a Rebuttal Brief
Appellant(s) is/are given a period of ONE MONTH from the mailing date of this examiner's answer within which to file a rebuttal brief in response to the examiner's answer. Prosecution otherwise remains closed.

The rebuttal brief of the patent owner may be directed to the examiner's answer and/or any respondent's brief. The rebuttal brief of the third party requester(s) may be directed to the examiner's answer and/or the respondent's brief of the patent owner. The rebuttal brief must (1) clearly identify each issue, and (2) point out *where* the issue was raised in the examiner's answer and/or in the respondent's brief. In addition, the rebuttal brief must be limited to issues raised in the examiner's answer or in the respondent's brief. The time for filing the rebuttal brief may not be extended. No further submission (other than the rebuttal brief(s)) will be considered, and any such submission will be treated in accordance with 37 CFR 1.939 and MPEP 2667.

☒ Attachment(s)
IDS filed 4/30/2015 and 12/19/2014

☐ Other:
/Joseph A. Kaufman/

Conferees: /Eileen Lillis/ /Jimmy Foster/

All correspondence relating to this *inter partes* reexamination proceeding should be directed to the **Central Reexamination Unit** at one of the following addresses:

Please mail any communications to:
Attn: Mail Stop "Inter partes Reexam"
Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Please hand-deliver any communication to:
Customer Service Window
Attn: Central Reexamination Unit
Randolph Building, Lobby Level
401 Dulany Street
Alexandria VA 22314

Please FAX any communications to: (571) 273-9900

IDS Form PTO/SB/08: Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY PATENT OWNER IN INTER PARTES REEXAMINATION

(Use as many sheets as necessary)

Sheet	1	of	1

Complete if Known	
Reexam Control Number	95/002,386
Request Filing Date	September 15, 2012
First Named Inventor	André Sloth ERIKSEN
Art Unit	3993
Examiner Name	Joseph A. KAUFMAN
Attorney Docket Number	10494.8000

U.S. PATENTS AND PUBLISHED U.S. PATENT APPLICATIONS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[6]

NONPATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[6]
		Final Verdict Form, Case 3:13-cv-00457-JST (N.D. Cal.), San Francisco Division, Document 219 (Dec. 17, 2014)	

Examiner Signature	/Joseph Kaufman/	Date Considered	05/14/2015

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.K./

IDS Form PTO/SB/08: Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY PATENT OWNER IN INTER PARTES REEXAMINATION

(Use as many sheets as necessary)

Sheet	1	of	1

Complete if Known	
Reexam Control Number	95/002,386
Request Filing Date	September 15, 2012
First Named Inventor	André Sloth ERIKSEN
Art Unit	3993
Examiner Name	Joseph A. KAUFMAN
Attorney Docket Number	10494.8000

U.S. PATENTS AND PUBLISHED U.S. PATENT APPLICATIONS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[6]

NONPATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[6]
		Findings Of Fact And Conclusions Of Law; Order Entering Judgment In Favor Of Plaintiff, Case 3:13-cv-00457-JST (N.D. Cal.), San Francisco Division, Document 249 (April 21, 2015)	

Examiner Signature	/Joseph Kaufman/	Date Considered	05/14/2015

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.K./

INTER PARTES REEXAMINATION COMMUNICATION	Control No. 95/002,386	Patent Under Reexamination 8245764
	Examiner JOSEPH KAUFMAN	Art Unit 3993

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

BELOW/ATTACHED YOU WILL FIND A COMMUNICATION FROM THE UNITED STATES PATENT AND TRADEMARK OFFICE OFFICIAL(S) IN CHARGE OF THE PRESENT REEXAMINATION PROCEEDING.

All correspondence relating to this *inter partes* reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of this communication.

IDS Form PTO/SB/08: Substitute for form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY PATENT OWNER IN INTER PARTES REEXAMINATION** *(Use as many sheets as necessary)*	*Complete if Known*	
	Reexam Control Number	95/002,386
	Request Filing Date	September 15, 2012
	First Named Inventor	André Sloth ERIKSEN
	Art Unit	3993
	Examiner Name	Joseph A. KAUFMAN
Sheet 1 of 1	*Attorney Docket Number*	10494.8000

U.S. PATENTS AND PUBLISHED U.S. PATENT APPLICATIONS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[6]

NONPATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[6]
		Findings Of Fact And Conclusions Of Law; Order Entering Judgment In Favor Of Plaintiff, Case 3:13-cv-00457-JST (N.D. Cal.), San Francisco Division, Document 249 (April 21, 2015)	

Examiner Signature		Date Considered	

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Electronic Acknowledgement Receipt

EFS ID:	22219016
Application Number:	95002386
International Application Number:	
Confirmation Number:	7254
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Customer Number:	22852
Filer:	Eric Paul Raciti/Karen Crespo
Filer Authorized By:	Eric Paul Raciti
Attorney Docket Number:	COOL-1.012
Receipt Date:	30-APR-2015
Filing Date:	15-SEP-2012
Time Stamp:	14:58:22
Application Type:	inter partes reexam

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Miscellaneous Incoming Letter	4-30-2015_Certificate_of_Service.pdf	32482 dfe2a9f9911d8faa69729f7607d9c6529d2395b8	no	1

Warnings:

Information:

2	Notice of concurrent proceedings / decisions	4-30-2015_Second_Notification_of_Concurrent_Proceedings.pdf	99112 7848026d387d632175c78d537b5835c660643536	no	3
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	4-30-2015_PTOSB08.pdf	91330 bfdaa0f2892edf590ad586733c4f493f9c915a97	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
4	Non Patent Literature	4-30-2015_Findings_of_Fact_and_Conclusions_of_Law.pdf	1989444 39eaf1cfd9ed66b662e61bc6ae4c7d26e49b8cdf	no	29
Warnings:					
Information:					
Total Files Size (in bytes):			2212368		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
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<u>New International Application Filed with the USPTO as a Receiving Office</u>
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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and correct copy of the Notification of Concurrent Proceedings -- Statement under 37 C.F.R. § 1.985(a) with PTO/SB/08 form and listed documents has been served via Federal Express on the 30th day of April, 2015, upon the Third Party Requester at the following address:

Ganz Law P.C.
163 Southeast 2nd Avenue,
Hillsboro, OR 97123

Eric P. Raciti
Reg. No. 41,475

Inter Partes **Reexamination**
Customer No. 22,852
Attorney Docket No. 10494.8000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Inter Partes* Reexamination of:	)
	)
André Sloth ERIKSEN	) Art Unit: 3993
	)
U.S. Patent No.: 8,245,764 B2	) Examiner: Joseph A. KAUFMAN
Filed: October 7, 2011	)
Issued: August 21, 2012	) Confirmation No.: 7254
	)
For: COOLING SYSTEM FOR A	)
COMPUTER	)
	)
Reexamination Proceeding	)
Control No.: 95/002,386	)
Filed: September 15, 2012	)

Mail Stop: ***Inter Partes* Reexam**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SECOND NOTIFICATION OF CONCURRENT PROCEEDINGS
STATEMENT UNDER 37 C.F.R. § 1.985(a)

Pursuant to 37 C.F.R. § 1.985(a), and further to the Notification of Concurrent Proceedings filed on December 19, 2014, Patent Owner notifies the Patent Office that on April 21, 2014, Judge Tigar of the U.S. District Court for the Northern District of California entered FINDINGS OF FACT AND CONCLUSIONS OF LAW; ORDER ENTERING JUDGMENT IN FAVOR OF PLAINTIFF on questions of infringement and validity in *Asetek Danmark A/S v. CMI USA, Inc., (*N. D. Cal.), No. 3:13-cv-00457-JST. The court found claims 1-15, 17 and 18 of the patent under this inter partes reexamination proceeding, U.S. Patent No. 8,245,764 B2 (the '764 Patent), not invalid for obviousness, lack of written description or indefiniteness.

Patent Owner further notifies the Patent Office that on April 17, 2015 Judge O'Grady of the U.S. District Court for the Eastern District of Virginia entered an ORDER dismissing the complaint in *Asia Vital Components Co., Ltd. v. Asetek Danmark A/S*, No. 1:14-cv-1293 (E.D. Va.). The court found that there existed no justiciable case or controversy. Declaratory Judgment plaintiff Asia Vital Components appealed the decision to the Federal Circuit Court of Appeals on April 24, 2015.

Patent Owner further notifies the Patent Office that the matter *Asetek Holdings, Inc. v. CoolIT Systems, Inc.*, (N.D. Cal.), No. 3:12-cv-04498-EMC has been dismissed pursuant to a confidential settlement agreement.

Patent Owner lists Judge Tigar's April 21, 2015 FINDINGS OF FACT AND CONCLUSIONS OF LAW; ORDER ENTERING JUDGMENT IN FAVOR OF PLAINTIFF on the attached IDS form PTO/SB/08 and respectfully requests that the Examiner consider the listed document and indicate that it was considered by making appropriate notations on the attached form.

If there is any fee due in connection with the filing of this Statement, please charge the fee to Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: April 30, 2015

By:__________________________
Eric P. Raciti
Reg. No. 41,475

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 12/22/2014
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
12/22/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patents and Trademark Office
P.O.Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS
GANZ LAW, PC
P O BOX 2200
HILLSBORO, OR 97123

Date: MAILED

DEC 22 2014

CENTRAL REEXAMINATION UNIT

Transmittal of Communication to Third Party Requester
Inter Partes Reexamination

REEXAMINATION CONTROL NO. : 95002386
PATENT NO. : 8245764
ART UNIT : 3993

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above-identified reexamination proceeding. 37 CFR 1.903.

Prior to the filing of a Notice of Appeal, each time the patent owner responds to this communication, the third party requester of the inter partes reexamination may once file written comments within a period of 30 days from the date of service of the patent owner's response. This 30-day time period is statutory (35 U.S.C. 314(b)(2)), and, as such, it cannot be extended. See also 37 CFR 1.947.

If an ex parte reexamination has been merged with the inter partes reexamination, no responsive submission by any ex parte third party requester is permitted.

All correspondence relating to this inter partes reexamination proceeding should be directed to the Central Reexamination Unit at the mail, FAX, or hand-carry addresses given at the end of the communication enclosed with this transmittal.

UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
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FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

: (For Patent Owner)

MAILED

DEC 22 2014

CENTRAL REEXAMINATION UNIT

GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

: (For Requester)

In re Eriksen	:
Inter Partes Reexamination Proceeding	: **DECISION**
Control No. 95/002,386	: **DISMISSING PETITION**
Filed: September 15, 2012	: **UNDER § 1.183**
For: U.S. Patent No. 8,245,764 B2	:

This is a decision on the August 20, 2014 petition entitled "PETITION UNDER 37 C.F.R. § 1.183 TO SUSPEND, IN PART, 37 C.F.R § 1.951 (b)" requesting waiver of the prohibition against filing second comments after the close of prosecution.

The patent owner petition is before the Office of Patent Legal Administration.

The petition is **dismissed.**

PERTINENT BACKGROUND[1]

1. On September 15, 2012, a request for *inter partes* reexamination of U.S. Patent Number 8,245,764 ("the '764 patent") was filed by the third party requester; the resulting reexamination proceeding was assigned control number 95/002,386 ("the '2386 proceeding").

2. On October 26, 2012, an order granting reexamination in the '2386 proceeding was mailed concurrently with a non-final Office action.

3. On December 26, 2012, patent owner submitted a response to the October 26, 2012 Office action.

[1] See the reexamination file for the full history.

4. On January 25, 2013, third party requester filed comments to the patent owner's December 26, 2012 response.

5. On May 7, 2013, the Office issued a notice stating that the third party requester's January 25, 2013 comments were defective and expunged them from the record and provided a 15 day period for the requester to file compliant replacement comments.

6. On May 22, 2013, the third party requester filed replacement comments in response to the May 7, 2013 notice.

7. On June 10, 2013, the third party requester filed a third set of comments along with a petition requesting waiver of 37 C.F.R. § 1.947 to enter the comments ("substitute comments").

8. On September 3, 2013, the Office issued an Action Closing Prosecution ("ACP") which stated that the requester's replacement comments of May 22, 2013, would not be entered because they propose a new rejection of unamended claims.

9. On September 13, 2013, the Office dismissed the requester's June 10, 2013 petition.

10. On October 3, 2013, the patent owner filed comments to the ACP including a declaration of Donald Tilton ("the Tilton declaration").

11. On November 4, 2013, the third party requester filed comments to the ACP including a declaration of Seri Lee ("the Lee declaration").

12. On June 30, 2014, the Office issued a notice stating that requester's November 4, 2013 comments were defective and expunged from the record because the comments propose new rejections of claims that had not been amended.

13. Concurrently, the Office mailed the Right of Appeal notice ("RAN").

14. On July 24, 2014, the patent owner filed a notice of appeal.

15. On August 20, 2014, the requester filed the instant petition requesting waiver of the rules to enter the Lee declaration.

16. On September 24, 2014, the patent owner filed an appellant's brief.

17. On October 24, 2014, requester filed a respondent's brief.

APPLICABLE RULE(S)

37 C.F.R. § 1.183 provides:

> In an extraordinary situation, when justice requires, any requirement of the regulations in this part which is not a requirement of the statutes may be suspended or waived by the Director or the Director's designee, sua sponte, or on petition of the interested party, subject to such other requirements as may be imposed. Any petition under this section must be accompanied by the petition fee set forth in § 1.17(f).

37 C.F.R. § 1.951(b) provides:

> When the patent owner does file comments, a third party requester may once file comments responsive to the patent owner's comments within 30 days from the date of service of patent owner's comments on the third party requester.

37 C.F.R. § 41.63(c) provides:

> Affidavits or other evidence filed after the date of filing an appeal pursuant to § 41.61 will not be admitted except as permitted by reopening prosecution under § 41.77(b)(1).

37 C.F.R. § 1.116(f) provides:

> Notwithstanding the provisions of paragraph (e) of this section, no affidavit or other evidence can be made in an inter partes reexamination proceeding after the right of appeal notice under § 1.953 except as provided in § 1.981 or as permitted by § 41.77 (b)(1) of this title.

DECISION

Third party requester petitions for waiver of the provision of Rule 1.951(b) which states that "a third party requester may once file comments responsive to the patent owner's comments within 30 days from the date of service of patent owner's comments on the third party requester." In the instant proceeding, the requester filed comments and the Lee declaration responsive to the patent owner's response to the ACP on November 4, 2013. The Office expunged these documents in a June 30, 2014 notice. Patent owner petitions to enter the resubmitted Lee declaration filed with the accompanying petition. The declaration is barred under rules 41.63(c), 1.116(f) and 1.951(b), and patent owner petitions for waiver of the relevant provisions of those rules.

Requester's petition is submitted under 37 C.F.R. § 1.183, which permits waiver of a rule that is not a requirement of the statutes, in an "extraordinary situation, when justice requires" the requested relief. Relief may be granted, therefore, if the existence of an extraordinary situation such that justice requires relief can be found in the current instance.

Requester requests entry of evidence in the form of a declaration of Seri Lee to address evidence submitted by the patent owner after ACP. In particular, requester asserts the (1) entry complies with 35 U.S.C. § 314 and 37 C.F.R. § 1.116,[2] and (2) entry serves justice and avoids undue prejudice.[3]

I. Requester has not Demonstrated an Extraordinary Situation

Requester argues that the Lee declaration should be entered because it complies with 35 U.S.C. § 314 and 37 C.F.R. § 1.116. However, requester does not demonstrate an "extraordinary situation" for which "justice requires" entry and consideration of the Lee declaration. As requester correctly recognizes, § 314 does not prohibit the correction of defective comments,[4] However, it is not enough simply to argue the submission is not prohibited by statute; any submission must also comply with the applicable rules and procedures. The Office's rules do not provide for the entry of corrected comments after ACP.[5] Instead, requester must seek to waive 37 C.F.R. § 1.951 by providing a grantable petition under § 1.183.[6] Any petition to accept a corrected comments submission at this stage of the proceeding must meet the requirements of 37 C.F.R. § 1.183, that is, the requester must demonstrate an "extraordinary situation."[7] Here the requester has not provided any showing of an extraordinary situation. Additionally, requester argues the declaration complies with 37 C.F.R. § 1.116(e). Yet § 1.116(e) is not applicable to the entry of the declaration at this stage; on the contrary, this submission is explicitly prohibited under § 1.116(f).[8] Any waiver of § 1.116 would require the showing of an extraordinary situation which requester has not demonstrated.

To the extent the requester argues the expungement of the Lee declaration after ACP has created an extraordinary situation, the Office notes that it is clearly set forth in the MPEP that if requester's comments after ACP are found improper, the submission will be expunged from the record.[9] Therefore, the situation where an otherwise proper evidence submission is expunged together with improper comments is clearly contemplated by the guidelines and cannot be described as "extraordinary."

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[2] Petition at 4-6.
[3] Petition at 4-5.
[4] It is noted that the requester is not asking to enter corrected comments, but to enter and consider evidence after RAN.
[5] MPEP 2672(IV) Note that corrected third party comments are provided for after a <u>non-</u>final rejection as provided in MPEP 2666.05(II)..
[6] *Id.*
[7] See MPEP 2672.
[8] "Notwithstanding the provisions of paragraph (e) of this section, no affidavit or other evidence can be made in an inter partes reexamination proceeding after the right of appeal notice under § 1.953 except as provided in § 1.981 or as permitted by § 41.77 (b)(1) of this title."
[9] MPEP 2672(IV).

II. Justice Does Not Require Entry of the Lee Declaration

Further, even if this situation could be categorized as extraordinary, petitioner must prove that "justice requires" waiver of the rules. In determining whether justice requires waiver, the Office must necessarily take into account the petitioner's behavior and role in creating the extraordinary situation. Here, the Lee declaration was expunged from the record because it was included as a part of an improper requester comments submission. But-for the requester's improper comments submission, the Lee declaration would likely have been entered and considered by the Office at the procedurally appropriate time. Moreover, the requester cannot argue this behavior is prudent because requester knew or should have known that new rejections for unamended claims are clearly prohibited by the rules. In fact, requester's January 25, 2013 comments were found defective for similar reasons.

Furthermore, requester also argues that there will be "unfair and undue prejudice" on the requester if the Lee declaration is not entered. However, any unfair prejudice that may occur is the result of requester's own actions in filing an improper paper after ACP. Further, as discussed above, unfair prejudice alone is not a ground to grant waiver of the rules. The petitioner must establish an extraordinary situation. It is noted, that entering the declaration at this stage of the proceeding would prejudice the patent owner because the patent owner has already filed their appeal brief and will not have an opportunity to fully respond to the evidence. Alternatively, the Office would need to reissue the RAN. Rolling the proceeding back to RAN without an extraordinary situation would not be in accordance with the statutory mandate to conduct the proceedings with "special dispatch."[10]

Petitioner here seeks waiver of the rule preventing evidence submissions after a Right of Appeal Notice ("RAN") has issued. Having weighed all of the facts and circumstances pertinent to the petition, the requester has not established the existence of an extraordinary circumstance such that justice requires entry of the Lee declaration. For that reason, relief is not provided under § 1.183, and requester's August 20, 2014 petition under § 1.183 is **dismissed.**

CONCLUSION

- The petition is **dismissed**.
- The reexamination proceeding is being forwarded to the Central Reexamination Unit for further handling not inconsistent with this decision.

[10] 35 U.S.C. § 314(c).

- Any inquiry concerning this decision should be directed to Matthew Sked at (571) 272-7627 or the undersigned at (571) 272-7700.

/Michael Cygan/
Michael Cygan
Senior Legal Advisor
Office of Patent Legal Administration

December 16, 2014

IDS Form PTO/SB/08: Substitute for form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY PATENT OWNER IN INTER PARTES REEXAMINATION** *(Use as many sheets as necessary)*	***Complete if Known***	
	Reexam Control Number	95/002,386
	Request Filing Date	September 15, 2012
	First Named Inventor	André Sloth ERIKSEN
	Art Unit	3993
	Examiner Name	Joseph A. KAUFMAN
Sheet 1 of 1	*Attorney Docket Number*	10494.8000

U.S. PATENTS AND PUBLISHED U.S. PATENT APPLICATIONS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Issue or Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	Translation[6]

NONPATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	Translation[6]
		Final Verdict Form, Case 3:13-cv-00457-JST (N.D. Cal.), San Francisco Division, Document 219 (Dec. 17, 2014)	

Examiner Signature		Date Considered	

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Electronic Acknowledgement Receipt

EFS ID:	21017420
Application Number:	95002386
International Application Number:	
Confirmation Number:	7254
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Customer Number:	22852
Filer:	Eric Paul Raciti/Marlene A Richards
Filer Authorized By:	Eric Paul Raciti
Attorney Docket Number:	COOL-1.012
Receipt Date:	19-DEC-2014
Filing Date:	15-SEP-2012
Time Stamp:	14:02:40
Application Type:	inter partes reexam

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Notice.pdf	556372 68972fc3491aca5d2f9b04d1c25a3c64a862e6bd	yes	10

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Notice of concurrent proceeding(s)	1	3
	Information Disclosure Statement (IDS) Form (SB08)	4	4
	Non Patent Literature	5	10
Warnings:			
Information:			
	Total Files Size (in bytes):	556372	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

***Inter Partes* Reexamination**
Customer No. 22,852
Attorney Docket No. 10494.8000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Inter Partes* Reexamination of:	)
	)
André Sloth ERIKSEN	) Art Unit: 3993
	)
U.S. Patent No.: 8,245,764 B2	) Examiner: Joseph A. KAUFMAN
Filed: October 7, 2011	)
Issued: August 21, 2012	) Confirmation No.: 7254
	)
For: COOLING SYSTEM FOR A COMPUTER	)
	)
	)
Reexamination Proceeding	)
Control No.: 95/002,386	)
Filed: September 15, 2012	)

Mail Stop: ***Inter Partes* Reexam**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

NOTIFICATION OF CONCURRENT PROCEEDINGS--
STATEMENT UNDER 37 C.F.R. § 1.985(a)

Pursuant to 37 C.F.R. § 1.985(a), Patent Owner notifies the Patent Office that the patent under this inter partes reexamination proceeding, U.S. Patent No. 8,245,764 B2 (the '764 Patent), is currently involved in three pending litigations, *Asetek Holdings, Inc. v. CMI USA, Inc. fka Cooler Master Co., Ltd., (*N. D. Cal.), No. 3:13-cv-00457-JST; *Asetek Holdings, Inc. v. CoolIt Systems, Inc.,* (N.D. Cal.), No. 3:12-cv-04498-EMC, and *Asia Vital Components Co., Ltd. v. Asetek Danmark A/S,* No. 1:14-cv-1293 (E.D. Va.). The jury in the above-identified *CMI USA, Inc.* litigation returned a verdict in favor of patent owner Asetek on questions of infringement and validity.

Patent Owner lists the Final Verdict Form on the attached IDS form PTO/SB/08 and respectfully requests that the Examiner consider the listed document and indicate that it was considered by making appropriate notations on the attached form.

If there is any fee due in connection with the filing of this Statement, please charge the fee to Deposit Account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: December 19, 2014

By: ____________________
Eric P. Raciti
Reg. No. 41,475

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and correct copy of the Notification of Concurrent Proceedings -- Statement under 37 C.F.R. § 1.985(a) with PTO/SB/08 form and listed documents has been served via Federal Express on the 19th day of December, 2014, upon the Third Party Requester at the following address:

Ganz Law P.C.
163 Southeast 2nd Avenue,
Hillsboro, OR 97123

Eric P. Raciti
Reg. No. 41,475

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re U.S. Patent No.: 8,245,764 **Applicant:** Andre Sloth Eriksen **Issued:** August 21, 2012 **Filed:** October 7, 2011 **Title:** COOLING SYSTEM FOR A COMPUTER SYSTEM	**Art Unit:** 3993 **Examiner:** Joseph A. Kaufman **Confirmation No.:** 7254

Reexamination Proceeding
Control No. 95/002,386
Filed: September 15, 2012

Mail Stop *Inter Partes* Reexam
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

RESPONDENT'S / REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

TABLE OF CONTENTS

INTRODUCTION

This brief responds to "Appellant's/Patent Owner's Appeal Brief under 37 C.F.R. § 41.67" served on Third-Party Requester (hereafter, "Respondent") on September 24, 2014, making the filing deadline October 24, 2014. *See* 37 C.F.R. § 41.66(b). Thus, this Appeal Brief is timely filed. The Appeal Brief contains fewer than 15 pages and, thus, complies with 37 C.F.R. § 1.943. A $1,000 fee under 37 C.F.R. § 41.20(b)(2)(ii) is concurrently submitted herewith.

Please charge any deficient or additional fees, or refund any excess payments, to Deposit Account No. 50-1001.

REAL PARTY IN INTEREST

Respondent, CoolIT Systems, Inc., having a principal place of business at 3920 29th Street NE, Calgary, Alberta T1Y 6B6, Canada, is the real party in interest in this Appeal Brief.

RELATED APPEALS, INTERFERENCES, AND TRIALS

Neither Respondent nor the undersigned representative of Respondent is aware of any related appeals or interferences before the Patent Trial and Appeal Board.

U.S. Patent No. 8,245,764 (Exhibit 1, the "'764 Patent") is currently involved in the following litigations: (I) *Asetek Holdings, Inc. v. CoolIT Systems, Inc.*, Civil Action No. 3:12-cv-04498-EMC; and (II) *Asetek Holdings, Inc. v. CMI USA, Inc.*, Civil Action No. 3:13-cv-00457-JST, both pending in the U.S. District Court for the Northern District of California.

STATUS OF CLAIMS

All claims (i.e., claims 1-30) stand rejected. Respondent therefore accepts Appellant's statement of the status of the claims.

STATUS OF AMENDMENTS

Respondent accepts Appellant's statement of the status of amendments.

SUMMARY OF CLAIMED SUBJECT MATTER

Appellant fancifully paraphrases several claims from the '764 Patent to allege features not actually recited in the claims, and later argues those non-recited features somehow distinguish the claims from U.S. Patent No. 7,544,049 to Koga, *et al* (Ex. 2, "*Koga*"). Therefore, Respondent disputes Appellant's summary of claimed subject matter.

Liquid cooling systems claimed in the '764 Patent include a reservoir, a heat exchanging interface for transferring heat to a cooling liquid, a radiator for dissipating heat from the cooling liquid, and a pump for circulating the cooling liquid through the cooling system. '764, 1:65-2:12. The reservoir includes a pump chamber and a thermal exchange chamber and the pump resides in the pump chamber. Id. at 22:26-53.

The purported invention in the '764 Patent concerns a vertical spacing of the pump chamber from the thermal exchange chamber. Id. at 27:53-55, 28:37-38, 29:1-3; Ex. 3 (Amendment dated April 6, 2012, pp. 8-14); Ex. 4 (Examiner's Reasons for Allowability, pp. 2-3).

Claim 1: As to the heat-exchanging interface, claim 1 requires that "the heat-exchanging interface form[] a boundary wall of the thermal exchange chamber and [be] configured to be placed in thermal contact with a surface of the heat-generating component." '764, 27:59-62; FIGS. 15, 17; *cf.* App. Br., 1:16-17. But, contrary to Appellant's rewriting of claim 1, independent claim 1 does not limit the heat-exchanging interface to having two sides, let alone to one side in contact with the cooling liquid in the thermal exchange chamber and the opposite side in contact with the heat generating component. *Cf.* App. Br., 1:16-17.

Also, claim 1 merely recites separate pump and thermal exchange chambers. '764, 27:55-56. And, claim 1 only requires that the heat radiator be fluidly coupled to the reservoir (i.e., without specifying a means of the coupling) and configured to dissipate heat from the cooling liquid (i.e., without specifying the source of the heat), contrary to the superfluous limitations alleged by Appellant. '764, 27:64; *cf.* App. Br., 1:6-8.

Claim 4: Respondent disputes Appellants summary of claim 4 to the extent it suggests the claimed "features that are adapted to increase heat transfer from the heat-exchanging interface" must be positioned in the thermal exchange chamber. App. Br., 2:2-5; *cf.* '764, 28:1-13, FIG. 15 (showing a portion of heat exchanging interface 4 overlying the impeller 33 to enclose a recess housing the impeller as well as extending over another portion of the reservoir, both portions being in contact with the cooling liquid within the reservoir), 19:52-61 (same), 20:42-53 (same). Nothing in claim 4, intervening claim 3, or independent claim 1 requires that the features be positioned in the thermal exchange chamber.

Claims 6 and 19: Respondent adopts Appellant's summary of claims 6 and 19.

Claim 10: Respondent disputes Appellant's summary of independent claim 10. Claim 10 recites separate, vertically arranged pump and thermal exchange chambers, but does not specify which chamber is "above" the other, as alleged by Appellant. '764, 28:35-38; *cf.* App. Br. 2:18. Claim 10 does not recite that the motor of the pump includes an impeller, as alleged by Appellant. App. Br., 2:14-15; *cf.* '764, 28:29-31. Rather, claim 10 merely recites that the pump comprises a stator and an impeller. Id.

Claim 23: Respondent adopts Appellant's summary of claim 23.

Claim 15: Respondent disputes Appellant's summary of independent claim 15. Claim 15 recites a "liquid-to-air heat exchanger" connected to the reservoir with tubing and "being configured to be positioned remote from the reservoir." '764, 29:11-13. But, contrary to Appellant's allegations, claim 15 does not require the "liquid-to-air heat exchanger" to be in the form of a "radiator." Id.; *cf.* App. Br. 3:7-10.

And, as to the heat-exchanging interface, claim 15 requires that "a first side of the heat-exchanging interface [be] in contact with a cooling liquid in the thermal exchange chamber and a second side of the heat-exchanging interface opposite the first side [be] configured to be placed in thermal contact with a surface of the heat-generating component." '764, 29:5-10; FIGS. 15, 17; *cf.* App. Br., 3:15-19. But, contrary to Appellant's rewriting of claim 15, independent claim 15 does not limit the heat-exchanging interface to having two sides. Id. Claim 15 also does not recite a "motor of a centrifugal pump," as Appellant alleges. App. Br., 3:9. Instead, claim 15 merely recites that the pump includes "an impeller exposed to the cooling liquid; and a stator isolated from the cooling liquid."

Claim 16: Respondent disputes Appellant's rewriting of claim 16. Claim 16 recites two openings (i.e., not two "passages") to direct cooling liquid from the pump chamber into the thermal exchange chamber. '764, 30:4-6. Claim 16 further recites that the impeller cover defines a first opening radially offset from a center of the impeller, but does not recite that such opening is "on" the impeller cover as Appellant alleges. Id. at 30:1-2; *cf.* App. Br. 3:23. Claim 16 also recites "the intermediate member includes a second passage" aligned with the first opening, but does not recite a second opening on the intermediate member, as Appellant alleges. Id. at 30:3-4; *cf.* App. Br. 4:1-2.

Claim 17: Respondent disputes Appellant's rewriting of claim 17. Claim 17 depends from independent claim 15. '764, 30:7. According to claim 15, a first side of the heat exchanging interface contacts cooling liquid in the thermal exchange chamber. '764, 28:3-5. Claim 17 recites further that the first side includes pins or fins. Id. at 30:7-9. However, nothing in claim 17 requires the pins or fins to be positioned in the thermal exchange chamber.to the extent it suggests the claimed "pins or fins" must be positioned in the thermal exchange chamber. '764, 19:52-61, 20:42-53, 29:5-7, 30:7-9; FIG. 15.

ISSUES TO BE REVIEWED ON APPEAL

Respondent disputes the completeness and accuracy of Appellant's statement of the issues presented for review on appeal. First, Appellant presents 8 ½ pages of arguments, 3 pages of which attempt to rewrite the claims under the guise of construing the claim term "thermal exchange chamber," before reaching the purported first issue on appeal. Second, Appellant misidentifies claims 1-30 as being anticipated by *Koga* under 35 U.S.C. § 102(b) (i.e., as opposed to claims 1-19, 21-23, 25-27, 29, and 30 as listed in the Right of Appeal Notice (Ex. 5, "RAN"). Third, Appellant's general statement regarding priority obscures determinative issues of law and fact. Therefore, Respondent proposes the following counter statement of issues to be reviewed on appeal:

1. Whether *Koga* anticipates claims 1-19, 21-23, 25-27, 29 and 30 under 35 U.S.C. § 102(b);

2. Whether the subject matter recited in claims 20, 24, and 28 under 35 U.S.C. § 103(a) would have been obvious from *Koga*; and
3. Whether claims in the '764 Patent to subject matter lacking from International Application No. PCT/DK2005/00310 ("the International Application," Ex. 6) and added to intervening applications years after the International Application's filing date find sufficient written description and other support under 35 U.S.C. § 112 to enjoy priority from the International Application's filing date.

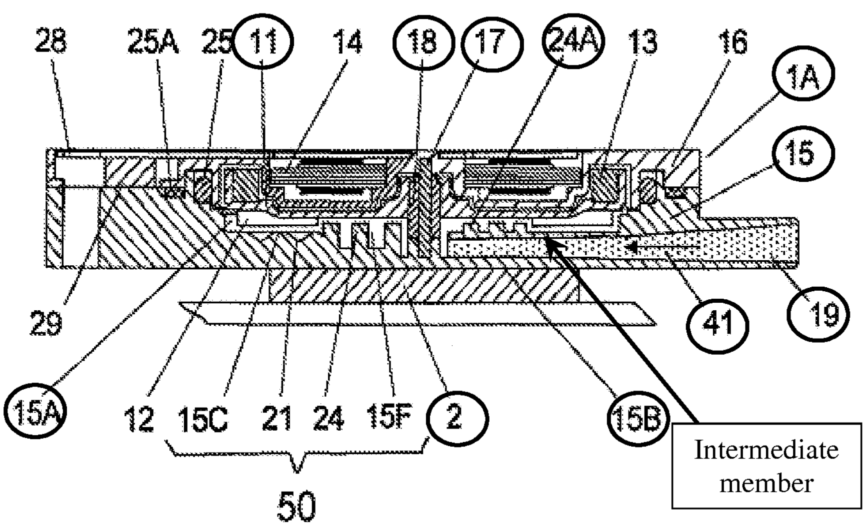
ARGUMENT

Each of claims 1-30 stands rejected over *Koga*. Each outstanding claim rejection should be maintained at least for reasons set forth in Respondent's original Request for *Inter Partes* Reexamination ("Request," Ex. 7), the Order Granting Request for Reexamination ("Order," Ex. 8), the Office Action dated October 26, 2012 ("the First Action," Ex. 9), the Action Closing Prosecution dated September 3, 2013 ("the ACP," Ex. 10), the RAN, and for the reasons set forth below. Respondent respectfully urges the Board to consider the Examiner's rejections set forth in the foregoing evidence, as well as all arguments herein.

I. SUMMARY OF *KOGA*

Koga disclosed a cooling system having each and every combination of elements arranged as claimed in the '764 Patent years before the application leading to the '764 Patent was filed.

Koga's cooling system includes a cooling device 1A configured to be placed in thermal contact with a heat-producing component 2 (e.g., a CPU). *Koga*, 1:61-62; 2:2-16; FIGS. 1, 3, 5, 7, and 8. The cooling device facilitates the transfer of heat from the CPU to a coolant 41 (FIG. 7) passing through the cooling device 1A. Id. The coolant can be water, or a mixture of water and propylene glycol. Id. Tubing 4 carries the heated coolant 41 to a radiator 3, where the heat previously collected by the coolant is rejected to outside air. Id. at 21-23. After being cooled in the radiator 3, the coolant 41 returns to the cooling device 1A. Id. at 4:11-13; 10:14-21; FIG. 1. In particular, the cold coolant returns to the device 1A through the "sucking channel" 19. Id. at 9:52-54.



As shown to the left, *Koga*'s cooling device 1A includes a pump chamber 15A above a separate thermal exchange chamber 19. *Koga*, 9:10-47, FIG. 7. A portion of the thermal exchange chamber 19 (e.g., "above" the lead line from reference numeral 15B) is positioned in thermal contact with the component 2. Id. *Koga* discloses that the casing 15 can be formed of a material having a high thermal conductivity, such as, for example, aluminum or copper. Id. at 5:14-18. Thus, the casing 15 absorbs heat from the component 2 through the heat receiving plane 15B and transfers that heat to the cold coolant 41 passing through the thermal exchange chamber 19. Id. at 4:58-60, 10:5-21, FIGS. 3, 7, 8.

A separate pump chamber (e.g., *Koga*'s "pump room" 15A, occupied by *Koga*'s impeller 11) is vertically spaced apart from the thermal exchange chamber 19, e.g., by the horizontal wall (labeled above as "intermediate member"). Id. The channel 19 terminates below the pump chamber 15A and defines a gap from the bearing 18 through which coolant 41 can flow from the thermal exchange chamber 19 into the pump chamber 15A (or in a reverse direction, as when the impeller 11 stops spinning). Id. Thus, the thermal exchange chamber and the pump chamber are connected with each other through a passage configured for fluid communication. Id. The gap adjacent the terminal end of the channel 19 is offset from a center of the impeller 12 (e.g., offset from the shaft 17 about which the impeller rotates). Id. at 4:50-55.

As well, a stator 14 is positioned above a portion of *Koga*'s double-sided chassis 16 to isolate the stator from the coolant 41 in the pump chamber 15A. *Koga*, 5:38-57, FIG. 7. The impeller 11 is positioned below the portion of the double-sided chassis 16 and in contact with the coolant 41 in the pump chamber. Id.

II. *KOGA* ANTICIPATES EACH OF CLAIMS 1-19, 21-23, 25-27, 29 AND 30

A. *Koga discloses a Claimed "Thermal Exchange Chamber"*

During reexamination, claims of an unexpired patent are to be construed under their broadest reasonable interpretation consistent with the specification. In re ICON Health and Fitness, Inc., 496 F.3d 1374, 1379 (Fed. Cir. 2007).[1] During reexamination, the claims must be interpreted as broadly as their terms reasonably allow. In re American Academy of Science Tech Center, 367 F.3d 1359, 1364 & 1369 (Fed. Cir. 2004). Respondent accordingly requests that the Board gives the claim terms in the '764 Patent their broadest reasonable interpretation.

Under a broadest reasonable interpretation, words of the claim must be given their plain meaning, unless such meaning is inconsistent with the specification. Phillips v. AWH Corp., 415 F.3d 1303 (Fed. Cir. 2005). The Federal Circuit departs from the plain meaning of the terms only when the patentee has acted as his own lexicographer by clearly setting forth a definition of a disputed claim term or where he has disavowed the full scope of the claim term using clear and unmistakable statements of disclaimer. GE Lighting Solutions, LLC v. AgiLight, Inc., 750 F.3d 1304, 1309 (Fed. Cir. 2014). "The standards for finding lexicography and disavowal are exacting. To act as its own lexicographer, a patentee must clearly set forth a definition of the disputed claim term, and clearly express an intent to define the term. Similarly, disavowal

[1] As the Federal Circuit has recognized, the "broadest reasonable intrepretation" standard is different from the manner in which the scope of a claim is determined in litigation. *See* In re Swanson, 540 F.3d 1368, 1377-78 (Fed. Cir. 2008).

requires that the specification or prosecution history make clear that the invention does not include a particular feature." Id. (internal quotations and citations omitted).

In its First Response, Appellant adopted the plain and ordinary meaning of the term "chamber" as being "any enclosed space; compartment …," as proposed by the Examiner. Ex. 11 ("First Response"), 18:7-10; *also see* Order, pp. 4, 7. As the Examiner has correctly determined, Koga's channel 19 is an enclosed space having an inlet and outlet, bounded by an upper wall ("intermediate member") and a lower wall (e.g., the wall defining the heat receiving plane 15B), and thus is properly considered as a "chamber." Id.; *Koga*, FIG. 7. Appellant does not, indeed cannot, contest that conclusion, as any reasonable definition of the term "channel" fits squarely within the definition of the term "chamber" adopted by Appellant in this appeal.

Respondent also agrees with Appellant insofar as Appellant asserts that a "thermal exchange chamber" is not just *any* chamber, "because not all chambers or compartments are configured to perform heat exchange." App. Br. 12:17-18. On that point, Appellant suggests that a chamber can be considered as a "thermal exchange chamber" if it is "configured to perform thermal exchange." Id. Respondent agrees: whether a given chamber constitutes a "thermal exchange chamber" is not a matter of degree under the plain and ordinary meaning – either the chamber is configured to perform thermal exchange and thus is a "thermal exchange chamber" or the chamber is not configured to perform thermal exchange and thus is not.

Koga's chamber 19 clearly is configured to perform thermal exchange. The outer surface of the highly conductive casing wall 15 (which Koga refers to as the "heat-receiving face" or "heat-receiving plane 15B") contacts the heat dissipating component 2. *Koga*, 4:38-43, FIG. 7. A portion of the chamber 19 extends directly over the heat dissipating component 2, providing a direct and short conduction path between the outer surface 15B of the casing wall 15 and the coolant 41 in the chamber 19. Id. The portion of the casing wall 15 between the coolant 41 and the outer surface 15B in the region of the chamber 19 necessarily has a high temperature by virtue of its contact with the component 2. By virtue of that contact, conduction heat transfer occurs through the contact surface 15B, and the casing 15 absorbs heat dissipated by the component 2, spreading the heat "everywhere," including to walls surrounding the chamber 19. Id. at 8:23-24, 10:5-21, FIG. 7. *Koga* even discloses enhancing that thermal exchange by forming the case 15 out of a "material having a high thermal conductivity and an excellent heat dissipating property, e.g., copper or aluminum, of which thermal conductivity is 380-400 W/mK and ca. 230 W/mK, respecitively. It is preferable to use the [*sic*: a] material having at least the foregoing specific thermal conductivity." *Koga*, 5:11-18.

And, the high-temperature casing wall adjacent the channel 19 is exposed to the lowest-temperature coolant 41 of any portion of the casing 15. *Koga*, 10:18-22. The incoming cold coolant 41 ***necessarily*** absorbs heat from the casing wall as the coolant 41 passes through Koga's channel 19 since energy in the form of heat ***necessarily*** moves from higher temperature regions to lower temperature regions. The large temperature difference between the coolant 41 and the casing wall surrounding the channel 19 ***promotes*** high per-surface-area heat transfer from the casing wall 15 to the coolant.

Thus, by virtue of Koga's arrangement of the chamber 19 in relation to the component 2, thermal exchange *necessarily and inevitably* occurs from the casing 15 to the cold coolant 41 because energy in the form of heat *necessarily and inevitably* flows from regions of higher temperature to regions of lower temperature. Id. Inherent aspects of the prior art need not be expressly mentioned in a reference for that reference to qualify as invalidating prior art under § 102. *See* Schering Corp. v. Geneva Pharm. Inc., 339 F.3d 1373, 1377 (Fed. Cir. 2003).

Accordingly, *Koga*'s chamber 19 constitutes a "thermal exchange chamber" under the plain and ordinary meaning of that term. Respondent's own expert admits *some* thermal exchange occurs within *Koga*'s chamber 19, and instead disputes the characterization of *Koga*'s chamber 19 as being a "thermal exchange chamber" solely on a matter of degree of thermal exchange that occurs in that chamber (i.e., "hardly any"). App. Br., Ex. 6 ¶ 12 (Tilton Decl.)

However, the '764 Patent does not set forth any particular meaning of the term "thermal exchange chamber," nor does the '764 Patent clearly express an intent to define the term or to define a degree of thermal exchange that must occur to distinguish between a chamber that constitutes a "thermal exchange chamber" and one that does not. Thus, the term "thermal exchange chamber" as used in the '7764 Patent must be construed on its plain and ordinary meaning.

The '764 Patent even describes alternative arrangements of "thermal exchange chambers," each providing varying degrees of thermal exchange. In some embodiments from the '764 Patent, a "thermal exchange chamber" has a network of fluid channels to facilitate heat dissipation from the heat-generating component to liquid flowing over the heat exchanging interface. App. Br. 10:22-11:22 (citing '764, 22:60-23:8). In other embodiments, however, the "thermal exchange chamber" has a heat exchanging surface with a plane outer surface for abutting a free surface of a heat generating component, as well as a plane (e.g., smooth) inner surface. '764, 12:34-40, 19:62-67, FIGS. 4, 6, 15. A stated advantage of a "thermal exchange chamber" having a smooth inner surface of the heat exchanging surface is to avoid machining (e.g., milling) of the inner surface. Id. 12:40-44, 19:67-20:5. Moreover, FIG. 15 in the '764 Patent illustrates a portion of the heat exchanging interface 4 overlying the impeller 33 to enclose a recess housing the impeller as well as extending over another portion of the reservoir both portions being in contact with the cooling liquid within the reservoir. '764, 19:52-61. Based on that arrangement, some thermal exchange must occur from the heat exchanging interface 4 to the coolant adjacent the impeller 33 (e.g., in the so-called "pump chamber"). Accordingly, nothing in the '764 Patent requires any particular degree of thermal exchange that must occur in a chamber for that chamber to be deemed a "thermal exchange chamber," as long as some thermal exchange occurs, consistent with the plain and ordinary meaning of the term "thermal exchange chamber." And, the '764 Patent even discloses an embodiment where thermal exchange occurs in the pump chamber as in *Koga*.

It therefore is farcical for Appellant to allege in its brief that the specification in the '764 Patent "requires" a "thermal exchange chamber" to have any particular characteristic other than to facilitate some degree of thermal exchange. *Cf.* App. Br., 10:22-11:22 (citing '764, 22:60-23:8).

The plain and ordinary meaning of the term "thermal exchange chamber" must control in context of the '764 Patent because the '764 Patent does not clearly set forth a range, measure, or degree of thermal exchange that must occur in a given chamber to determine whether that chamber constitutes a "thermal exchange chamber." GE Lighting Solutions, LLC v. AgiLight, Inc., 750 F.3d at 1309 (Fed. Cir. 2014).

Thus, because thermal exchange inherently occurs within *Koga*'s chamber 19, that chamber constitutes a "thermal exchange chamber" as that term is used in the claims of the '764 Patent.

B. *Koga is Prior Art for all it Discloses*

Appellant admitted that Koga qualifies as prior art to the '764 Patent. First Response, pp. 26-27.

To be anticipatory, a reference must describe, either expressly or inherently, each and every claim limitation and enable one of skill in the art to practice an embodiment of the claimed invention without undue experimentation. ClearValue, Inc. v. Pearl River Polymers, Inc., 668 F. 3d 1340, 1344 (Fed. Cir. 2012) (citing American Calcar, Inc. v. American Honda Motor Co., 651 F. 3d 1318, 1341 (Fed. Cir. 2011); In re Gleave, 560 F.3d 1331, 1334 (Fed.Cir.2009)).

As a threshold matter, enablement is a question of law based on underlying factual findings, and a prior art patent cited by an examiner is presumptively enabling until a patent owner puts forth a credible showing otherwise, at which point, the Board must make an enablement determination based available evidence and argument. In re Morsa, 713 F.3d 104, 109 (Fed. Cir. 2013) (citing In re Antor Media Corp., 689 F.3d 1282, 1288 & 1292 (Fed. Cir. 2012). Accordingly, the Examiner was under no burden to establish *Koga* as enabling because Appellant did not previously challenge *Koga* on enablement grounds. Since *Koga* is presumptively enabling on the record in this appeal, the mere lack of a record that the Examiner considered enablement of *Koga* provides no basis for reversing the Examiner, contrary to Appellant's unfounded assertion otherwise. *See* App. Br. 9:23-10:2.

Moreover, enablement of prior art merely requires that the reference teach a skilled artisan to make or carry out what it discloses *in relation* to the claimed invention. In re Antor Media Corp., 689 F.3d 1282, 1290-1291 (Fed. Cir. 2012) (internal citations omitted) (emphasis added). "Even if a reference discloses an inoperative device, *it is prior art for all that it teaches*." Beckman Instruments, Inc. v. LKB Produkter AB, 892 F.2d 1547, 1551 (Fed. Cir. 1989) (emphasis added). Enablement is satisfied as long as a skilled artisan is able to make or carry out what the prior art discloses. In re Antor Media Corp., 689 F.3d at 1290-1291. The enablement inquiry in relation to anticipation concerns whether what the skilled artisan is able to make or carry out on the basis of the prior art reference includes all limitations set out in the claim. *See* In re Gleave, 560 F.3d at 1334 ("While those limitations must be arranged or combined in the same way as in the claim, the reference need not satisfy an *ipsissimis verbis* test.") (internal quotes and citations omitted). Moreover, the Federal Circuit has confirmed that there is a "distinction between a written description adequate to *support* a claim under § 112 and a written description sufficient to *anticipate* its subject matter under § 102(b)." Id. (citing Vas-Cath Inc. v. Mahurkar, 935 F.2d 1555, 1562 (Fed. Cir. 1991)).

Appellant does not carry its burden in contesting whether *Koga* is enabling as to what it actually discloses. For example, nowhere does Appellant argue that one of ordinary skill in the art would not be able to make or otherwise carryout *Koga*'s cooling device 1A shown in *Koga*'s FIG. 7 and briefly described above. For example, Appellant appears to concede that one of ordinary skill in the art would be able to make *Koga*'s cooling device having a "pump room 15A" and a "sucking channel 19." *See* App. Br. 9:4-6. But, Appellant simply thumps its chest that *Koga*'s chamber 19 should not be considered as a "thermal exchange chamber," and on that basis alleges that *Koga* does not enable a thermal exchange chamber.

Appellant's argument confounds the questions of what *Koga* enables and whether that includes each and every claim limitation. To make matters worse, Appellant confuses the distinction between a written description adequate to *support* a claim under § 112 and a written description sufficient to *anticipate* its subject matter under § 102(b). *See* In re Gleave, 560 F.3d at 1334.

The question here is not whether *Koga* adequately described a "thermal exchange chamber" for purposes of supporting a claim under § 112, as Appellant suggests. *See*, App. Br. 9:7-12, 14:2-8. Rather, the question is whether *Koga* sufficiently enabled one of ordinary skill in the art to carry out *Koga*'s cooling device 1A, which Appellant does not dispute. Indeed, enablement of *Koga*'s cooling device 1A could not be in dispute. Undue experimentation is determined based on both the nature of the invention and the state of the art. In re Antor Media Corp., 689 F. 3d at 1290 (citations omitted). The thermal exchange arts are well-developed and predictable. Koga describes and illustrates the structure of the device 1A, as well as materials used in its construction. Since the enablement of *Koga*'s cooling device 1A is not in dispute, the anticipation inquiry is simply whether *Koga*'s cooling device 1A includes, expressly or inherently, all limitations arranged as claimed in the '764 Patent. ClearValue, Inc. v. Pearl River Polymers, Inc., 668 F. 3d at 1344.

Just like Appellant attempted to rewrite the claims in the guise of summarizing them, Appellant also misstates the law of enablement and the disclosure in *Koga*, as well as the record in this appeal. For example, Appellant alleges the Examiner does not address whether *Koga*'s chamber 19 would be able to perform any heat transfer (or "thermal exchange"), utterly ignoring that the Examiner incorporated substantial portions of Respondent's Request for *Inter Partes* Reexamination in the first Office Action, the Action Closing Prosecution, and in the Right of Appeal Notice. *See, e.g.*, First Action, 3:15-16 (citing Request pp. 149-164); ACP, 3:22-23 (citing Request pp. 149-164); RAN, 4:4-5 (citing Request pp. 149-164); *see also* Request, pp. 37:3-18, 152-153, 157, and 161; *Cf.* App. Br., 9:16-17. As well, Appellant alleges that *Koga* teaches that thermal exchange occurs nowhere other than the pump chamber 15A, which is an utterly fanciful and erroneous misstatement of fact. App. Br. 9:7-8.

Indeed, at the time of its publication, *Koga* enabled one of ordinary skill in the art to make and carry out all that it disclosed, including the cooling device 1A. The Examiner adopted the portions of Respondent's Request demonstrating that *Koga*'s chamber 19 performs thermal exchange and therefore is properly considered as a "thermal exchange chamber". Appellant's gross mischaracterizations of facts and law should not be countenanced by the Board.

C. *Neither the Claims nor Patent Owner's Concept of "The Invention" Limits a Claimed Cooling System to One Thermal Exchange Chamber*

Each claim in the '764 Patent recites "A cooling system … comprising … a thermal exchange chamber." It is well-settled that the transitional term "comprising" is inclusive or open-ended and does not exclude additional, unrecited elements. *See, e.g.*, Mars Inc. v. H.J. Heinz Co., 377 F.3d 1369, 1376 (Fed. Cir. 2004); *see also* MPEP § 2111.03. Appellant's chosen formulation for independent claim 1 ensnares cooling systems having one, two (like *Koga*), a dozen, or one hundred (or more) thermal exchange chambers.

As explained above in Section II.A, *Koga*'s channel 19 constitutes a thermal exchange chamber. Nonetheless, Respondent argues that *Koga* cannot anticipate claim 1 because, in essence, coolant in *Koga*'s pump chamber 15A absorbs heat. App. Br. 14:14-21.

Appellant's extreme position ignores that heat transfer to the coolant can (and indeed does) occur elsewhere in *Koga*'s device. As noted above, *Koga* explains that the casing 15 has a high thermal conductivity and that heat absorbed from the component 2 "travels everywhere." *Koga*, col. 10:5-6. And, considering the large temperature difference between *Koga*'s casing wall 15 and the coolant 41 in the channel 19, thermal exchange inherently occurs in the chamber 19. Thus, although the coolant absorbs heat in *Koga*'s pump chamber 15A, the coolant also absorbs heat from the component 2 as the coolant passes through *Koga*'s thermal exchange chamber 19.

But, regardless of whether additional heat transfer occurs within *Koga*'s pump chamber 15A, all claim 1 requires is a cooling device having "a thermal exchange chamber" separate from a pump chamber. Nowhere does the '764 Patent, let alone in any of the claims, specify any particular degree of thermal exchange that must occur in a given chamber for that chamber to constitute a "thermal exchange chamber." Had Patent Owner wished to claim a cooling device having only one thermal exchange chamber (or a device in which thermal exchange occurs solely in the thermal exchange chamber and nowhere else, or a chamber with a given degree of thermal exchange), Appellant could have selected any of a variety of different formulations for independent claim 1. Appellant also had ample opportunity to revise claim 1 during prosecution of the application leading to the '764 Patent, and in this *inter partes* reexamination. The Board should deny Appellant's attempt to add limitations in the guise of "construction."

Appellant maintained an open-ended formulation of independent claim 1, reciting merely "a thermal exchange chamber." With Patent Owner's chosen formulation, claim 1 ensnares devices having more than one thermal exchange chamber, including *Koga*'s.

The necessary, open-ended construction of claim 1 comports with Patent Owner's concept of "the invention." The '764 Patent describes a device having more than one thermal exchange chamber. For example, FIG. 15 in the '764 Patent illustrates a portion of the heat exchanging interface 4 overlying the impeller 33 to enclose a recess housing the impeller as well as extending over another portion of the reservoir both portions being in contact with the cooling liquid within the reservoir. '764, 19:52-61. Based on that arrangement, some thermal exchange must occur from the heat exchanging interface 4 to the coolant adjacent the impeller 33 (e.g., in the so-called "pump chamber"). Thermal exchange that occurs in *Koga*'s pump chamber 15A concurrently with thermal exchange in *Koga*'s thermal exchange chamber 19 is no different than thermal exchange occurring in the pump chamber of the device shown in FIG. 15 of the '764 Patent. The '764 Patent also explains that the reservoir housing 14 can be "made of a metal such as copper or aluminum or other metal having a high thermal conductance" and that the coolant "may radiate the heat via the exterior surface of the reservoir housing 14 itself." '764 Patent, col. 22:15-20. Thus, the '764 Patent does not limit thermal exchange to one particular region or chamber in the cooling device.

Appellant's argument that *Koga*'s chamber 19 is not a thermal exchange chamber because heat transfer also occurs in *Koga*'s pump chamber 15A utterly defies logic. Patent Owner crafted claim 1 in an open-ended manner that ensnares devices having a plurality of thermal exchange chambers, and heat transfer occurs in at least two different locations within embodiments described in the '764 Patent. Whether heat transfer also occurs in *Koga*'s pump chamber 15A is immaterial as to whether Koga's thermal exchange also occurs in *Koga*'s chamber 19.

Koga's channel 19 constitutes a chamber, and the coolant 41 therein absorbs heat dissipated by *Koga*'s component 2 through the interface 15B. Therefore, thermal exchange occurs in Koga's chamber 19, and that chamber constitutes a claimed "thermal exchange chamber".

D. *The Board should maintain the Anticipation Rejections of Claims 1-19, 21-23, 25-27, 29 and 30 based on Koga*

Independent Claim 1: Respondent disagrees with Appellant's allegations that *Koga*'s cooling device lacks a "thermal exchange chamber." For reasons stated herein and in the Request, as well as in the First Action, the ACP, and the RAN, Respondent respectfully urges the Board to confirm the Examiner's determination , including that *Koga*'s channel 19 constitutes a "thermal exchange chamber."

Inherent anticipation requires that the missing descriptive material is necessarily present, not merely probably or possibly present in the prior art. Trintec Indus., Inc. v. Top-U.S.A. Corp, 295 F.3d 1292, 1295 (Fed. Cir. 2002). As described above in Section II.A, thermal exchange necessarily and inevitably occurs within the chamber 19 of *Koga*'s cooling device 1A configured as shown in *Koga*'s FIG. 7 (reproduced above in Section I). The outer surface of the highly conductive casing wall 15 contacts the electronic component 2. *Koga*, 4:38-43, FIG. 7. A portion of the chamber 19 extends directly over the heat dissipating component 2, providing a direct and short conduction path between the outer surface 15B of the casing wall 15 and the coolant 41 in the chamber 19. Id. By virtue of that contact, conduction heat transfer occurs through the contact surface 15B, and the casing 15 absorbs heat dissipated by the component 2, spreading the heat "everywhere," including to the walls surrounding the chamber 19. Id. at 8:23-24, 10:5-21, FIG. 7. *Koga* enhances that thermal exchange by forming the case 15 out of a "material having a high thermal conductivity and an excellent heat dissipating property …." *Koga*, 5:11-18. The high-temperature casing wall adjacent the channel 19 is exposed to the lowest-temperature coolant 41 of any portion of the casing 15. *Koga*, 10:18-22.

The incoming cold coolant 41 necessarily absorbs heat from the casing wall as the coolant 41 passes through Koga's channel 19 since energy in the form of heat *necessarily* moves from higher temperature regions to lower temperature regions.

Accordingly, *Koga*'s device inherently comprises a "thermal exchange chamber" as claimed. As well, *Koga* discloses each and every other limitation arranged as in claim 1, as set forth in the original Request and in the First Action, the ACP, and the RAN. The Board should affirm the rejection of claim 1.

Dependent Claims 2-9 and 19-22: Respondent respectfully urges the Board to maintain the rejections of claims 2-9 and 19-22 for at least the same reasons that the rejection of claim 1 should be maintained, as well as because *Koga* also discloses each and every limitation arranged as in those claims, as explained in the Request, the First Action, the ACP, and the RAN.

Dependent Claims 4 and 5: Contrary to Appellant's assertions, dependent claim 4 does not require that the claimed "features" be positioned within the "thermal exchange chamber." Rather, claim 4 merely requires that a side of the heat-exchanging interface (i.e. *Koga*'s casing 15) in contact with the cooling liquid 41 have "features that are adapted to increase heat transfer from the heat exchanging interface to the cooling liquid in the thermal exchange chamber." '764, 28:8-12. Those features need not be in the thermal exchange chamber.

Though the meaning of "adapted to increase heat transfer" is unclear (e.g., "increase" relative to what?), *Koga* discloses each and every element arranged as in claim 4 (as best understood). As FIG. 7 shows, a first side of the wall 15 is in contact with coolant in both *Koga*'s thermal exchange chamber 19 and in the pump chamber 15A. That arrangement is similar to the arrangement shown in FIG. 15 of the '764 Patent in which a portion of the heat exchanging interface 4 forms a wall and is in contact with coolant in both the pump chamber (occupied by impeller 33) and the thermal exchange chamber.

In addition, *Koga* teaches that the "backside of heat receiving plane 15B" can be dimpled or have fins (e.g., protrusions). *Koga*, 6:52-53, FIG. 7. Such fins are shown in FIG. 7 (reproduced above in Section I). *Koga* explains further that such features on the "backside" facilitate heat transfer from the casing wall 15 to the coolant 41 by disrupting a boundary layer. Koga, col. 6:56-62. Still further, *Koga* explains that the casing 15 and thus the protrusions are made of "highly conductive material," which further increases heat transfer to the cooling liquid in the thermal exchange chamber 19. *See, e.g.*, Koga, col. 10:22-23. Therefore, *Koga*'s fins constitute "features that are adapted to increase heat transfer from the heat exchanging interface to the cooling liquid in the thermal exchange chamber," as claimed in claim 4.

The Board should affirm the outstanding rejection of claims 4 and 5 (i.e., *Koga*'s protrusions constitute fins as claimed in claim 5).

Dependent Claim 6: Respondent agrees with Appellant that the gap between *Koga*'s bearing 18 and the terminal end of *Koga*'s thermal exchange chamber 19 constitutes a passage that fluidly couples the pump chamber 15A and the thermal exchange chamber 19. *Koga*, FIG. 7; *also see*, App. Br., 22:19-21. Respondent, however, respectfully disagrees that that passage is at the rotational *center* of *Koga*'s impeller 11 because *Koga*'s "fixed shaft 17" is positioned at the rotational center of the impeller. *Koga*, 4:53-57 ("Fixed shaft 17 is equipped with a bearing 18 provided at the center of impeller 11."); FIG. 7. In fact, the passage between the terminal end of the thermal exchange chamber 19 and the bearing 18 is offset from the center of the impeller 11, as shown in the cross-sectional view in FIG. 7 and claimed in claim 6. Id.

Thus, Respondent respectfully urges the Board to maintain the outstanding rejection of claim 6.

Independent Claim 10: *Koga*'s cooling device 1A includes each and every limitation arranged as in claim 10. As described above in Section II.A, thermal exchange necessarily and inevitably occurs within the chamber 19 of *Koga*'s cooling device 1A configured as shown in *Koga*'s FIG. 7 (reproduced above in Section I). *Koga*'s cooling device 1A also includes a pump chamber 15A separate from and above the thermal exchange chamber 19. *Koga*, 9:10-47, FIG. 7. Even though thermal exchange occurs within *Koga*'s pump chamber 15A, claim 10 merely recites that claimed cooling systems "comprise" a separate thermal exchange chamber. Nothing in claim 10 requires that a claimed cooling device have only one thermal exchange chamber.

Also, the gap between *Koga*'s bearing 18 and the terminal end of *Koga*'s thermal exchange chamber 19 constitutes a passage fluidly coupling the pump chamber 15A and the thermal exchange chamber 19. That passage is offset from the center of the impeller 11, as shown in the cross-sectional view in FIG. 7. *Koga*, 4:53-57; FIG. 7.

Thus, the Board should affirm the outstanding rejection of claim 10, and claims 11-14 and 23-26.

Dependent Claims 19 and 23: Claims 19 and 23 depend from independent claims 1 and 10, respectively. According to Appellant, claims 19 and 23 recite "a passage that allows cooling liquid to flow from the pump chamber directly into the thermal exchange chamber." App. Br. 2:7-9. The gap between *Koga*'s bearing 18 and the terminal end of *Koga*'s thermal exchange chamber 19 constitutes such a passage that allows cooling liquid to flow from the pump chamber directly into the thermal exchange chamber. *Koga*, 4:53-57; FIG. 7. Nothing in *Koga* provides for or even suggests that anything could obstruct the passage to prevent cooling liquid to flow from the pump chamber directly into the thermal exchange chamber. Claims 19 and 23 recite limitations directed solely to the *passage*, and not to *Koga*'s device overall. That passage permits flow from *Koga*'s pump chamber 15A into the thermal exchange chamber 19, and vice-versa. Therefore, *Koga*'s passage is "configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber," precisely as claims 19 and 23 recite.

Thus, the Board should affirm the outstanding rejection of claims 19 and 23.

Independent Claim 15: *Koga* disclosed each and every limitation in claim 15. For reasons already explained, *Koga* disclosed a thermal exchange chamber and a separate pump chamber. *Koga* also disclosed "an impeller cover" and "an intermediate member" as claimed, contrary to Appellant's assertions.

Koga's "extension 30" (shown in FIG. 8 and annotated as "intermediate member" in Section I, above) constitutes an intermediate member. Although the use of different terms indicates different elements, CAE Screen Plates, Inc. v. Heinrich Fiedler GMBH & Co. KG, 224 F.3d 1308, 1317 (Fed. Cir. 2000), those elements can coexist on a device having a unitary construction, such as *Koga*'s casing 15 and the '764 Patent's heat exchanging interface 4. For example, *Koga* describes protrusions 24 extending from the upper wall of the chamber 19, just as the '764 Patent describes pins 4A extending from the copper heat exchanging interface 4. *Koga*, 9:4-9; '764, 22:60-67. Like the pins 4A in the '764 Patent, *Koga*'s upper wall of the chamber 19 (labeled as an intermediate member in Section I, above) is a separately identifiable element compared to the rest of the casing 15 forming the impeller cover.

Accordingly, *Koga*'s casing 15 constitutes an impeller cover and the separately identifiable upper wall of *Koga*'s thermal exchange chamber 19 constitutes an intermediate member, precisely as claim 15 recites. Thus, *Koga* discloses each and every feature arranged as claimed in claim 15, including: (I) a top wall of the reservoir, which is defined by Koga's casing cover (cover wall) 16; (II) an impeller cover, which is defined by Koga's casing 15; (III) a claimed pump chamber (i.e., Koga's casing cover (cover wall) 16 and the casing 15 define Koga's pump room 15A); (IV) an intermediate member, defined by Koga's "transverse section 30"; (V) a heat exchange interface, which is defined by a portion of the casing wall defining the heat receiving plane 15B; and (VI) a claimed thermal exchange chamber 19 formed between Koga's transverse section 30 and the portion of the casing wall defining the heat receiving plane 15B.

Clearly, the portion of the casing wall defining the heat receiving plane 15B and positioned below the chamber 19 constitutes a "heat exchange interface," precisely as claimed. Thus, *Koga*'s intermediate member (i.e., the upper wall of the chamber 19) and heat exchanging interface (i.e., the lower wall of the chamber 19) define a thermal exchange chamber, precisely as claimed in claim 15.

Thus, the Board should maintain the outstanding rejection of claims 19 and 23.

Dependent Claim 16: *Koga*'s intermediate member (shown in Section I, above) is spaced from the bearing 18, defining a passage offset from the center of the impeller, as claimed. As well, *Koga*'s impeller cover 15 defines an opening or passage 20 also offset from the center of the impeller. Notably, claim 16, as best understood given its confusing and unclear reference to openings and passages, focuses solely on the arrangement of openings/passages. *Koga*'s gap and opening/ passage 20 therefore are in alignment with each other insofar as fluid that passes through one of the openings/passages can pass through the other. Notably, claim 16 does not require any direct connection between the openings/passages. And, the claim recites just two openings/passages being in alignment. Since any two points in space define a straight line, two openings/passages not obstructed from each other must be aligned with each other as claimed. No other aspect of "alignment" is alleged or claimed in claim 16. And, claimed arrangements are able to direct cooling liquid from the pump chamber into the thermal exchange chamber. No other limitation or structure is recited in that claim (or claim 15) to impart any particular direction of flow. The arrangement of *Koga*'s gap and opening/passage 20 thus are able to direct the cooling liquid from the pump chamber into the thermal exchange chamber precisely as claimed.

Claim 17: Contrary to Appellant's assertions, claim 17 does not require fins and/or pins to be placed in the thermal exchange chamber. '764, 19:52-61, 20:42-53, 29:5-7, 30:7-9, FIG. 15. Instead, claim 17 merely requires that a side of the heat exchanging interface include pins or fins. As the Examiner correctly notes, *Koga*, discloses that a side of the casing 15 positioned opposite the heat receiving plane 15B defines fins. *Koga*, 3:25-27, FIG. 7.

The Board should maintain the rejection of claim 17.

III. None of Claims 20, 24 and 28 is Patentable over *Koga*

Each of claims 20, 24 and 28 depends from a rejected base claim and recites a plurality of passages opening into the thermal exchange chamber. As the Examiner correctly concluded, slightly modifying *Koga*'s device to include such a plurality of passages would have been well within grasp of one of ordinary skill in the art, as to reduce flow resistance and increase flow rate through *Koga*'s device. Contrary to Appellant's assertions, such a modification would not have rendered *Koga*'s device inoperable. *Koga* disclosed an embodiment in which the entire upper wall of the chamber 19 is removed. *Koga*, FIG. 3. Perforating that upper wall to add a few holes to reduce pressure drop through *Koga*'s device 1A certainly would have less impact on performance as compared to removing it, as *Koga* discloses. Thus, to achieve a performance level between the two extremes shown in *Koga*'s FIGS. 3 and 7, one of ordinary skill in the art would have found it obvious to try perforating the wall shown in FIG. 7. The recited passages do not confer patentability to the claims.

The outstanding rejection of claims 20, 24 and 28 should be maintained.

IV. No Claim in the '764 Patent is Entitled to Priority from the International Application

As explained more fully in the Request, Patent Owner added FIG. 20 more than two years after the International Application published. Request, pp. 15-19. Substantial description of that drawing was added to the specification in a fourth preliminary amendment, almost five years after the International Application published, i.e., on July 14, 2011. Ex. 12, Preliminary Amendment of July 14, 2011, p. 8.

To satisfy the written description requirement of 35 U.S.C. § 112, a patent specification must describe the claimed invention <u>in sufficient detail</u> that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention. *See, e.g.*, <u>Moba, B.V. v. Diamond Automation, Inc.</u>, 325 F.3d 1306, 1319 (Fed. Cir. 2003); <u>Vas-Cath, Inc. v. Mahurkar</u>, 935 F.2d 1555, 1563 (Fed. Cir. 1991). An applicant shows possession of the claimed invention by <u>describing the claimed invention with all of its limitations</u> using such descriptive means as words, structures, figures, diagrams, and formulas that fully set forth the claimed invention. <u>Lockwood v. American Airlines, Inc.</u>, 107 F.3d 1565, 1572 (Fed. Cir. 1997).

The entire written description inquiry revolves around whether subject matter is clearly identified. By the Appellant's own admission, the subject matter contained in FIG. 20 and the passages added to the specification were NOT clearly identified. App. Br. 29:22-23. On that basis alone, priority to earlier than July 14, 2011, should remain denied.

In any event, each claim requires a vertical spacing between the pump chamber and the thermal exchange chamber. The chain of applications leading to the International Application lacked a sufficiently detailed written description of such vertical spacing that one skilled in the art could reasonably conclude that the inventor had possession of such spacing, until FIG. 20 and the corresponding written description was added years after the International Application was filed.

Moreover, by adding FIG. 20 and the corresponding written description of that drawing to the specification years after the International Application was filed, Appellant clearly believed there was a deficiency in the earlier application's disclosure. However, mere inference is not required -- Appellant admitted during prosecution of the Parent Application, and since has reiterated in this appeal, that the amendments were made "to help clearly identify" subject matter that was not clearly presented earlier. App. Br. 29:22-23.

For Appellant now to allege that such subject matter, which appears throughout the claims of the '764 Patent, was described in sufficient detail in the earlier applications is utterly fanciful and without merit. The '764 Patent is not entitled to priority earlier than July 14, 2011. The Board should maintain the Examiner's denial of earlier priority for every claim in the '764 Patent.

V. CONCLUSION

For at least the reasons set forth above, the Board is respectfully requested to maintain all rejections of claims 1-30 and to continue to deny an earlier priority date than determined by the Examiner.

Respectfully submitted,

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Date: October 24, 2014

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CLAIMS APPENDIX

1. (Original) A cooling system for a heat-generating component, comprising::

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator and an impeller, the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including

a pump chamber including the impeller and formed below the chassis, the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through

a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and

a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component; and

a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.

2. (Original) The cooling system of claim 1, wherein the chassis shields the stator from the cooling liquid in the reservoir.

3. (Original) The cooling system of claim 1, wherein the heat-exchanging interface

includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.

4. (Original) The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.

5. (Original) The cooling system of claim 4, wherein the features include at least one of pins or fins.

6. (Original) The cooling system of claim 1, wherein a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller.

7. (Original) The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.

8. (Original) The cooling system of claim 1, wherein the heat-exchanging interface includes one of copper and aluminum.

9. (Original) The cooling system of claim 1, wherein the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir.

10. (Original) A cooling system for a computer system, comprising:

a centrifugal pump adapted to circulate a cooling liquid, the pump including:

an impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:

a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;

a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber, and wherein at least one of the one or more passages is offset from a center of the impeller.

11. (Original) The cooling system of claim 10, wherein a top wall of the reservoir physically separates the impeller from the stator.

12. (Original) The cooling system of claim 10, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component.

13. (Original) The cooling system of claim 10, further including a heat radiator fluidly coupled to the reservoir using flexible conduits, wherein the heat radiator is configured to be positioned remote from the reservoir.

14. (Original) The cooling system of claim 10, wherein the fluid passage that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller.

15. (Original) A cooling system for a heat-generating component, comprising:

a pump adapted to circulate a cooling liquid, the pump including:

an impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir including an impeller cover, an intermediate member and a heat exchange interface, wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber, the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together; and

wherein a first side of the heat-exchanging interface is in contact with a cooling liquid in the thermal exchange chamber and a second side of the heat-exchanging interface opposite the first side is configured to be placed in thermal contact with a surface of the heat-generating component; and

a liquid-to-air heat exchanger fluidly coupled to the reservoir using flexible conduits, the heat exchanger being configured to be positioned remote from the reservoir.

16. (Original) The cooling system of claim 15, wherein the impeller cover includes a first opening radially offset from a center of the impeller and the intermediate member includes a second passage that is aligned with the first opening, the first and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber.

17. (Original) The cooling system of claim 15, wherein the first side of the heat-exchanging interface includes at least one of pins or fins.

18. (Original) The cooling system of claim 15, wherein the top wall of the reservoir extends between the stator and the impeller and shields the stator from the cooling liquid in the reservoir.

19. (Previously Added) The cooling system of claim 1, wherein the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly

into the thermal exchange chamber.

20. (Previously Added) The cooling system of claim 1, wherein the one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber.

21. (Previously Added) The cooling system of claim 1, wherein an entire surface of the heat-exchanging interface in contact with the cooling liquid in the reservoir forms the boundary wall of the thermal exchange chamber.

22. (Previously Added) The cooling system of claim 1, wherein the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

23. (Previously Added) The cooling system of claim 10, wherein the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

24. (Previously Added) The cooling system of claim 10, wherein the one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber.

25. (Previously Added) The cooling system of claim 12, wherein an entire surface of the heat-exchange interface in contact with the cooling liquid in the reservoir forms a boundary wall of the thermal exchange chamber.

26. (Previously Added) The cooling system of claim 10, wherein the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

27. (Previously Added) The cooling system of claim 15, wherein the pump chamber

and the thermal exchange chamber are fluidly coupled together by one or more passages, the one or more passages including a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

28. (Previously Added) The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by a plurality of passages positioned within the reservoir that open into the thermal exchange chamber.

29. (Previously Added) The cooling system of claim 15, wherein an entire surface of the heat-exchanging interface in contact with the cooling liquid in the reservoir forms a boundary wall of the thermal exchange chamber.

30. (Previously Added) The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by one or more passages, and the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

EVIDENCE APPENDIX

Pursuant to 37 C.F.R. § 41.68(c)(ix), Respondent / Third Party Requester Submits the following evidence relied upon in its Appeal Brief.

Exhibit No.	Description	Comments
1	U.S. Patent No. 8,245,764	Patent under appeal
2	U.S. Patent No. 7,544,049 to Koga, *et al*	35 U.S.C. § 102(b) prior art to the '764 Patent over which all claims stand rejected
3	Amendment dated April 6, 2012 in U.S. Patent Application No. 13/269,234, which matured into the '764 Patent	Patent Owner's Amendment to the '234 Application.
4	Examiner's Reason for Allowance in the U.S. Patent Application No. 13/269,234	Examiner's Reason for Allowance dated May 23, 2012.
5	Right of Appeal Notice dated June 30, 2014 ("RAN")	Right of Appeal Notice under 37 C.F.R. § 1.953 issued in this reexamination
6	International Patent Application No. PCT/DK2005/00310, filed May 6, 2005	The '764 Patent alleges priority from the International Application
7	*Inter Partes* Reexamination Request filed on September 15, 2012	Cover page, transmittal and pages 1-4, 12, 14-21, 36-39, and 149-164 of the Request (relevant to *Koga* and priority of the '764 Patent) are included
8	Order Granting/Denying Request for *Inter Partes* Reexamination dated October 26, 2012	Order instituting this reexamination.
9	Office Action dated October 26, 2012	First Office Action issued by the Examiner in the current reexamination.
10	Action Closing Prosecution dated	Action Closing Prosecution under 37 C.F.R. § 1.949 issued by the Examiner in the current reexamination.
11	Response under 37 C.F.R. § 1.111 dated December 26, 2012	Pages 18 and 27 of Patent Owner's Comments entered by Examiner in this reexamination
12	Fourth Preliminary Amendment dated July 14, 2011 in U.S. Patent Application No. 11/919,974	Fourth Preliminary Amendment in U.S. Patent Application No. 11/919,974. U.S. Application No. 13/269,234, issued as the '764 Patent claims priority benefit from the'974 Application.

RELATED PROCEEDINGS APPENDIX

Pursuant to 37 C.F.R. § 41.68(c)(x), Respondent / Third Party Requester Submits the following decisions from (I) *Asetek Holdings, Inc. v. CoolIT Systems, Inc.*, Civil Action No. 3:12-cv-04498-EMC (N.D. Ca.); and (II) *Asetek Holdings, Inc. v. CMI USA, Inc.*, Civil Action No. 3:13-cv-00457-JST (N.D. Ca.):

> Order Re Claim Construction for Asetek Patents (U.S. Patent Nos. 8,240,362 and 8,245,764) dated December 3, 2013 (combined claim construction order).

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a complete copy of this RESPONDENT'S / REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68, with all concurrently filed papers, was served on counsel for the patent owner, at the following address:

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via first class mail, with sufficient postage affixed thereto, on October 24, 2014.

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EXHIBIT 1 TO RESPONDENT'S/REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

US008245764B2

(12) **United States Patent**
Eriksen

(10) **Patent No.: US 8,245,764 B2**
(45) **Date of Patent: Aug. 21, 2012**

(54) **COOLING SYSTEM FOR A COMPUTER SYSTEM**

(75) Inventor: **André Sloth Eriksen**, Aalborg C (DK)

(73) Assignee: **Asetek A/S**, Bronderslev (DK)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/269,234**

(22) Filed: **Oct. 7, 2011**

(65) **Prior Publication Data**

US 2012/0061058 A1 Mar. 15, 2012

Related U.S. Application Data

(63) Continuation of application No. 11/919,974, filed as application No. PCT/DK2005/000310 on May 6, 2005.

(51) **Int. Cl.**
F28F 7/00 (2006.01)
H05K 7/20 (2006.01)

(52) **U.S. Cl.** **165/80.4**; 361/699

(58) **Field of Classification Search** 165/80.2, 165/80.4, 104.21, 104.31, 104.33; 361/699, 361/702, 720; 417/423.1
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,810,509 A 5/1974 Kun
4,563,620 A 1/1986 Komatsu
4,898,579 A 2/1990 Groshong et al.
5,708,564 A 1/1998 Lin
5,731,954 A 3/1998 Cheon
5,784,257 A 7/1998 Tata
5,825,622 A 10/1998 Rife et al.
5,890,880 A 4/1999 Lustwerk
5,901,037 A 5/1999 Hamilton et al.
6,019,165 A * 2/2000 Batchelder 165/80.3
6,166,907 A 12/2000 Chien
6,263,957 B1 7/2001 Chen et al.
6,305,463 B1 10/2001 Salmonson
6,343,478 B1 2/2002 Chang
6,415,860 B1 7/2002 Kelly et al.
6,447,270 B1 9/2002 Schmidt et al.
6,551,734 B1 4/2003 Simpkins et al.
6,668,911 B2 12/2003 Bingler
6,725,682 B2 4/2004 Scott
6,749,012 B2 6/2004 Gwin et al.
6,892,802 B2 5/2005 Kelly et al.
6,967,841 B1 11/2005 Chu et al.

(Continued)

FOREIGN PATENT DOCUMENTS

EP 0574823 A2 12/1993

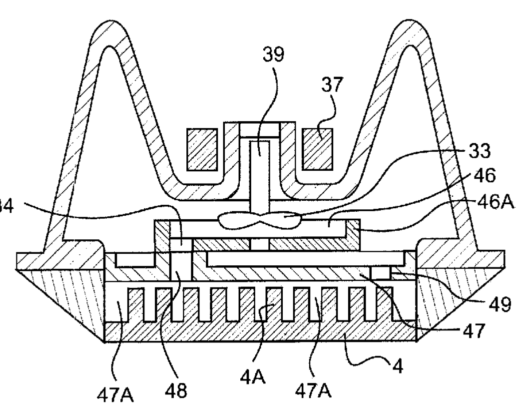
(Continued)

Primary Examiner — Frantz Jules
Assistant Examiner — Emmanuel Duke
(74) *Attorney, Agent, or Firm* — Finnegan, Henderson, Farabow, Garrett & Dunner, LLP

(57) **ABSTRACT**

The invention relates to a cooling system for a computer system, said computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid. The cooling system has a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, Different embodiments of the heat exchanging system as well as means for establishing and controlling a flow of cooling liquid and a cooling strategy constitutes the invention of the cooling system.

18 Claims, 12 Drawing Sheets



U.S. PATENT DOCUMENTS

6,972,954	B2	12/2005	Minamitani et al.	
7,215,546	B2	5/2007	Hata et al.	
7,298,617	B2	11/2007	Campbell et al.	
7,325,588	B2	2/2008	Malone et al.	
7,325,591	B2	2/2008	Duan et al.	
7,359,197	B2	4/2008	Stefanoski et al.	
2003/0010050	A1	1/2003	Scott	
2003/0151895	A1	8/2003	Zuo	
2004/0052048	A1	3/2004	Wu et al.	
2004/0052049	A1	3/2004	Wu et al.	
2004/0105232	A1	6/2004	Ito et al.	
2005/0061482	A1 *	3/2005	Lee et al.	165/96
2005/0069432	A1 *	3/2005	Tomioka	417/423.1
2005/0083656	A1	4/2005	Hamman	
2006/0113066	A1	6/2006	Mongia et al.	

FOREIGN PATENT DOCUMENTS

EP	0610826	A2	8/1994
WO	WO 01/25881	A	4/2001
WO	WO 2005/017468	A2	2/2005
WO	WO 2005/045654	A2	5/2005
WO	PCT/DK2005/000310	*	11/2006

* cited by examiner

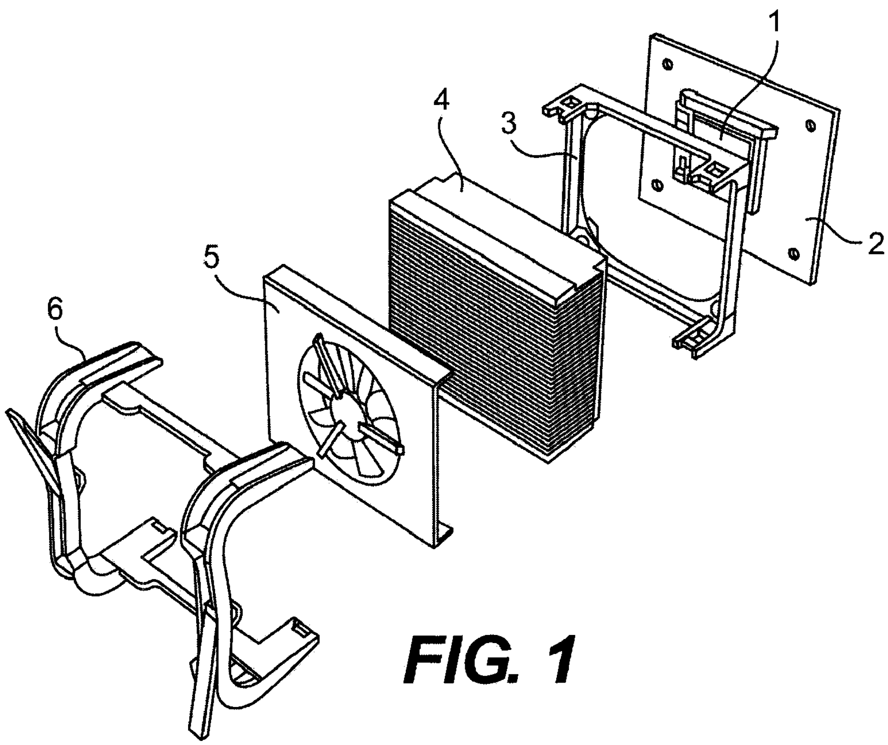


FIG. 1

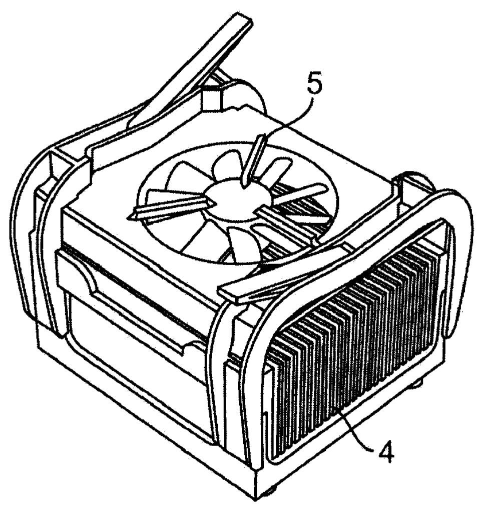


FIG. 2

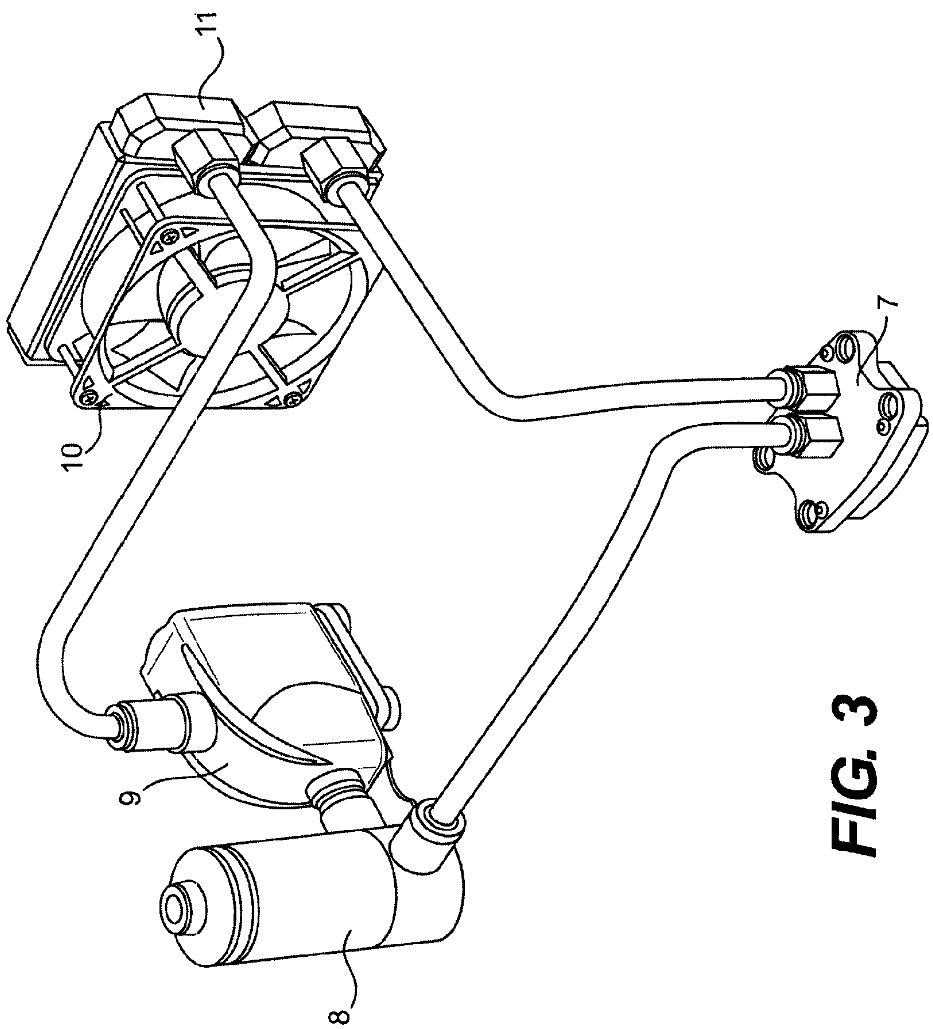


FIG. 3

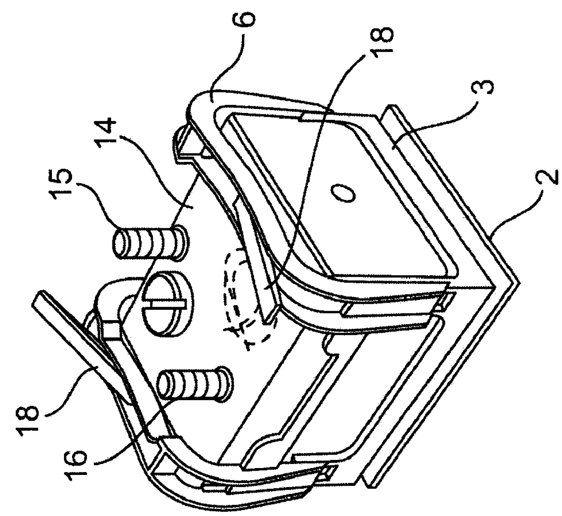


FIG. 5

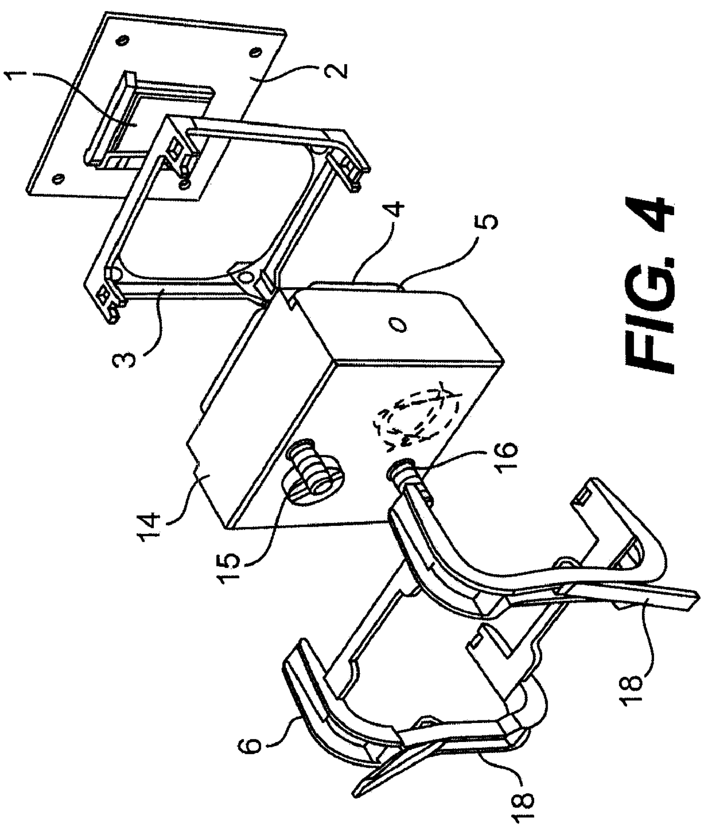


FIG. 4

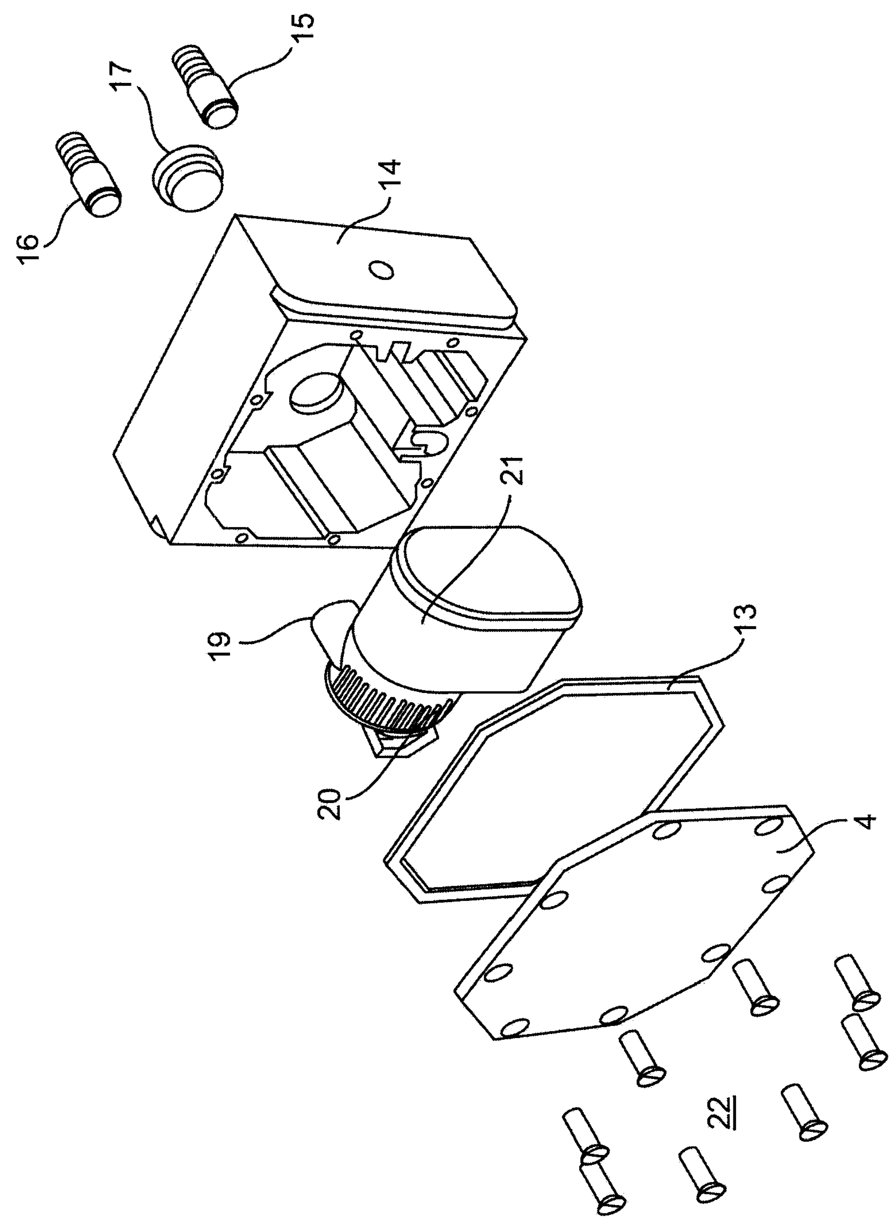


FIG. 6

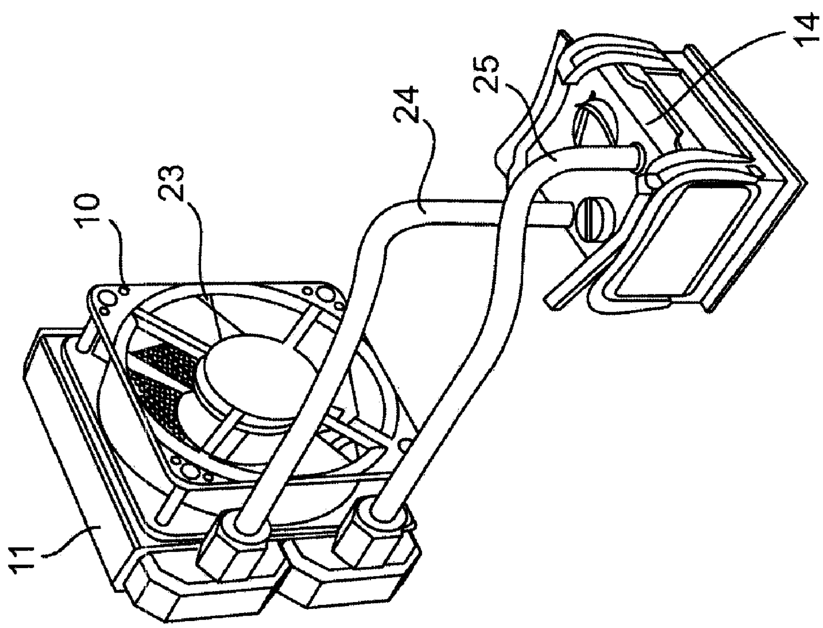


FIG. 7

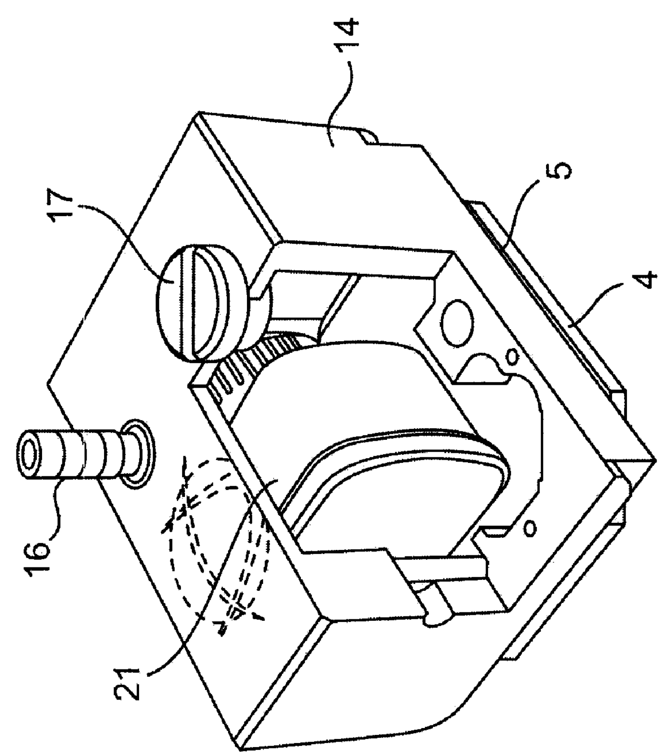


FIG. 8

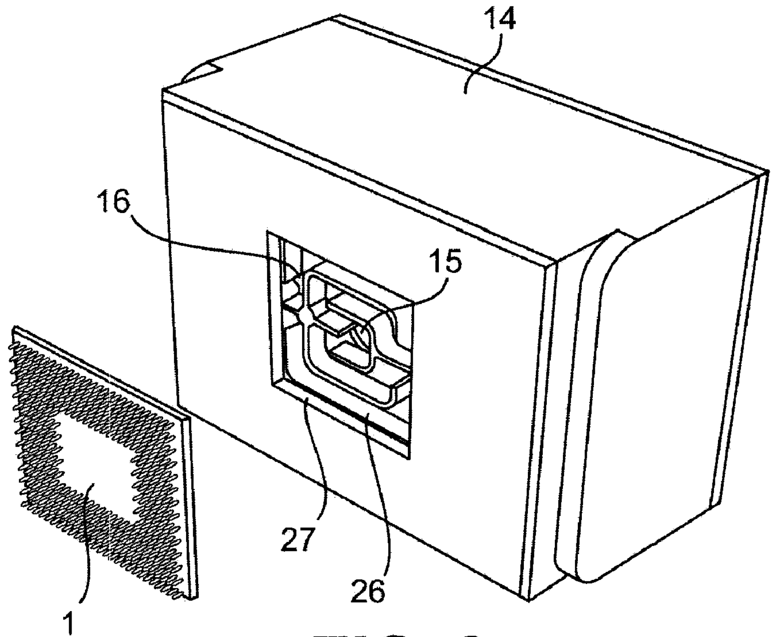


FIG. 9

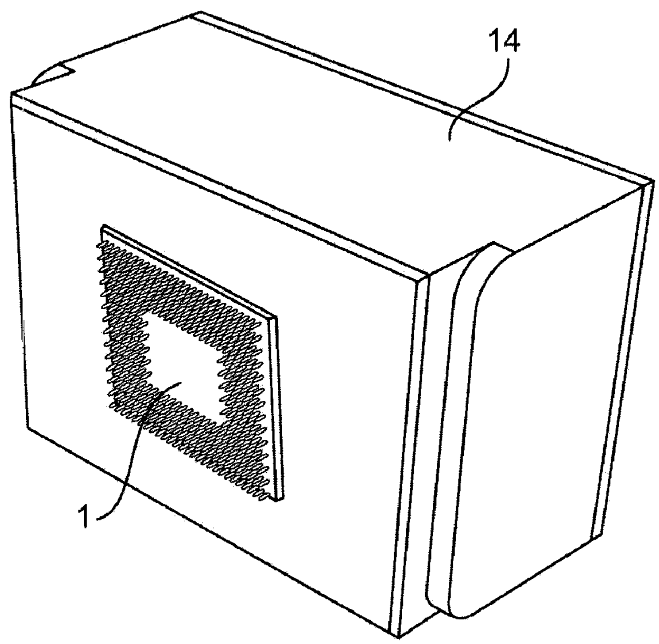


FIG. 10

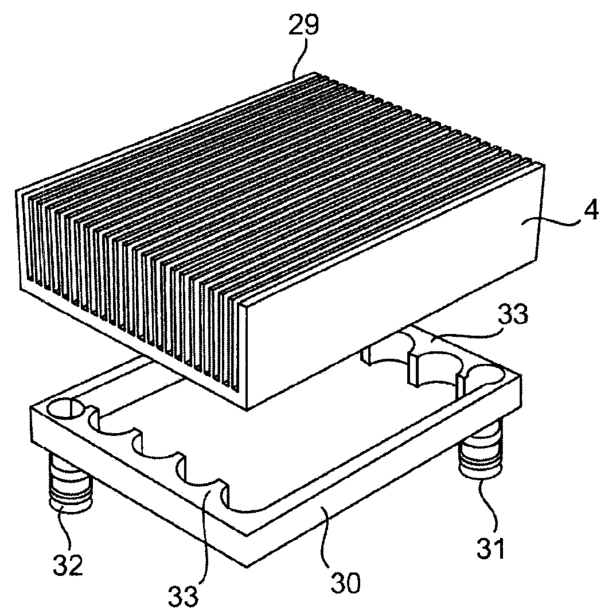


FIG. 11

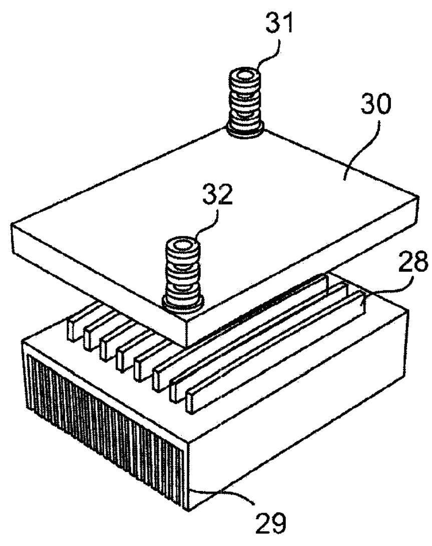


FIG. 12

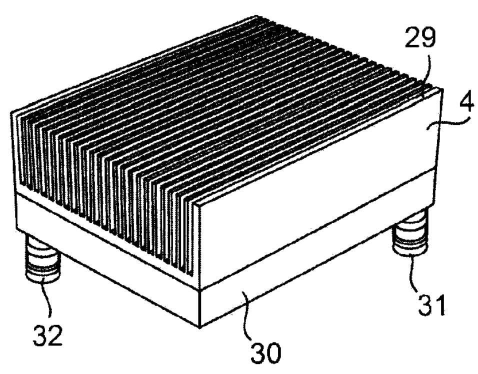


FIG. 13

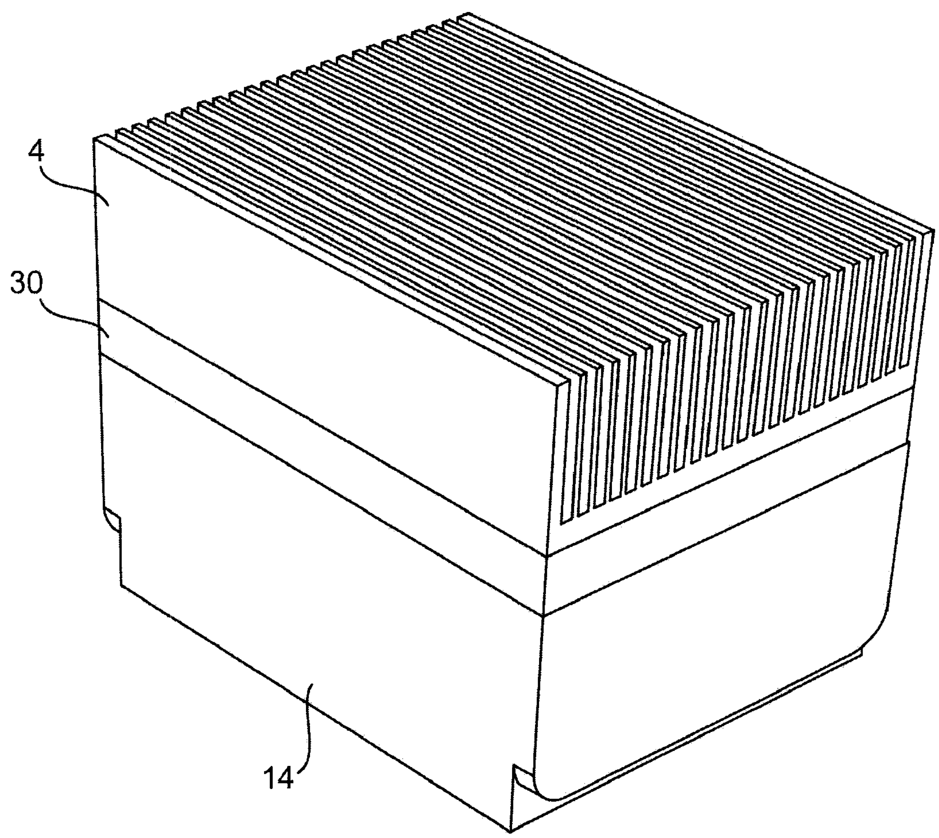


FIG. 14

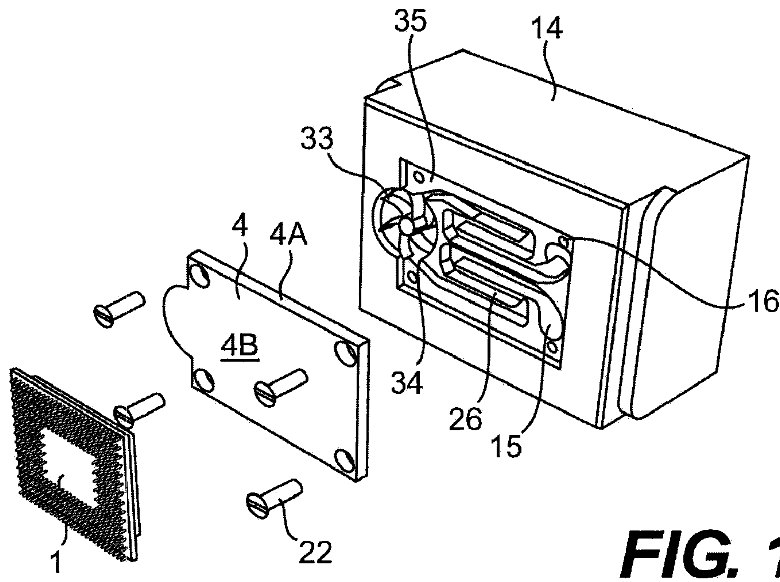


FIG. 15

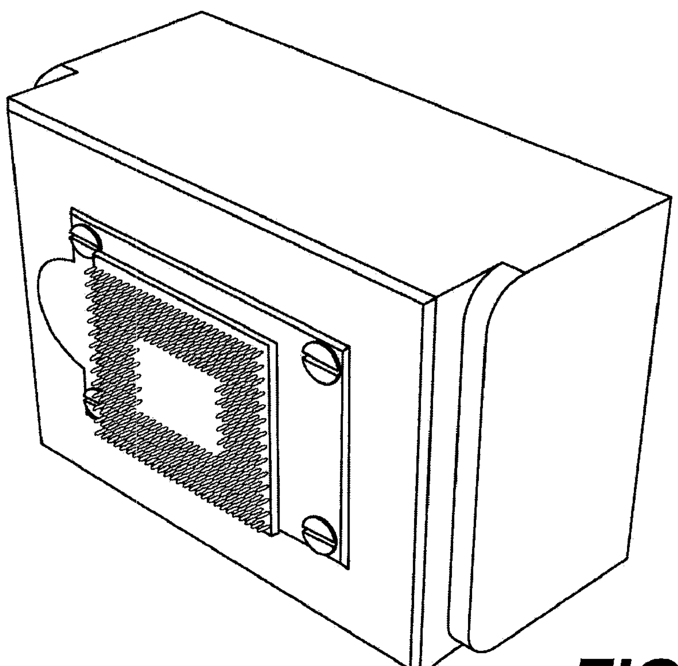
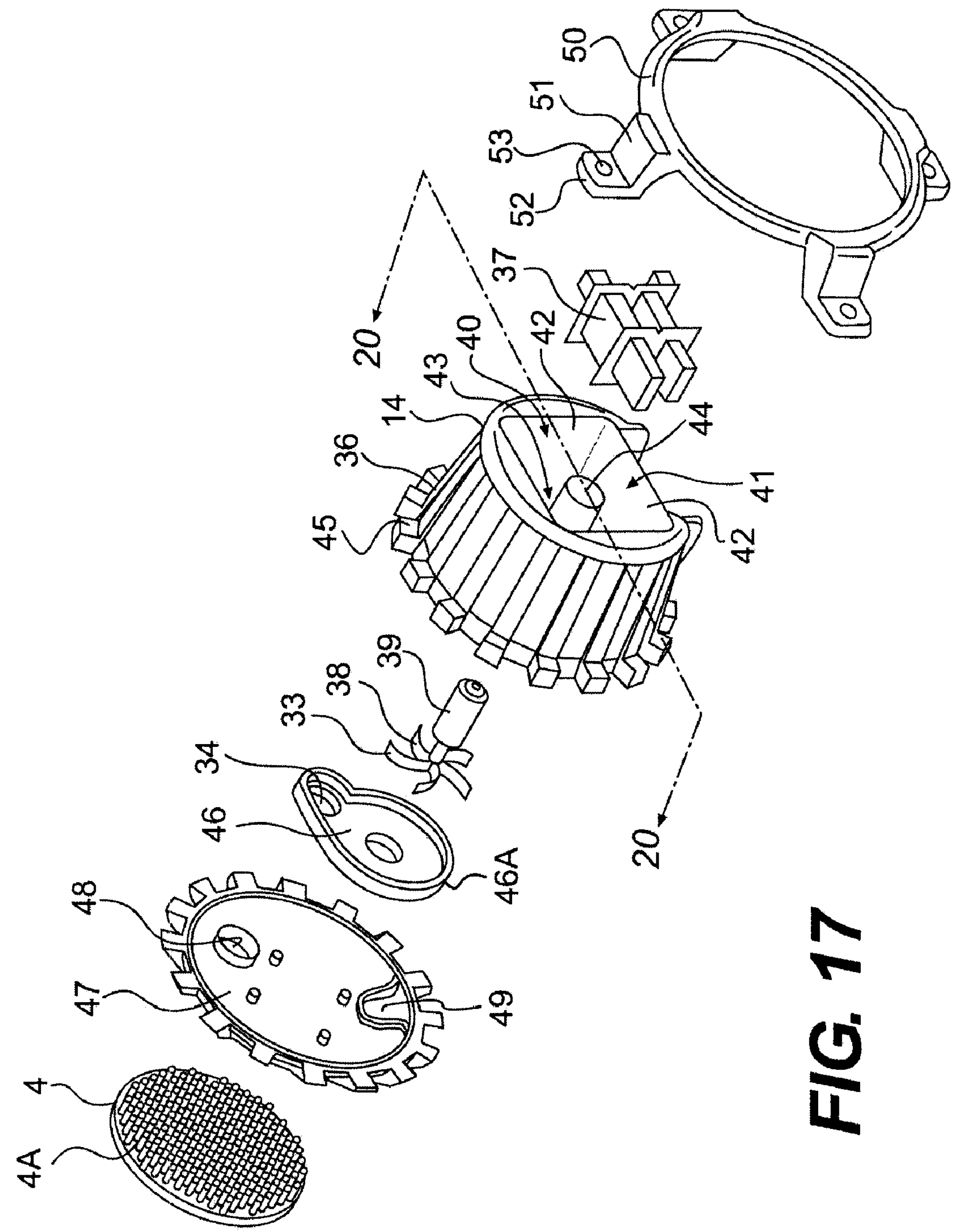


FIG. 16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46
20
46A
48
47
49
4
4A

FIG. 17

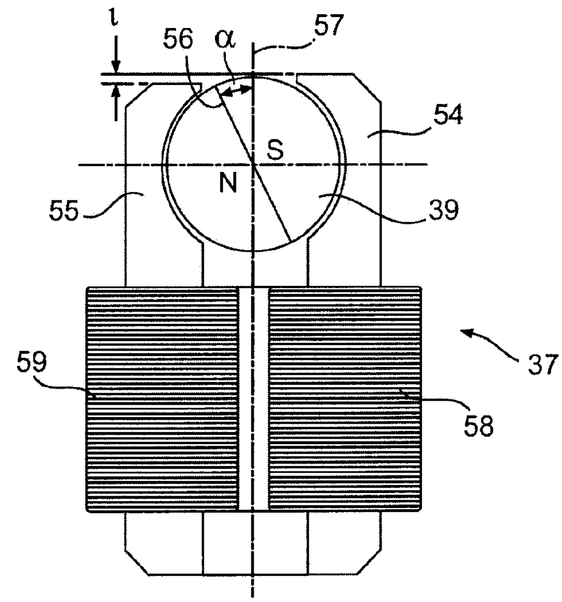

FIG. 18

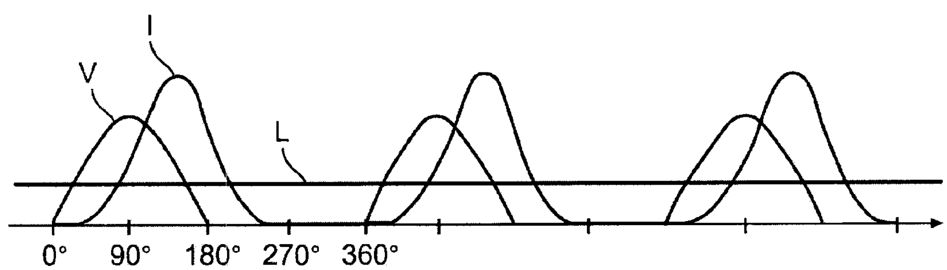

FIG. 19

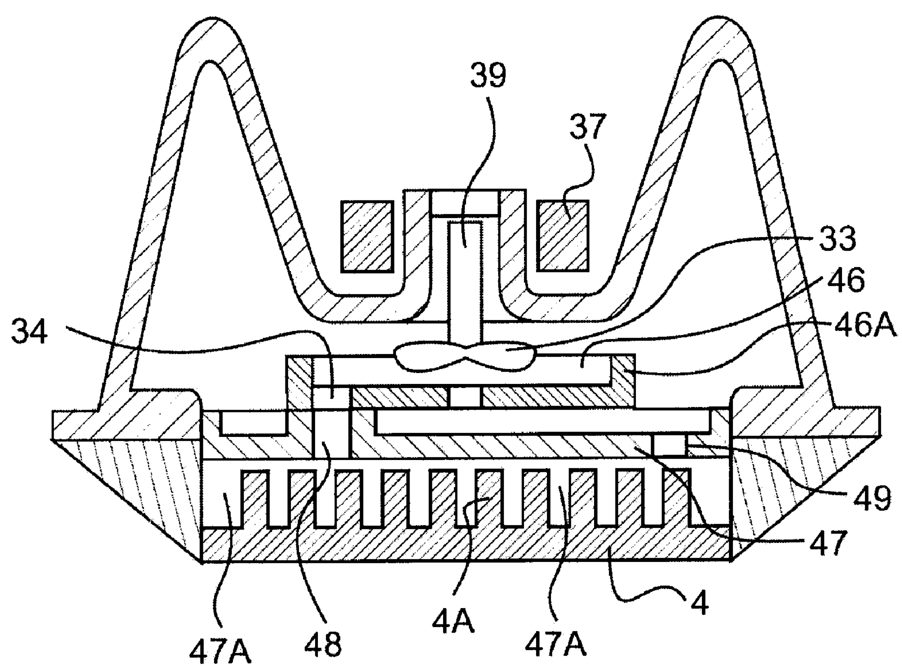

FIG. 20

COOLING SYSTEM FOR A COMPUTER SYSTEM

This application is a continuation of U.S. application Ser. No. 11/919,974, filed Jan. 6, 2009, which is a U.S. National Phase Application of PCT/DK2005/000310, filed May 6, 2005, which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

The present invention relates to a cooling system for a central processing unit (CPU) or other processing unit of a computer system. More specifically, the invention relates to a liquid-cooling system for a mainstream computer system such as a PC.

During operation of a computer, the heat created inside the CPU or other processing unit must be carried away fast and efficiently, keeping the temperature within the design range specified by the manufacturer. As an example of cooling systems, various CPU cooling methods exist and the most used CPU cooling method to date has been an air-cooling arrangement, wherein a heat sink in thermal contact with the CPU transports the heat away from the CPU and as an option a fan mounted on top of the heat sink functions as an air fan for removing the heat from the heat sink by blowing air through segments of the heat sink. This air-cooling arrangement is sufficient as long as the heat produced by the CPU is kept at today's level, however it becomes less useful in future cooling arrangements when considering the development of CPUs since the speed of a CPU is said to double perhaps every 18 months, thus increasing the heat production accordingly.

Another design used today is a CPU cooling arrangement where cooling liquid is used to cool the CPU by circulating a cooling liquid inside a closed system by means of a pumping unit, and where the closed system also comprises a heat exchanger past which the cooling liquid is circulated.

A liquid-cooling arrangement is more efficient than an air-cooling arrangement and tends to lower the noise level of the cooling arrangement in general. However, the liquid-cooling design consists of many components, which increases the total installation time, thus making it less desirable as a mainstream solution. With a trend of producing smaller and more compact PCs for the end-users, the greater amount of components in a typical liquid-cooling arrangement is also undesirable. Furthermore, the many components having to be coupled together incurs a risk of leakage of cooling liquid from the system.

SUMMARY

It may be one object of the invention to provide a small and compact liquid-cooling solution, which is more efficient than existing air-cooling arrangements and which can be produced at a low cost enabling high production volumes. It may be another object to create a liquid-cooling arrangement, which is easy-to-use and implement, and which requires a low level of maintenance or no maintenance at all. It may be still another object of the present invention to create a liquid-cooling arrangement, which can be used with existing CPU types, and which can be used in existing computer systems.

This object may be obtained by a cooling system for a computer system, said computer system comprising: at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pump being provided as part of an integrate element, said integrate element comprising the heat exchanging interface, the reservoir and the pump, said pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means.

By providing an integrate element, it is possible to limit the number of separate elements of the system. However, there is actually no need for limiting the number of elements, because often there is enough space within a cabinet of a computer system to encompass the different individual elements of the cooling system. Thus, it is surprisingly that, at all, any attempt is conducted of integrating some of the elements.

In possible embodiments according to this aspect of the invention, the entire pump is placed inside the reservoir with at least an inlet or an outlet leading to the liquid in the reservoir. In an alternative embodiment the pump is placed outside the reservoir in the immediate vicinity of the reservoir and wherein at least an inlet or an outlet is leading directly to the liquid in the reservoir. By placing the pump inside the reservoir or in the immediate vicinity outside the reservoir, the integrity of the combined reservoir, heat exchanger and pump is obtained, so that the element is easy to employ in new and existing computer systems, especially mainstream computer systems.

In a preferred embodiment, the pumping member of the pump and a driven part of the motor of the pump, such as a rotor of en electrical motor, is placed inside the reservoir embedded in the cooling liquid, and wherein a stationary part of the motor of the pump, such as a stator of an electrical motor, is placed outside the reservoir. By having the driven part of the motor placed inside the reservoir submerged in the cooling liquid and the stationary part of the motor outside the reservoir, there is no need for encapsulating the stationary part in a liquid-proof insulation. However, problems may occur having then stationary part driving the driven part. However, the present invention provide means for obtaining such action, although not at all evident how to solve this problem.

The object may also be obtained by a cooling system for a computer system, said computer system comprising: at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, said cooling system being intended for thermal contact with the processing unit by means of existing fastening means associated with the processing unit, and said heat radiating means intended for radiating from the cooling liquid thermal energy, dissipated to the cooling liquid, to surroundings of the heat radiating means.

The use of existing fastening means has the advantage that fitting of the cooling system is fast and easy. However, once again there is no problem for the person skilled in the art to adopt specially adapted mounting means for any element of the cooling system, because there are numerous possibilities in existing cabinets of computer systems for mounting any kind of any number of elements, also elements of a cooling system.

In preferred embodiments according to this aspect of the invention, the existing fastening means are means intended for attaching a heat sink to the processing unit, or the existing fastening means are means intended for attaching a cooling fan to the processing unit, or the existing fastening means are means intended for attaching a heat sink together with a cooling fan to the processing unit. Existing fastening means of the kind mentioned is commonly used for air cooling of CPUs of computer systems, however, air cooling arrangements being much less complex than liquid cooling systems. Nevertheless, it has ingeniously been possible to develop a complex and effective liquid cooling system capable of utilizing such existing fastening means for simple and less effective air cooling arrangements.

According to an aspect of the invention, the pump is selected from the following types: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible finer pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. By adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

According to another aspect of the invention, driving means for driving the pump is selected among the following driving means: electrically operated rotary motor, piezo-electrically operated motor, permanent magnet operated motor, fluid-operated motor, capacitor-operated motor. As is the case when selecting the pump to pump the liquid, by adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

The object may also be obtained by a cooling system for a computer system, said computer system comprising: at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, and said cooling system further comprising a pump wherein the pump is driven by an AC electrical motor by a DC electrical power supply of the computer system, where at least part of the electrical power from said power supply is intended for being converted to AC being supplied to the electrical motor.

It may be advantageous to use an AC motor, such as a 12V AC motor, for driving the pump in order to obtain a stabile unit perhaps having to operate 24 hours a day, 365 days a year. However, the person skilled in the art will find it unnecessary to adopt as example a 12V motor because high voltage such as 220V or 110V is readily accessible as this is the electrical voltage used to power the voltage supply of the computer system itself. Although choosing to use a 12V motor for the pump, it has never been and will never be the choice of the person skilled in the art to use an AC motor. The voltage supplied by the voltage supply of the computer system itself is DC, thus this will be the type of voltage chosen by the skilled person.

In preferred embodiments according to any aspect of the invention, an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, or an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means, or an electrical motor is intended both for driving the pump for pumping the liquid, and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means.

By utilizing a single electrical motor for driving more than one element of the cooling system according to any of the aspects of the invention, the lesser complexity and the reliability of the cooling system will be further enhanced.

The heat exchanging interface may be an element being separate from the reservoir, and where the heat exchanging interface is secured to the reservoir in a manner so that the heat exchanging interface constitutes part of the reservoir when being secured to the reservoir. Alternatively, the heat exchanging interface constitutes an integrate surface of the reservoir, and where the heat exchanging surface extends along an area of the surface of the reservoir, said area of surface being intended for facing the processing unit and said area of surface being intended for the close thermal contact with the processing unit. Even alternatively, the heat exchanging interface is constitutes by a free surface of the processing unit, and where the free surface is capable of establishing heat dissipation between the processing unit and the cooling liquid through an aperture provided in the reservoir, and where the aperture extends along an area of the surface of the reservoir, said surface being intended for facing the processing unit.

Possibly, an uneven surface such as pins or fins extending from the copper plate provide a network of channels across the inner surface of the heat exchanging interface. A network of channels ensure the cooling liquid being passed along the inner surface of the interface such as a copper plate in a way that maximizes the retention time of the cooling liquid along the heat exchanging interface and in a way that optimizes the thermal exchange between the heat exchanging interface and the cooling liquid as long as the cooling liquid is in thermal contact with heat exchanging interface.

Possibly, the cooling system may be provided with a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pumping means being intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means, said heat exchanging interface constituting a heat exchanging surface being manufactured from a material suitable for heat conducting, and with a first side of the heat exchanging surface facing the central processing unit being substantially plane and with a second side of the heat exchanging surface facing the cooling liquid being substantially plane and said reservoir being manufactured from plastic, and channels or segments being provided in the reservoir for establishing a certain flow-path for the cooling liquid through the reservoir.

Providing a plane heat exchanging surface, both the first, inner side being in thermal contact with the cooling liquid and the second, outer side being in thermal contact with the heat generating processing unit, results in the costs for manufacturing the heat exchanging surface is reduced to an absolute minimum.

According to the above possible solution, an inlet of the pumping means is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

Alternatively, or additionally, an outlet of said pumping means being positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchange interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

However, a plane first, inner surface may also result in the cooling liquid passing the heat exchanging surface too fast. This may be remedied by providing grooves along the inner surface, thereby providing a flow path in the heat exchanging surface. This however results in the costs for manufacturing the heat exchanging surface increasing.

The solution to this problem has been dealt with by providing channels or segments in the reservoir housing instead. The reservoir housing may be manufactured by injection molding or by casting, depending on the material which the reservoir housing is made from. Proving channels or segments during molding or casting of the reservoir housing is much more cost-effective than milling grooves along the inner surface of the heat exchanging surface.

Possibly, the cooling system may be provided with at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid, said cooling system being adapted such as to provide transfer of said heat from a heat dissipating surface to a heat radiating surface where said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

Heat dissipation from the processing unit to the cooling liquid must be very efficient to ensure proper cooling of the processing unit, Especially in the case, where the processing unit is a CPU, the surface for heat dissipation is limited by the surface area of the CPU. This may be remedied by utilizing a heat exchanging surface being made of a material having a high thermal conductivity such as copper or aluminum and ensuring a proper thermal bondage between the heat exchanging interlace and the CPU.

However, in a possible embodiment according to the features in the above paragraph, the heat dissipation takes place directly between the processing unit and the cooling liquid by providing an aperture in the reservoir housing, said aperture being adapted for taking up a free surface of the processing unit. Thereby, the free surface of the processing unit extends into the reservoir or constitutes a part of the boundaries of the reservoir, and the cooling liquid has direct access to the free surface of the processing unit.

A possible heat exchanging interface may be the direct contact between the heat generating unit such as a CPU and the cooling liquid, where at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit comprising at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid, said cooling system being adapted such as to provide transfer of said heat from a heat dissipating interface to a heat radiating surface where said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

The aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a the processing unit, said boundaries being liquid-proof when attached to the free surface of the processing unit so that the liquid may flow freely across the free surface without the risk of the liquid dissipating through the boundaries. Alternatively, but posing the same technical effect, the aperture of the reservoir is intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of the processing unit.

If a heat sink is provided as an aid in dissipating heat from the heat generating unit such as a CPU, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a heat sink. Alternatively, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of a heat sink. Alternatively, possibly, the heat exchanging interface may be provided as a first reservoir intended for being closed by attaching boundaries of an aperture in the first reservoir to, alternatively along, a free surface of a said processing unit, and a second reservoir intended for being closed by attaching boundaries of an aperture in the second reservoir to, alternatively along, a free surface of a to a free surface of a heat sink, and liquid conducting means provided between the first reservoir and the second reservoir.

The first reservoir may be closed by attaching said first reservoir to a heat exchanging surface element being in close thermal contact with the processing unit, said heat exchanging surface intended for dissipating heat from the processing unit to cooling liquid in the first reservoir, and wherein a second reservoir is closed by attaching said second reservoir to a surface of a heat sink, said heat sink intended for radiating heat from cooling liquid in the second reservoir to the exterior surroundings.

Also, the first reservoir and said second reservoir may be provided as a monolithic structure comprising both the first reservoir and the second reservoir and where both a heat dissipation from the processing unit to the cooling liquid in the first reservoir and heat radiation from the cooling liquid in the second reservoir to exterior surrounding is provided by the monolithic structure. The said monolithic structure may preferably be manufactured at least partly from plastic, preferably being manufactured fully in plastic, and said monolithic structure thus being manufactured by injection molding.

Transfer of said cooling liquid from an outlet of the first reservoir to an inlet of the second reservoir, and from an outlet of the second reservoir to an inlet of the first reservoir, and circulating the cooling liquid within said liquid conducting means is provided by a pumping means being intended for pumping the cooling liquid. One of said reservoirs of said monolithic structure may comprise said pumping means.

An inlet and/or an outlet and/or a pumping member of said pumping means, may be provided in the vicinity of said substantially plane side in order to provide a turbulence of flow and hereby improve the exchange of heat between said cooling liquid and substantially plane side, and the inlet of the pumping means may be provided within the first reservoir and the outlet may be provided within the second reservoir.

According to one aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilizing a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface and a pumping means, said method of cooling comprising the steps of establishing, or defining, or selecting an operative status of the pumping means; controlling the operation of the motor of the pumping means in response to the following parameters; the necessary direction of movement for obtaining a pumping action of a pumping member of the pumping means, the possible direction of movement of a driving part of the motor of the pumping means; and in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve the necessary direction of movement of the driving part of the motor for establishing the necessary direction of movement for obtaining he pumping action of the pumping member.

There may be pumping means, where the pumping member is only operable in one direction but where the motor driving the pumping member is operable in two directions. The solution to this problem is to either choose a pumping member operable in both directions or to chose a motor being operable in only one direction. According to the invention, a solution is provided where a one-way directional pumping member may be operated any a two-way directional motor. Despite the contradictory nature of this solution, advantages may however be present.

As example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and where said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor before applying a full-wave AC power signal.

As an alternative example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor after having applied the full-wave AC power signal.

In both the above examples, the advantages of the one-way impeller from a traditional DC pump together with the advantages of a motor from a traditional AC pump is obtained in the solution mentioned. The performance of an impeller of a DC pump is much better than the performance of an impeller from an AC pump. The motor from an AC pump is more reliable than a motor from a DC pump. The advantageous obtained is thus of synergetic nature, seeing that different advantages of the impeller of the DC pump and of the motor of the AC pump are different in nature.

According to another aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilizing a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface, an air blowing fan, a pumping means, said method of cooling comprising the steps of applying one of the following possibilities of how to operate the computer system: establishing, or defining, or selecting an operative status of the computer system; controlling the operation of at least one of the following means of the computer system; the pumping means and the air blowing fan in response to at least one of the following parameters; a surface temperature of the heat generating processing unit, an internal temperature of the heat generating processing unit, or a processing load of the CPU; and in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve at least one of the following conditions; a certain cooling performance of the cooling system, a certain electrical consumption of the cooling system, a certain noise level of the cooling system.

Applying the above method ensures an operation of the computer system being in accordance with selected properties during the use of the computer system. For some applications, the cooling performance is vital such as may be the case when working with image files or when downloading large files from a network during which the processing units is highly loaded and thus generating much heat. For other applications, the electrical power consumption is more vital such as may be the case when utilizing domestic computer systems or in large office building in environments where the electrical grid may be weak such as in third countries. In still other applications, the noise generated by the cooling system is to be reduced to a certain level, which may be the case in office buildings with white collar people working alone, or at home, if the domestic computer perhaps is situated in the living room, or at any other location where other exterior considerations have to be dealt with.

According to another aspect of the invention, a method is envisaged, said method being employed with cooling system further comprising a pumping means with an impeller for pumping the cooling liquid through a pumping housing, said pumping means being driven by an AC electrical motor with a stator and a rotor, and said pumping means being provided with a means for sensing a position of the rotor, and wherein the method comprises the following steps: initially establishing a preferred rotational direction of the rotor of the electrical motor; before start of the electrical motor, sensing the angular position of the rotor; during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor; said selection being made according to the preferred rotational direction; and said application of the AC signal, such as an AC voltage, being performed by the computer system for applying the AC signal, such as an AC voltage, from the electrical power supply of the computer system during conversions of the electrical DC signal, such as a DC voltage, of the power supply to the AC signal, such as an AC voltage, for the electrical motor.

Adopting the above method according to the invention ensures the most efficient circulation of cooling liquid in the cooling system and at the same time ensures the lowest possible energy consumption of the electrical motor driving the impeller. The efficient circulation of the cooling liquid is obtained by means of an impeller being designed for rotation in one rotational direction only, thus optimizing the impeller design with regard to the only one rotational direction as opposed to both rotational directions. The low energy consumption is achieved because of the impeller design being optimized, thus limiting the necessary rotational speed of the impeller for obtaining e certain amount of flow of the cooling liquid through the cooling system. A bonus effect of the lowest possible energy consumption being obtained is the lowest possible noise level of the pump also being obtained. The noise level of the pump is amongst other parameters also dependent on the design and the rotational speed of the impeller. Thus, an optimized impeller design and impeller speed will reduce the noise level to the lowest possible in consideration of ensuring a certain cooling capacity.

BRIEF DESCRIPTION OF THE FIGURES

The invention will hereafter be described with reference to the drawings, where

FIG. **1** shows an embodiment of the prior art. The figure shows the typical components in an air-cooling type CPU cooling arrangement.

FIG. **2** shows an embodiment of the prior art. The figure shows the parts of the typical air-cooling type CPU cooling arrangement of FIG. **1** when assembled.

FIG. **3** shows an embodiment of the prior art. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement.

FIG. **4** is an exploded view of the invention and the surrounding elements.

FIG. **5** shows the parts shown in the previous figure when assembled and attached to the motherboard of a computer system.

FIG. **6** is an exploded view of the reservoir from the previous FIGS. **4** and **5** seen from the opposite site and also showing the pump.

FIG. **7** is a cut-out view into the reservoir housing the pump and an inlet and an outlet extending out of the reservoir.

FIG. **8** is a view of the cooling system showing the reservoir connected to the heat radiator.

FIG. **9-10** are perspective views of a possible embodiment of reservoir housing providing direct contact between a CPU and a cooling liquid in a reservoir.

FIG. **11-13** are perspective views of a possible embodiment of heat sink and a reservoir housing constituting an integrated unit.

FIG. **14** is a perspective view of the embodiment shown in FIG. **9-10** and the embodiment shown in FIG. **11-13** all together constituting an integrated unit.

FIG. **15-16** are perspective view of a possible embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit

FIG. **17** is a perspective view of a preferred embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit,

FIG. **18** is a plane view of a possible, however preferred embodiment of an AC electrical motor for a pumping means of the cooling system according to the invention, and

FIG. **19** is a graph showing a method for starting a rotor of the electrical AC motor, said AC motor driving an impeller selected from a pump driven by a DC motor.

FIG. **20** is a is a simplified schematic showing a cross-sectional view of the reservoir along plane **20-20** of FIG. **17**.

DETAILED DESCRIPTION

FIG. **1** is an exploded view of an embodiment of prior art cooling apparatus for a computer system. The figure shows the typical components in an air-cooling type CPU cooling arrangement. The figure shows a prior art heat sink **4** intended for air cooling and provided with segments intersected by interstices, a prior art air fan **5** which is to be mounted on top of the heat sink by use of fastening means **3** and **6**.

The fastening means comprises a frame **3** provided with holes intended for bolts, screws, rivets or other suitable fastening means (not shown) for thereby attaching the frame to a motherboard **2** of a CPU **1** or onto another processing unit of the computer system. The frame **3** is also provided with mortises provided in perpendicular extending studs in each corner of the frame, said mortises intended for taking up tenons of a couple of braces. The braces **6** are intended for enclosing the heat sink **4** and the air fan **5** so that the air fan and the heat sink thereby is secured to the frame. Using proper retention mechanisms, when the frame is attached to the motherboard of the CPU of other processing unit, and when the tenons of the braces are inserted into the mortises of the frame, the air fan and heat exchanger is pressed towards the CPU by using a force perpendicular to the CPU surface, said force being provided by lever arms.

FIG. **2** shows the parts of the typical air-cooling type CPU cooling arrangement of FIG. **1**, when assembled. The parts are attached to each other and will be mounted on top of a CPU on a motherboard (not shown) of a computer system.

FIG. **3** shows another embodiment of a prior art cooling system. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement. The figure shows a prior art heat exchanger **7**, which is in connection with a prior art liquid reservoir **8**, a prior art liquid pump **9** and a heat radiator **11** and an air fan **10** provided together with the heat radiator. The prior art heat exchanger **7**, which can be mounted on a CPU (not shown) is connected to a radiator and reservoir, respectively. The reservoir serves as a storage unit for excess liquid not capable of being contained in the remaining components. The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid. The heat radiator **11** serves as a means for removing the heat from the liquid by means of the air fan **10** blowing air through the heat radiator. All the components are in connection with each other via tubes for conducting the liquid serving as the cooling medium.

FIG. **4** is an exploded view of a cooling system according to an embodiment of the invention. Also elements not being part of the cooling system as such are shown. The figure shows a central processing unit CPU **1** mounted on a motherboard of a computer system **2**. The figure also shows a part of the existing fastening means, i.e. amongst others the frame **3** with mortises provided in the perpendicular extending studs in each corner of the frame. The existing fastening means, i.e. the frame **3** and the braces **6**, will during use be attached to the motherboard **2** by means of bolts, screws, rivets or other suitable fastening means extending through the four holes provided in each corner of the frame and extending through corresponding holes in the motherboard of the CPU. The frame **3** will still provide an opening for the CPU to enable the CPU to extend through the frame.

The heat exchanging interface **4** is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminum, and which will be in thermal contact with the CPU **1**, when the cooling system is fastened to the motherboard **2** of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing **14**, thus the heat exchanger **4** constitutes the part of the liquid reservoir housing facing the CPU. The reservoir may as example be made of plastic or of metal. The reservoir or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

If the reservoir is made of metal or any other material having a relative high heat conductivity compared to as example plastic, the heat exchanging interface as a separate element may be excluded because the reservoir itself may constitute a heat exchanger over an area, wherein the reservoir is in thermal contact with the processing unit. Alternatively to having the heat exchanging interface constitute part of the liquid reservoir housing, the liquid reservoir housing may be tightly attached to the heat exchanging interface by means of screws, glue, soldering, brazing or the like means for securing the heat exchanging interface to the housing and vice versa, perhaps with a sealant **5** provided between the housing and the heat exchanging interface.

Alternatively to providing a heat exchanging interface integrate with the reservoir containing the cooling liquid, it will be possible to exclude the heat exchanger and providing another means for dissipating heat from the processing unit to the cooling liquid in the reservoir, The other means will be a hole provided in the reservoir, said hole intended for being directed towards the processing unit. Boundaries of the hole will be sealed towards boundaries of the processing unit or will be sealed on top of the processing unit for thereby preventing cooling liquid from the reservoir from leaking. The only prerequisite to the sealing is that a liquid-tight connection is provided between boundaries of the hole and the processing unit or surrounding of the processing unit, such as a carrier card of the processing unit.

By excluding the heat exchanger, a more effective heat dissipation will be provided from the processing unit and to the cooling liquid of the reservoir, because the intermediate element of a heat exchanger is eliminated. The only obstacle in this sense is the provision of a sealing being fluid-tight in so that the cooling liquid in the reservoir is prevented from leaking.

The heat exchanging surface **4** is normally a copper plate. When excluding the heat exchanging surface **4**, which may be a possibility not only for the embodiments shown in FIG. **4**, but for all the embodiments of the invention, it may be necessary to provide the CPU with a resistant surface that will prevent evaporation of the cooling liquid and/or any damaging effect that the cooling liquid may pose to the CPU. A resistant surface may be provided the CPU from the CPU producer or it may be applied afterwards. A resistant surface to be applied afterwards may e.g. be a layer, such as an adhesive tape provided on the CPU. The adhesive tape may be made with a thin metal layer e.g. in order to prevent evaporation of the cooling liquid and/or any degeneration of the CPU itself.

Within the liquid reservoir, a liquid pump (not shown) is placed for pumping a cooling liquid from an inlet tube **15** connection being attached to the housing of the reservoir through the reservoir and past the heat exchanger in thermal contact with the CPU to an outlet tube connection **16** also being attached to the reservoir housing. The existing fastening means comprising braces **6** with four tenons and the frame **3** with four corresponding mortises will fasten the reservoir and the heat exchanger to the motherboard of the CPU. When fastening the two parts of the existing fastening means to each other the fastening will by means of the lever arms **18** create a force to assure thermal contact between the CPU **1** mounted on the motherboard and the heat exchanger **4** being provided facing the CPU.

The cooling liquid of the cooling system may be any type of cooling liquid such as water, water with additives such as anti-fungicide, water with additives for improving heat conducting or other special compositions of cooling liquids such as electrically non-conductive liquids or liquids with lubricant additives or anti-corrosive additives.

FIG. **5** shows the parts shown in FIG. **4** when assembled and attached to the motherboard of a CPU of a computer system **2**. The heat exchanger and the CPU is in close thermal contact with each other. The heat exchanger and the remainder of the reservoir housing **14** is fastened to the motherboard **2** by means of the existing fastening means being secured to the motherboard of the CPU and by means of the force established by the lever arms **18** of the existing fastening means. The tube inlet connection **15** and the tube outlet connection **16** are situated so as to enable connection of tubes to the connections.

FIG. **6** is an exploded view of the reservoir shown in previous FIG. **4** and FIG. **5** and seen from the opposite site and also showing the pump **21** being situated inside the reservoir. Eight screws **22** are provided for attaching the heat exchanging surface **4** to the remainder of the reservoir. The heat exchanging surface is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see FIG. **4**). However, also the inner surface (not shown, see FIG. **7**) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the octagonal shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

A sealant in form of a gasket **13** is used for the connection between the reservoir housing **14** and the heat exchanging surface forming a liquid tight connection. The pump is intended for being placed within the reservoir. The pump has a pump inlet **20** through which the cooling liquid flows from the reservoir and into the pump, and the pump has a pump outlet **19** through which the cooling liquid is pumped from the pump and to the outlet connection. The figure also shows a lid **17** for the reservoir. The non-smooth inner walls of the reservoir and the fact that the pump is situated inside the reservoir will provide a swirling of the cooling liquid inside the reservoir.

However, apart from the non-smooth walls of the reservoir and the pump being situated inside the reservoir, the reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir (see FIG. **9**-**10** and FIG. **15**). Channel or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. By providing channels or segments inside the reservoir, a flow will be provided forcing the cooling liquid to pass the heat exchanging surface, and the amount of time increased of the cooling liquid being resident inside the reservoir, thus enhancing heat dissipation. If channels or segments are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting.

The cooling liquid enters the reservoir through the tube inlet connection **15** and enters the pump inlet **20**, and is pumped out of the pump outlet **19** connected to the outlet connection **16**. The connection between the reservoir and the inlet tube connection and the outlet tube connection, respectively, are made liquid tight. The pump may not only be a self-contained pumping device, but may be made integrated into the reservoir, thus making the reservoir and a pumping device one single integrated component. This single integrated element of the reservoir and the pumping device may also be integrated, thus making the reservoir, the pumping device and the heat exchanging surface one single integrated unit. This may as example be possible if the reservoir is made of a metal such as aluminum. Thus, the choice of material provides the possibility of constituting both the reservoir and a heat exchanging surface having a relatively high heat conductivity, and possibly also renders the possibility of providing bearings and the like constructional elements for a motor and a pumping wheel being part of the pumping device.

In an alternative embodiment, the pump is placed in immediate vicinity of the reservoir, however outside the reservoir. By placing the pump outside, but in immediate vicinity of the reservoir, still an integrate element may be obtained. The pump or the inlet or the outlet is preferably positioned so as to obtain a turbulence of flow in the immediate vicinity of the heat exchanging interface, thereby promoting increased heat dissipation between the heat exchanging interface end the cooling liquid. even in the alternative, a pumping member such as an impeller (see FIG. **15**-**16**) may be provided in the immediate vicinity of the heat exchanging surface. The pumping member itself normally introduces a turbulence of flow, and thereby the increased heat dissipation is promoted irrespective of the position of the pump itself, or the position of the inlet or of the outlet to the reservoir or to the pump.

The pump may be driven by an AC or a DC electrical motor. When driven by an AC electrical motor, although being technically and electrically unnecessary in a computer system, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the pump. The pump may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. However, in the embodiment shown, the pump is driven by a 12V AC electrical motor.

Control of the pump in case the pump is driven by an AC electrical motor, preferably takes place by means of the operative system or an alike means of the computer system itself, and where the computer system comprises means for measuring the CPU load and/or the CPU temperature. Using the measurement performed by the operative system or alike system of the computer system eliminates the need for special means for operating the pump. Communication between the operative system or alike system and a processor for operating the pump may take place along already established communication links in the computer system such as a USB-link. Thereby, a real-time communication between the cooling system and the operative system is provided without any special means for establishing the communication.

In the case of the motor driving the pump is an AC electrical motor, the above method of controlling the pump may be combined with a method, where said pumping means is provided with a means for sensing a position of the rotor of the electrical motor, and wherein the following steps are employed: Initially establishing a preferred rotational direction of the rotor of the electrical motor, before start of the electrical motor, sensing the angular position of the rotor, during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor, said selection being made according to the preferred rotational direction, and said application of the AC voltage being performed by the computer system for applying the AC voltage from the electrical power supply of the computer system during conversion of the electrical DC voltage of the power supply to AC voltage for the electrical motor. By the operative system of the computer system itself generating the AC voltage for the electrical motor, the rotational direction of the pump is exclusively selected by the computer system, non-depending on the applied voltage of the public grid powering the computer system.

Further control strategies utilizing the operative system or alike system of the computer system may involve balancing the rotational speed of the pump as a function of the cooling capacity needed. If a lower cooling capacity is needed, the rotational speed of the pump, may be limited, thereby limiting the noise generating by the motor driving the pump.

In the case an air fan is provided in combination with a heat sink as shown in FIG. **1**, of the air fan is provided in combination with the heat radiator, the operative system or alike system of the computer system may be designed for regulating the rotational speed of the pump, and thus of the motor driving the pump, and the rotational speed of the air fan, and thus the motor driving the air fan. The regulation will take into account the cooling capacity needed, but the regulation will at the same time take into account which of the two cooling means, i.e. the pump and the air fan, is generating the most noise. Thus, it the air fan generally is generating more noise than the pump, then the regulation will reduce the rotational speed of the air fan before reducing the rotational speed of the pump, whenever a lower cooling capacity is needed. Thereby, the noise level of the entire cooling system is lowered as much as possible. If the opposite is the case, i.e. the pump generally generating more noise than the air fan, then the rotational speed of the pump will be reduced before reducing the rotational speed of the air fan.

Even further control strategies involve controlling the cooling capacity in dependence on the type of computer processing taking place. Some kind of computer processing, such as word-processing, applies a smaller load on the processing units such as the CPU than other kinds of computer processing, such as image processing. Therefore, the kind of processing taking place on the computer system may be used as an indicator of the cooling capacity. It may even be possible as part of the operative system or similar system to establish certain cooling scenarios, depending on the kind of processing intended by the user. If the user selects as example word-processing, a certain cooling strategy is applied based on a limited need for cooling. If the user selects as example image-processing, a certain cooling strategy is applied based on an increased need for cooling. Two or more different cooling scenarios may be established depending on the capacity and the control possibilities and capabilities of the cooling system and depending on the intended use of the computer system, either as selected by a user during use of the computer system or as selected when choosing hardware during build-up of the computer system, i.e. before actual use of the computer system.

The pump is not being restricted to a mechanical device, but can be in any form capable of pumping the cooling liquid through the system. However, the pump is preferably one of the following types of mechanical pumps: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. Similarly, the motor driving the pumping member need not be electrical but may also be a piezo-electrically operated motor, a permanent magnet operated motor, a fluid-operated motor or a capacitor-operated motor. The choice of pump and the choice of motor driving the pump id dependent on many different parameters, and it is up to the person skilled in the art to choose the type of pump and the type of motor depending on the specific application. As example, some pumps and some motors are better suited for small computer systems such as lab-tops, some pumps and some motors are better suited for establishing high flow of the cooling liquid and thus a high cooling effect, and even some pumps and motors are better suited for ensuring a low-noise operation of the cooling system.

FIG. **7** is a cut-out view into the reservoir, when the reservoir and the heat exchanging surface **4** is assembled and the pump **21** is situated inside the reservoir. The reservoir is provided with the tube inlet connection (not seen from the figure) through which the cooling liquid enters the reservoir. Subsequently, the cooling liquid flows through the reservoir passing the heat exchanging surface and enters the inlet of the pump. After having been passed through the pump, the cooling liquid is passed out of the outlet of the pump and further out through the tube outlet connection **16**. The figure also shows a lid **17** for the reservoir. The flow of the cooling liquid inside the reservoir and trough the pump may be further optimized in order to use as little energy as possible for pumping the cooling liquid, but still having a sufficient amount of heat from the heat exchanging surface being dissipated in the cooling liquid. This further optimization can be established by changing the length and shape of the tube connection inlet within the reservoir, and/or by changing the position of the pump inlet, and/or for instance by having the pumping device placed in the vicinity and in immediate thermal contact with the heat exchanging surface and/or by providing channels or segments inside the reservoir.

In this case, an increased turbulence created by the pumping device is used to improve the exchange of heat between the heat exchanging surface and the cooling liquid. Another or an additional way of improving the heat exchange is to force the cooling liquid to pass through specially adapted channels or segments being provided inside the reservoir or by making the surface of the heat exchanging surface plate inside the reservoir uneven or by adopting a certain shape of a heat sink with segments. In the figure shown, the inner surface of the heat exchanging surface facing the reservoir is plane.

FIG. **8** is a perspective view of the cooling system showing the reservoir housing **14** with the heat exchanging surface (not shown) and the pump (not shown) inside the reservoir. The tube inlet connection and the tube outlet connection are connected to a heat radiator by means of connecting tubes **24** and **25** through which the cooling liquid flows into and out of the reservoir and the heat radiator, respectively. Within the heat radiator **11**, the cooling liquid passes a number of channels for radiating the heat, which has been dissipated into the cooling liquid inside the reservoir, and to the surroundings of the heat exchanger. The air fan **10** blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir.

According to the invention, the heat radiator **11** may be provided alternatively. The alternative heat radiator is constituted by a heat sink, such as a standard heat sink made of extruded aluminum with fins on a first side and a substantially plane second side. An air-fan may be provided in connection with the fins along the first side. Along the second side of the heat sink a reservoir is provided with at least one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the substantial plane side of the heat sink. When closing the reservoir in such a way a surface of the heat sink is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the at least one aperture. This alternative way of providing the heat radiator may be used in the embodiment shown in FIG. **8** or may be used as a heat radiator for another use and/or for another embodiment of the invention.

A pumping means for pumping the cooling liquid trough the reservoir may or may not be provided inside the reservoir at the heat sink. The reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir. Channels or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. If channels or segments in the reservoir are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting.

By means of the alternative heat radiator, the heat radiator **11** is not provided as is shown in the figure with the rather expensive structure of channels leading the cooling liquid along ribs connecting the channels for improved surface of the structure. Instead, the heat radiator is provided as described as a unit constituted by a heat sink with or without a fan and a reservoir, and thereby providing a simpler and thereby cheaper heat radiator than the heat radiator **11** shown in the figure.

The alternative heat radiator provided as an unit constituted by a heat sink and a reservoir, may be used solely, with or without a pump inside the reservoir and with or without the segments or channels, for being placed in direct or indirect thermal contact with a heat generating processing unit such as CPU or with the heat exchanging surface, respectively. These embodiments of the invention may e.g. be used for a reservoir, where the cooling liquid along a first side within the reservoir is in direct heat exchanging contact with the heat generating processing unit such as a CPU and the cooling liquid along a second side within the reservoir is in direct heat exchanging contact with a heat sink. Such a reservoir may be formed such as to provide a larger area of heat exchanging surface towards the heat generating processing unit such as a CPU than the area of the heat exchanging surface facing the heat sink. This may e.g. have the purpose of enlarging the area of the heat exchanging surface so as to achieve an improved heat dissipation form e.g. the CPU to the heat sink than that of a conventional heat sink without a reservoir attached. Conventional heat sinks normally only exchanges heat with the CPU through the area as given by the area of the top side of the CPU. A system comprising a liquid reservoir and a heat sink with a fan provided has been found to be a simple, cost optimized system with an improved heat dissipation than that of a standard heat sink with a fan, but without the reservoir. In another embodiment of the invention, which may be derived from FIG. **8**, the air fan and the heat radiator is placed directly in alignment of the reservoir. Thereby, the reservoir housing **14**, the air fan **10** and the radiator **11** constitute an integrate unit. Such an embodiment may provide the possibility of omitting the connection tubes, and passing the cooling liquid directly from the heat radiator to the reservoir via an inlet connection of the reservoir, and directly from the reservoir to the heat radiator via an outlet connection of the reservoir. Such an embodiment may even render the possibility of both the pumping device of the liquid pump inside the reservoir and the electrical motor for the propeller of the air fan **23** of the heat radiator **11** being driven by the same electrical motor, thus making this electrical motor the only motor of the cooling system.

When placing the heat radiator on top of the air fan now placed directly in alignment with the reservoir and connecting the heat radiator directly to the inlet connection and outlet connection of the reservoir, a need for tubes will not be present. However, if the heat radiator and the reservoir is not in direct alignment with each other, but tubes may still be needed, but rather than tubes, pipes made of metal such as copper or aluminum may be employed, such pipes being impervious to any possible evaporation of cooling liquid. Also, the connections between such pipes and the heat radiator and the reservoir, respectively, may be soldered so that even the connections are made impervious to evaporation of cooling liquid.

In the derived embodiment just described, an integrated unit of the reservoir, the heat exchanging surface and the pumping device will be given a structure establishing improved heat radiating characteristics because the flow of air of the air fan may also be directed along outer surfaces of the reservoir. If the reservoir is made of a metal, the metal will be cooled by the air passing the reservoir after having passed or before passing the heat radiator. If the reservoir is made of metal, and if the reservoir is provided with segments on the outside surface of the reservoir, such cooling of the reservoir by the air will be further improved. Thereby, the integrated unit just described will be applied improved heat radiating characteristics, the heat radiation function normally carried out by the heat radiator thus being supplemented by one or more of the further elements of the cooling system, i.e. the reservoir, the heat exchanging surface, the liquid pump and the air fan.

FIG. **9-10** show an embodiment of a reservoir housing **14**, where channels **25** are provided inside the reservoir for establishing a forced flow of the cooling liquid inside the reservoir. The channels **25** in the reservoir housing **14** lead from an inlet **15** to an outlet **16** like a maze between the inlet and the outlet. The reservoir housing **14** is provided with an aperture **27** having outer dimensions corresponding to the dimensions of a free surface of the processing unit **1** to be cooled. In the embodiment shown, the processing unit to be cooled is a CPU **1**.

When channels **26** are provided inside the reservoir, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps manufactured by injection molding, or is to be made of metal such as aluminum, perhaps manufactured by extrusion or by die casting.

The reservoir housing **14** or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The CPU **1** is intended for being positioned in the aperture **27**, as shown in FIG. **10**, so that outer boundaries of the CPU are engaging boundaries of the aperture. Possibly, a sealant (not shown) may be provided along the boundaries of the CPU and the aperture for ensuring a fluid tight engagement between the boundaries of the CPU and the boundaries of the aperture. When the CPU **1** is positioned in the aperture **27**, the free surface (not shown) of the CPU is facing the reservoir, i.e. the part of the reservoir having the channels provided. Thus, when positioned in the aperture **27** (see FIG. **10**), the free surface of the CPU **1** is having direct contact with cooling liquid flowing through the channels **26** in the reservoir.

When cooling liquid is forced from the inlet **15** along the channels **26** to the outlet **16**, the whole of the free surface of the CPU **1** will be passed over by the cooling liquid, thus ensuring a proper and maximized cooling of the CPU. The configuration of the channels may be designed and selected according to any one or more provisions, i.e. high heat dissipation, certain flow characteristics, ease of manufacturing etc. Accordingly, the channels may have another design depending on any desire or requirement and depending on the type of CPU and the size and shape of the free surface of the CPU. Also. other processing units than a CPU may exhibit different needs for heat dissipation, and may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the channels. If the processing unit is very elongate, such as a row of microprocessors, one or a plurality of parallel channels may be provided, perhaps just having a common inlet and a common outlet.

FIG. **11-13** show an embodiment of a heat sink **4**, where segments **28** are provided at a first side **4**A of the heat sink, and fins **29** for dissipating heat to the surroundings are provided at the other, second side **4**B of the heat sink. An intermediate reservoir housing **30** is provided having a recessed reservoir at the one side facing the first side **4**A of the heat sink. The recessed reservoir **30** has an inlet **31** and an outlet **32** at the other side opposite the side facing the heat sink **4**.

When segments **28** are provided on the first side **4**A of the heat sink, the shape of the segments may be decisive of whether the reservoir, which is made from metal such as aluminum or copper, is to be made by extrusion or is to be made by other manufacturing processes such as die casting. Especially when the segments **28** are linear and are parallel with the fins **29**, as shown in the embodiment, extrusion is a possible and cost-effective means of manufacturing the heat sink **4**.

The intermediate reservoir **30** or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The recessed reservoir is provided with a kind of serration **33** along opposite sides of the reservoir, and the inlet **31** and the outlet **32**, respectively, are provided at opposite corners of the intermediate reservoir **30**. The segments **28** provided at the first side **4**A of the heat sink, i.e. the side facing the intermediate reservoir **30**, are placed so that when the heat sink is assembled with the intermediate reservoir housing (see FIG. **13**) the segments **29** run from one serrated side of the reservoir to the other serrated side of the reservoir.

When cooling liquid is forced from the inlet **31** through the reservoir, along channels (not shown) formed by the segments **29** of the heat sink **4** and to the outlet **32**, the whole of the first side **4**A of the heat sink will be passed over by the cooling liquid, thus ensuring a proper and maximized heat dissipation between the cooling liquid and the heat sink. The configuration of the segments on the first side **4**A of the heat sink and the configuration of the serrated sides of the intermediate reservoir housing may be designed and selected according to any provisions. Accordingly, the segments may have another design, perhaps being wave-shaped or also a serrated shape, depending on any desired flow characteristics of the cooling liquid and depending on the type of heat sink and the size and shape of the reservoir.

Also other types of heat sinks, perhaps circular shaped heat sinks may exhibit different needs for heat dissipation, may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the segments and the intermediate reservoir. If the heat sink and the reservoir are circular or oval, a spiral-shaped segmentation or radially extending segments may be provided, perhaps having the inlet or the outlet in the centre of the reservoir. If an impeller of the pump is provided, as shown in FIG. **15-16**, the impeller of the pump may be positioned in the centre of a spiral-shaped segmentation or in the centre of radially extending segments.

FIG. **14** shows the reservoir housing **14** shown in FIG. **9-10** and the heat sink **4** and the intermediate reservoir **30** shown in FIG. **11-13** being assembled for thereby constituting an integrated monolithic unit. It is not absolutely necessary to assemble the reservoir housing **14** of FIG. **9-10** and the heat sink **4** and the intermediate reservoir **30** of FIG. **11-13** in order to obtain a properly functioning cooling system. The inlet **15** and the outlet **16** of the reservoir housing **14** of FIG. **9-10** may be connected to the outlet **32** and the inlet **31**, respectively, of the intermediate reservoir of FIG. **11-13** by means of tubes or pipes.

The reservoir housing **14** of FIG. **9-10** and the heat sink **4** and the intermediate reservoir **30** of FIG. **11-13** may then be positioned in the computer system at different locations. However, by assembling the reservoir housing **14** of FIG. **9-10** and the heat sink **4** and the intermediate reservoir **30** of FIG. **11-13** a very compact monolithic unit is obtained, also obviating the need for tubes or pipes. Tubes or pipes may involve an increased risk of leakage of cooling liquid or may require soldering or other special working in order to eliminate the risk of leakage of cooling liquid. By eliminating the need for tubes or pipes, any leakage and any additional working is obviated when assembling the cooling system.

FIG. **15-16** show a possible embodiment of a reservoir according to the invention. The reservoir is basically similar to the reservoir shown in FIG. **9-10**. However, an impeller **33** of the pump of the cooling system is provided in direct communication with the channels **26**. Also, in the embodiment shown, a heat exchanging interface **4** such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed between the channels **26** inside the reservoir and the CPU **1** as the processing unit.

The heat exchanging surface **4** is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU **1** (see FIG. **4**). However, also the inner surface (not shown, see FIG. **7**) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

The provision of the heat exchanging surface **4** need not be a preferred embodiment, seeing that the solution incorporating the aperture (see FIG. **9-10**) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging surface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging surface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

In the embodiment shown, the heat exchanging surface **4** is secured to the reservoir by means of bolts **22**. Other convenient fastening means may be used. The heat exchanging surface **4** and thus the reservoir housing **14** may be fastened to the CPU **1** or other processing unit by any suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging surface. One such means may be the fastening means shown in FIG. **4** and FIG. **5** or similar fastening means already provided as part of the computer system.

When channels **26** are provided inside the reservoir housing **14**, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting.

The reservoir housing **14** or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The impeller **33** (see FIG. **14**) of the pump is positioned in a separate recess of the channels **26**, said separate recess having a size corresponding to the diameter of the impeller of the pump. The recess is provided with an inlet **34** and an outlet **35** being positioned opposite an inlet **31** and an outlet **32** of cooling liquid to and from, respectively, the channels **26**. The impeller **33** of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clockwise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. in a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer system supplying DC electrical power, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump. However, in the embodiment shown, the impeller of the pump is driven by a 12V electrical motor.

FIG. **17** shows a preferred possible embodiment of a reservoir according to the invention. The reservoir housing **14**, as shown in FIGS. **17** and **20**, is in the form of a double-sided chassis configured to mount an electrical motor. The reservoir housing **14** has basically the same features as the reservoir housing shown in FIG. **15-16**. In the embodiment shown, the reservoir substantially has a conical, circular configuration and is provided with stiffening ribs **36** extending axially along the exterior of the reservoir housing **14**.

Other shapes such as cylindrical, circular, or conical rectangular or cylindrical, rectangular or even oval or triangular shapes may be adopted, when designing and possibly injection molding or casting the reservoir. The dimension of the embodiment shown is approximately 55 mm in diameter and also 55 mm in axial extension.

The reservoir housing **14** has a recess **40** in the centre on the upper side_of the reservoir. The recess **40** is intended for accommodating a stator **37** of an electrical motor driving an impeller **33** of the pump, said impeller being attached to a shaft **38** of a rotor **39** of the electrical motor. The recess **40** has an orifice **41**, four sidewalls **42**, a bottom **43** and a circular jacket **44** extending from the bottom **43** of the recess **40** and outwards towards the orifice **41** of the recess **40**. The interior (see FIG. **20**) of the jacket **44** is intended for encompassing the rotor **39** of the pump. As shown in FIG. **20**, the impeller **33** is housed in a recess on the underside of the reservoir housing **14**, the recess being an extension of the interior of the jacket **44**.

Thereby, a liquid-proof division is made between the rotor **39** of the motor, said rotor **39** being placed inside the interior of the jacket **44** and being submerged in the cooling liquid, and the stator **37** of the pump, said stator **37** being positioned in the recess **40** and surrounding the exterior of the jacket **44**. Accordingly, the stator **37** need not be sealed against the cooling liquid, because the recess **40** together with the jacket **44** ensures the stator staying dry from the cooling liquid, but the stator **37** still being capable of driving the rotor **39**, when being supplied with electrical power from a power supply (not shown) of the computer system.

Along an outer circumferential extension, the reservoir housing **14** is provided with protrusions **45** extending outwardly from the circumferential extension. The protrusions are intended for cooperating with a clip (see description below) for fastening the reservoir housing **14** to the CPU or other processing unit of the computer system. The protrusions **45** are shown as a plurality of singular protrusions. Alternatively, the protrusions may be only one continuous protrusion extending outwardly and around the circumferential extension.

The reservoir housing **14** may also be provided with an inlet (not shown) and an outlet (not shown) for the cooling liquid. The inlet and the outlet are provided along a surface of the reservoir facing downward and inwards when seen in the perspective view of the drawing. The inlet and the outlet lead to a radiator (not shown) intended for cooling the cooling liquid after having been heated by the processing unit via a heat exchanging surface (see description below).

The radiator may be placed nearby or distant from the reservoir housing **14**, depending on the set-up of the computer system. In one possible embodiment, the radiator is placed in the immediate vicinity of the reservoir, thereby possible excluding any tubing extending between the radiator and the inlet and the outlet, respectively. Such embodiment provides a very compact configuration of the entire cooling system, namely a monolithic configuration where all elements needed for the cooling system are incorporated in one unit.

In an alternative embodiment, the reservoir housing **14** itself also constitutes the radiator of the cooling system. In such embodiment, an inlet and an outlet are not needed. If the reservoir is made of a metal such as copper or aluminum or other material having a high thermal conductance, the cooling liquid, after having been heated by the processing unit via a heat exchanging surface **8** see description below) may radiate the heat via the exterior surface of the reservoir housing **14** itself. In such embodiment, the ribs **36** along the exterior surface of the reservoir housing **14** may also, or may instead, function as cooling fins. In such embodiment, the fins will have a smaller dimension than the transverse dimension of the ribs **14** shown in FIG. **17**, and the number of fins will be greater than the number of fins shown in FIG. **17**.

An impeller **33** of the pump of the cooling system is provided in direct communication with a pump chamber **46** formed by impeller cover **46**A having an outlet **34** provided tangentially to the circumference of the impeller **33**. Thus, the pump functions as a centrifugal pump. The inlet of the pump chamber **46** is the entire opening into the cavity that the pump chamber configures, said cavity being in direct communication with the interior of the reservoir housing **14** as such. An intermediate member **47** is provided between the pump chamber **46** together with the interior of the reservoir and a heat exchanging interface **4**. The intermediate member **47** is provided with a first passage **48** for leading cooling liquid from the pump chamber **46** to a thermal exchange chamber **47**A provided at the opposite of the intermediate member **47**. The intermediate member **47** is provided also with a second passage **49** for leading cooling liquid from the thermal exchange chamber **47**A provided at the opposite of the intermediate member **47** to the interior of the reservoir housing **14**. Thus, the area enclosed between the underside of the reservoir housing **14** and the heat exchange surface **4** constitutes an enclosed space for circulating the cooling liquid therethrough. The enclosed spaced is divided into two separate chambers by the impeller cover **46**A and the intermediate member **47**, as shown in FIG. **20**. The impeller cover **46**A interfaces with the recess on the underside of the reservoir **14** to define the pump chamber **46** which houses the impeller **33**, while the intermediate member **47** and the heat exchange surface **4** together define the thermal exchange chamber **47**A.

In the embodiment shown, a heat exchanging interface **4** such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member **47**.

The heat exchanging interface **4** is preferably made from a copper plate having a plane outer surface (not shown) at the opposite side as the side shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see FIG. **4**). The inner surface facing the thermal exchange chamber (not shown) at the opposite side of the intermediate member **47** is provided with pins **4**A extending from the base of the copper plate and into the thermal exchange chamber (not shown) at the opposite side of intermediate member **47**. The pins **4**A constitutes an uneven surface and may either be provided during casting of the copper plate or may be provided by means of milling or other machining process of a copper plate. The pins provide a network of channels across the inner surface of the heat exchanging interface, along which network the cooling liquid is intended to flow.

Alternatively, also the inner surface of the copper plate facing the reservoir is plane. In this alternative embodiment, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown. No milling or other machining process of the inner and/or the outer surface need be provided, when both the outer surface and the inner surface is plane.

The provision of the heat exchanging interface **4** need not be a preferred embodiment, seeing that the solution incorporating the aperture (see FIG. **9**-**10**) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging interface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging interface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

In the embodiment shown, the heat exchanging interface **4** is secured to the intermediate member **47** by means of gluing or other means ensuring a proper and liquid-tight fastening of the heat exchanging interface with the intermediate member. Any other suitable and convenient means (not shown) for securing the heat exchanging interface to the intermediate member may be envisaged.

The heat exchanging interface and thus the reservoir is fastened to the top of the CPU by means of a clip **50**. The clip **50** has a circular configuration and has four legs **51** extending axially from the circular configuration. The four legs **51** are provided with footing **52** and the footings **52** are provided with holes **53**. The clip **50** is intended for being displaced around the exterior of the reservoir housing **14** and further axially to the protrusions **45** of the reservoir housing **14**.

The clip **50**, after having been placed around the reservoir housing **14**, is fastened to the motherboard of the computer system by means of bolts (not shown) or the like fastening means extending through the holes **53** in the footings **52** and further though corresponding holes in the motherboard. The corresponding holes in the motherboard are preferably holes already available in the motherboard in the vicinity of the CPU and the socket of the CPU, respectively. Accordingly, the legs **51** and the footings **52** of the clip **50** are specially designed in accordance with the already provided holes in the motherboard.

Alternatively, the heat exchanging interface **4** and thus the reservoir housing **14** may be fastened to the CPU or other processing unit by any other suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging interface. One such means may be the fastening means shown in FIG. **4** and FIG. **5** or similar fastening means already provided as part of the computer system.

When stiffening and/or cooling fins **36** are provided at the exterior of the reservoir housing **14**, the shape of and the number of fins may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting. Also, the purpose of the fins i.e. just for stiffening the reservoir, or also or instead for cooling purposes, may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting.

The reservoir housing **14** or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The impeller **33** of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. In a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V AC power or 220V AC power. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by either an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer system supplying DC electrical power, this may be nevertheless be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump.

In every aspect of the invention, where an AC motor is used for driving an impeller from a DC motor, although this way of configuring a pump is contradictory, the following preferred mode of operation is established for alleviating the disadvantages:

In order to be able to control direction of rotation of the impeller attached to the rotor and to optimize the conditions of maximum average torque value during starting, i.e. from zero speed up to the synchronous speed, an electronic control circuit is used. The electronic control circuit comprises a processing unit, which drives a static power switch, constituted for example by a triac arranged in series between the alternating-voltage power, which is obtained from the DC power supply of the computer system, and the AC motor. The same series network also includes a detector for the current I which flows through the triac and then through the AC motor. The output of the current detector is an input signal for the electronic processing unit.

The electronic control circuit may also comprise a number or sensors suitable for detecting the position and polarity of the permanent magnets comprised in the rotor of the AC motor, both when the rotor is moving and when it is in particular operating conditions, or when it is motionless or stalled at zero speed. The number of position sensors may be

Hall sensors, encoders or optical or electromechanical sensors capable of establishing and/or measuring the position of the rotor. The output signal from the number of position sensors is an input signal for the electronic processing unit.

Alternatively, the output signal from the position sensor may be phase shifted by means of an electronic phase shifting circuit before the output signal is sent to the input of the electronic processing unit.

A third signal may be input to the processing unit, said third signal enabling the processing unit to detect the polarity of the AC voltage applied to the AC motor. However, the third signal is not compulsory.

The signals input to the electronic processing unit are converted into digital form and after being processed by the processing unit, an output signal is provided by the processing unit. The output signal is used for closing or opening the static switch constituted by a triac arranged in series with the AC motor.

In the electronic processing unit, the current signal provided by the current sensor enters a zero-crossing detector which provides in output a logical "1" signal indicating that said current approaches zero with a positive or negative deviation from the zero value of said current. This deviation depends on the type of motor used and on its application, as well as on the type of static power switch being used. The signal arriving from the position sensor enters a phase-shift and processing circuit the output whereof is 1 or 0 according to the position and polarity of the rotor.

In the electronic processing unit, the phase shifted position signal as well as the signal processed from the AC voltage, enter an electronic logic XOR gate which outputs a "1" signal if the digital value of the AC voltage is equal to "0" and the digital value of the phase shifted position signal is equal to "1" or the digital value of the AC voltage is equal to "1" and the digital value of the phase shifted position signal is equal to "0".

The output of the zero-crossing detector and the output of the XOR gate, thus in digital form, enter an electronic logic AND gate which provides in output the control signal for closing or opening the static power switch.

The AND gate with two inputs and the signal processing system allow determining two conditions: 1) the AC voltage signal is positive, the current is proximate to zero, and the rotor rotation angle is between 0 degrees and 180 degrees; 2) the AC voltage signal is negative, the current is proximate to zero, and the rotor rotation angle is between 180 degrees and 360 degrees. These two conditions provide the same rotation direction of the rotor of the AC motor.

FIG. **18** shows an embodiment of an AC motor in which one stator pole **54** is longer than the other stator pole **55** by an amount indicated by 1. With this configuration the permanent-magnet rotor **39** with an ideal line **56** separating the north N and the south S of the rotor, is positioned so that the ideal line **56** do not coincide with the median axis **57** of the stator **37**, but so that the ideal line **56** is tilted by a certain angle .alpha. in respect to the median **57** of the stator **37**.

Two energizing windings **58**, **59** are provided on the two poles **54**,**55** of the stator **37**, respectively, and the energizing windings are connected in series and are powered, through terminals (not shown), by an AC power source. With this configuration of the AC motor, the motor is able to start more easily in an intended rotational direction of the rotor.

In a preferred embodiment of the invention, the control electronics supplies the AC motor with only a half-wave voltage signal during start up, thereby providing torque pulses to the rotor. Since only a half-wave voltage signal is supplied to the motor, the torque pulses are always unidirectional and will therefore force the rotor to start rotating in a required direction. The required direction of rotation is determined by the design of the impeller attached to the rotor and by polarity of the half-wave voltage signal.

After some amount of time, in which a number of half-wave voltage signals has been supplied to the motor, the rotor will stop rotating at a certain position e.g. as shown in the figure. Thus, the rotor is brought into a determined steady state position that is independent of its start position. Subsequent to this process, the AC motor is supplied with a full-wave voltage signal that will accelerate the rotor until the motor enters synchronous operation, that is, when the rotor rotates with the same cyclic frequency as the frequency of the AC voltage source.

The initial polarity of the AC voltage signal is determinative for the resulting direction of rotation of the rotor, thus if the initial voltage is positive with an increasing amplitude, the rotor will start rotating in one direction, whereas if the voltage is negative with a decreasing amplitude, the rotor will start rotating in an opposite direction.

The number of half-waves required for bringing the rotor into a determined steady state position, where the rotor stops rotating, depends on the characteristics of the motor such as moment of inertia and the external load applied to the rotor. Thus, the number of half-waves required is based on empirical analysis of a particular motor in particular load conditions.

The half-wave voltage signal and the corresponding half-wave current signal supplied to the motor will have an appearance as shown in FIG. **19**.

In an alternative embodiment the control electrics used to drive the AC motor shown if FIG. **18** is configured so that that the control electronics dictates the AC motor to stop at a predetermined position by supplying the motor with a number of half-wave voltage signals subsequent to the synchronous operation in which the motor was supplied with a full-wave voltage signal. Thus, at the time the motor needs to be started again, the rotor is already in a position so that only the polarity of the full-wave AC voltage signal supplied to the motor must be chosen so that the resulting direction of rotation of the rotor is in conformity with the terminal position of the rotor at the last operation.

According to this method, the initial step of bringing the rotor into a determined steady state position by supplying the motor with a number of half-wave voltage signals is not required. Even in the alternative, it will be possible to both terminate the full-wave power supply with a number of half-wave voltage signals as well as commencing the full-wave power supply by initially supplying the motor with a number of half-wave signals. However, this is more cumbersome, but nevertheless more safe.

FIG. **19** shows a voltage signal V and a current signal I applied to the AC motor as well as the position signal of the rotor. Initially the rotor stands still, which is represented by the straight line L. The electronic control circuit controls the static power switch so that the voltage signal V and the current signal I are present as half-waves. Thus, the rotor receives torque pulses due to the current-voltage combination; these pulses are always one-way directional and tend to start the rotor moving in the required direction. Subsequent to the start-up phase, the rotor enters into its synchronous operation.

Thus, an AC signal is generated, preferably a 12 VAC signal, possibly by means of digital electric pulses from the 12 V DC power supply of the computer's power supply. Based on a possible sensor output relating to the impeller position, a decision is made of how to initiate the AC power signal, i.e. with a negative or positive half-wave, and by doing making sure the impeller starts in the same rotational direction each time and thus the performance benefits of the AC pump is similar to those of a DC pump.

Alternatively, the magnetic field sensor is omitted, and instead of reading the impeller position, the impeller is forced to be in the same position every time the impeller starts. To be sure the impeller is in a defined position before start, a signal is supplied to the stator of the AC motor for a defined period of time. The signal is supplied perhaps three times in a row according to the curvature of the electrical power source. The pulses must be within the same half-wave part of a signal period. The frequency of the pulsed signal is arbitrary, but may be 50/60 Hz, although, despite the fact that under normal circumstances an AC pump being driven by the AC signal from the power outlet of the public electrical power network and transformed from 230/115 V to 12V would not function, as there is no chance of changing the sine signal from the public network.

By this way the impeller will be forced to the right polarity before start, and the pump will start turning the impeller in a defined way of rotation when the power signal full-wave is supplied. The full-wave power signal, which is supplied, must start in the opposite signal half-wave amplitude than that of the initial half-wave pulses, that was supplied before start of the full-wave power signal.

The invention has been described with reference to specific embodiments and with reference to specific utilization, it is to be noted that the different embodiments of the invention may be manufactured, marketed, sold and used separately or jointly in any combination of the plurality of embodiments. In the above detailed description of the invention, the description of one embodiment, perhaps with reference to one or more figures, may be incorporated into the description of another embodiment, perhaps with reference to another or more other figures, and vice versa. Accordingly, any separate embodiment described in the text and/or in the drawings, or any combination of two or more embodiments is envisaged by the present application.

What is claimed is:

1. A cooling system for a heat-generating component, comprising:

- a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator and an impeller, the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;
- a reservoir adapted to pass the cooling liquid therethrough, the reservoir including:
  - a pump chamber including the impeller and formed below the chassis, the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through;
  - a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and
  - a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component; and
- a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.

2. The cooling system of claim **1**, wherein the chassis shields the stator from the cooling liquid in the reservoir.

3. The cooling system of claim **1**, wherein the heat-exchanging interface includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.

4. The cooling system of claim **3**, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.

5. The cooling system of claim **4**, wherein the features include at least one of pins or fins.

6. The cooling system of claim **1**, wherein a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller.

7. The cooling system of claim **1**, wherein the impeller includes a plurality of curved blades.

8. The cooling system of claim **1**, wherein the heat-exchanging interface includes one of copper and aluminum.

9. The cooling system of claim **1**, wherein the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir.

10. A cooling system for a computer system, comprising:

- a centrifugal pump adapted to circulate a cooling liquid, the pump including:
  - an impeller exposed to the cooling liquid; and
  - a stator isolated from the cooling liquid;
- a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:
  - a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;
  - a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber, and wherein at least one of the one or more passages is offset from a center of the impeller.

11. The cooling system of claim **10**, wherein a top wall of the reservoir physically separates the impeller from the stator.

12. The cooling system of claim **10**, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component.

13. The cooling system of claim **10**, further including a heat radiator fluidly coupled to the reservoir using flexible conduits, wherein the heat radiator is configured to be positioned remote from the reservoir.

14. The cooling system of claim **10**, wherein the fluid passage that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller.

15. A cooling system for a heat-generating component, comprising:

- a pump adapted to circulate a cooling liquid, the pump including:
  - an impeller exposed to the cooling liquid; and
  - a stator isolated from the cooling liquid;
- a reservoir including an impeller cover, an intermediate member and a heat exchange interface, wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define

a thermal exchange chamber, the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together; and

wherein a first side of the heat-exchanging interface is in contact with a cooling liquid in the thermal exchange chamber and a second side of the heat-exchanging interface opposite the first side is configured to be placed in thermal contact with a surface of the heat-generating component; and

a liquid-to-air heat exchanger fluidly coupled to the reservoir using flexible conduits, the heat exchanger being configured to be positioned remote from the reservoir.

16. The cooling system of claim **15**, wherein the impeller cover includes a first opening radially offset from a center of the impeller and the intermediate member includes a second passage that is aligned with the first opening, the first and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber.

17. The cooling system of claim **15**, wherein the first side of the heat-exchanging interface includes at least one of pins or fins.

18. The cooling system of claim **15**, wherein the top wall of the reservoir extends between the stator and the impeller and shields the stator from the cooling liquid in the reservoir.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 8,245,764 B2
APPLICATION NO. : 13/269234
DATED : August 21, 2012
INVENTOR(S) : André Sloth Eriksen

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Claim 10, col. 28, line 37, “vertically spaced part” should read --vertically spaced apart--.

Signed and Sealed this
Twenty-fifth Day of September, 2012

David J. Kappos
Director of the United States Patent and Trademark Office

EXHIBIT 2 TO RESPONDENT'S/REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

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(12) United States Patent
Koga et al.

(10) **Patent No.:** **US 7,544,049 B2**

(45) **Date of Patent:** **Jun. 9, 2009**

(54) **COOLING DEVICE AND CENTRIFUGAL PUMP TO BE USED IN THE SAME DEVICE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 647 days.

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H05K 7/20 (2006.01)

(52) **U.S. Cl.** **417/423.8**; 417/423.1; 417/423.14; 361/699

(58) **Field of Classification Search** 361/689, 361/699, 687, 701, 697, 698, 199; 417/423.14, 417/423.1, 423.8
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,764,483	A	6/1998	Ohashi et al.	
6,019,165	A	2/2000	Batchelder	
6,208,512	B1	3/2001	Goldowsky et al.	
6,327,145	B1	12/2001	Lian et al.	
6,351,384	B1	2/2002	Daikoku et al.	
6,408,937	B1 *	6/2002	Roy	165/104.33
6,829,142	B2 *	12/2004	Belady et al.	361/687
6,867,973	B2 *	3/2005	Chang	361/699
7,255,154	B2	8/2007	Koga et al.	
2003/0151130	A1 *	8/2003	Cheon	257/712
2004/0052048	A1 *	3/2004	Wu et al.	361/699
2004/0052663	A1	3/2004	Laing et al.	

(Continued)

FOREIGN PATENT DOCUMENTS

JP 05264139 A 10/1993

(Continued)

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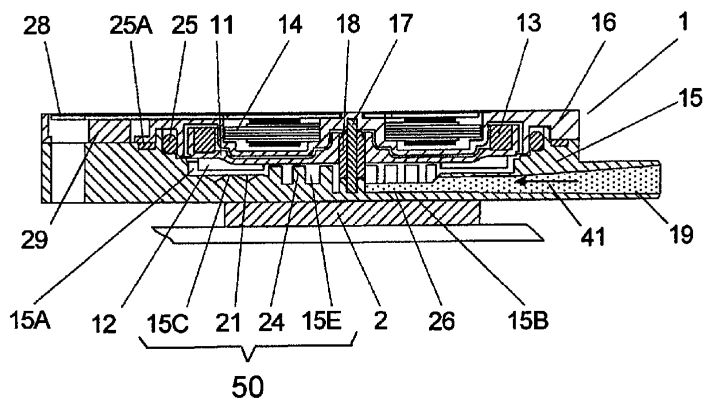
(57) **ABSTRACT**

A cooling device has a closed circulating channel for circulating coolant, and in the channel, a radiator and a contact-heat-exchanger type centrifugal pump are provided. A heat-producing electronic component contacts with the centrifugal pump, and the coolant in the pump collects the heat off the component due to the heat exchanging function. Then the heat is dissipated from the radiator. The pump includes a pump-casing made of highly heat conductive material and an impeller. The pump casing has a base wall and a cover wall opposite the base wall. The base wall has an outer wall face constituting a heat-receiving face, and an inner wall face facing the impeller. The impeller is disposed in a pump room defined between the base wall and cover wall of the casing. A sucking channel is provided between the heat-receiving face and an inner wall face of the pump room. This inner wall has a recess where protrusions extending toward the impeller or dimples are provided.

50 Claims, 5 Drawing Sheets



U.S. PATENT DOCUMENTS

2004/0123614	A1 *	7/2004	Stewart	62/259.2
2004/0190254	A1 *	9/2004	Hu et al.	361/699

FOREIGN PATENT DOCUMENTS

JP	7-143615		6/1995
JP	07142886	A	6/1995
JP	1 085 217		3/2001
WO	03/098415		11/2003
WO	WO03098415	A1 *	11/2003

* cited by examiner

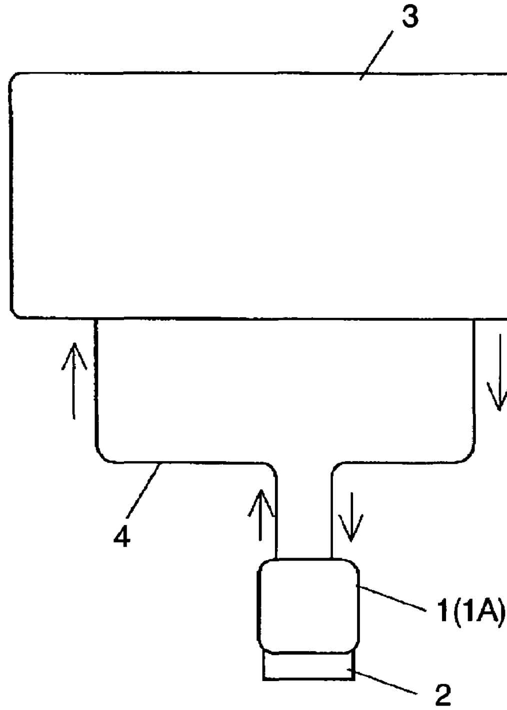


FIG.1

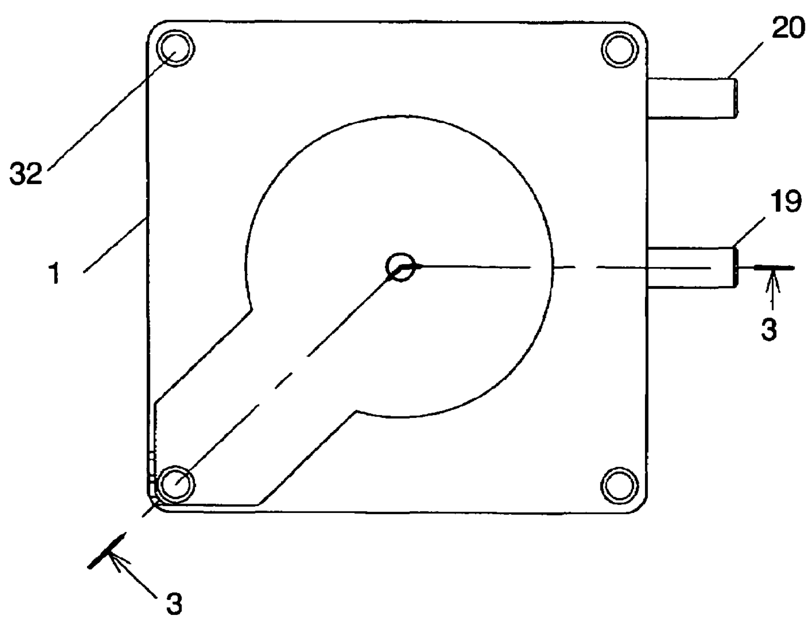


FIG.2

FIG.3

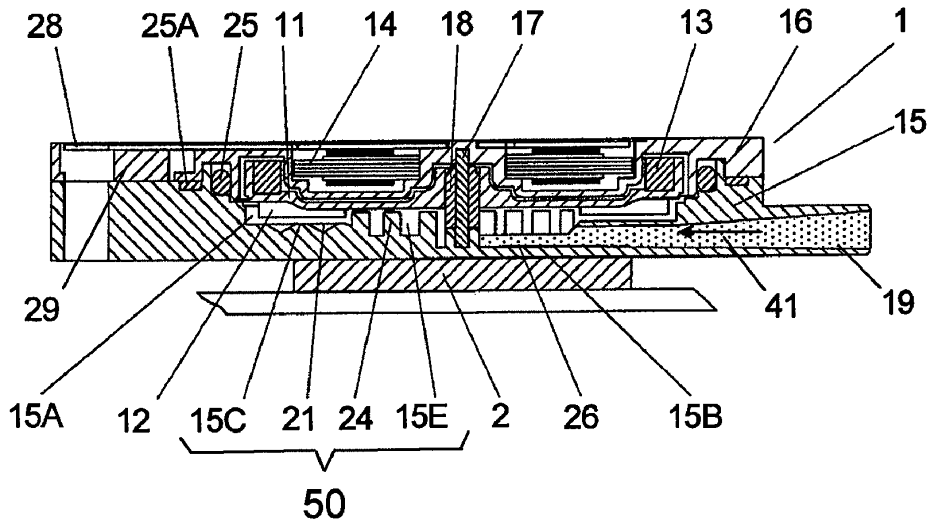

28
25A
25
11
14
18
17
13
16
1
15
29
41
19
15A
12
15C
21
24
15E
2
26
15B
50

FIG.4

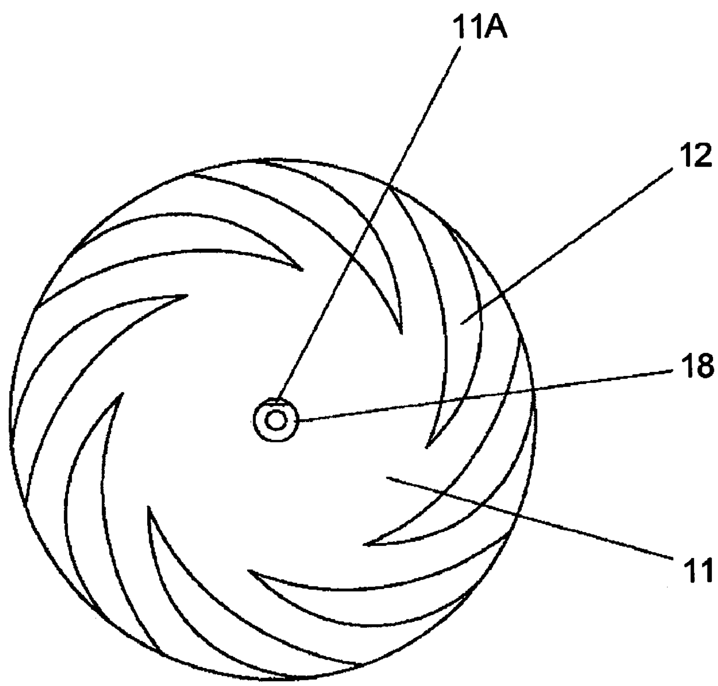

11A
12
18
11

FIG.5

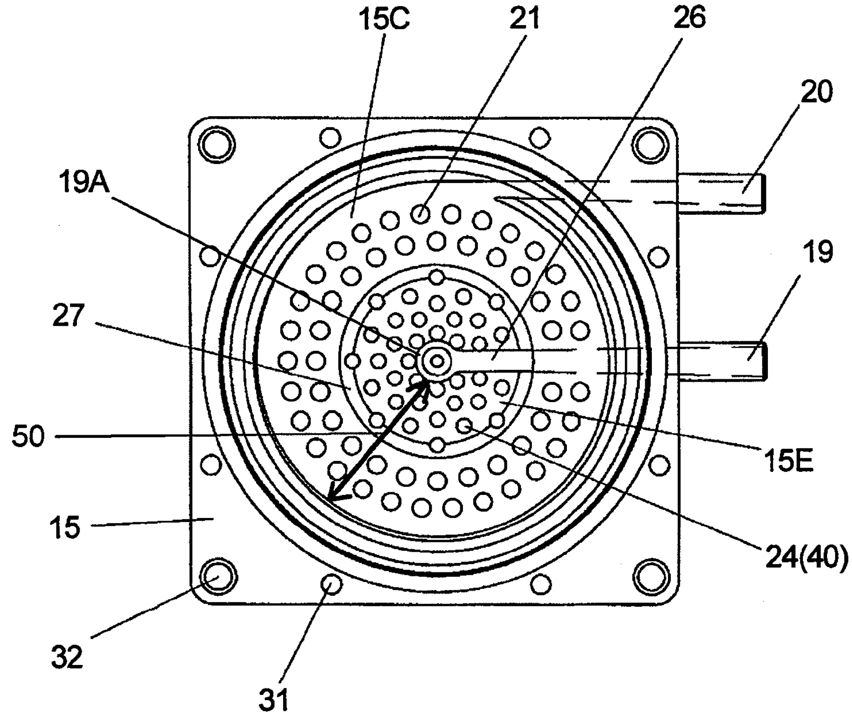


FIG.6

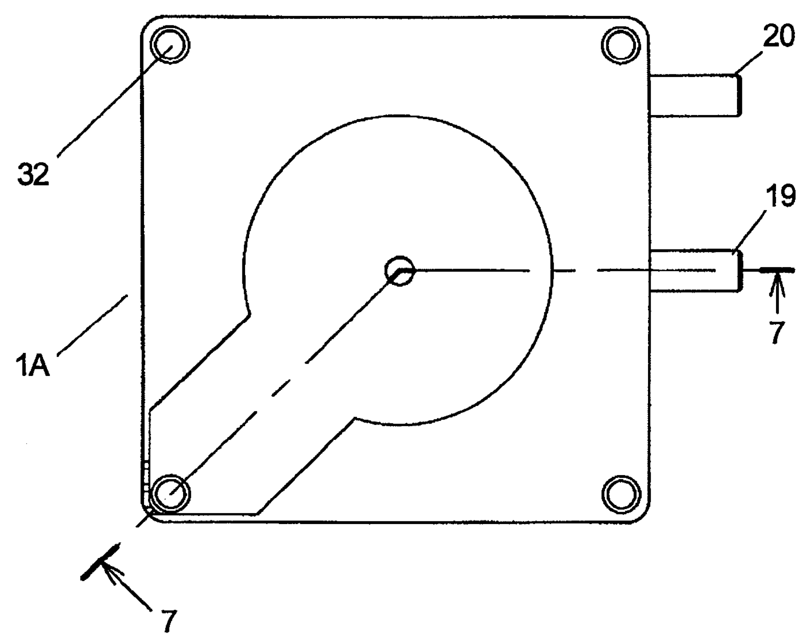
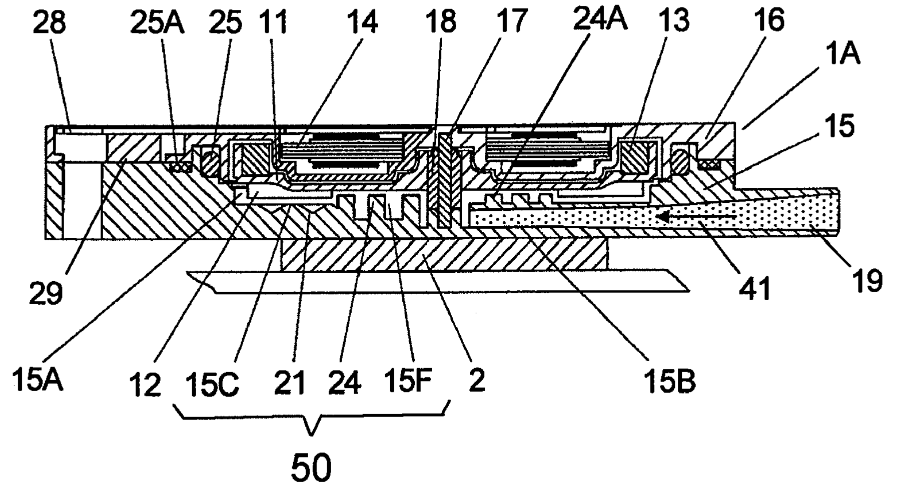
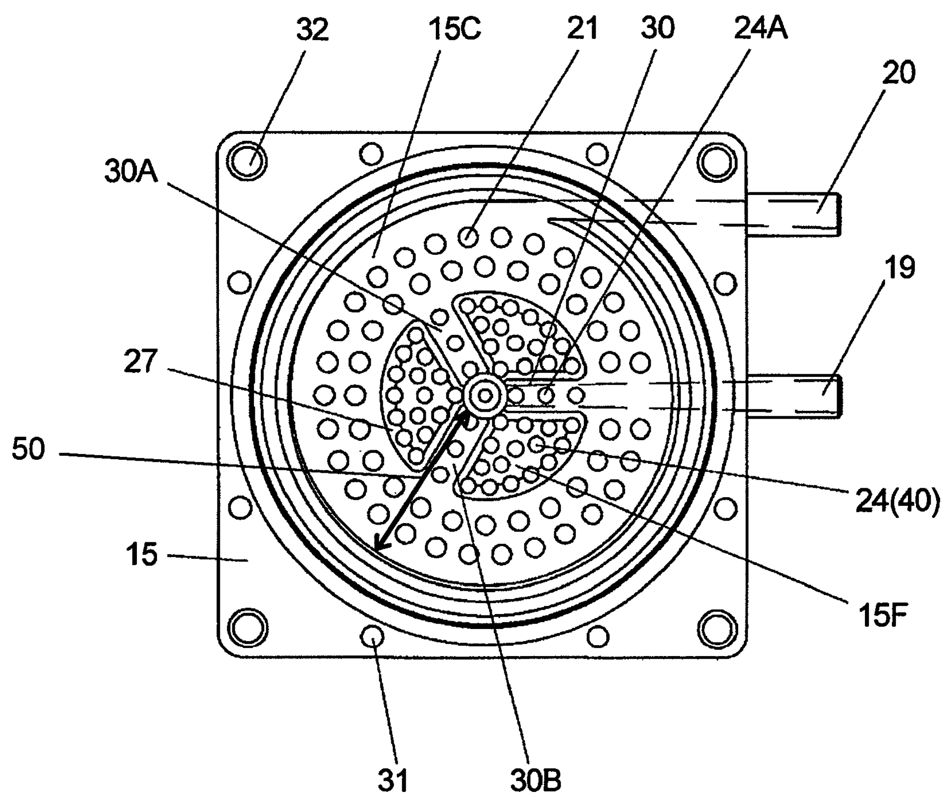


FIG.7



28
25A
25
11
14
18
17
24A
13
16
1A
15
29
41
19
15A
12
15C
21
24
15F
2
15B
50

FIG.8



32
15C
21
30
24A
20
30A
19
27
50
24(40)
15
15F
31
30B

FIG.9 PRIOR ART

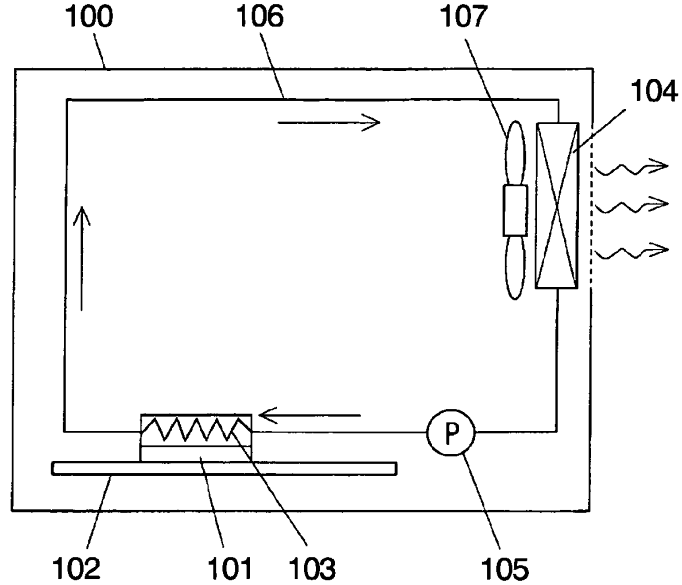
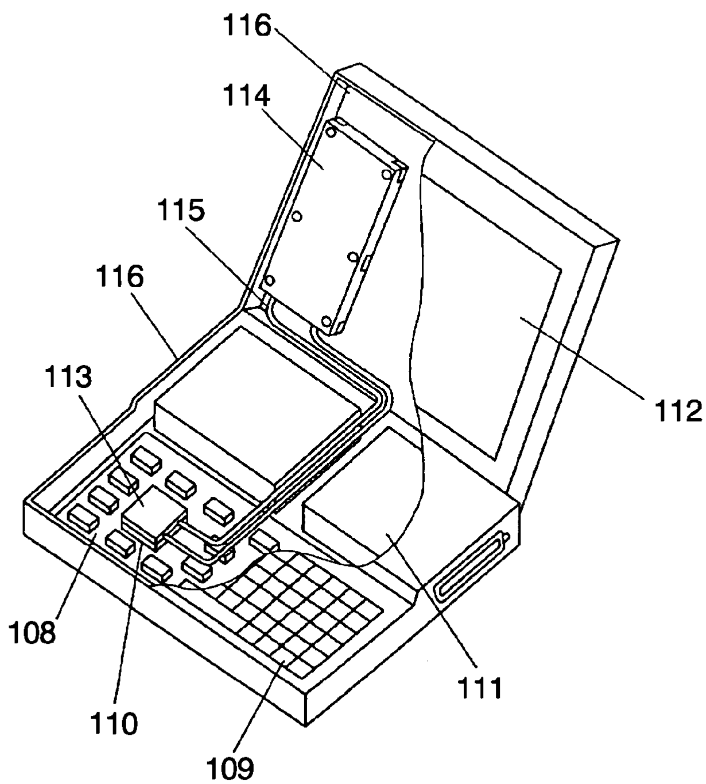


FIG.10 PRIOR ART



COOLING DEVICE AND CENTRIFUGAL PUMP TO BE USED IN THE SAME DEVICE

TECHNICAL FIELD

The present invention relates to a cooling device which cools heat-producing electronic components, such as a central processing unit (CPU), disposed in a housing by circulating coolant. It also relates to a centrifugal pump to be used in the cooling device.

BACKGROUND ART

A speed enhancement technology has been developed rapidly in the computer industry, so that a clock frequency of a CPU becomes substantially higher than a previous one. As a result, the CPU produces too much heat for a conventional heat sink to air-cool the CPU. Thus a cooling device of high power and high efficiency is vitally required. One of such cooling devices is disclosed in Japanese Patent Application Non-Examined Publication No. H07-142886. This cooling device circulates coolant through a substrate on which heat-producing electronic components are mounted, thereby cooling the substrate.

This conventional cooling device that circulates the coolant for cooling an electronic apparatus is described hereinafter. The electronic apparatus in this description refers to such an apparatus that carries out a process by loading a program to a CPU, in particular, a small size and portable apparatus such as a notebook-size computer. Besides the foregoing apparatus, the conventional cooling device can also cool an apparatus in which electronic components producing heat due to energizing are mounted.

A first conventional cooling device has a structure as shown in FIG. **9**. Housing **100** accommodates circuit board **102**, cooler **103** and radiator **104**. Heat-producing electronic component (hereinafter referred to simply as component) **101** is mounted on board **102**. Cooler **103** exchanges the heat between component **101** and coolant, thereby cooling component **101**. Radiator **104** liberates the heat from the coolant. Pump **105** circulates the coolant through pipe **106**, and fan **107** air-cools radiator **104**.

An operation of the first conventional cooling device is described hereinafter. Pump **105** discharges the coolant, which then travels through pipe **106** and arrives at cooler **103**, where the coolant collects heat off component **101** and its temperature thus rises. The coolant then travels to radiator **104**, where fan **107** air-cools forcibly the coolant, so that its temperature lowers. The coolant returned to pump **15**, and repeats the foregoing cycle. As discussed above, the coolant circulates through pipe **106**, thereby cooling component **101**.

The foregoing Non-Examined Publication also discloses a second conventional cooling device of which structure is shown in FIG. **10**. When a heat-producing member is mounted in a confined housing, this second cooling device efficiently transfers the heat generated from the heat-producing member to a wall of the metal housing which works as a radiator, thereby cooling the heat-producing member.

An electronic apparatus includes circuit board **108**, keyboard **109**, heat-producing semiconductor element (hereinafter referred to simply as element) **110**, disc device **111** and display device **112** accommodated in metal housing **116**. The second cooling device thermally couples heat-producing element **110** to housing **116** with a heat-transport device having a flexible structure. The heat transport device includes a liquid flow channel mounted to element **110**, and is formed of heat-receiving header **113**, heat-radiating header **114** and flexible

tube **115**. Flat heat-receiving header **113** exchanges heat with element **110**. Heat-radiating header **114** includes the liquid flow channel and contact with a wall of housing **116**. Flexible tube **115** couples header **113** to header **114**. A liquid driving mechanism integrated in heat-radiating header **114** drives or circulates the liquid that is sealed in the mechanism between heat-receiving header **113** and heat-radiating header **114**. This liquid driving mechanism thus couples element **110** to housing **116** with ease regardless of the components arrangement, and transports the heat efficiently using the liquid movement. Since heat-radiating header **114** is thermally coupled to housing **116**, which has a high heat conduction rate, the heat diffuses extensively to housing **116**.

The first conventional cooling device, however, needs cooler **103**, radiator **104**, pump **105** and a refilling tank (not shown) for refilling pump **105** with the coolant. Those elements are assembled into the cooling device, so that the device becomes bulky and complicated. As a result, it is difficult to reduce the size of the device and the device becomes expensive. In other words, the first cooling device is basically fit for cooling a large size electronic apparatus, but is not suitable for a recent notebook-size computer which is compact, light-weight, slim, and carried in a variety of postures.

The second cooling device can be used in a notebook-size computer; however, both of heat-receiving header **113** and heat-radiating header **114** are box-shaped and substantially thick, which prevents the notebook-size computer from being slimmed. To be more specific, in the second cooling device, a reciprocating pump (not shown) is prepared in header **114**. This pump has a rather narrower width than other pumps and works as the liquid driving mechanism; however, the thickness of header **114** is specified by this pump, so that the overall thickness cannot be reduced. As a result, the notebook-size computer cannot be further slimmed.

In the notebook size computer, it is difficult for heat-receiving header **113** to accommodate the reciprocating pump of the second cooling device. To be more specific, the thickness of the pump on top of the thickness of element **110** increases the height of the computer, and this configuration goes against the trend toward the slimmed-down design. Further, the reciprocating pump produces vibrations and noises, which influence element **110** on which the pump is placed. The vibrations and noises sometimes cause harsh grating noises. This configuration is thus difficult to be realized.

In the second cooling device, heat-radiating header **114** brought into contact with a wall of housing **116** has a limited heat-radiating area, so that it has a low heat conduction efficiency and a limited cooling power. Increasing a heat-radiating area is one of the ideas for boosting the cooling power; however, the larger area lengthens the liquid flow channel, and an amount of circulating coolant increases, which requires a greater power of the built-in reciprocating pump. The greater power of the pump needs, inconsistently, a greater thickness of header **114**. Thus, the reciprocating pump can be independently accommodated in housing **116**; however, in this case, another space must be prepared for the pump although the notebook-size computer has been ultimately downsized, and the assembly work becomes cumbersome. As discussed above, the second cooling device limits further downsizing of the notebook-size computer. To be more specific, the performance of the CPU will continue to increase, thereby requiring greater cooling power, so that the second conventional cooling device having the foregoing problems will no longer be used.

A conventional pump having a heat exchanger function needs a cooling water channel in the pump for cooling the coolant with the cooling water supplied separately, so that the pump becomes bulky and complicated. The pump also needs a second pump for circulating the cooling water and a second heat exchanger for collecting the heat off the cooling water, so that the cooling system becomes complicated and is difficult to downsize. The pump thus needs a number of components and its assembly work becomes inefficient. The conventional cooling devices thus cannot be expected to have better thermal efficiency or to be less expensive.

SUMMARY OF THE INVENTION

A cooling device of the present invention includes a radiator and a centrifugal pump of contact heat exchanger model, both disposed in a closed circulating channel in which coolant circulates. Heat-producing electronic components are brought into contact with the centrifugal pump, so that the coolant in the pump collects the heat off the electronic components due to its heat exchanger function, and the radiator of the cooling device dissipates the heat. The centrifugal pump includes a pump-casing made of highly heat conductive material and an impeller. The pump casing has a heat-receiving plane formed on a side face along an interior pump room, and a sucking channel prepared between the heat-receiving plane and an inner wall of the pump room. On the inner wall of the pump room, a recess is provided. In this recess, protrusions extending toward the impeller or dimples are provided. According to the present invention, the cooling device of a simple structure, which allows downsizing and slimming-down, is obtainable while its cooling efficiency is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a structure of a cooling device in accordance with an exemplary embodiment of the present invention.

FIG. **2** shows a front view illustrating an appearance of a centrifugal pump of heat-exchanger model, i.e. an element of the cooling device shown in FIG. **1**.

FIG. **3** shows a sectional view of the centrifugal pump of heat-exchanger model shown in FIG. **2**.

FIG. **4** shows a front view of an impeller of the centrifugal pump shown in FIG. **2**.

FIG. **5** shows an appearance of a wall of a pump room disposed in the centrifugal pump shown in FIG. **2**.

FIG. **6** shows a front view illustrating an appearance of another centrifugal pump of heat exchanger model, an element of the cooling device in accordance with the exemplary embodiment of the present invention.

FIG. **7** shows a sectional view of the centrifugal pump shown in FIG. **6**.

FIG. **8** shows an appearance of an inner wall of an interior pump room in the centrifugal pump shown in FIG. **6**.

FIG. **9** shows a structure of a first conventional cooling device that cools an electronic apparatus.

FIG. **10** shows a structure of a second conventional cooling device that cools an electronic apparatus.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** shows a structure of a cooling device in accordance with an exemplary embodiment of the present invention, FIG. **2** shows a front view illustrating an appearance of a centrifugal pump of heat-exchanger model, i.e. an element of the cooling device. FIG. **3** shows a sectional view of the centrifugal pump of heat-exchanger model taken out along line **3-3** in FIG. **2**. FIG. **4** shows a front view of an impeller of the centrifugal pump shown in FIG. **2**, and FIG. **5** shows an appearance of an inner wall of a pump room.

Centrifugal pump **1** of heat exchanger model (hereinafter referred to simply as pump **1**) is an element of the cooling device. Heat-producing component **2** (hereinafter referred to simply as component) such as a CPU is, in general, a chip component having a flat surface. Pump **1** and component **2** are extremely small and mounted in a compact portable electronic apparatus such as a notebook-size computer. Radiator **3** radiates the heat collected from component **2** by coolant **41** to the outside. Closed circulating channel **4** couples pump **1** to radiator **3**, thereby circulating coolant **41**, which is liquid and preferably a water solution of propylene glycol which is harmless and used as a food additive. In the case of using aluminum or copper as a material of the casing, an anti-corrosion additive is preferably added in order to increase resistance to corrosion caused by those materials.

Radiator **3** is formed of material having a high heat conductivity and an excellent heat dissipating property, such as a thin plate of copper or aluminum. A coolant path and a reserve tank are formed in radiator **3**. A fan can be prepared for forcibly air-cooling radiator **3** so that a better cooling effect can be expected. Circulating channel **4** is formed of flexible rubber having a low gas-permeability, such as butyl rubber tubing because this material allows a flexible piping layout as well as preventing bubbles from entering into the tube.

Next, an interior structure of pump **1** is described. Open impeller **11** has through hole **11**A and open blades **12**. Ring magnet **13** is inserted into impeller **11**. Stator **14** is disposed inside ring-magnet **13**. Pump casing **15** forms pump room **15**A which accommodates impeller **11** while casing **15** restores kinetic energy, which impeller **11** has given to coolant **41**, by a pressure recovery method and guides the energy to a discharge port. Pump room **15**A restores kinetic energy, which blades **12** have given to supplied coolant **41**, by the pressure recovery method and guides the energy to the discharge port.

Heat-receiving plane **15**B is formed on an outer wall face of a base wall of casing **15** along pump room **15**A, and brought into contact with component **2**, thereby collecting heat off component **2**. Heat-receiving plane **15**B is formed on the outer wall face of casing **15** substantially parallel with a revolution surface of impeller **11**. On radially outer wall surface **15**C of the pump room **15**A, a large number of dimples **21** are formed. A recess (recessed area) **15**E defines a radially inner wall surface on a bottom of the pump room **15**A that faces toward impeller **11**, and has a large number of protrusions **24** projected from the radially outer wall surface and toward impeller **11**. Recess **15**E, slope **27**, and radially outer wall surface **15**C together define an inner wall face **50** of casing **15**. Casing cover (cover wall) **16** accommodates impeller **11**, and forms pump room **15**A together with casing **15**. As shown in FIG. **3**, fixed shaft (rotary shaft) **17** is disposed to extend between the cover wall **16** and the base wall of casing **15** rotatively supports impeller **11**. Fixed shaft **17** is equipped with bearing **18** provided at the center of impeller **11**. Sucking channel **19** sucks coolant **41**, and discharging channel **20** discharges coolant **41**. Sucking channel **19** is disposed between heat-receiving plane **15**B and inner wall face **50**.

Sucking groove **26** is provided together with sucking channel **19** unitarily along a direction common to channel **19** and groove **26**, and extends toward the rotational center of impeller **11**. Sucking groove **26** is formed as a step down from recess **15**E and communicates with recess **15**E. Sucking groove **26** guides coolant **41** sucked through sucking channel **19** to near the rotational center of impeller **11**. Slope **27** gradually goes uphill to radially outer wall surface **15**C, which is a sloped step up from recess **15**E. O-ring **25** seals the engagement between cover **16** and casing **15**, and packing **25**A functions similar to O-ring **25**.

IC **29** regulates an output voltage applied to the windings of stator **14** and is mounted to control board **28**. Screw holes **31** are provided for screwing cover **16** to casing **15**. Springs or screws are inserted into fixing holes **32** for bringing pump **1** into contact with component **2**, urging pump **1** toward component **2**, or fixing pump **1** to component **2**.

Cover **16** and casing **15** are assembled into the outer shell of pump **11**. Of the cover **16** and the casing **15**, at least the casing **15**, is formed of material having a high thermal conductivity and an excellent heat dissipating property, e.g. copper or aluminum, of which thermal conductivity is 380-400 W/m·k and ca. 230 W/m·K respectively. It is preferable to use the material having at least the foregoing specific thermal conductivity.

Pump **1** has the following specifications: thickness is 5-50 mm; representative dimension of radial direction is 10-100 mm; flow rate is 0.2-5.0 L/minute; head is 0.2-4 m. More typical values are listed below: thickness along the axial direction of rotation is 7-40 mm; representative dimension of radial direction is 20-50 mm; flow rate is 0.3-3.0 L/minute; head is 0.35-2 m; and rpm is 2500-4000. If the specification of this pump is expressed in terms of specific speed, it can be 30-250 $m \cdot m^3$/minute rpm. This value proves that pump **1** is extraordinarily smaller and slimmer than the conventional pumps.

In pump **1**, blades **12** of impeller **11** are disposed facing component **2**, and heat-receiving plane **15**B is formed to have a surface complementary to the upper surface of component **2**, so that pump room **15**A receives the heat via heat-receiving plane **15**B. FIG. **3** shows that pump **1** is disposed above component **2**; however pump **1** can be placed below component **2**, or those elements can be laterally placed depending on the placement of component **2**.

Stator **14** is press-fitted into cover **16** so that the outer rim of stator **14** faces the inner rim of ring-magnet **13**. Cover **16** is placed between stator **14** and ring-magnet **13** as a partition for isolating those two elements, so that stator **14** is completely isolated from coolant **41** flowing through pump room **15**A. Ring-magnet **13** is a magnet of which at least one face of its circumference is covered with soft magnetic material shaped like a ring. Impeller **11** can be unitarily formed with ring-magnet **13**; however, it is separately formed from magnet **13** in this embodiment. In the case of a unitary design, impeller **11** is made of magnet material and a section thereof facing stator **14** is magnetized. Ring magnet **13** is rotated by the rotary magnetic field of stator **14**, thereby rotating impeller **11**. Then negative pressure occurs around the center of impeller **11**, so that coolant **41** is sucked through sucking channel **19** communicating with impeller **11**. Coolant **14** is discharged outside by kinetic momentum due to impeller **11**. A discharge port (not shown) is provided to casing **15** at a section facing the outer rim of impeller **11**, so that coolant **41** is discharged to circulating channel **4** via discharging channel **20**.

Bearing **18** made of resin having abrasion resistance and low friction is press-fitted at the center of impeller **11**, and fixed shaft **17** made of stainless steel is prepared inside bearing **18** with its two ends fixed at casing **15** and cover **16**. Bearing **18** can be insert-molded with impeller **11** instead of being press-fitted. Fixed shaft **17** can also be insert-molded with cover **15** or press-fitted. As shown in FIG. **4**, bearing **18** is provided with a D-cut on its outer wall-face, so that a space is prepared between a press-fit hole (not shown) of impeller **11** and bearing **18** per se. As a result, pump room **15**A communicates with the backside of impeller **11**. This space is used as through hole **11**A deviated from the rotation center. Through hole **11**A guides parts of coolant **41** pushed out due to the centrifugal force of impeller **11** to the backside of impeller **11**, then the parts of coolant **41** pass through hole **11**A and flow out to sucking inlet **19**A of impeller **11** with negative pressure. In other words, the parts of coolant **41** flow back. Coolant **41** flowing back is mixed at sucking inlet **19**A, so that flow-back coolant **41** is always replaced with another flow-back and never stays at one place.

Impeller **11** receives negative pressure around its center due to the centrifugal force of itself, so that cavitation tends to occur there. However, since pump **1** has specific speed of 30-250 $m \cdot m^3$/minute·rpm, the cavitation hardly occurs, and even if it occurs, it is mixed by the foregoing flow-back and discharged. The cavitation possibly generated will not stay around the center of impeller **11** because coolant **41** circulates so as to replace itself with incoming coolant at the backside of impeller **11** and sucking inlet **19**A. If air is mixed somewhere in the cooling device, and if the air is sucked into pump **1**, the bubbles will not stay around the center of impeller **11** due to the circulation, and the bubbles are discharged gradually. Therefore, there is little noise caused by the cavitation, and no gas space is formed, so that the flow becomes turbulent, which increases an amount of heat transferred.

In pump **1**, recess **15**E is provided around the center of inner wall face **50** of the pump room of casing **15**, and cylindrical protrusions (surface-area-increasing parts) **24** extend from the bottom face of recess **15**E toward impeller **11**. This structure reduces the overall thickness of pump **1** by the depth of recess **15**E, so that the heat transferred from the electronic component to casing **15** can be collected by coolant **41** with ease. As discussed above, the thickness of pump **1** is reduced as much as possible while the performance of pump **1** is maintained, so that a high heat-collecting efficiency is achieved.

In this embodiment, blades **12** are disposed radially outside the area having protrusions **24** instead of being disposed within the area, so that impeller **11** is placed nearer to casing **15**. This structure reduces the overall thickness of the pump, and yet, the height of protrusions **24** becomes greater. If the thickness of the pump can increase in some degree, blades **12** can be provided within the area of protrusions **24**, i.e. above protrusions **24**.

Sucking channel **19** does not have a hole-shape all the way to the center of impeller **11**, but its upper thickness is removed to form sucking groove **26**, so that recess **15**E and protrusions **24** can be formed. This structure allows pump **1** to reduce its overall size while its performance is maintained.

Further, as shown in FIG. **3**, a number of dimples **21** are formed on at least a part of a section, where impeller **11** slides, of radially outer wall surface **15**C (backside of heat-receiving plane **15**B). In this structure, coolant **41** flowing due to the rotation of impeller **11** peels a laminar boundary layer formed on radially outer wall surface **15**C, so that coolant **41** flows turbulently. As a result, an amount of heat transferred from heat-receiving plane **15**B to coolant **41** becomes greater. The presence of dimples **21** at the sliding section of impeller **12** facilitates peeling of the laminar boundary layer of coolant **41** off radially outer wall surface **15**C, so that the amount of the heat transferred from heat-receiving plane **15**B to coolant **41** becomes even greater. In this case, the torque necessary for spinning impeller **11** increases a little, so that the placement and the number of dimples should be designed appropriately to the torque tolerance. Radially outer wall surface **15**C can undergo a shot peening process or a sand blasting process to form peaks and valleys thereon or roughening itself. Such a process can also increase the heat collecting efficiency based on the same principle though the effect is rather low. Although it is not shown in the accompanying drawings, a spiral groove can be formed on radially outer wall surface **15**C for coolant **41** to flow turbulently, so that the amount of heat transferred can be increased.

Slope **27** disposed around recess **15**E reduces flow resistance as much as possible when coolant **41** passes from recess **15**E to radially outer wall surface **15**C stepped-up, in other words, step **27** helps maintain the pump performance.

O-ring **25** is sandwiched in a radial direction between cover **16** and casing **15** when those two elements are engaged with each other, and seals the two elements off from each other. Packing **25**A is compressed by cover **16** and casing **15** when those two elements are tightened up together with screws (not shown), thereby sealing the two elements off from each other. Thus pump room **15**A is doubly sealed. This structure allows coolant **41** to vaporize in substantially less quantity than in the case of a single seal, and increases the safety against liquid-leakage from the cooling device. O-ring **25** and packing **25**A can be unitarily formed of rubber for double sealing.

A temperature of IC **29** rises as high as nearly 100° C. or more during the pump operation; however if IC **29** is mounted such that it is brought into contact with casing **15**, the heat of IC **29** is collected by casing **15**. In other words, pump **1** also collects the heat off IC **29**, thereby lowering the temperature of IC **29** during the operation. As a result, IC **29** works always steadily. Further, this structure allows IC **29** to extend its life because IC **29** prolongs its service life at a lower temperature. FIG. **3** shows that board **28** is placed such that IC **29** is directly contact with casing **15**. However, a free-face of board **28** (the face where electronic components such as IC **29** are not mounted, i.e. the face behind the face having IC **29**) can be brought into contact with casing **15** for dissipating the heat of IC **29**.

Next, an operation of pump **1** is demonstrated hereinafter. IC **29** and board **28** apply a control voltage to the windings of stator **14**, thereby generating rotary magnetic field in stator **14**. The rotary magnetic field spins ring-magnet **13**, namely, impeller **11**.

Magnetic flux flows from ring-magnet **13** toward stator **14**; however some flux leaks in other directions, so that the rotation of impeller **11** extends the shifting magnetic field leaked from ring-magnet **13** to metal casing **15** (conductive material), and an eddy current occurs in casing **15**. This eddy current makes resistance against the rotation of ring-magnet **13**. Thus if the minimum distance between ring-magnet **13** and casing **15** can be kept at not less than 2 mm in every direction, the resistance can be substantially reduced. In the case of disposing stator **14** within ring-magnet **13** in a radius direction, ring-magnet **13** is magnetized to produce magnetic force inward in the radius direction. This preparation allows the leakage magnetic field to occur mainly at the outside as far as within the height in an axial direction of ring-magnet **13**. Thus if metal casing **15** (conductive material) is placed at a distance not less than 2 mm from ring-magnet **13** and in the same level as the height of ring-magnet **13** in the axial direction, the resistance against the rotation of ring-magnet **13** can be substantially reduced. In other words, the outer rim of ring-magnet **13** is preferably off casing **15** by not less than 2 mm along the radius direction of the rotating axis of impeller **11**. If a yoke is further provided at the outer rim of ring-magnet **13**, the leakage magnetic field can be almost prevented. If ring-magnet **13** tapers inward and is magnetized at its inner rim, and both of ring-magnet **13** and stator **14** are placed in the radial direction, the resistance against the rotation caused by the eddy current due to the shifting magnetic field can be reduced.

Coolant **41** is sucked through sucking channel **19** by spinning blades **12**, and discharged from discharging channel **20**. During this operation, in pump room **15**A, coolant **41** sucked from channel **19** is transported to recess **15**E of casing **15** and further flows along sucking groove **26** to near the rotation center of impeller **11**. Then coolant **41** hits against bearing **18** to diffuse in every direction, and hits a number of protrusions **24** before entering between blades **12**. On the other hand, the heat generated from component **2** travels to casing **15** and is transferred to protrusions **24** projected from recess **15**E, so that coolant **41** collects the heat when it hits against protrusions **24**. The flow of coolant **41** through spaces between protrusions **24** produces eddies, which peel thermal boundary layers off protrusions **24**. In other words, coolant **41** peels liquid film clung to protrusions **24** off, thereby collecting the heat off protrusions **24**. Instead of protrusions **24**, dimples **40** can be provided on the bottom face of recess **15**E. This preparation also peels the thermal boundary layer and can collect the heat off casing **15** with ease.

The heat transferred from component **2** to casing **15** travels everywhere on radially outer wall surface **15**C. On the other hand, the laminar boundary layer, which is formed when coolant **41** passes through pump room **15**A in such a manner as the layer clings to radially outer wall surface **15**C, is peeled off by dimples **21** and impeller **11** or blades **12** sliding there. In other words, the layer which stores the heat transferred to casing **15**, namely, the thermal boundary layer, is peeled off. As a result, much more heat transferred to casing **15** can be collected by coolant **41**. As discussed above, the heat generated from component **2**, i.e. the heat stored in protrusions **24** and casing **15**, is collected by coolant **41**, and discharged through discharging channel **20** together with coolant **41** by spinning blades **12**. Coolant **41** then flows through circulating channel **4** to radiator **3**, which cools coolant **41**, and is sucked into pump **1** again with a lower temperature. This circulation is repeated, thereby cooling component **2**.

As described above, pump **1** includes casing **15** made from material having a high thermal conductivity, and open impeller **11** having blades **12**. Inner wall face **15C** has recess **15**E, and protrusions **24** extend from the bottom face of recess **15**E toward impeller **11**. This structure allows reducing the thickness of pump **1** and increasing the surface area of interior wall of the pump room, so that a heat collecting efficiency increases. The shape of heat-receiving plane **15**B and the shape of an upper surface of component **2** complement each other three-dimensionally, so that sucking channel **19** does not extend over component **2**. This structure allows heat-receiving plane **15**B and the upper surface of component **2** to solidly contact with each other, so that the heat can be transferred efficiently.

Next, another structure of the centrifugal pump in accordance with the embodiment is described hereinafter. FIG. **6** shows a front view illustrating an appearance of this another centrifugal pump of heat exchanger model, i.e. an element of the cooling device in accordance with this exemplary embodiment of the present invention. FIG. **7** shows a sectional view of the centrifugal pump taken along line **7-7** in FIG. **6**. FIG. **8** shows an appearance of an interior wall of a pump room disposed in the centrifugal pump shown in FIG. **6**. Centrifugal pump **1**A differs from pump **1** in the following point: A sucking channel delivered from the outside of pump **1**A crosses a part of recessed section in the pump room and extends to near the center of the impeller with itself being kept in a tubular form. Similar elements to those of pump **1** shown in FIG. **2**-FIG. **5** have the same reference marks, and the descriptions thereof are omitted here.

Recess **15**F of the pump room is disposed one step down from radially outer wall surface **15**C of casing **15**. Cylindrical protrusions **24** extend from a bottom face of recess **15**F toward impeller **11**. Recess transversal sections **30**, **30**A, **30**B cross recess **15**F and extend from sucking channel **19** toward the center of casing **15**. Protrusions **24**A extend from the upper faces of transverse sections **30**, **30**A, **30**B.

Transverse section **30** has sucking channel **19** therein, and guides channel **19** to near the center of casing **15**. The upper face of transverse section **30** has approximately the same height as radially outer wall surface **15**C. In other words, sucking channel **19** crosses parts of recess **15**F. During the operation of pump **1**A, coolant **41** sucked is drawn by impeller **11** and flows on recess **15**F to the outside of impeller **11**. In this case, transverse section **30** works as resistance against the flow of coolant **41** and floats impeller **11**. In order to keep the flotation balance of impeller **11**, transverse sections **30**A, **30**B having a similar shape viewed from pump room **15**A to transverse section **30** are provided at the same intervals. This structure allows impeller **11** to rotate free from slanting because impeller **11** receives floating force well balanced. If there is only transverse section **30**, impeller **11** tends to rotate slantingly with respect to radially outer wall surface **15**C. In this case, fixed shaft **17** and bearing **18** shorten their service lives, or impeller **11** rotates contacting with wall face **15**C, so that the performance of the pump lowers, and in the worst case, the pump stops. In this embodiment, three transverse sections **30**, **30**A, **30**B are provided at the same intervals (120 degrees). If they are provided radially from shaft **17** at the same intervals, it is preferable to provide a number of transverse sections.

Transverse sections **30**, **30**A, **30**B have protrusions **24**A on their faces toward pump room **15**A, and blades **12** are not provided in the area of protrusions **24**A. This structure allows increasing the surface area of radially outer wall surface **15**C, so that the overall thickness of the pump can be reduced while the heat collecting efficiency increases. In the case of increasing the pump performance instead of the heat collecting performance, protrusions **24**A are omitted, and blades **12** can be provided at the places toward the protrusion-omitted places. If a user does not stick to a slim pump, protrusions **24**A are provided, and blades **12** are also provided above the protruded area such that blades **12** do not touch protrusions **24**A. In this case, both of the heat-collecting performance and the pump performance can increase.

Next, an operation of pump **1**A is demonstrated. IC **29** and board **28** apply a control voltage to the windings of stator **14**, thereby generating rotary magnetic field in stator **14**. The rotary magnetic field spins ring-magnet **13**, namely, impeller **11**. Coolant **41** is sucked through sucking channel **19** by spinning impeller **11**, namely blades **12**, and discharged from discharging channel **20**. During this operation, in pump room **15**A, coolant **41** sucked from channel **19** crosses recess **15**F of casing **15** passing through transverse section **30** and further flows to near the center of pump room **15**A. Then coolant **41** hits against bearing **18** to diffuse in every direction, and hits a number of protrusions **24** before entering between blades **12**. On the other hand, the heat generated from component **2** travels to casing **15** and is transferred to protrusions **24**, **24**A projected from recess **15**F, so that coolant **41** collects the heat when it hits against protrusions **24**. The flow of coolant **41** through spaces between protrusions **24** produces eddies, which peel thermal boundary layers off protrusions **24**. In other words, coolant **41** peels liquid film clung to protrusions **24** off, thereby collecting the heat off protrusions **24**. Instead of protrusions **24**, dimples **40** can be provided on the bottom face of recess **15**F. This preparation also peels the thermal boundary layer and can collect the heat off casing **15** with ease.

The heat transferred from component **2** to casing **15** travels everywhere on radially outer wall surface **15**C. On the other hand, the laminar boundary layer, which is formed when coolant **41** passes through pump room **15**A in such a manner as the layer clings to radially outer wall surface **15**C, is peeled off by dimples **21** and impeller **11** or blades **12** sliding there. In other words, the layer which stores the heat transferred to casing **15**, namely, the thermal boundary layer, is peeled off. As a result, much more heat transferred to casing **15** can be collected by coolant **41**. As discussed above, the heat generated from component **2**, i.e. the heat stored in protrusions **24** and casing **15**, is collected by coolant **41**, and discharged through discharging channel **20** together with coolant **41** by spinning blades **12**. Coolant **41** then flows through circulating channel **4** to radiator **3**, which cools coolant **41**, and is sucked into pump **1** again with a lower temperature. This circulation is repeated, thereby cooling component **2**.

As described above, pump **1**A includes casing **15** made of material having a high thermal conductivity, and open impeller **11** having blades **12**. Radially outer wall surface **15**C surrounds recess **15**F, and protrusions **24** extend from the bottom face of recess **15**F toward impeller **11**. This structure allows reducing the thickness of the pump and increasing the surface area of interior wall of the pump room, so that a heat collecting efficiency increases. Further, transverse sections **30**, **30**A and **30**B positively guide coolant **41** sucked to near the center of recess **15**F. Protrusions **24** thus positively transferred the heat to coolant **41**, so that the heat collecting efficiency further increases. The shape of heat-receiving plane **15**B and the shape of an upper surface of component **2** complement each other three-dimensionally, so that sucking channel **19** does not extend over component **2**. This structure allows heat-receiving plane **15**B and the upper surface of component **2** to solidly contact with each other, so that the heat can be transferred efficiently.

In a closed circulating channel which circulates coolant, a radiator and a centrifugal pump of contact heat-exchanger model are provided. A heat-producing electronic component is brought into contact with the centrifugal pump, and the coolant in the pump collects the heat off the electronic component due to the heat exchanging function. Then the heat is dissipated from the radiator. A cooling device is thus obtainable. The centrifugal pump includes a pump-casing and an impeller both made of highly heat conductive material. In the pump casing, a heat-receiving plane is formed on a side face along a pump room disposed in the casing, and a sucking channel is prepared between the heat-receiving plane and an inner wall of the pump room. On the inner wall of the pump room, a recess is provided. In this recess, protrusions extending toward the impeller, or dimples are provided. The cooling device as structured above has a simple structure and can be downsized and slimmed while its cooling efficiency is improved.

What is claim is:

1. A centrifugal pump comprising:

a pump casing made of thermally conductive material and having a pump room defined therein, said pump casing including a casing base wall;

an impeller rotatably mounted in said pump room for rotation about a rotary axis extending in a thickness direction of said pump casing;

wherein said casing base wall has an inner wall face facing said impeller in the thickness direction;

wherein said casing base wall has an outer wall face opposite said inner wall face, said outer wall face being provided in a heat receiving plane and configured to receive heat from a component;

wherein said inner wall face includes a radially inner surface and a radially outer surface, said radially outer surface being disposed outwardly of said radially inner surface with respect to said rotary axis;

wherein said radially inner surface and said radially outer surface are disposed at different levels in the thickness direction so as to be at different distances from said impeller;

wherein said inner and outer surfaces both face an interior of said pump room, and said radially inner surface constitutes a recessed area that is recessed, relative to said radially outer surface away from said impeller;

wherein said inner wall face further includes a step portion formed between said radially inner surface and said radially outer surface;

wherein a surface-area-increasing part is formed in said recessed area so as to project in the thickness direction toward said impeller from said radially inner surface;

wherein said pump casing further includes a peripheral side wall having an inwardly facing surface that defines an outer boundary of said pump room;

wherein said radially outer surface has an outer periphery defined by said inwardly facing surface of said peripheral side wall of said pump casing, and said radially outer surface extends continuously from said outer periphery thereof to said step portion; and

said radially outer surface of said inner wall face of said base wall of said pump casing constitutes a surrounding area that surrounds said recessed area and is disposed closer to said impeller than said recessed area, and said step portion of said inner wall face constitutes a sloped portion as a transition between said recessed area and said surrounding area, said sloped portion gradually sloping from said recessed area toward said impeller.

2. The centrifugal pump of claim **1**, wherein

said recessed area includes a recessed surface having a portion thereof that is open toward said impeller.

3. The centrifugal pump of claim **1**, wherein

said surface-area-increasing part comprises a protrusion protruding toward said impeller from said recessed area of said inner wall face.

4. The centrifugal pump of claim **3**, wherein

said protrusion is one of a plurality of protrusions protruding toward said impeller from said recessed area of said inner wall face.

5. The centrifugal pump of claim **1**, wherein

at least one dimple is provided on said inner wall face outside said recessed area, said at least one dimple facing toward said impeller.

6. The centrifugal pump of claim **1**, wherein

a sucking channel is disposed, in said thickness direction of said pump casing, between said heat receiving plane and an inner wall face plane in which said inner wall face extends, for sucking coolant into said pump room.

7. The centrifugal pump of claim **6**, wherein

said sucking channel extends into said pump room toward said recessed area to communicate with said recessed area and allow coolant to be sucked into said recessed area via said sucking channel.

8. The centrifugal pump of claim **7**, wherein

said sucking channel crosses part of said recessed area.

9. The centrifugal pump of claim **6**, wherein

said sucking channel extends into said pump room toward the rotary axis of said impeller to communicate with said recessed area and allow coolant to be sucked into said recessed area via said sucking channel.

10. The centrifugal pump of claim **9**, wherein

said sucking channel crosses part of said recessed area.

11. The centrifugal pump of claim **9**, wherein

a groove is formed in said recessed area in a direction extending along said sucking channel.

12. The centrifugal pump of claim **1**, wherein

said impeller includes a ring-shaped magnet, and at least one face of a circumference of said magnet is covered with ring-shaped soft magnetic material.

13. The centrifugal pump of claim **12**, wherein

said centrifugal pump further includes a stator facing said magnet and being wound with a winding, and a circuit board having an IC for controlling power to said winding, wherein said circuit board is mounted to said pump casing such that said circuit board is in contact with said pump casing.

14. The centrifugal pump of claim **12**, wherein

said centrifugal pump further includes a stator facing the magnet and being wound with a winding, and an IC for controlling power to said winding, wherein said IC is mounted such that said IC is in contact with said pump casing.

15. The centrifugal pump of claim **1**, wherein

said impeller includes a ring-shaped magnet spaced from said pump casing by at least 2 mm in every direction.

16. The centrifugal pump of claim **15**, wherein

said centrifugal pump further includes a stator facing said magnet and being wound with a winding, and a circuit board having an IC for controlling power to said winding, wherein said circuit board is mounted to said pump casing such that said circuit board is in contact with said pump casing.

17. The centrifugal pump of claim **15**, wherein

said centrifugal pump further includes a stator facing the magnet and being wound with a winding, and an IC for controlling power to said winding, wherein said IC is mounted such that said IC is in contact with said pump casing.

18. The centrifugal pump of claim **1**, wherein

said impeller includes a ring-shaped magnet having an outer rim spaced from said pump casing by at least 2 mm in a radial direction.

19. The centrifugal pump of claim **18**, wherein

said centrifugal pump further includes a stator facing said magnet and being wound with a winding, and a circuit board having an IC for controlling power to said winding, wherein said circuit board is mounted to said pump casing such that said circuit board is in contact with said pump casing.

20. The centrifugal pump of claim **18**, wherein

said centrifugal pump further includes a stator facing the magnet and being wound with a winding, and an IC for controlling power to said winding, wherein said IC is mounted such that said IC is in contact with said pump casing.

21. The centrifugal pump of claim **1**, wherein

said outer wall face of said base wall of said pump casing has a shape configured to be complementary with a three-dimensional shape of a surface of the component so that said outer wall face and the component can contact each other complementarily to facilitate heat transfer from the component to said base wall of said pump casing.

22. The centrifugal pump of claim **1**, wherein

said pump casing further includes a casing cover wall disposed opposite said casing base wall, said pump room being defined between said casing base wall and said casing cover wall.

23. The centrifugal pump of claim **1**, wherein

said impeller has an impeller blade; and

said impeller blade of said impeller is not disposed in the immediate space opposite said inner surface of said inner wall face in said thickness direction.

24. The centrifugal pump of claim **23**, wherein

said outer surface is annular and is disposed radially outwardly of said radially inner surface; and

each of said radially inner surface and said outer surface extends circumferentially and radially.

25. The centrifugal pump of claim **1**, wherein

said outer surface is annular and is disposed radially outwardly of said radially inner surface; and

each of said radially inner surface and said outer surface extends circumferentially and radially.

26. A cooling device including:

a centrifugal pump comprising

a pump casing made of thermally conductive material and having a pump room defined therein, said casing including a casing base wall,

an impeller rotatably mounted in said pump room for rotation about a rotary axis extending in a thickness direction of said pump casing,

wherein said casing base wall has an inner wall face facing said impeller in the thickness direction,

wherein said casing base wall has an outer wall face opposite said inner wall face, said outer wall face being provided in a heat receiving plane and configured to receive heat from a heat-producing electronic component,

wherein said inner wall face includes a radially inner surface and a radially outer surface, said radially outer surface being disposed outwardly of said radially inner surface with respect to said rotary axis,

wherein said radially inner surface and said radially outer surface are disposed at different levels in the thickness direction so as to be at different distances from said impeller,

wherein said inner and radially outer surfaces both face an interior of said pump room, and said radially inner surface constitutes a recessed area that is recessed, relative to said outer surface away from said impeller,

wherein said inner wall face further includes a step portion formed between said radially inner surface and said radially outer surface,

wherein a surface-area-increasing part is formed in said recessed area so as to project in the thickness direction toward said impeller from said radially inner surface,

wherein said pump casing further includes a peripheral side wall having an inwardly facing surface that defines an outer boundary of said pump room,

wherein said radially outer surface has an outer periphery defined by said inwardly facing surface of said peripheral side wall of said pump casing, and said radially outer surface extends continuously from said outer periphery thereof to said step portion, and

wherein said radially outer surface of said inner wall face of said base wall of said pump casing constitutes a surrounding area that surrounds said recessed area and is disposed closer to said impeller than said recessed area, and said step portion of said inner wall face constitutes a sloped portion as a transition between said recessed area and said surrounding area, said sloped portion gradually sloping from said recessed area toward said impeller;

a radiator; and

a closed circulating channel fluidically coupling said pump room with said radiator to circulate coolant through said pump room and said radiator so that heat produced by the electronic component, when the electronic component is contacted with said outer wall face of said base wall of said pump casing, is transferred to said coolant and then from said coolant to said radiator so that the heat can be dissipated by said radiator.

27. The cooling device of claim **26**, wherein

said recessed area includes a recessed surface having a portion thereof that is open toward said impeller.

28. The cooling device of claim **26**, wherein

said surface-area-increasing part comprises a protrusion protruding toward said impeller from said recessed area of said inner wall face.

29. The cooling device of claim **28**, wherein

said protrusion is one of a plurality of protrusions protruding toward said impeller from said recessed area of said inner wall face.

30. The cooling device of claim **26**, wherein

at least one dimple is provided on said inner wall face outside said recessed area, said at least one dimple facing toward said impeller.

31. The cooling device of claim **26**, wherein

a sucking channel is disposed, in said thickness direction of said pump casing, between said heat receiving plane and an inner wall face plane in which said inner wall face extends, for sucking coolant into said pump room.

32. The cooling device of claim **31**, wherein

said sucking channel extends into said pump room toward said recessed area to communicate with said recessed area and allow coolant to be sucked into said recessed area via said sucking channel.

33. The cooling device of claim **32**, wherein

said sucking channel crosses part of said recessed area.

34. The cooling device of claim **31**, wherein

said sucking channel extends into said pump room toward the rotary axis of said impeller to communicate with said recessed area and allow coolant to be sucked into said recessed area via said sucking channel.

35. The cooling device of claim **34**, wherein

said sucking channel crosses part of said recessed area.

36. The cooling device of claim **34**, wherein

a groove is formed in said recessed area in a direction extending along said sucking channel.

37. The cooling device of claim **26**, wherein

said impeller includes a ring-shaped magnet, and at least one face of a circumference of said magnet is covered with ring-shaped soft magnetic material.

38. The cooling device of claim **37**, wherein

said centrifugal pump further includes a stator facing said magnet and being wound with a winding, and a circuit board having an IC for controlling power to said winding, wherein said circuit board is mounted to said pump casing such that said circuit board is in contact with said pump casing.

39. The cooling device of claim **37**, wherein

said centrifugal pump further includes a stator facing the magnet and being wound with a winding, and an IC for controlling power to said winding, wherein said IC is mounted such that said IC is in contact with said pump casing.

40. The cooling device of claim **26**, wherein

said impeller includes a ring-shaped magnet spaced from said pump casing by at least 2 mm in every direction.

41. The cooling device of claim **40**, wherein

said centrifugal pump further includes a stator facing said magnet and being wound with a winding, and a circuit board having an IC for controlling power to said winding, wherein said circuit board is mounted to said pump casing such that said circuit board is in contact with said pump casing.

42. The cooling device of claim **40**, wherein

said centrifugal pump further includes a stator facing the magnet and being wound with a winding, and an IC for controlling power to said winding, wherein said IC is mounted such that said IC is in contact with said pump casing.

43. The cooling device of claim **26**, wherein

said impeller includes a ring-shaped magnet having an outer rim spaced from said pump casing by at least 2 mm in a radial direction.

44. The cooling device of claim **43**, wherein

said centrifugal pump further includes a stator facing said magnet and being wound with a winding, and a circuit board having an IC for controlling power to said winding, wherein said circuit board is mounted to said pump casing such that said circuit board is in contact with said pump casing.

45. The cooling device of claim **43**, wherein

said centrifugal pump further includes a stator facing the magnet and being wound with a winding, and an IC for controlling power to said winding, wherein said IC is mounted such that said IC is in contact with said pump casing.

46. The cooling device of claim **26**, wherein

said outer wall face of said base wall of said pump casing has a shape configured to be complementary with a three-dimensional shape of a surface of the component so that said outer wall face and the component can contact each other complementarily to facilitate heat transfer from the component to said base wall of said pump casing.

47. The cooling device of claim **26**, wherein

said pump casing further includes a casing cover wall disposed opposite said casing base wall, said pump room being defined between said casing base wall and said casing cover wall.

48. The cooling device of claim **26**, wherein

said impeller has an impeller blade; and

said impeller blade of said impeller is not disposed in the immediate space opposite said inner surface of said inner wall face in said thickness direction.

49. The cooling device of claim **48**, wherein

said outer surface is annular and is disposed radially outwardly of said radially inner surface; and

each of said radially inner surface and said outer surface extends circumferentially and radially.

50. The cooling device of claim **26**, wherein

said outer surface is annular and is disposed radially outwardly of said radially inner surface; and

each of said radially inner surface and said outer surface extends circumferentially and radially.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,544,049 B2 Page 1 of 2
APPLICATION NO. : 10/852179
DATED : June 9, 2009
INVENTOR(S) : Shinya Koga et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

<u>In the Claims</u>:

(column 11, line 13), after "wherein said" insert --radially--;

(column 11, lines 26-30), please indent the paragraph (in the same manner as the other paragraphs of claim 1);

(column 11, line 51), after "is provided on" insert --said radially outer surface of--;

(column 13, line 12), after "opposite said" insert --radially--;

(column 13, line 15), after "said" insert --radially--;

(column 13, line 17), after "and said" insert --radially--;

(column 13, line 20), after "said" insert --radially--;

(column 13, line 22), after "and said" insert --radially--;

(column 13, line 47), after "wherein said" insert --radially--; before "outer surfaces" delete "radially";

(column 13, line 50), after "to said" insert --radially--;

(column 14, line 28), after "is provided on" insert --said radially outer surface of--;

(column 16, line 20), after "opposite said" insert --radially--;

(column 16, line 23), after "said" insert --radially--;

(column 16, line 25), after "and said" insert --radially--;

(column 16, line 28), after "said" insert --radially--; and

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,544,049 B2 Page 2 of 2
APPLICATION NO. : 10/852179
DATED : June 9, 2009
INVENTOR(S) : Shinya Koga et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

(column 16, line 30), after "and said" insert --radially--.

Signed and Sealed this

Fifteenth Day of September, 2009

David J. Kappos

David J. Kappos
Director of the United States Patent and Trademark Office

EXHIBIT 3 TO RESPONDENT'S/REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

PATENT
Customer No. 22,852
Attorney Docket No. 10494.0003-01000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
André Sloth ERIKSEN	)	Group Art Unit: 3784
	)	
Application No.: 13/269,234	)	Examiner: DUKE, Emmanuel E.
	)	
Filed: October 7, 2011	)	
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	Confirmation No.: 1954
	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

REPLY TO OFFICE ACTION

In reply to the Office Action mailed March 13, 2012, please amend the above-identified application as follows:

Amendments to the Claims are reflected in the listing of claims in this paper.

Remarks/Arguments follow the amendment sections of this paper.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently amended) A cooling system for a heat-generating component, comprising:

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator and an impeller, the impeller being positioned ~~in a recess~~ on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including:

a pump chamber ~~formed by the recess and~~ including the impeller and formed below the chassis, the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through;

a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and

a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component; and

a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.

2. (Original) The cooling system of claim 1, wherein the chassis shields the stator from the cooling liquid in the reservoir.

3. (Original) The cooling system of claim 1, wherein the heat-exchanging interface includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.

4. (Original) The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.

5. (Original) The cooling system of claim 4, wherein the features include at least one of pins or fins.

6. (Cancelled).

7. (Original) The cooling system of claim 1, wherein a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller.

8. (Original) The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.

9. (Cancelled).

10. (Original) The cooling system of claim 1, wherein the heat-exchanging interface includes one of copper and aluminum.

11. (Original) The cooling system of claim 1, wherein the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir.

12. (Original) A cooling system for a computer system, comprising:

a centrifugal pump adapted to circulate a cooling liquid, the pump including:

an impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:

a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;

a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber, and wherein at least one of the one or more passages is offset from a center of the impeller.

13. (Original) The cooling system of claim 12, wherein a top wall of the reservoir physically separates the impeller from the stator.

14. (Original) The cooling system of claim 12, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component.

15. (Original) The cooling system of claim 12, further including a heat radiator fluidly coupled to the reservoir using flexible conduits, wherein the heat radiator is configured to be positioned remote from the reservoir.

16. (Original) The cooling system of claim 12, wherein the fluid passage that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller.

17. (Original) A cooling system for a heat-generating component, comprising:

a pump adapted to circulate a cooling liquid, the pump including:

an impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir including an impeller cover, an intermediate member and a heat exchange interface, wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber, the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together; and

wherein a first side of the heat-exchanging interface is in contact with a cooling liquid in the thermal exchange chamber and a second side of the heat-exchanging interface opposite the first side is configured to be placed in thermal contact with a surface of the heat-generating component; and

a liquid-to-air heat exchanger fluidly coupled to the reservoir using flexible conduits, the heat exchanger being configured to be positioned remote from the reservoir.

18. (Original) The cooling system of claim 17, wherein the impeller cover includes a first opening radially offset from a center of the impeller and the intermediate member includes a

second passage that is aligned with the first opening, the first and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber.

19. (Original) The cooling system of claim 17, wherein the first side of the heat-exchanging interface includes at least one of pins or fins.

20. (Original) The cooling system of claim 17, wherein the top wall of the reservoir extends between the stator and the impeller and shields the stator from the cooling liquid in the reservoir.

REMARKS

In the Office Action mailed on March 13, 2012("Office Action"), claims 1-4, 6-9, and 11-16 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent Publication No. 2005/0069432 to Tomioka ("Tomioka"); claim 5 was rejected under 35 U.S.C. 103(a) as being unpatentable over Tomioka in view of U.S. Patent Publication No. 2005/0069432 to Lee et al. ("Lee"); claims 10, 17, 18, and 20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Tomioka, in view of U.S. Patent No. 6,019,165 to Batchelder ("Batchelder"), and claim 19 was rejected under 35 U.S.C. 103(a) as being unpatentable over Tomioka and Batchelder as applied to claims 17, in view of Lee.

Applicant does not necessarily agree with the rejections in the Office Action. Nevertheless, to advance prosecution, Applicant amends claim 1, and cancels claims 6 and 9. These amendments find support in the originally filed specification and claims. Claims 1-5, 7, 8, and 10-20 are pending.

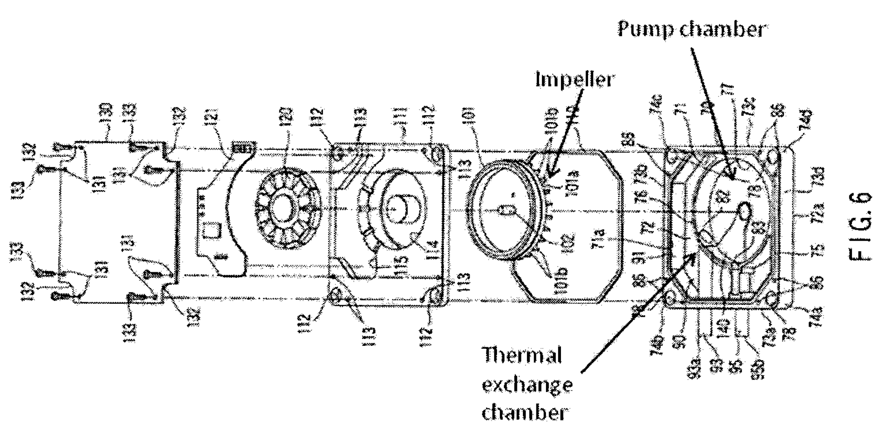
Record of Personal Interview under 37 C.F.R. § 1.133(b).

A telephone interview was conducted on Thursday, March 29, 2012 between a representative of the Applicant, Biju Chandran, Examiner Emmanuel Duke, and SPE Frantz Jules to discuss the Office Action. The Applicant and Applicant's representative thank Examiner Duke and SPE Jules for taking the time to discuss this Office Action. Prior to the interview, in an email to the Examiner, the Applicant's representative explained the differences between the recited reservoir of independent claims 12 and 17, and the reservoir of Tomioka. During the interview, the Examiner acknowledged the differences between independent claims 12 and 17 and Tomioka, but maintained that independent claim 1 does not include these differences. The amendments and remarks in this response substantially conform to the discussions during the interview.

Among the pending claims, claims 1, 12, and 17 are independent.

Independent claim 12

Independent claim 12 recites a cooling system for a computer system including, among other features, a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including "a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component; [and] a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber." That is, independent claims 12 recites a reservoir with a "pump chamber vertically spaced part from the thermal exchange chamber." In the Office Action, independent claim 12 was rejected as being anticipated by Tomioka. Office Action, pg. 2.



With reference to FIGS. 4-7 (FIG. 6 reproduced above), Tomioka describes a pump unit 60 of an electronic apparatus. Abstract. The pump unit 60 includes a housing 70. ¶ [0039]. The bottom surface 72 of the housing 70 serves as a heat receiving surface that contacts a top surface of a CPU 33. ¶¶ [0039], [0050]. The housing 70 includes a centrally located pump chamber 77 that houses the impeller 101a of the pump, and a reserve tank 90 located radially outwards of the pump chamber 77. ¶¶[0043], [0044]. The pump chamber 77 and the reserve tank 90 are separated by a partition member 76 having fluid passages (first pipe 93, second pipe 94, and third pipe 95) therethrough. ¶[0043], ll.12-16; ¶[0044]. In the Office Action, as illustrated in annotated FIG. 6 of Tomioka above, the central chamber 77 is interpreted as the "pump chamber," and the reserve tank 90 is interpreted as the vertically spaced apart "thermal exchange chamber." See Office Action, pg. 5, lns. 10-12; pg. 7, lns. 24-26. However, as agreed upon during the interview, these chambers are not vertically spaced apart as required by independent claim 12.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." M.P.E.P. 2131 quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F. 2d 628, 631, 2 USPQ 2d 1051, 1053 (Fed. Cir. 1987). Tomioka does not expressly or inherently disclose at least this aspect of independent claim 12. Accordingly, independent claim is not anticipated by Tomioka. Claims 13-16 depend from independent claim 12 and include all of its limitations. Therefore, these dependent claims are allowable over Tomioka at least for the same reason independent claim 12 is allowable over Tomioka. These dependent claims are also allowable because Tomioka does not expressly or inherently disclose the combined limitations of these dependent claims with independent claim 12.

Independent claim 17

Independent claim 17 recites a cooling system for a heat-generating component including, among other features, a reservoir including an impeller cover, an intermediate member and a heat exchange interface, wherein "a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber, <u>the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction</u> and fluidly coupled together."

In the Office Action, independent claim 17 was rejected as being obvious over Tomioka and Batchelder. Office Action, pg. 7. Among these references, Tomioka was relied upon for the teaching of the vertically spaced apart pump chamber and thermal exchange chamber (Office Action, pg. 7), and Batchelder was relied upon for the teaching of the recited intermediate member. Office Action, pg. 8. However, for similar reasons as discussed with reference to independent claim 12, Tomioka does not disclose that "the pump chamber and the thermal exchange chamber [are] spaced apart from each other in a vertical direction," as recited in independent claim 17. In fact, as explained below, Tomioka teaches away from spacing apart the pump chamber 77 and the reserve tank 90 in a vertical direction.

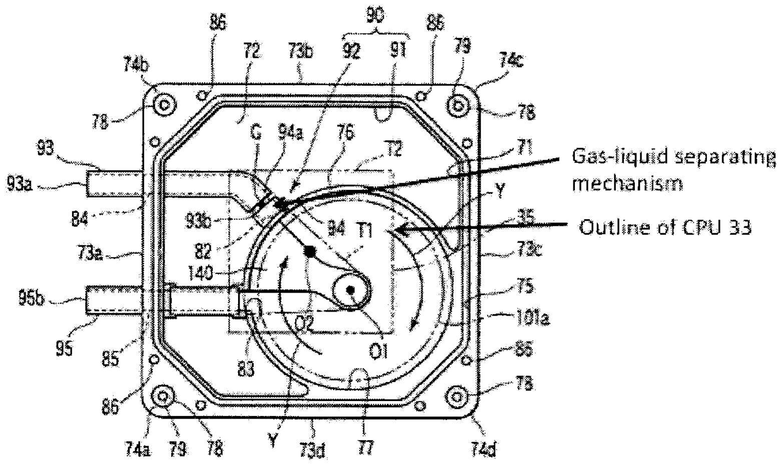


FIG. 7

With reference to FIG. 7 annotated and reproduced above, in Tomioka, a first pipe 93 delivers liquid from outside the pump housing 70 to the reserve tank 90, and the second pipe 94 directs the liquid from the reserve tank 90 to the pump chamber 77. ¶[0045]. The outlet 93b of the first pipe 93 and the inlet of the 94a of the second pipe 94 form a gas-liquid separating mechanism 92 (¶[0044). This gas-liquid separating mechanism 92 operates by using the heat of the CPU 33. ¶[0050]. To enable the mechanism 92 to be heated by the heat of CPU 33, the mechanism 92 is positioned proximate the CPU 33. *Id.* Additionally, to ensure that the gas-liquid separating mechanism 92 is always submerged in the liquid in the pump housing 70 even when the housing 70 is tilted (see FIG. 8 and 9) (so that the mechanism works), the mechanism 92 is positioned at the center of mass (barycenter G) and proximate the bottom wall 72. ¶[0046]. Since the gas-liquid separating mechanism 72 is formed at the inlet of the passage which directs fluid from the reserve tank 90 to the pump chamber 77, if these chambers (pump chamber 77 and the reserve tank 90) were "spaced apart from each other in a vertical direction," the gas-liquid separating mechanism 92 will be positioned further away from the bottom wall 72 and the CPU

33. Applicant submits that, positioning the gas-liquid separating mechanism 92 away from the bottom wall 72 and the CPU 33 will decrease the amount of heat transmitted to mechanism 92 from the CPU 33, and also cause the mechanism 92 to be above the fluid surface when the housing 70 is tilted (see FIG. 9). Therefore, the gas-liquid separating mechanism 92 will not function properly if the pump chamber 77 and the reserve tank 90 of Tomioka were "spaced apart from each other in a vertical direction," as recited in independent claim 17[1]. That is, Tomioka teaches away from spacing apart the pump chamber 77 and the reserve tank 90 "in a vertical direction," as recited in independent claim 17. Therefore, Tomioka also does not suggest this aspect of independent claim 17. Batchelder does not rectify the deficiencies of Tomioka. Accordingly, independent claim 17 is allowable over Tomioka and Batchelder. Claims 18 and 20 depend from independent claim 17, and is therefore allowable over these references at least for the same reason independent claim 17 is allowable.

Claim 19 was rejected as being obvious over Tomioka and Batchelder and further in view of Lee. Office Action, pg. 6. Lee does not remedy the deficiencies of Tomioka and Batchelder discussed above. Therefore, claim 19 is allowable over these references at least for the same reason independent claim 17 is allowable over Tomioka and Batchelder.

Independent claim 1

Although different in scope, amended independent claim 1 includes limitations similar to those discussed with reference to independent claims 12 and 17. For instance, amended independent claim 1 recites a cooling system for a heat-generating component having a double-

[1] See Examination Guidelines Update: Developments in the Obviousness Inquiry After KSR v.Teleflex, Federal Register, Vol. 75, No. 169, September 1, 2010, p. 53649, describing *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 567 F.3d 1314 (Fed. Cir. 2009) as supporting the proposition that combinations that render the modified device unsuitable for its intended purposes are grounds for a finding of non-obviousness.

sided chassis with an impeller positioned on the underside of the chassis and a stator positioned on the upper side of the chassis, a reservoir including "a pump chamber including the impeller and formed below the chassis," the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through, "a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber," the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages.

In the Office Action, independent claim 1 was rejected as being anticipated by Tomioka. Office Action, pg. 2. However, for similar reasons as discussed with reference to independent claim 12, Tomioka does not expressly or inherently disclose the above recited aspects of independent claim 1. Accordingly, independent claim 1 is not anticipated by Tomioka. Claims 6 and 9 have been cancelled by this response, thereby mooting the rejection of these claims. Claims 2-4, 8, and 11 depend from amended independent claim 1 and include all of its limitations. Therefore, these dependent claims are allowable over Tomioka at least for the same reason amended independent claim 1 is allowable over Tomioka.

In the Office Action, claim 5 was rejected as being obvious over Tomioka in view of Lee. Claim 5 depends from amended independent claim 1. Lee does not remedy the deficiencies of Tomioka discussed above. Therefore, dependent claim 5 is allowable over Tomioka and Lee at least for the same reason amended independent claim 1 is allowable over these references.

For the reasons discussed above, Applicant submits that the pending claims are allowable over the prior art of record. If the Examiner disagrees, the MPEP states that "a second or any subsequent action on the merits in any application ... will not be made final if it includes a rejection, on newly cited art, … , of any claim not amended by applicant or patent owner in spite of the fact that other claims may have been amended to require newly cited art." M.P.E.P. § 706.07(a). Applicant notes that independent claims 12 and 17, and the claims that depend therefrom, are not amended by this response. Therefore, to the extent that the Examiner rejects these unamended claims using newly cited art, Applicant respectfully requests that the Examiner make the rejection non-final.

CONCLUSIONS

In view of the foregoing remarks, Applicant respectfully requests reconsideration and reexamination of this application and the timely allowance of all pending claims.

The Office Action contains characterizations of the claims with which Applicant does not necessarily agree. Unless expressly noted otherwise, Applicant declines to subscribe to any statement or characterization in the Office Action.

If the Examiner believes a telephone conversation might advance prosecution, the Examiner is invited to call Applicant's undersigned representative at 202.408.4230.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: April 6, 2012

By: ____________________

Biju I. Chandran
Reg. No. 63,684
(202) 408-4000

EXHIBIT 4 TO RESPONDENT'S/REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

REASON FOR ALLOWANCE

The following is an examiner's statement of reasons for allowable: The prior art of record when consider as a whole, alone or in combination, neither anticipates nor renders obvious: A cooling system for a heat-generating component, comprising: a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, a reservoir adapted to pass the cooling liquid there through, the reservoir including: a pump chamber including an impeller and formed below the chassis, the pump chamber defined by at least an impeller cover having one or more passage for the cooling liquid to pass through; a thermal exchange chamber formed below the pump chamber and vertically space apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and a heat exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component of instant claims 1, 12 and 17.

Tomioka (US 2005/0069432) teaches a cooling apparatus having pump unit for cooling an electronic device; however, Tomioka '432 does not teach a thermal exchange chamber formed below the pump chamber and vertically space apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages of instant claims 1, 12 and 17.

Additional references that also fail to meet the bounds of the present invention's claims are as follows: Lee et al. (US 2005/0061482) teach a liquid cooling system having pump unit for cooling an electronic device; however, Lee et al. '482 does not teach a thermal exchange chamber formed below the pump chamber and vertically space apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages of instant claims 1, 12 and 17.

Batchelder (US 6,019,165) teaches a heat exchange apparatus having pump unit for cooling an electronic device; however, Batchelder ‘165 does not teach a thermal exchange chamber formed below the pump chamber and vertically space apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages of instant claims 1, 12 and 17.

Therefore, independents claims 1, 12 and 17 with the depending claims therefrom are considered allowable.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EMMANUEL DUKE whose telephone number is (571)270-5290. The examiner can normally be reached on Monday - Friday; 8:00am - 5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Cheryl Tyler or Frantz Jules can be reached on 571-272-4834 or 571-272-

6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Frantz F. Jules/
Supervisory Patent Examiner, Art Unit 3784

/EMMANUEL DUKE/
Examiner, Art Unit 3784
05/11/2012

EXHIBIT 5 TO RESPONDENT'S/REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 06/30/2014
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
06/30/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Transmittal of Communication to Third Party Requester *Inter Partes* Reexamination	Control No. 95/002,386	Patent Under Reexamination 8245764	
	Examiner JOSEPH KAUFMAN	Art Unit 3993	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above-identified reexamination prceeding. 37 CFR 1.903.

Prior to the filing of a Notice of Appeal, each time the patent owner responds to this communication, the third party requester of the *inter partes* reexamination may once file written comments within a period of 30 days from the date of service of the patent owner's response. This 30-day time period is statutory (35 U.S.C. 314(b)(2)), and, as such, it cannot be extended. See also 37 CFR 1.947.

If an *ex parte* reexamination has been merged with the *inter partes* reexamination, no responsive submission by any *ex parte* third party requester is permitted.

All correspondence relating to this inter partes reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of the communication enclosed with this transmittal.

U.S. Patent and Trademark Office
PTOL-2070 (Rev. 07-04)

Paper No. 20140604

Right of Appeal Notice (37 CFR 1.953)	Control No. 95/002,386	Patent Under Reexamination 8245764
	Examiner JOSEPH KAUFMAN	Art Unit 3993

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

Responsive to the communication(s) filed by:
Patent Owner on 03 October, 2013
Third Party(ies) on _____

Patent owner and/or third party requester(s) may file a notice of appeal with respect to any adverse decision with payment of the fee set forth in 37 CFR 41.20(b)(1) within **one-month or thirty-days (whichever is longer)**. See MPEP 2671. In addition, a party may file a notice of **cross** appeal and pay the 37 CFR 41.20(b)(1) fee **within fourteen days of service** of an opposing party's timely filed notice of appeal. See MPEP 2672.

All correspondence relating to this inter partes reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of this Office action.

If no party timely files a notice of appeal, prosecution on the merits of this reexamination proceeding will be concluded, and the Director of the USPTO will proceed to issue and publish a certificate under 37 CFR 1.997 in accordance with this Office action.

The proposed amendment filed _____ ☐ will be entered ☐ will not be entered*

*Reasons for non-entry are given in the body of this notice.

1a. ☒ Claims 1-30 are subject to reexamination.
1b. ☐ Claims _____ are not subject to reexamination.
2. ☐ Claims _____ have been cancelled.
3. ☐ Claims _____ are confirmed. [Unamended patent claims].
4. ☐ Claims _____ are patentable. [Amended or new claims].
5. ☒ Claims 1-30 are rejected.
6. ☐ Claims _____ are objected to.
7. ☐ The drawings filed on _____ ☐ are acceptable. ☐ are not acceptable.
8. ☐ The drawing correction request filed on _____ is ☐ approved. ☐ disapproved.
9. ☐ Acknowledgment is made of the claim for priority under 35 U.S.C. 119 (a)-(d) or (f). The certified copy has:
☐ been received. ☐ not been received. ☐ been filed in Application/Control No. _____.
10. ☐ Other _____

Attachments
1. ☐ Notice of References Cited by Examiner, PTO-892
2. ☒ Information Disclosure Citation, PTO/SB/08
3. ☐ _____

Extensions of Time

Extensions of time under 37 CFR 1.136(a) will **not** be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexamination proceeding. Additionally, 35 U.S.C. 314(c) requires that *inter partes* reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.937). Patent owner extensions of time in *inter partes* reexamination proceedings are provided for in 37 CFR 1.956. Extensions of time are not available for third party requester comments, because a comment period of 30 days from service of patent owner's response is set by statute. 35 USC 314(b)(3).

Notification of Concurrent Proceedings

The patent owner is reminded of the continuing responsibility under 37 CFR 1.985 to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving the Eriksen patent throughout the course of this reexamination proceeding. The third party requester is also reminded of the ability to similarly apprise the Office of any such activity or proceeding throughout the course of this reexamination proceeding. See MPEP § 2686 and 2686.04.

Service of Papers

Any paper filed by either the patent owner or the third party requester ***must be served*** on the other party in the reexamination proceeding in the manner provided by 37 CFR 1.248. See 37 CFR 1.903 and MPEP 2666.06.

Non-Entry of Requester's Response

Requester has been previously notified that when claims have not been amended, no new rejections over those claims are permissible. In the response by Requester dated 4 November 2013, Requester proposes new rejections of all of the claims based on Ryu and Duan. Therefore, Requester's response dated 4 November 2013 is improper, will not be considered in its entirety, and be expunged from the record.

Declaration

The Declaration submitted by Patent Owner on 3 October 2013 has been considered. The following rejections and comments are maintained/made in light of the declaration.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Koga et al.

Requester has stated that Patent Owner is only eligible for the effective filing date of 7 October 2011 as the original application did not have Figure 20 or the passages in the specification to support the claimed subject matter. This material was added on 9 January 2009 and 14 July 2011. Therefore, the Examiner will use the effective filing date of 14 July 2011.

The Examiner incorporates by reference the claim charts on pages 149-164 of the Request.

Claims 19, 21-23, 25-27, 29 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Koga et al.

Koga et al. has been discussed in detail as noted in the above rejection. In addition, as seen in Figure 7, a passage directs cooling liquid from the pump chamber 15 directly to the thermal exchange chamber; an entire surface of the heat exchange interface that contacts the cooling liquid forms a boundary wall of the thermal exchange chamber as seen with either surface of 19 in Figure 7; and the pump and thermal exchange chambers are connected together by one of more passages as noted above and in Figure 7, and the reservoir has and inlet and outlet at 19 and 20 as seen in Figure 8.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been

> obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 20, 24 and 28 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Koga et al.

Koga et al. has been discussed in detail above, but while showing at least one passage between the pump and thermal exchange chamber, is silent as to a plurality of passages between the two. It would have been obvious to one of ordinary skill in the art to provide a plurality of passages between the pump and thermal exchange chambers in order to further enhance communication between the two which would increase flow and thus be better able to cool the device.

Response to Arguments

Summary of Patent Owner's Arguments:

Patent Owner contends that Koga et al. does not anticipate the claims, nor renders the claims obvious. Specifically, Patent Owner states that Koga et al. does not show a thermal exchange chamber separate from the pump chamber nor is the chamber in thermal contact with the electronic component to be cooled. With regard to the dependent claims, Patent Owner contends that Koga et al. does not disclose that an inner wall of the chamber acts as a heat exchanger and further, does not have the required protrusions. With regard to independent claim 15 and its dependent claims, Patent Owner argues that Koga et al. does not teach the required intermediate member. Patent Owner alleges that the Examiner has not explained how the modification of multiple channels would operate. Finally, Patent Owner has contends that the Examiner has not addressed the priority claim and that the invention is due a filing date going back to the filing date of the PCT.

Examiner's Remarks:

The Examiner begins by referencing the above rejections of the claims. Specifically pages 149-164 of the Request that gives the details of the rejections over Koga et al., Figure 3 of the drawings of Koga and Figure 20 of the Eriksen patent. Eriksen shows a pump chamber 46 and passage 34 connecting the pump chamber to thermal exchange chamber 47A. Now looking at Koga et al., Koga shows pump chamber 15A connected to thermal exchange chamber 19, the thermal exchange chamber being separated vertically from the pump chamber and connected by a channel. Various parts of the casing 15 that forms the thermal exchange chamber cool component 2 as clearly seen in Figure 3.

In light of the above, the Examiner will now address the specific arguments set forth by Patent Owner. Regarding the contention that Koga et al. does not show a separate chamber, it is not clear how feature 19 does not meet the conventional definition of a chamber. The chamber of Koga is an enclosed space and a compartment as would have been recognized by one of ordinary skill in the art. Further, when comparing the Figures of Koga et al. and Eriksen, it is clear that both 19 and 47A respectively have a separate volume, and inlet and outlet.

Patent Owner discusses the passage in Koga that states that the chamber 19 does not sit directly over component 2. It is evident that the wall portion of the chamber does contact the component and acts as the heat-exchanging interface as required by the claims. The chamber 19 is not required to be in direct contact with the component, only the interface. The Tilton declaration also addresses the channel and not the interface.

Regarding claim 4 and by extension 5, looking at Figure 7 of Koga et al., pins 24 and 24A increase the surface area of the heat exchange unit 15B. 15B is the wall of the thermal exchange chamber. Therefore, the pins are the features that "are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber".

With regard to the intermediate member of claim 15 and its dependent claims, Patent Owner contends that the intermediate member must be "separate". First, it should be noted that the intermediate member is part of the reservoir as required by the claim. Further, Requester has shown that Koga et al. discloses that the intermediate member is a region of the reservoir, different in location to the cover and heat exchange interface (page 160 of the Request, copied below):

Koga's reservoir 1A has casings 15 and 16, forming an impeller cover as claimed. An upper wall of the channel 19 defines an intermediate member. The lower portion of the casing defines a heat exchange interface of the reservoir 1A.

This can be seen in Figure 3. Therefore, the region disclosed by Koga et al. defining the intermediate member is indeed separate from the other disclosed features of the reservoir while still being a part of the reservoir as required by the claim.

Patent Owner questions how the addition of additional passages would increase the flow as it would disrupt the purpose of the sucking channel. The Examiner notes that the Koga et al. reference has all of the claimed structure as noted above in the rejection. Therefore, it is unclear how adding the feature of additional passages would negatively impact the operation of the device as this would call into question the operability of Patent Owner's invention. Further, the motivation provided is an implicit reason one would add additional passages. It is implicit in the concept of flow that adding additional passages (more area for the fluid to pass through) would increase the flow with respect to having fewer passages (under the conditions present in the Koga et al. system). Therefore, proper motivation has been provided

Finally, with respect to Patent Owners assertion that the Examiner ignored /did not address Patent Owner's remarks with regard to priority, this is not in evidence. The Examiner reiterated when additional material was added to the disclosure and hence what the effective filing date was. Contrary to Patent Owner's assertions and indeed, in Patent Owner's explanation of support, there are features that were not in the original disclosure that are now claimed. For example, all of the claims require that the thermal exchange chamber be vertically spaced from the pump chamber. There is no mention in the passage cited by Patent Owner of any vertical spacing between the thermal exchange chamber and the pump chamber (see page 18 of Patent Owner's response to

ACP, for example). The Examiner cannot find any evidence in the disclosure as filed that there is explicit support for this relationship. Further, Figure 17 also does not show this relationship. For this one reason alone, Patent Owner is not entitled to the earlier filing date.

Conclusion

This is a RIGHT OF APPEAL NOTICE (RAN); see MPEP § 2673.02 and § 2674. The decision in this Office action as to the patentability or unpatentability of any original patent claim, any proposed amended claim and any new claim in this proceeding is a FINAL DECISION.

No amendment can be made in response to the Right of Appeal Notice in an *inter partes* reexamination. 37 CFR 1.953(c). Further, no affidavit or other evidence can be submitted in an *inter partes* reexamination proceeding after the right of appeal notice, except as provided in 37 CFR 1.981 or as permitted by 37 CFR 41.77(b)(1). 37 CFR 1.116(f).

Each party has a **thirty-day or one-month time period, whichever is longer**, to file a notice of appeal. The patent owner may appeal to the Board of Patent Appeals and Interferences with respect to any decision adverse to the patentability of any original or proposed amended or new claim of the patent by filing a notice of appeal and paying the fee set forth in 37 CFR 41.20(b)(1). The third party requester may appeal to the Board of Patent Appeals and Interferences with respect to any decision favorable to the patentability of any original or proposed amended or new claim of the patent by filing a notice of appeal and paying the fee set forth in 37 CFR 41.20(b)(1).

In addition, a patent owner who has not filed a notice of appeal may file a notice of cross appeal within **fourteen days of service** of a third party requester's timely filed notice of appeal and pay the fee set forth in 37 CFR 41.20(b)(1). A third party requester who has not filed a notice of appeal may file **a notice of cross appeal within fourteen days of service** of a patent owner's timely filed notice of appeal and pay the fee set forth in 37 CFR 41.20(b)(1).

Any appeal in this proceeding must identify the claim(s) appealed, and must be signed by the patent owner (for a patent owner appeal) or the third party requester (for a third party requester appeal), or their duly authorized attorney or agent.

Any party that does not file a timely notice of appeal or a timely notice of cross appeal will lose the right to appeal from any decision adverse to that party, but will not lose the right to file a respondent brief and fee where it is appropriate for that party to do so. If no party files a timely appeal, the reexamination prosecution will be terminated, and the Director will proceed to issue and publish a certificate under 37 CFR 1.997 in accordance with this Office action.

All correspondence relating to this *inter partes* reexamination proceeding should be directed:

By EFS: Registered users may submit via the electronic filing system EFS-Web, at https://efs.uspto.gov/efile/myportal/efs-registered

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Any inquiry concerning this communication or earlier communications from the examiner, or as to the status of this proceeding, should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

Signed:

/Joseph A. Kaufman/
Joseph A. Kaufman
Primary Examiner
Art Unit 3993

Conferees: /RF/

/EDL/

EXHIBIT 6 TO RESPONDENT'S/REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

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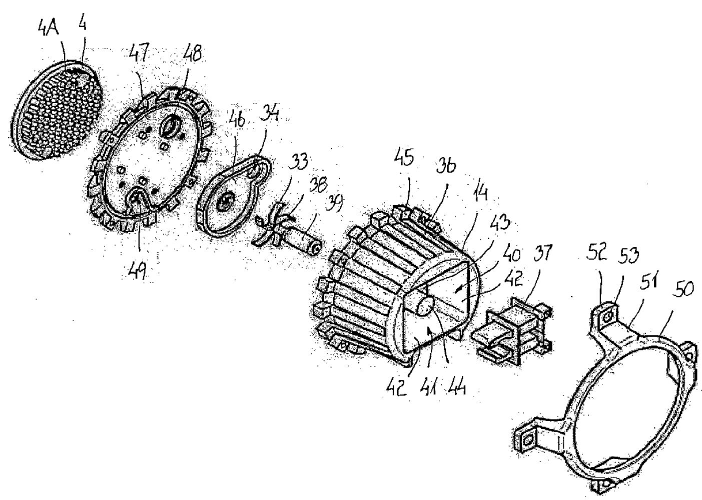
(54) **Title:** COOLING SYSTEM FOR A COMPUTER SYSTEM



(57) Abstract: The invention relates to a cooling system for a compute system, said computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid. The cooling system has a heat exchanging interface for providing thermal contact between he processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, Different embodiments of the heat exchanging system as well as means for establishing and controlling a flow of cooling liquid and a cooling strategy constitutes the invention of the cooling system.

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COOLING SYSTEM FOR A COMPUTER SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to a cooling system for a central processing unit (CPU) or other processing unit of a computer system. More specifically, the invention relates to a liquid-cooling system for a mainstream computer system such as a PC.

During operation of a computer, the heat created inside the CPU or other processing unit must be carried away fast and efficiently, keeping the temperature within the design range specified by the manufacturer. As an example of cooling systems, various CPU cooling methods exist and the most used CPU cooling method to date has been an air-cooling arrangement, wherein a heat sink in thermal contact with the CPU transports the heat away from the CPU and as an option a fan mounted on top of the heat sink functions as an air fan for removing the heat from the heat sink by blowing air through segments of the heat sink. This air-cooling arrangement is sufficient as long as the heat produced by the CPU is kept at today's level, however it becomes less useful in future cooling arrangements when considering the development of CPUs since the speed of a CPU is said to double perhaps every 18 months, thus increasing the heat production accordingly.

Another design used today is a CPU cooling arrangement where cooling liquid is used to cool the CPU by circulating a cooling liquid inside a closed system by means of a pumping unit, and where the closed system also comprises a heat exchanger past which the cooling liquid is circulated.

A liquid-cooling arrangement is more efficient than an air-cooling arrangement and tends to lower the noise level of the cooling arrangement in general. However, the liquid-cooling design consists of many components, which increases the total installation time, thus making it less desirable as a mainstream solution. With a trend of producing smaller and more compact PCs for the end-users, the greater amount of components in a typical liquid-cooling arrangement is also undesirable. Furthermore, the many components having to be coupled together incurs a risk of leakage of cooling liquid from the system.

SUMMARY OF INVENTION

It may be one object of the invention to provide a small and compact liquid-cooling solution, which is more efficient than existing air-cooling arrangements and which can be produced at a low cost enabling high production volumes. It may be another object to create a liquid-cooling arrangement, which is easy-to-use and implement, and which

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requires a low level of maintenance or no maintenance at all. It may be still another object of the present invention to create a liquid-cooling arrangement, which can be used with existing CPU types, and which can be used in existing computer systems.

This object may be obtained by a cooling system for a computer system, said computer system comprising:
- at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit,
- a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid,
- a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid,
- a pump being provided as part of an integrate element, said integrate element comprising the heat exchanging interface, the reservoir and the pump,
- said pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means,
- said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means.

By providing an integrate element, it is possible to limit the number of separate elements of the system. However, there is actually no need for limiting the number of elements, because often there is enough space within a cabinet of a computer system to encompass the different individual elements of the cooling system. Thus, it is surprisingly that, at all, any attempt is conducted of integrating some of the elements.

In possible embodiments according to this aspect of the invention, the entire pump is placed inside the reservoir with at least an inlet or an outlet leading to the liquid in the reservoir. In an alternative embodiment the pump is placed outside the reservoir in the immediate vicinity of the reservoir and wherein at least an inlet or an outlet is leading directly to the liquid in the reservoir. By placing the pump inside the reservoir or in the immediate vicinity outside the reservoir, the integrity of the combined reservoir, heat exchanger and pump is obtained, so that the element is easy to employ in new and existing computer systems, especially mainstream computer systems.

In a preferred embodiment, the pumping member of the pump and a driven part of the motor of the pump, such as a rotor of en electrical motor, is placed inside the reservoir embedded in the cooling liquid, and wherein a stationary part of the motor of the pump, such as a stator of an electrical motor, is placed outside the reservoir. By having the driven part of the motor placed inside the reservoir submerged in the cooling liquid and the stationary part of the motor outside the reservoir, there is no need for encapsulating the stationary part in a liquid-proof insulation. However, problems may occur having then stationary part driving the driven part. However, the present invention provide means for obtaining such action, although not at all evident how to solve this problem.

The object may also be obtained by a cooling system for a computer system, said computer system comprising:
- at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit,
- a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid,
- a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid,
- a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means,
- said cooling system being intended for thermal contact with the processing unit by means of existing fastening means associated with the processing unit, and
- said heat radiating means intended for radiating from the cooling liquid thermal energy, dissipated to the cooling liquid, to surroundings of the heat radiating means.

The use of existing fastening means has the advantage that fitting of the cooling system is fast and easy. However, once again there is no problem for the person skilled in the art to adopt specially adapted mounting means for any element of the cooling system, because there are numerous possibilities in existing cabinets of computer systems for mounting any kind of any number of elements, also elements of a cooling system.

In preferred embodiments according to this aspect of the invention, the existing fastening means are means intended for attaching a heat sink to the processing unit, or the existing fastening means are means intended for attaching a cooling fan to the processing unit, or the existing fastening means are means intended for attaching a heat sink together with a cooling fan to the processing unit. Existing fastening means of the kind mentioned is commonly used for air cooling of CPUs of computer systems, however, air cooling arrangements being much less complex than liquid cooling systems. Nevertheless, it has ingeniously been possible to develop a complex and effective liquid cooling system capable of utilising such existing fastening means for simple and less effective air cooling arrangements.

According to an aspect of the invention, the pump is selected from the following types: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. By adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

According to another aspect of the invention, driving means for driving the pump is selected among the following driving means: electrically operated rotary motor, piezo-electrically operated motor, permanent magnet operated motor, fluid-operated motor, capacitor-operated motor. As is the case when selecting the pump to pump the liquid, by adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

The object may also be obtained by a cooling system for a computer system, said computer system comprising:

- at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit,
- a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid,
- a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid,
- a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, and
- said cooling system further comprising a pump wherein the pump is driven by an AC electrical motor by a DC electrical power supply of the computer system,
- where at least part of the electrical power from said power supply is intended for being converted to AC being supplied to the electrical motor.

It may be advantageous to use an AC motor, such as a 12V AC motor, for driving the pump in order to obtain a stabile unit perhaps having to operate 24 hours a day, 365 days a year. However, the person skilled in the art will find it unnecessary to adopt as example a 12V motor because high voltage such as 220V or 110V is readily accessible as this is the electrical voltage used to power the voltage supply of the computer system itself. Although choosing to use a 12V motor for the pump, it has never been and will never be the choice of the person skilled in the art to use an AC motor. The voltage supplied by the voltage supply of the computer system itself is DC, thus this will be the type of voltage chosen by the skilled person.

In preferred embodiments according to any aspect of the invention, an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, or an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means, or an electrical motor is intended both for driving the pump for pumping the liquid, and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means.

By utilising a single electrical motor for driving more than one element of the cooling system according to any of the aspects of the invention, the lesser complexity and the reliability of the cooling system will be further enhanced.

The heat exchanging interface may be an element being separate from the reservoir, and where the heat exchanging interface is secured to the reservoir in a manner so that the heat exchanging interface constitutes part of the reservoir when being secured to the reservoir. Alternatively, the heat exchanging interface constitutes an integrate surface of the reservoir, and where the heat exchanging surface extends along an area of the surface of the reservoir, said area of surface being intended for facing the processing unit and said area of surface being intended for the close thermal contact with the processing unit. Even alternatively, the heat exchanging interface is constitutes by a free surface of the processing unit, and where the free surface is capable of establishing heat dissipation between the processing unit and the cooling liquid through an aperture provided in the reservoir, and where the aperture extends along an area of the surface of the reservoir, said surface being intended for facing the processing unit.

Possibly, an uneven surface such as pins or fins extending from the copper plate provide a network of channels across the inner surface of the heat exchanging interface. A network of channels ensure the cooling liquid being passed along the inner surface of the interface such as a copper plate in a way that maximises the retention time of the cooling liquid along the heat exchanging interface and in a way that optimises the thermal exchange between the heat exchanging interface and the cooling liquid as long as the cooling liquid is in thermal contact with heat exchanging interface.

Possibly, the cooling system may be provided with a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid,

- a pumping means being intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means,
- said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means,
- said heat exchanging interface constituting a heat exchanging surface being manufactured from a material suitable for heat conducting, and
- with a first side of the heat exchanging surface facing the central processing unit being substantially plane and
- with a second side of the heat exchanging surface facing the cooling liquid being substantially plane and
- said reservoir being manufactured from plastic, and channels or segments being provided in the reservoir for establishing a certain flow-path for the cooling liquid through the reservoir.

Providing a plane heat exchanging surface, both the first, inner side being in thermal contact with the cooling liquid and the second, outer side being in thermal contact with the heat generating processing unit, results in the costs for manufacturing the heat exchanging surface is reduced to an absolute minimum.

According to the above possible solution, an inlet of the pumping means is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

Alternatively, or additionally, an outlet of said pumping means being positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchange interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

However, a plane first, inner surface may also result in the cooling liquid passing the heat exchanging surface too fast. This may be remedied by providing grooves along the inner surface, thereby providing a flow path in the heat exchanging surface. This however results in the costs for manufacturing the heat exchanging surface increasing.

The solution to this problem has been dealt with by providing channels or segments in the reservoir housing in stead. The reservoir housing may be manufactured by injection moulding or by casting, depending on the material which the reservoir housing is made from. Proving channels or segments during moulding or casting of the reservoir housing is much more cost-effective than milling grooves along the inner surface of the heat exchanging surface.

Possibly, the cooling system may be provided with at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid,
- said cooling system being adapted such as to provide transfer of said heat from a heat dissipating surface to a heat radiating surface where
- said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

Heat dissipation from the processing unit to the cooling liquid must be very efficient to ensure proper cooling of the processing unit, Especially in the case, where the processing unit is a CPU, the surface for heat dissipation is limited by the surface area of the CPU. This may be remedied by utilising a heat exchanging surface being made of a material having a high thermal conductivity such as copper or aluminium and ensuring a proper thermal bondage between the heat exchanging interface and the CPU.

However, in a possible embodiment according to the features in the above paragraph, the heat dissipation takes place directly between the processing unit and the cooling liquid by providing an aperture in the reservoir housing, said aperture being adapted for taking up a free surface of the processing unit. Thereby, the free surface of the processing unit extends into the reservoir or constitutes a part of the boundaries of the reservoir, and the cooling liquid has direct access to the free surface of the processing unit.

A possible heat exchanging interface may be the direct contact between the heat generating unit such as a CPU and the cooling liquid, where
- at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit comprising
- at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid,

- said cooling system being adapted such as to provide transfer of said heat from a heat dissipating interface to a heat radiating surface where
- said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

The aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a the processing unit, said boundaries being liquid-proof when attached to the free surface of the processing unit so that the liquid may flow freely across the free surface without the risk of the liquid dissipating through the boundaries. Alternatively, but posing the same technical effect, the aperture of the reservoir is intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of the processing unit.

If a heat sink is provided as an aid in dissipating heat from the heat generating unit such as a CPU, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a heat sink. Alternatively, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of a heat sink. Alternatively,

Possibly, the heat exchanging interface may be provided as
- a first reservoir intended for being closed by attaching boundaries of an aperture in the first reservoir to, alternatively along, a free surface of a said processing unit, and
- a second reservoir intended for being closed by attaching boundaries of an aperture in the second reservoir to, alternatively along, a free surface of a to a free surface of a heat sink, and
- liquid conducting means provided between the first reservoir and the second reservoir.

The first reservoir may be closed by attaching said first reservoir to a heat exchanging surface element being in close thermal contact with the processing unit, said heat exchanging surface intended for dissipating heat from the processing unit to cooling liquid in the first reservoir, and wherein a second reservoir is closed by attaching said second reservoir to a surface of a heat sink, said heat sink intended for radiating heat from cooling liquid in the second reservoir to the exterior surroundings.

Also, the first reservoir and said second reservoir may be provided as a monolithic structure comprising both the first reservoir and the second reservoir and where both a heat dissipation from the processing unit to the cooling liquid in the first reservoir and heat radiation from the cooling liquid in the second reservoir to exterior surrounding is provided by the monolithic structure. The said monolithic structure may preferably be manufactured at least partly from plastic, preferably being manufactured fully in plastic, and said monolithic structure thus being manufactured by injection moulding.

Transfer of said cooling liquid from an outlet of the first reservoir to an inlet of the second reservoir, and from an outlet of the second reservoir to an inlet of the first reservoir, and circulating the cooling liquid within said liquid conducting means is provided by a pumping means being intended for pumping the cooling liquid.

One of said reservoirs of said monolithic structure may comprise said pumping means.

An inlet and/or an outlet and/or a pumping member of said pumping means, may be provided in the vicinity of said substantially plane side in order to provide a turbulence of flow and hereby improve the exchange of heat between said cooling liquid and substantially plane side, and the inlet of the pumping means may be provided within the first reservoir and the outlet may be provided within the second reservoir.

According to one aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilising a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface and a pumping means, said method of cooling comprising the steps of

- establishing, or defining, or selecting an operative status of the pumping means
- controlling the operation of the motor of the pumping means in response to the following parameters; the necessary direction of movement for obtaining a pumping action of a pumping member of the pumping means, the possible direction of movement of a driving part of the motor of the pumping means, and
- in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve the necessary direction of movement of the driving part of the motor for establishing the necessary direction of movement for obtaining he pumping action of the pumping member.

There may be pumping means, where the pumping member is only operationable in one direction but where the motor driving the pumping member is operationable in two directions. The solution to this problem is to either choose a pumping member operationale in both directions or to chose a motor being operationable in only one direction. According to the invention, a solution is provided where a one-way directional pumping member may be operated ny a two-way directional motor. Despite the contradictory nature of this solution, advantages may however be present.

As example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and where said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor before applying a full-wave AC power signal.

As an alternative example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor after having applied the full-wave AC power signal.

In both the above examples, the advantages of the one-way impeller from a traditional DC pump together with the advantages of a motor from a traditional AC pump is obtained in the solution mentioned. The performance of an impeller of a DC pump is much better than the performance of an impeller from an AC pump. The motor from an AC pump is more reliable than a motor from a DC pump. The advantageous obtained is thus of synergetic nature, seeing that different advantages of the impeller of the DC pump and of the motor of the AC pump are different in nature.

According to another aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilising a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface, an air blowing fan, a pumping means, said method of cooling comprising the steps of

- applying one of the following possibilities of how to operate the computer system: establishing, or defining, or selecting an operative status of the computer system
- controlling the operation of at least one of the following means of the computer system; the pumping means and the air blowing fan in response to at least one of the following

parameters; a surface temperature of the heat generating processing unit, an internal temperature of the heat generating processing unit, or a processing load of the CPU and
- in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve at least one of the following conditions; a certain cooling performance of the cooling system, a certain electrical consumption of the cooling system, a certain noise level of the cooling system.

Applying the above method ensures an operation of the computer system being in accordance with selected properties during the use of the computer system. For some applications, the cooling performance is vital such as may be the case when working with image files or when downloading large files from a network during which the processing units is highly loaded and thus generating much heat. For other applications, the electrical power consumption is more vital such as may be the case when utilising domestic computer systems or in large office building in environments where the electrical grid may be weak such as in third countries. In still other applications, the noise generated by the cooling system is to be reduced to a certain level, which may be the case in office buildings with white collar people working alone, or at home, if the domestic computer perhaps is situated in the living room, or at any other location where other exterior considerations have to be dealt with.

According to another aspect of the invention, a method is envisaged, said method being employed with cooling system further comprising a pumping means with an impeller for pumping the cooling liquid through a pumping housing, said pumping means being driven by an AC electrical motor with a stator and a rotor, and said pumping means being provided with a means for sensing a position of the rotor, and wherein the method comprises the following steps:
- initially establishing a preferred rotational direction of the rotor of the electrical motor
- before start of the electrical motor, sensing the angular position of the rotor
- during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor
- said selection being made according to the preferred rotational direction, and
- said application of the AC signal, such as an AC voltage, being performed by the computer system for applying the AC signal, such as an AC voltage, from the electrical power supply of the computer system during conversions of the electrical DC signal, such as a DC voltage, of the power supply to the AC signal, such as an AC voltage, for the electrical motor.

Adopting the above method according to the invention ensures the most efficient circulation of cooling liquid in the cooling system and at the same time ensures the lowest possible energy consumption of the electrical motor driving the impeller. The efficient circulation of the cooling liquid is obtained by means of an impeller being designed for rotation in one rotational direction only, thus optimising the impeller design with regard to the only one rotational direction as opposed to both rotational directions. The low energy consumption is achieved because of the impeller design being optimised, thus limiting the necessary rotational speed of the impeller for obtaining e certain amount of flow of the cooling liquid through the cooling system. A bonus effect of the lowest possible energy consumption being obtained is the lowest possible noise level of the pump also being obtained. The noise level of the pump is amongst other parameters also dependent on the design and the rotational speed of the impeller. Thus, an optimised impeller design and impeller speed will reduce the noise level to the lowest possible in consideration of ensuring a certain cooling capacity.

BRIEF DESCRIPTION OF THE FIGURES

The invention will hereafter be described with reference to the drawings, where

Fig. 1 shows an embodiment of the prior art. The figure shows the typical components in an air-cooling type CPU cooling arrangement.
Fig. 2 shows an embodiment of the prior art. The figure shows the parts of the typical air-cooling type CPU cooling arrangement of figure 1 when assembled.
Fig. 3 shows an embodiment of the prior art. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement.
Fig. 4 is an exploded view of the invention and the surrounding elements.
Fig. 5 shows the parts shown in the previous figure when assembled and attached to the motherboard of a computer system.
Fig. 6 is an exploded view of the reservoir from the previous figures 4 and 5 seen from the opposite site and also showing the pump.
Fig. 7 is a cut-out view into the reservoir housing the pump and an inlet and an outlet extending out of the reservoir.
Fig. 8 is a view of the cooling system showing the reservoir connected to the heat radiator.
Fig. 9-10 are perspective views of a possible embodiment of reservoir housing providing direct contact between a CPU and a cooling liquid in a reservoir.
Fig. 11-13 are perspective views of a possible embodiment of heat sink and a reservoir housing constituting an integrated unit.
Fig. 14 is a perspective view of the embodiment shown in fig. 9-10 and the embodiment shown in fig. 11-13 all together constituting an integrated unit.
Fig. 15-16 are perspective view of a possible embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit

Fig. 17 is a perspective view of a preferred embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit,
Fig. 18 is a plane view of a possible, however preferred embodiment of an AC electrical motor for a pumping means of the coolling system according to the invention, and
Fig. 19 is a graph showing a method for starting a rotor of the electrical AC motor, said AC motor driving an impeller selected from a pump driven by a DC motor.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 is an exploded view of an embodiment of prior art cooling apparatus for a computer system. The figure shows the typical components in an air-cooling type CPU cooling arrangement. The figure shows a prior art heat sink 4 intended for air cooling and provided with segments intersected by interstices, a prior art air fan 5 which is to be mounted on top of the heat sink by use of fastening means 3 and 6.

The fastening means comprises a frame 3 provided with holes intended for bolts, screws, rivets or other suitable fastening means (not shown) for thereby attaching the frame to a motherboard 2 of a CPU 1 or onto another processing unit of the computer system. The frame 3 is also provided with mortises provided in perpendicular extending studs in each corner of the frame, said mortises intended for taking up tenons of a couple of braces. The braces 6 are intended for enclosing the heat sink 4 and the air fan 5 so that the air fan and the heat sink thereby is secured to the frame. Using proper retention mechanisms, when the frame is attached to the motherboard of the CPU of other processing unit, and when the tenons of the braces are inserted into the mortises of the frame, the air fan and heat exchanger is pressed towards the CPU by using a force perpendicular to the CPU surface, said force being provided by lever arms.

Fig. 2 shows the parts of the typical air-cooling type CPU cooling arrangement of figure 1, when assembled. The parts are attached to each other and will be mounted on top of a CPU on a motherboard (not shown) of a computer system.

Fig. 3 shows another embodiment of a prior art cooling system. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement. The figure shows a prior art heat exchanger 7, which is in connection with a prior art liquid reservoir 8, a prior art liquid pump 9 and a heat radiator 11 and an air fan 10 provided together with the heat radiator. The prior art heat exchanger 7, which can be mounted on a CPU (not shown) is connected to a radiator and reservoir, respectively. The reservoir serves as a storage unit for excess liquid not capable of being contained in the remaining components. The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid. The heat radiator 11 serves as a means for removing the heat from the liquid by means of the air fan 10 blowing air through the heat radiator. All the components are in connection with each other via tubes for conducting the liquid serving as the cooling medium.

Fig. 4 is an exploded view of a cooling system according to an embodiment of the invention. Also elements not being part of the cooling system as such are shown. The figure shows a central processing unit CPU 1 mounted on a motherboard of a computer system 2. The figure also shows a part of the existing fastening means, i.e. amongst others the frame 3 with mortises provided in the perpendicular extending studs in each corner of the frame. The existing fastening means, i.e. the frame 3 and the braces 6, will during use be attached to the motherboard 2 by means of bolts, screws, rivets or other suitable fastening means extending through the four holes provided in each corner of the frame and extending through corresponding holes in the motherboard of the CPU. The frame 3 will still provide an opening for the CPU to enable the CPU to extend through the frame.

The heat exchanging interface 4 is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminium, and which will be in thermal contact with the CPU 1, when the cooling system is fastened to the motherboard 2 of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing 14, thus the heat exchanger 4 constitutes the part of the liquid reservoir housing facing the CPU. The reservoir may as example be made of plastic or of metal. The reservoir or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

If the reservoir is made of metal or any other material having a relative high heat conductivity compared to as example plastic, the heat exchanging interface as a separate element may be excluded because the reservoir itself may constitute a heat exchanger over an area, wherein the reservoir is in thermal contact with the processing unit. Alternatively to having the heat exchanging interface constitute part of the liquid reservoir housing, the liquid reservoir housing may be tightly attached to the heat exchanging interface by means of screws, glue, soldering, brazing or the like means for securing the heat exchanging interface to the housing and vice versa, perhaps with a sealant 5 provided between the housing and the heat exchanging interface.

Alternatively to providing a heat exchanging interface integrate with the reservoir containing the cooling liquid, it will be possible to exclude the heat exchanger and providing another means for dissipating heat from the processing unit to the cooling liquid in the reservoir, The other means will be a hole provided in the reservoir, said hole intended for being directed towards the processing unit. Boundaries of the hole will be sealed towards boundaries of the processing unit or will be sealed on top of the processing unit for thereby preventing cooling liquid from the reservoir from leaking. The only prerequisite to the sealing is that a liquid-tight connection is provided between boundaries of the hole and the processing unit or surrounding of the processing unit, such as a carrier card of the processing unit.

By excluding the heat exchanger, a more effective heat dissipation will be provided from the processing unit and to the cooling liquid of the reservoir, because the intermediate element of a heat exchanger is eliminated. The only obstacle in this sense is the provision of a sealing being fluid-tight in so that the cooling liquid in the reservoir is prevented from leaking.

The heat exchanging surface 4 is normally a copper plate. When excluding the heat exchanging surface 4, which may be a possibility not only for the embodiments shown in fig. 4, but for all the embodiments of the invention, it may be necessary to provide the CPU with a resistant surface that will prevent evaporation of the cooling liquid and/or any damaging effect that the cooling liquid may pose to the CPU. A resistant surface may be provided the CPU from the CPU producer or it may be applied afterwards. A resistant surface to be applied afterwards may e.g. be a layer, such as an adhesive tape provided on the CPU. The adhesive tape may be made with a thin metal layer e.g. in order to prevent evaporation of the cooling liquid and/or any degeneration of the CPU itself.

Within the liquid reservoir, a liquid pump (not shown) is placed for pumping a cooling liquid from an inlet tube 15 connection being attached to the housing of the reservoir through the reservoir and past the heat exchanger in thermal contact with the CPU to an outlet tube connection 16 also being attached to the reservoir housing. The existing fastening means comprising braces 6 with four tenons and the frame 3 with four corresponding mortises will fasten the reservoir and the heat exchanger to the motherboard of the CPU. When fastening the two parts of the existing fastening means to each other the fastening will by means of the lever arms 18 create a force to assure thermal contact between the CPU 1 mounted on the motherboard and the heat exchanger 4 being provided facing the CPU.

The cooling liquid of the cooling system may be any type of cooling liquid such as water, water with additives such as anti-fungicide, water with additives for improving heat conducting or other special compositions of cooling liquids such as electrically non-conductive liquids or liquids with lubricant additives or anti-corrosive additives.

Fig. 5 shows the parts shown in fig. 4 when assembled and attached to the motherboard of a CPU of a computer system 2. The heat exchanger and the CPU is in close thermal contact with each other. The heat exchanger and the remainder of the reservoir 14 is fastened to the motherboard 2 by means of the existing fastening means being secured to the motherboard of the CPU and by means of the force established by the lever arms 18 of the existing fastening means. The tube inlet connection 15 and the tube outlet connection 16 are situated so as to enable connection of tubes to the connections.

Fig. 6 is an exploded view of the reservoir shown in previous fig. 4 and fig. 5 and seen from the opposite site and also showing the pump 21 being situated inside the reservoir. Eight screws 22 are provided for attaching the heat exchanging surface 4 to the remainder of the reservoir. The heat exchanging surface is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see fig. 4). However, also the inner surface (not shown, see fig. 7) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the octagonal shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

A sealant in form of a gasket 13 is used for the connection between the reservoir 14 and the heat exchanging surface forming a liquid tight connection. The pump is intended for being placed within the reservoir. The pump has a pump inlet 20 through which the cooling liquid flows from the reservoir and into the pump, and the pump has a pump outlet 19 through which the cooling liquid is pumped from the pump and to the outlet connection. The figure also shows a lid 17 for the reservoir. The non-smooth inner walls of the reservoir and the fact that the pump is situated inside the reservoir will provide a swirling of the cooling liquid inside the reservoir.

However, apart from the non-smooth walls of the reservoir and the pump being situated inside the reservoir, the reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir (see fig 9-10 and fig 15). Channel or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. By providing channels or segments inside the reservoir, a flow will be provided forcing the cooling liquid to pass the heat exchanging surface , and the amount of time increased of the cooling liquid being resident inside the reservoir, thus enhancing heat dissipation. If channels or segments are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

The cooling liquid enters the reservoir through the tube inlet connection 15 and enters the pump inlet 20, and is pumped out of the pump outlet 19 connected to the outlet connection 16. The connection between the reservoir and the inlet tube connection and the outlet tube connection, respectively, are made liquid tight. The pump may not only be a self-contained pumping device, but may be made integrated into the reservoir, thus making the reservoir and a pumping device one single integrated component. This single integrated element of the reservoir and the pumping device may also be integrated, thus making the reservoir, the pumping device and the heat exchanging surface one single integrated unit. This may as example be possible if the reservoir is made of a metal such as aluminium. Thus, the choice of material provides the possibility of constituting both the reservoir and a heat exchanging surface having a relatively high heat conductivity, and possibly also renders the possibility of providing bearings and the like constructional elements for a motor and a pumping wheel being part of the pumping device.

In an alternative embodiment, the pump is placed in immediate vicinity of the reservoir, however outside the reservoir. By placing the pump outside, but in immediate vicinity of the reservoir, still an integrate element may be obtained, The pump or the inlet or the outlet is preferably positioned so as to obtain a turbulence of flow in the immediate vicinity of the heat exchanging interface, thereby promoting increased heat dissipation between the heat exchanging interface end the cooling liquid. even in the alternative, a pumping member such as an impeller (see fig. 15-16) may be provided in the immediate vicinity of the heat exchanging surface. The pumping member itself normally introduces a turbulence of flow, and thereby the increased heat dissipation is promoted irrespective of the position of the pump itself, or the position of the inlet or of the outlet to the reservoir or to the pump.

The pump may be driven by an AC or a DC electrical motor. When driven by an AC electrical motor, although being technically and electrically unnecessary in a computer system, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the pump. The pump may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. However, in the embodiment shown, the pump is driven by a 12V AC electrical motor.

Control of the pump in case the pump is driven by an AC electrical motor, preferably takes place by means of the operative system or an alike means of the computer system itself, and where the computer system comprises means for measuring the CPU load and/or the CPU temperature. Using the measurement performed by the operative system or alike system of the computer system eliminates the need for special means for operating the pump. Communication between the operative system or alike system and a processor for operating the pump may take place along already established communication links in the computer system such as a USB-link. Thereby, a real-time communication between the cooling system and the operative system is provided without any special means for establishing the communication.

In the case of the motor driving the pump is an AC electrical motor, the above method of controlling the pump may be combined with a method, where said pumping means is provided with a means for sensing a position of the rotor of the electrical motor, and wherein the following steps are employed: Initially establishing a preferred rotational direction of the rotor of the electrical motor, before start of the electrical motor, sensing the angular position of the rotor, during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor, said selection being made according to the preferred rotational direction, and said application of the AC voltage being performed by the computer system for applying the AC voltage from the electrical power supply of the computer system during conversion of the electrical DC voltage of the power supply to AC voltage for the electrical motor. By the operative system of the computer system itself generating the AC voltage for the electrical motor, the rotational direction of the pump is exclusively selected by the computer system, non-depending on the applied voltage of the public grid powering the computer system.

Further control strategies utilising the operative system or alike system of the computer system may involve balancing the rotational speed of the pump as a function of the cooling capacity needed. If a lower cooling capacity is needed, the rotational speed of the pump, may be limited, thereby limiting the noise generating by the motor driving the pump.

In the case an air fan is provided in combination with a heat sink as shown in fig. 1, of the air fan is provided in combination with the heat radiator, the operative system or alike system of the computer system may be designed for regulating the rotational speed of the pump, and thus of the motor driving the pump, and the rotational speed of the air fan, and thus the motor driving the air fan. The regulation will take into account the cooling capacity needed, but the regulation will at the same time take into account which of the two cooling means, i.e. the pump and the air fan, is generating the most noise. Thus, it the air fan generally is generating more noise than the pump, then the regulation will reduce the rotational speed of the air fan before reducing the rotational speed of the pump, whenever a lower cooling capacity is needed. Thereby, the noise level of the entire cooling system is lowered as much as possible. If the opposite is the case, i.e. the pump generally generating more noise than the air fan, then the rotational speed of the pump will be reduced before reducing the rotational speed of the air fan.

Even further control strategies involve controlling the cooling capacity in dependence on the type of computer processing taking place. Some kind of computer processing, such as word-processing, applies a smaller load on the processing units such as the CPU than other kinds of computer processing, such as image processing. Therefore, the kind of processing taking place on the computer system may be used as an indicator of the cooling capacity. It may even be possible as part of the operative system or similar system to establish certain cooling scenarios, depending on the kind of processing intended by the user. If the user selects as example word-processing, a certain cooling strategy is applied based on a limited need for cooling. If the user selects as example image-processing, a certain cooling strategy is applied based on an increased need for cooling. Two or more different cooling scenarios may be established depending on the capacity and the control possibilities and capabilities of the cooling system and depending on the intended use of the computer system, either as selected by a user during use of the computer system or as selected when choosing hardware during build-up of the computer system, i.e. before actual use of the computer system.

The pump is not being restricted to a mechanical device, but can be in any form capable of pumping the cooling liquid through the system. However, the pump is preferably one of the following types of mechanical pumps: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. Similarly, the motor driving the pumping member need not be electrical but may also be a piezo-electrically operated motor, a permanent magnet operated motor, a fluid-operated motor or a capacitor-operated motor. The choice of pump and the choice of motor driving the pump id dependent on many different parameters, and it is up to the person skilled in the art to choose the type of pump and the type of motor depending on the specific application. As example, some pumps and some motors are better suited for small computer systems such as lab-tops, some pumps and some motors are better suited for establishing i high flow of the cooling liquid and thus a high cooling effect, and even some pumps and motors are better suited for ensuring a low-noise operation of the cooling system.

Fig. 7 is a cut-out view into the reservoir, when the reservoir and the heat exchanging surface 4 is assembled and the pump 21 is situated inside the reservoir. The reservoir is provided with the tube inlet connection (not seen from the figure) through which the cooling liquid enters the reservoir. Subsequently, the cooling liquid flows through the reservoir passing the heat exchanging surface and enters the inlet of the pump. After having been passed through the pump, the cooling liquid is passed out of the outlet of the pump and further out through the tube outlet connection 16. The figure also shows a lid 17 for the reservoir. The flow of the cooling liquid inside the reservoir and trough the pump may be further optimised in order to use as little energy as possible for pumping the cooling liquid, but still having a sufficient amount of heat from the heat exchanging surface being dissipated in the cooling liquid. This further optimisation can be established by changing the length and shape of the tube connection inlet within the reservoir, and/or by changing the position of the pump inlet, and/or for instance by having the pumping device placed in the vicinity and in immediate thermal contact with the heat exchanging surface and/or by providing channels or segments inside the reservoir.

In this case, an increased turbulence created by the pumping device is used to improve the exchange of heat between the heat exchanging surface and the cooling liquid. Another or an additional way of improving the heat exchange is to force the cooling liquid to pass through specially adapted channels or segments being provided inside the reservoir or by making the surface of the heat exchanging surface plate inside the reservoir uneven or by adopting a certain shape of a heat sink with segments. In the figure shown, the inner surface of the heat exchanging surface facing the reservoir is plane.

Fig. 8 is a perspective view of the cooling system showing the reservoir 14 with the heat exchanging surface (not shown) and the pump (not shown) inside the reservoir. The tube inlet connection and the tube outlet connection are connected to a heat radiator by means of connecting tubes 24 and 25 through which the cooling liquid flows into and out of the reservoir and the heat radiator, respectively. Within the heat radiator 11, the cooling liquid passes a number of channels for radiating the heat, which has been dissipated into the cooling liquid inside the reservoir, and to the surroundings of the heat exchanger. The air fan 10 blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir.

According to the invention, the heat radiator 11 may be provided alternatively. The alternative heat radiator is constituted by a heat sink, such as a standard heat sink made of extruded aluminium with fins on a first side and a substantially plane second side. An air-fan may be provided in connection with the fins along the first side. Along the second side of the heat sink a reservoir is provided with at least one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the substantial plane side of the heat sink. When closing the reservoir in such a way a surface of the heat sink is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the at least one aperture. This alternative way of providing the heat radiator may be used in the embodiment shown in fig. 8 or may be used as a heat radiator for another use and/or for another embodiment of the invention.

A pumping means for pumping the cooling liquid trough the reservoir may or may not be provided inside the reservoir at the heat sink. The reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir. Channels or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. If channels or segments in the reservoir are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

By means of the alternative heat radiator, the heat radiator 11 is not provided as is shown in the figure with the rather expensive structure of channels leading the cooling liquid along ribs connecting the channels for improved surface of the structure. Instead, the heat radiator is provided as described as a unit constituted by a heat sink with or without a fan and a reservoir, and thereby providing a simpler and thereby cheaper heat radiator than the heat radiator 11 shown in the figure.

The alternative heat radiator provided as an unit constituted by a heat sink and a reservoir, may be used solely, with or without a pump inside the reservoir and with or without the segments or channels, for being placed in direct or indirect thermal contact with a heat generating processing unit such as CPU or with the heat exchanging surface, respectively. These embodiments of the invention may e.g. be used for a reservoir, where the cooling liquid along a first side within the reservoir is in direct heat exchanging contact with the heat generating processing unit such as a CPU and the cooling liquid along a second side within the reservoir is in direct heat exchanging contact with a heat sink. Such a reservoir may be formed such as to provide a larger area of heat exchanging surface towards the heat generating processing unit such as a CPU than the area of the heat exchanging surface facing the heat sink. This may e.g. have the purpose of enlarging the area of the heat exchanging surface so as to achieve an improved heat dissipation form e.g. the CPU to the heat sink than that of a conventional heat sink without a reservoir attached. Conventional heat sinks normally only exchanges heat with the CPU through the area as given by the area of the top side of the CPU. A system comprising a liquid reservoir and a heat sink with a fan provided has been found to be a simple, cost optimised system with an improved heat dissipation than that of a standard heat sink with a fan, but without the reservoir. In another embodiment of the invention, which may be derived from fig. 8, the air fan and the heat radiator is placed directly in alignment of the reservoir. Thereby, the reservoir 14, the air fan 10 and the radiator 11 constitute an integrate unit. Such an embodiment may provide the possibility of omitting the connection tubes, and passing the cooling liquid directly from the heat radiator to the reservoir via an inlet connection of the reservoir, and directly from the reservoir to the heat radiator via an outlet connection of the reservoir. Such an embodiment may even render the possibility of both the pumping device of the liquid pump inside the reservoir and the electrical motor for the propeller of the air fan 23 of the heat radiator 11 being driven by the same electrical motor, thus making this electrical motor the only motor of the cooling system.

When placing the heat radiator on top of the air fan now placed directly in alignment with the reservoir and connecting the heat radiator directly to the inlet connection and outlet connection of the reservoir, a need for tubes will not be present. However, if the heat radiator and the reservoir is not in direct alignment with each other, but tubes may still be needed, but rather than tubes, pipes made of metal such as copper or aluminium may be employed, such pipes being impervious to any possible evaporation of cooling liquid. Also, the connections between such pipes and the heat radiator and the reservoir, respectively, may be soldered so that even the connections are made impervious to evaporation of cooling liquid.

In the derived embodiment just described, an integrated unit of the reservoir, the heat exchanging surface and the pumping device will be given a structure establishing improved heat radiating characteristics because the flow of air of the air fan may also be directed along outer surfaces of the reservoir. If the reservoir is made of a metal, the metal will be cooled by the air passing the reservoir after having passed or before passing the heat radiator. If the reservoir is made of metal, and if the reservoir is provided with segments on the outside surface of the reservoir, such cooling of the reservoir by the air will be further improved. Thereby, the integrated unit just described will be applied improved heat radiating characteristics, the heat radiation function normally carried out by the heat radiator thus being supplemented by one or more of the further elements of the cooling system, i.e. the reservoir, the heat exchanging surface, the liquid pump and the air fan.

Fig. 9-10 show an embodiment of a reservoir housing 14, where channels 25 are provided inside the reservoir for establishing a forced flow of the cooling liquid inside the reservoir. The channels 25 in the reservoir 14 lead from an inlet 15 to an outlet 16 like a maze between the inlet and the outlet. The reservoir 14 is provided with an aperture 27 having outer dimensions corresponding to the dimensions of a free surface of the processing unit 1 to be cooled. In the embodiment shown, the processing unit to be cooled is a CPU 1.

When channels 26 are provided inside the reservoir, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps manufactured by injection moulding, or is to be made of metal such as aluminium, perhaps manufactured by extrusion or by die casting.

The reservoir 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The CPU 1 is intended for being positioned in the aperture 27, as shown in fig. 10, so that outer boundaries of the CPU are engaging boundaries of the aperture. Possibly, a sealant (not shown) may be provided along the boundaries of the CPU and the aperture for ensuring a fluid tight engagement between the boundaries of the CPU and the boundaries of the aperture. When the CPU 1 is positioned in the aperture 27, the free surface (not shown) of the CPU is facing the reservoir, i.e. the part of the reservoir having the channels provided. Thus, when positioned in the aperture 27 (see fig. 10), the free surface of the CPU 1 is having direct contact with cooling liquid flowing through the channels 26 in the reservoir.

When cooling liquid is forced from the inlet 15 along the channels 26 to the outlet 16, the whole of the free surface of the CPU 1 will be passed over by the cooling liquid, thus ensuring a proper and maximised cooling of the CPU. The configuration of the channels may be designed and selected according to any one or more provisions, i.e. high heat dissipation, certain flow characteristics, ease of manufacturing etc. Accordingly, the channels may have another design depending on any desire or requirement and depending on the type of CPU and the size and shape of the free surface of the CPU. Also. other processing units than a CPU may exhibit different needs for heat dissipation, and may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the channels. If the processing unit is very elongate, such as a row of microprocessors, one or a plurality of parallel channels may be provided, perhaps just having a common inlet and a common outlet.

Fig. 11-13 show an embodiment of a heat sink 4, where segments 28 are provided at a first side 4A of the heat sink, and fins 29 for dissipating heat to the surroundings are provided at the other, second side 4B of the heat sink. An intermediate reservoir housing 30 is provided having a recessed reservoir at the one side facing the first side 4A of the heat sink. The recessed reservoir 30 has an inlet 31 and an outlet 32 at the other side opposite the side facing the heat sink 4.

When segments 28 are provided on the first side 4A of the heat sink, the shape of the segments may be decisive of whether the reservoir, which is made from metal such as aluminium or copper, is to be made by extrusion or is to be made by other manufacturing processes such as die casting. Especially when the segments 28 are linear and are parallel with the fins 29, as shown in the embodiment, extrusion is a possible and cost-effective means of manufacturing the heat sink 4.

The intermediate reservoir 30 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The recessed reservoir is provided with a kind of serration 33 along opposite sides of the reservoir, and the inlet 31 and the outlet 32, respectively, are provided at opposite corners of the intermediate reservoir 30. The segments 28 provided at the first side 4A of the heat sink, i.e. the side facing the intermediate reservoir 30, are placed so that when the heat

sink is assembled with the intermediate reservoir housing (see fig 13) the segments 29 run from one serrated side of the reservoir to the other serrated side of the reservoir.

When cooling liquid is forced from the inlet 31 through the reservoir, along channels (not shown) formed by the segments 29 of the heat sink 4 and to the outlet 32, the whole of the first side 4A of the heat sink will be passed over by the cooling liquid, thus ensuring a proper and maximised heat dissipation between the cooling liquid and the heat sink. The configuration of the segments on the first side 4A of the heat sink and the configuration of the serrated sides of the intermediate reservoir housing may be designed and selected according to any provisions. Accordingly, the segments may have another design, perhaps being wave-shaped or also a serrated shape, depending on any desired flow characteristics of the cooling liquid and depending on the type of heat sink and the size and shape of the reservoir.

Also other types of heat sinks, perhaps circular shaped heat sinks may exhibit different needs for heat dissipation, may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the segments and the intermediate reservoir. If the heat sink and the reservoir are circular or oval, a spiral-shaped segmentation or radially extending segments may be provided, perhaps having the inlet or the outlet in the centre of the reservoir. If an impeller of the pump is provided, as shown in fig. 15-16, the impeller of the pump may be positioned in the centre of a spiral-shaped segmentation or in the centre of radially extending segments.

Fig. 14 shows the reservoir 14 shown in fig. 9-10 and the heat sink 4 and the intermediate reservoir 30 shown in fig. 11-13 being assembled for thereby constituting an integrated monolithic unit. It is not absolutely necessary to assemble the reservoir 14 of fig. 9-10 and the heat sink 4 and the intermediate reservoir 30 of fig. 11-13 in order to obtain a properly functioning cooling system. The inlet 15 and the outlet 16 of the reservoir 14 of fig. 9-10 may be connected to the outlet 32 and the inlet 31, respectively, of the intermediate reservoir of fig. 11-13 by means of tubes or pipes.

The reservoir 14 of fig. 9-10 and the heat sink 4 and the intermediate reservoir 30 of fig. 11-13 may then be positioned in the computer system at different locations. However, by assembling the reservoir 14 of fig- 9-10 and the heat sink 4 and the intermediate reservoir 30 of fig. 11-13 a very compact monolithic unit is obtained, also obviating the need for tubes or pipes. Tubes or pipes may involve an increased risk of leakage of cooling liquid or may require soldering or other special working in order to eliminate the risk of leakage of cooling liquid. By eliminating the need for tubes or pipes, any leakage and any additional working is obviated when assembling the cooling system.

Fig. 15-16 show a possible embodiment of a reservoir according to the invention. The reservoir is basically similar to the reservoir shown in fig. 9-10. However, an impeller 33 of the pump of the cooling system is provided in direct communication with the channels 26. Also, in the embodiment shown, a heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed between the channels 26 inside the reservoir and the CPU 1 as the processing unit.

The heat exchanging surface 4 is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU 1 (see fig. 4). However, also the inner surface (not shown, see fig. 7) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

The provision of the heat exchanging surface 4 need not be a preferred embodiment, seeing that the solution incorporating the aperture (see fig. 9-10) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging surface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging surface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

In the embodiment shown, the heat exchanging surface 4 is secured to the reservoir by means of bolts 22. Other convenient fastening means may be used. The heat exchanging surface 4 and thus the reservoir 14 may be fastened to the CPU 1 or other processing unit by any suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging surface. One such means may be the fastening means shown in fig. 4 and fig. 5 or similar fastening means already provided as part of the computer system.

When channels 26 are provided inside the reservoir 14, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

The reservoir 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The impeller 33 (see fig. 14) of the pump is positioned in a separate recess of the channels 26, said separate recess having a size corresponding to the diameter of the impeller of the pump. The recess is provided with an inlet 34 and an outlet 35 being positioned opposite an inlet 31 and an outlet 32 of cooling liquid to and from, respectively, the channels 26. The impeller 33 of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. In a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer systemsupplying DC electrical power, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump. However, in the embodiment shown, the impeller of the pump is driven by a 12V electrical motor.

Fig. 17 shows a preferred possible embodiment of a reservoir according to the invention. The reservoir 14 has basically the same features as the reservoir shown in fig. 15-16. In the embodiment shown, the reservoir substantially has a conical, circular configuration and is provided with stiffening ribs 36 extending axially along the exterior of the reservoir 14.

Other shapes such as cylindrical, circular, or conical rectangular or cylindrical, rectangular or even oval or triangular shapes may be adopted, when designing and possibly injection moulding or casting the reservoir. The dimension of the embodiment shown is approximately 55 mm in diameter and also 55 mm in axial extension.

The reservoir 14 has a recess 40 in the centre of the reservoir. The recess 37 is intended for accommodating a stator 37 of an electrical motor driving an impeller 33 of the pump, said impeller being attached to a shaft 38 of a rotor 39 of the electrical motor. The recess 40 has an orifice 41, four sidewalls 42, a bottom 43 and a circular jacket 44 extending from the bottom 43 of the recess 40 and outwards towards the orifice 41 of the recess 40. The interior (not shown) of the jacket 44 is intended for encompassing the rotor 39 of the pump.

Thereby, a liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system.

Along an outer circumferential extension, the reservoir 14 is provided with protrusions 45 extending outwardly from the circumferential extension. The protrusions are intended for cooperating with a clip (see description below) for fastening the reservoir 14 to the CPU or other processing unit of the computer system. The protrusions 45 are shown as a plurality of singular protrusions. Alternatively, the protrusions may be only one continuous protrusion extending outwardly and around the circumferential extension.

The reservoir 14 may also be provided with an inlet (not shown) and an outlet (not shown) for the cooling liquid. The inlet and the outlet are provided along a surface of the reservoir facing downward and inwards when seen in the perspective view of the drawing. The inlet and the outlet lead to a radiator (not shown) intended for cooling the cooling liquid after having been heated by the processing unit via a heat exchanging surface (see description below).

The radiator may be placed nearby or distant from the reservoir 14, depending on the set-up of the computer system. In one possible embodiment, the radiator is placed in the immediate vicinity of the reservoir, thereby possible excluding any tubing extending between the radiator and the inlet and the outlet, respectively. Such embodiment provides a very compact configuration of the entire cooling system, namely a monolithic configuration where all elements needed for the cooling system are incorporated in one unit.

In an alternative embodiment, the reservoir 14 itself also constitutes the radiator of the cooling system. In such embodiment, an inlet and an outlet are not needed. If the reservoir is made of a metal such as copper or aluminium or other material having a high thermal conductance, the cooling liquid, after having been heated by the processing unit via a heat exchanging surface 8see description below) may radiate the heat via the exterior surface of the reservoir 14 itself. In such embodiment, the ribs 36 along the exterior surface of the reservoir 14 may also, or may in stead, function as cooling fins. In such embodiment, the fins will have a smaller dimension than the transverse dimension of the ribs 14 shown in figure 17, and the number of fins will be greater than the number of fins shown in figure 17.

An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33. Thus, the pump functions as a centrifugal pump. The inlet if the pump chamber 46 is the entire opening into the cavity that the pump chamber configures, said cavity being in direct communication with the interior of the reservoir 14 as such. An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir 14.

In the embodiment shown, a heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47.

The heat exchanging interface 4 is preferably made from a copper plate having a plane outer surface (not shown) at the opposite side as the side shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see fig. 4). The inner surface facing the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47 is provided with pins 4A extending from the base of the copper plate and into the thermal exchange chamber (not shown) at the opposite side of intermediate member 47. The pins 4A constitutes an uneven surface and may either be provided during casting of the copper plate or may be provided by means of milling or other machining process of a copper plate. The pins provide a network of channels across the inner surface of the heat exchanging interface, along which network the cooling liquid is intended to flow.

Alternatively, also the inner surface of the copper plate facing the reservoir is plane. In this alternative embodiment, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown. No milling or other machining process of the inner and/or the outer surface need be provided, when both the outer surface and the inner surface is plane.

The provision of the heat exchanging interface 4 need not be a preferred embodiment, seeing that the solution incorporating the aperture (see figure 9-10) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging interface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging interface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

In the embodiment shown, the heat exchanging interface 4 is secured to the intermediate member 47 by means of gluing or other means ensuring a proper and liquid-tight fastening of the heat exchanging interface with the intermediate member. Any other suitable and convenient means (not shown) for securing the heat exchanging interface to the intermediate member may be envisaged.

The heat exchanging interface and thus the reservoir is fastened to the top of the CPU by means of a clip 50. The clip 50 has a circular configuration and has four legs 51 extending axially from the circular configuration. The four legs 51 are provided with footing 52 and the footings 52 are provided with holes 53. The clip 50 is intended for being displaced around the exterior of the reservoir 14 and further axially to the protrusions 45 of the reservoir 14.

The clip 50, after having been placed around the reservoir 14, is fastened to the motherboard of the computer system by means of bolts (not shown) or the like fastening means extending through the holes 53 in the footings 52 and further though corresponding holes in the motherboard. The corresponding holes in the motherboard are preferably holes already available in the motherboard in the vicinity of the CPU and the socket of the CPU, respectively. Accordingly, the legs 51 and the footings 52 of the clip 50 are specially designed in accordance with the already provided holes in the motherboard.

Alternatively, the heat exchanging interface 4 and thus the reservoir 14 may be fastened to the CPU or other processing unit by any other suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging interface. One such means may be the fastening means shown in fig. 4 and fig. 5 or similar fastening means already provided as part of the computer system.

When stiffening and/or cooling fins 36 are provided at the exterior of the reservoir 14, the shape of and the number of fins may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting. Also, the purpose of the fins i.e. just for stiffening the reservoir, or also or in stead for cooling purposes, may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

The reservoir 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The impeller 33 of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. In a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V AC power or 220V AC power. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by either an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer system supplying DC electrical power, this may be nevertheless be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump.

In every aspect of the invention, where an AC motor is used for driving an impeller from a DC motor, although this way of configuring a pump is contradictory, the following preferred mode of operation is established for alleviating the disadvantages:

In order to be able to control direction of rotation of the impeller attached to the rotor and to optimise the conditions of maximum average torque value during starting, i.e. from zero speed up to the synchronous speed, an electronic control circuit is used. The electronic control circuit comprises a processing unit, which drives a static power switch, constituted for example by a triac arranged in series between the alternating-voltage power, which is obtained form the DC power supply of the computer system, and the AC motor. The same series network also includes a detector for the current I which flows through the triac and then through the AC motor. The output of the current detector is an input signal for the electronic processing unit.

The electronic control circuit may also comprise a number or sensors suitable for detecting the position and polarity of the permanent magnets comprised in the rotor of the AC motor, both when the rotor is moving and when it is in particular operating conditions, or when it is motionless or stalled at zero speed. The number of position sensors may be Hall sensors, encoders or optical or electro-mechanical sensors capable of establishing and/or measuring the position of the rotor. The output signal from the number of position sensors is an input signal for the electronic processing unit.

Alternatively, the output signal from the position sensor may be phase shifted by means of an electronic phase shifting circuit before the output signal is sent to the input of the electronic processing unit.

A third signal may be input to the processing unit, said third signal enabling the processing unit to detect the polarity of the AC voltage applied to the AC motor. However, the third signal is not compulsory.

The signals input to the electronic processing unit are converted into digital form and after being processed by the processing unit, an output signal is provided by the processing unit. The output signal is used for closing or opening the static switch constituted by a triac arranged in series with the AC motor.

In the electronic processing unit, the current signal provided by the current sensor enters a zero-crossing detector which provides in output a logical "1" signal indicating that said current approaches zero with a positive or negative deviation from the zero value of said current. This deviation depends on the type of motor used and on its application, as well as on the type of static power switch being used. The signal arriving from the position sensor enters a phase-shift and processing circuit the output whereof is 1 or 0 according to the position and polarity of the rotor.

In the electronic processing unit, the phase shifted position signal as well as the signal processed from the AC voltage, enter an electronic logic XOR gate which outputs a "1" signal if the digital value of the AC voltage is equal to "0" and the digital value of the phase shifted position signal is equal to "1" or the digital value of the AC voltage is equal to "1" and the digital value of the phase shifted position signal is equal to "0".

The output of the zero-crossing detector and the output of the XOR gate, thus in digital form, enter an electronic logic AND gate which provides in output the control signal for closing or opening the static power switch.

The AND gate with two inputs and the signal processing system allow determining two conditions: 1) the AC voltage signal is positive, the current is proximate to zero, and the rotor rotation angle is between 0 degrees and 180 degrees; 2) the AC voltage signal is negative, the current is proximate to zero, and the rotor rotation angle is between 180 degrees and 360 degrees. These two conditions provide the same rotation direction of the rotor of the AC motor.

Fig. 18 shows an embodiment of an AC motor in which one stator pole 54 is longer than the other stator pole 55 by an amount indicated by l. With this configuration the permanent-magnet rotor 39 with an ideal line 56 separating the north N and the south S of the rotor, is positioned so that the ideal line 56 do not coincide with the median axis 57 of the stator 37, but so that the ideal line 56 is tilted by a certain angle α in respect to the median 57 of the stator 37.

Two energising windings 58, 59 are provided on the two poles 54,55 of the stator 37, respectively, and the energising windings are connected in series and are powered, through terminals (not shown), by an AC power source. With this configuration of the AC motor, the motor is able to start more easily in an intended rotational direction of the rotor.

In a preferred embodiment of the invention, the control electronics supplies the AC motor with only a half-wave voltage signal during start up, thereby providing torque pulses to the rotor. Since only a half-wave voltage signal is supplied to the motor, the torque pulses are always unidirectional and will therefore force the rotor to start rotating in a required direction. The required direction of rotation is determined by the design of the impeller attached to the rotor and by polarity of the half-wave voltage signal.

After some amount of time, in which a number of half-wave voltage signals has been supplied to the motor, the rotor will stop rotating at a certain position e.g. as shown in the figure. Thus, the rotor is brought into a determined steady state position that is independent of its start position. Subsequent to this process, the AC motor is supplied with a full-wave voltage signal that will accelerate the rotor until the motor enters synchronous operation, that is, when the rotor rotates with the same cyclic frequency as the frequency of the AC voltage source.

The initial polarity of the AC voltage signal is determinative for the resulting direction of rotation of the rotor, thus if the initial voltage is positive with an increasing amplitude, the rotor will start rotating in one direction, whereas if the voltage is negative with a decreasing amplitude, the rotor will start rotating in an opposite direction.

The number of half-waves required for bringing the rotor into a determined steady state position, where the rotor stops rotating, depends on the characteristics of the motor such as moment of inertia and the external load applied to the rotor. Thus, the number of half-waves required is based on empirical analysis of a particular motor in particular load conditions.

The half-wave voltage signal and the corresponding half-wave current signal supplied to the motor will have an appearance as shown in Fig. 19.

In an alternative embodiment the control electrics used to drive the AC motor shown if Figure 18 is configured so that that the control electronics dictates the AC motor to stop at a predetermined position by supplying the motor with a number of half-wave voltage signals subsequent to the synchronous operation in which the motor was supplied with a full-wave voltage signal. Thus, at the time the motor needs to be started again, the rotor is already in a position so that only the polarity of the full-wave AC voltage signal supplied to the motor must be chosen so that the resulting direction of rotation of the rotor is in conformity with the terminal position of the rotor at the last operation.

According to this method, the initial step of bringing the rotor into a determined steady state position by supplying the motor with a number of half-wave voltage signals is not required. Even in the alternative, it will be possible to both terminate the full-wave power supply with a number of half-wave voltage signals as well as commencing the full-wave power supply by initially supplying the motor with a number of half-wave signals. However, this is more cumbersome, but nevertheless more safe.

Fig. 19 shows a voltage signal V and a current signal I applied to the AC motor as well as the position signal of the rotor. Initially the rotor stands still, which is represented by the straight line L. The electronic control circuit controls the static power switch so that the voltage signal V and the current signal I are present as half-waves. Thus, the rotor receives torque pulses due to the current-voltage combination; these pulses are always one-way directional and tend to start the rotor moving in the required direction. Subsequent to the start-up phase, the rotor enters into its synchronous operation.

Thus, an AC signal is generated, preferably a 12 V AC signal, possibly by means of digital electric pulses from the 12 V DC power supply of the computer's power supply. Based on a possible sensor output relating to the impeller position, a decision is made of how to initiate the AC power signal, i.e. with a negative or positive half-wave, and by doing making sure the impeller starts in the same rotational direction each time andthus the performance benefits of the AC pump is similar to those of a DC pump.

Alternatively, the magnetic field sensor is omitted, and instead of reading the impeller position, the impeller is forced to be in the same position every time the impeller starts. To be sure the impeller is in a defined position before start, a signal is supplied to the stator of tha AC motor for a defined period of time. The signal is supplied perhaps three times in a row according to the curvature of the electrical power source. The pulses must be within the same half-wave part of a signal period. The frequency of the pulsed signal is arbitrary, but may be 50/60 Hz, although, despite the fact that under normal circumstances an AC pump being driven by the AC signal from the power outlet of the public electrical power network and transformed from 230/115 V to 12V would not function, as there is no chance of changing the sine signal from the public network.

By this way the impeller will be forced to the right polarity before start, and the pump will start turning the impeller in a defined way of rotation when the power signal full-wave is supplied. The full-wave power signal, which is supplied, must start in the opposite signal half-wave amplitude than that of the initial half-wave pulses, that was supplied before start of the full-wave power signal.

The invention has been described with reference to specific embodiments and with reference to specific utilisation, it is to be noted that the different embodiments of the invention may be manufactured, marketed, sold and used separately or jointly in any combination of the plurality of embodiments. In the above detailed description of the invention, the description of one embodiment, perhaps with reference to one or more figures, may be incorporated into the description of another embodiment, perhaps with reference to another or more other figures, and vice versa. Accordingly, any separate embodiment described in the text and/or in the drawings, or any combination of two or more embodiments is envisaged by the present application.

CLAIMS

1. A cooling system for a computer system, said computer system comprising
- at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising
- a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid,
- a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid,
- a pumping means being provided as part of an integrate element, said integrate element comprising the heat exchanging interface, the reservoir and the pump,
- said pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means,
- said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means.

2. A cooling system according to claim 1, wherein the entire pump is placed inside the reservoir with at least an inlet or an outlet leading to the cooling liquid in the reservoir.

3. A cooling system according to claim 1, wherein the pumping member of the pump and a movable driven part of the motor of the pump, such as a rotor of en electrical motor, is placed inside a liquid-containing interior of the reservoir, embedded in the cooling liquid, and wherein a stationary driving part of the motor of the pump, such as a stator of an electrical motor, is placed outside the liquid-containing interior of the reservoir.

4. A cooling system according to claim 1, wherein the entire pump is placed outside the reservoir in the immediate vicinity of the reservoir, and wherein at least an inlet or an outlet of the pump is leading directly to the cooling liquid in the reservoir.

5. A cooling system according to any of the preceding claims, wherein an inlet of the pump is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface.

6. A cooling system according to any of the preceding claims, wherein an outlet of the pump is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface.

7. A cooling system according to any of the preceding claims, wherein a pumping member such as an impeller of the pump is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface.

8. A cooling system according to any of the preceding claims, wherein the pumping member of the pump is intended for only one-way of displacement for pumping, such as one-way rotation for pumping, and where the pumping member is driven by a motor capable of two-way displacement when operating, such as both clockwise and counter-clockwise rotation when operating.

9. A cooling system according to any of the preceding claims, wherein the pump is selected from the following types: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump.

10. A cooling system according to any of the preceding claims, wherein driving means for driving the pump is selected among the following driving means: electrically operated rotary DC motor, electrically operated rotary AC motor, piezo-electrically operated motor, permanent magnet operated motor, fluid-operated motor, capacitor-operated motor.

11. A cooling system according to any of claims 8-10, wherein the pumping member of the pump is a one-way rotational impeller of a centrifugal pump, and wherein the motor of the pump is an electrical rotary AC motor driven by AC electrical power.

12. A cooling system according to any of the preceding claims, wherein one or more of the following means are provided inside the reservoir for increasing the heat absorption by the cooling liquid: channels or segments inside the reservoir, an uneven surface being provided on a physical surface of the heat exchanging interface, a heat sink with segments provided inside the reservoir and being in thermal contact with the cooling liquid.

13. A cooling system according to any of the preceding claims, wherein the heat exchanging interface is a heat exchanging surface being in close thermal contact with the processing unit for dissipating heat from the processing unit to the cooling liquid via the heat exchanging surface.

14. A cooling system according to any of the preceding claims, where the heat exchanging interface is a free surface of the processing unit, said free surface of the processing unit having direct access to the cooling liquid for dissipating heat from the processing unit directly to the cooling liquid.

15. A cooling system for a computer system, said computer system comprising
- at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising
- a reservoir having an amount of cooling liquid for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid,
- a heat exchanging interface for providing thermal contact with the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid,
- a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, and
- said cooling system further comprising a pump wherein the pump is driven by an AC electrical motor powered by a DC electrical power supply of the computer system,
- where at least part of the DC electrical power from said power supply is intended for being converted to AC electrical power being supplied to the electrical motor.

16. A cooling system according to claim 15, wherein the pump is selected from the following types: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump.

17. A cooling system according to claim 15 or 16, wherein one or more of the following means are provided inside the reservoir for increasing the heat absorption by the cooling liquid: channels or segments inside the reservoir, an uneven surface being provided on a physical surface of the heat exchanging interface, a heat sink with segments provided inside the reservoir and being in thermal contact with the heat exchanging surface.

18. A cooling system according to any of claims 15-17, where the heat exchanging interface is a heat exchanging surface being in close thermal contact with the processing unit for dissipating heat from the processing unit to the cooling liquid via the heat exchanging surface.

19. A cooling system according to any of the claims 15-17, where the heat exchanging interface is a free surface of the processing unit, said free surface of the processing unit having direct access to the cooling liquid for dissipating heat from the processing unit directly to the cooling liquid,

20. A cooling system according to any of the claims 1-19, wherein a motor is intended both for driving the pump for pumping the cooling liquid and for driving a fan for establishing a flow of air in the vicinity of the reservoir.

21. A cooling system according to any of the claims 1-19, wherein a motor is intended both for driving the pump for pumping the cooling liquid and for driving a fan for establishing a flow of air in the vicinity of the heat radiating means.

22. A cooling system according to any of the claims 1-19, wherein a motor is intended both for driving the pump for pumping the cooling liquid, and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, and for driving a fan for establishing a flow of air in the vicinity of the heat radiating means.

23. A cooling system according to any of the preceding claims, wherein the heat exchanging interface is an element being separate from the reservoir, and where the heat exchanging interface is secured to the reservoir in a manner so that the heat exchanging interface constitutes part of the reservoir when being secured to the reservoir.

24. A cooling system according to any of claims 1-22, wherein the heat exchanging interface constitutes an integrate part of the reservoir, and where the heat exchanging interface extends along an area of a surface of the reservoir, said area of surface being intended for facing the processing unit and said area of surface being intended for close thermal contact with the processing unit.

25. A cooling system according to any of claims 1-22, wherein the heat exchanging interface is constituted between a free surface of the processing unit and the cooling liquid in the reservoir, and where the heat exchanging interface is capable of establishing the close thermal contact with the processing unit through an aperture provided in the reservoir, and where the aperture extends along an area of the surface of the reservoir, said area of surface being intended for facing the processing unit.

26. A method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilising a cooling system for cooling the at least one processing unit and, said cooling system comprising - a reservoir, at least one heat exchanging interface and a pumping means, said method of cooling comprising the steps of
establishing, or defining, or selecting an operative status of the pumping means
- controlling the operation of the motor of the pumping means in response to the following parameters; the necessary direction of movement for obtaining a pumping action of a pumping member of the pumping means, the possible direction of movement of a driving part of the motor of the pumping means, and
- in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve the necessary direction of movement of the driving part of the motor for establishing the necessary direction of movement for obtaining he pumping action of the pumping member.

27. A method according to claim 26, said method being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and
said method comprising the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor before applying a full-wave AC power signal.

28. A method according to claim 26, said method being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and
said method comprising the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor after having applied the full-wave AC power signal.

29. A method according to claim 26, said method being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and
said method comprising the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and terminating a full-wave AC power signal having been applied with a selected known orientation of the last half-wave of the AC power signal.

30. A method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilising a cooling system for cooling the at least one processing unit and, said cooling system comprising - a reservoir, at least one heat exchanging interface, a pumping means and an air blowing fan, said method of cooling comprising the steps of
- applying one of the following possibilities of how to operate the computer system: establishing, or defining, or selecting an operative status of the computer system
- controlling the operation of at least one of the following means of the computer system; the pumping means and the air blowing fan in response to at least one of the following parameters; a surface temperature of the heat generating processing unit, an internal temperature of the heat generating processing unit, or a processing load of the CPU and
- in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve at least one of the following conditions; a certain cooling performance of the cooling system, a certain electrical consumption of the cooling system, a certain noise level of the cooling system.

31. A method according to claim 32 for cooling a computer system, wherein the operation of the air blowing fan is controlled before any control of the operation of the pumping means in order to achieve the at least one selected condition of the cooling system.

32. A method according to claim 32 or 33 for cooling a computer system, wherein said computer system further comprises an operative system or an alike means comprising a means for measuring the CPU load and/or the CPU temperature, and wherein said method of cooling said CPU further comprises the step of
- using a measurement, performed by said BIOS or alike means, of the CPU load and/or the CPU temperature for controlling said cooling system.

33. A method according to claim 32 for cooling a computer system, wherein said cooling system further comprises a temperature measuring means for measuring a temperature of the CPU, and wherein said method of cooling said CPU further comprises the step of
- using a measurement, performed by said temperature measurement means, of the CPU temperature for controlling said cooling system.

34. A method for cooling a computer system, wherein said cooling system further comprises a pumping means with an impeller for pumping the cooling liquid through a pump chamber, said pumping means being driven by an AC electrical motor with a stator and a rotor, and said pumping means being provided with a means for sensing a position of the rotor, and wherein the method comprises the following steps

- initially establishing a preferred rotational direction of the rotor of the electrical motor
- before start of the electrical motor, sensing the angular position of the rotor
- during start, applying an electrical AC signal to the electrical motor and selecting the signal value, positive or negative, of the AC signal at start of the electrical motor
- said selection being made according to the preferred rotational direction, and
- said application of the AC signal being performed by the computer system for applying the AC voltage from the electrical power supply of the computer system during conversions of the electrical DC voltage of the power supply to AC voltage for the electrical motor.

35. A method according to claim 34, where sensing the angular position of the rotor is accomplished by a number Hall-sensors placed at angular intervals for detection of the rotor's magnetic poles, the number of sensors corresponding to the number of magnetic poles establishing the mechanical angle, and corresponding to the electrical angle.

36. A method according to claim 34 or claim 35, where application of the electrical AC voltage to the electrical motor and selection of the signal value, positive or negative, of the AC voltage at start of the electrical motor is accomplished by the operating system of the computer system and is communicated to an DC/AC converter of the computer system.

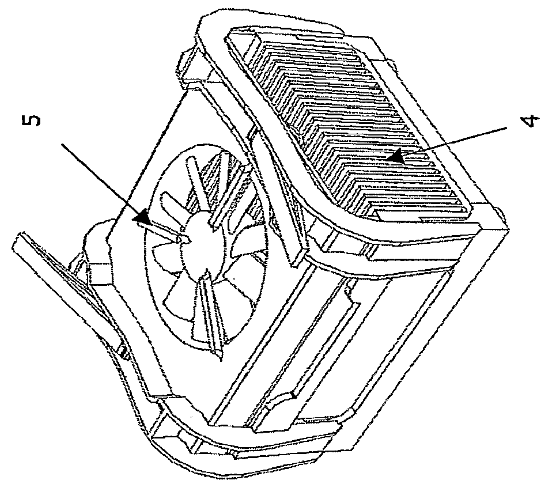

FIG. 2

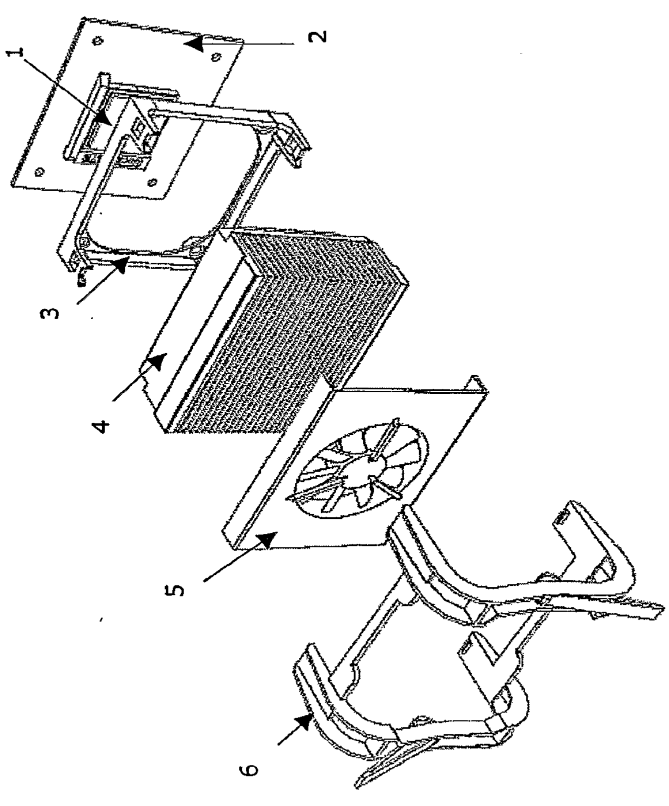

FIG. 1

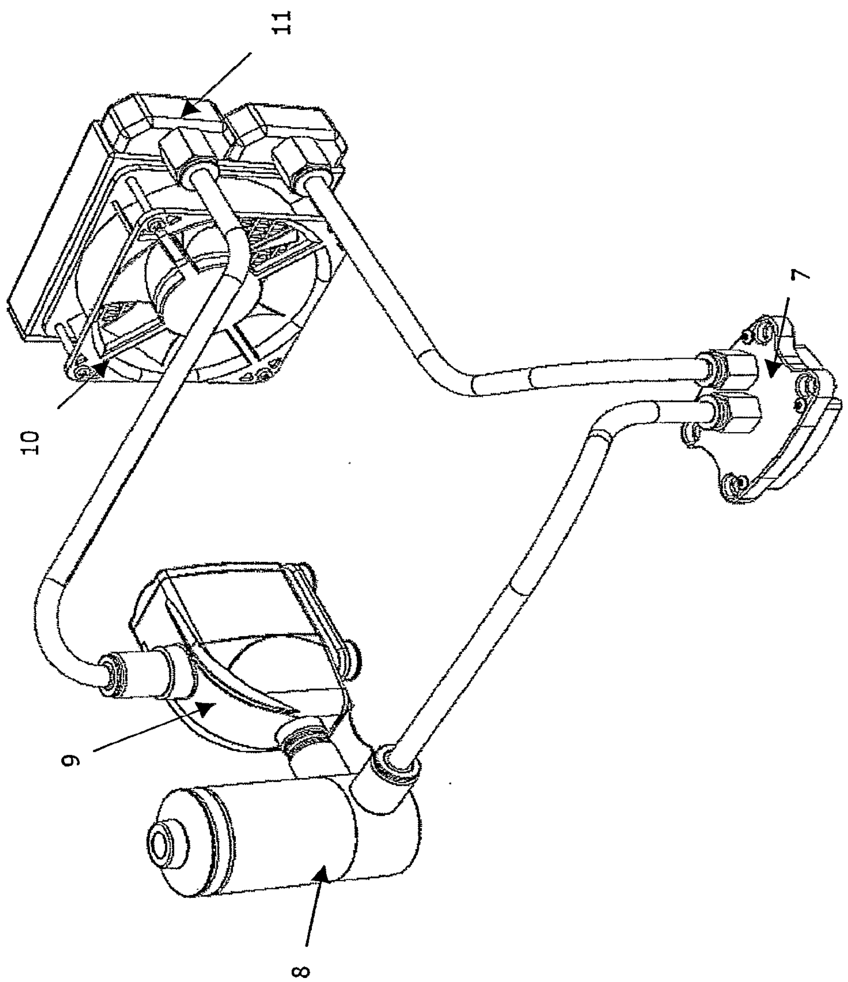

FIG. 3

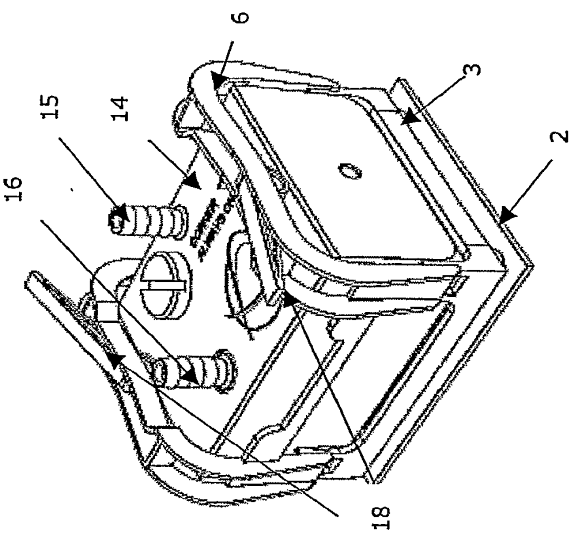

FIG. 5

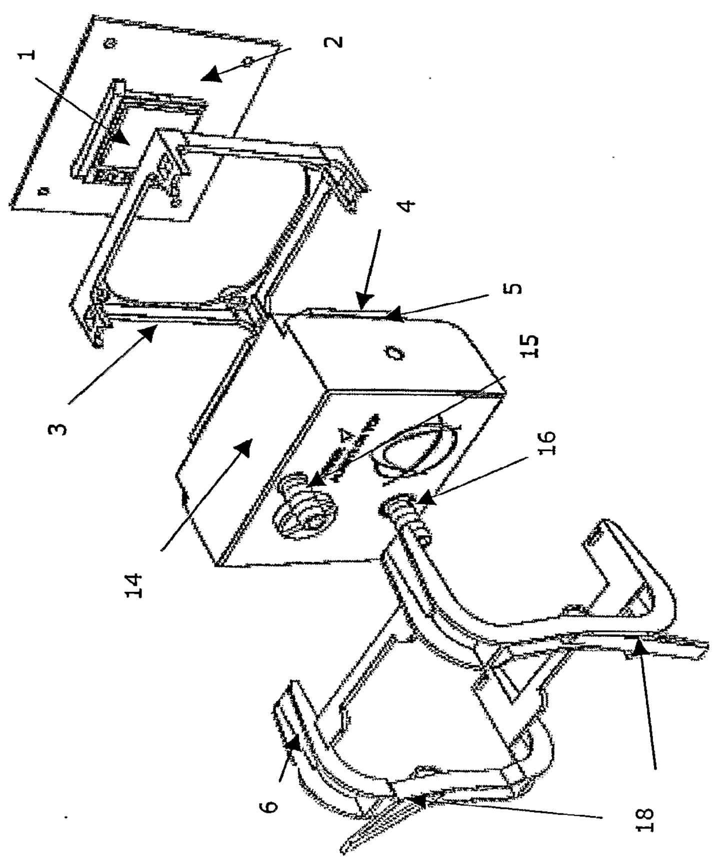

FIG. 4

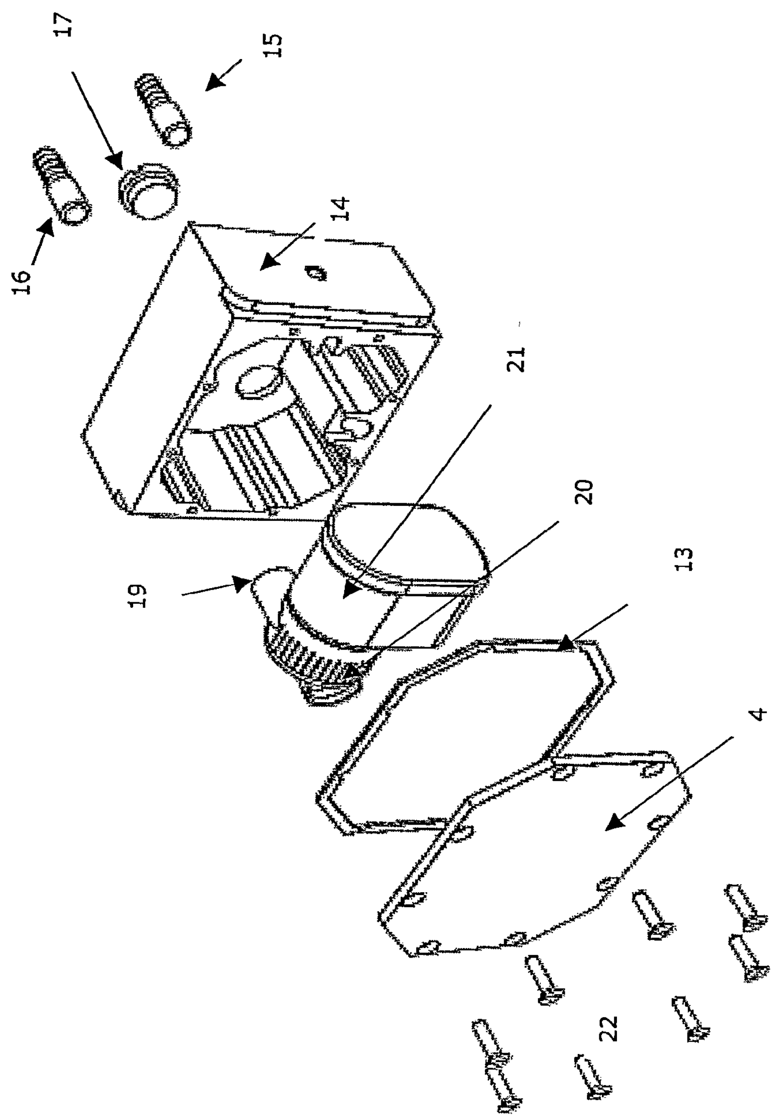

FIG. 6

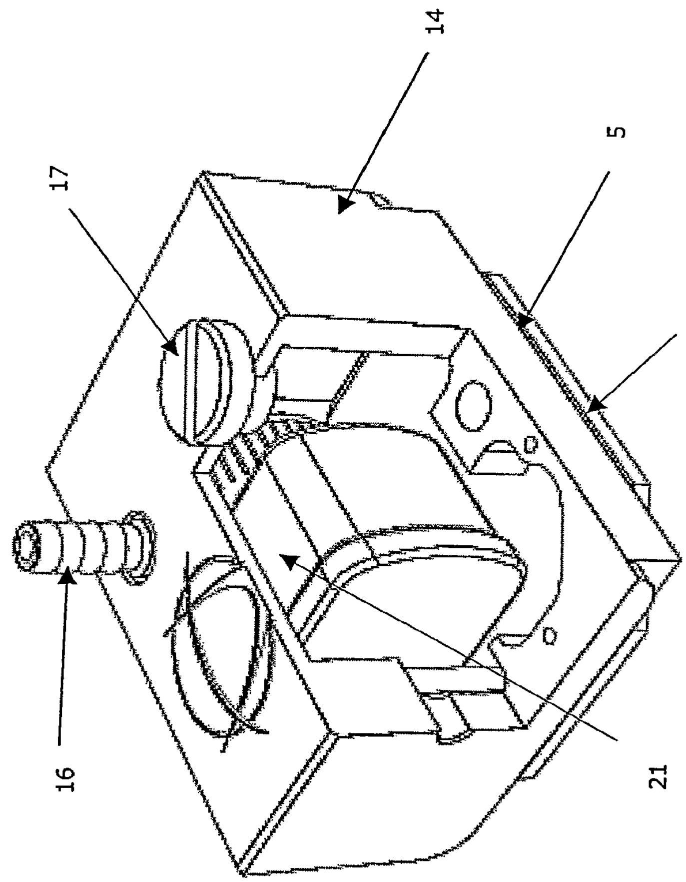

FIG. 7

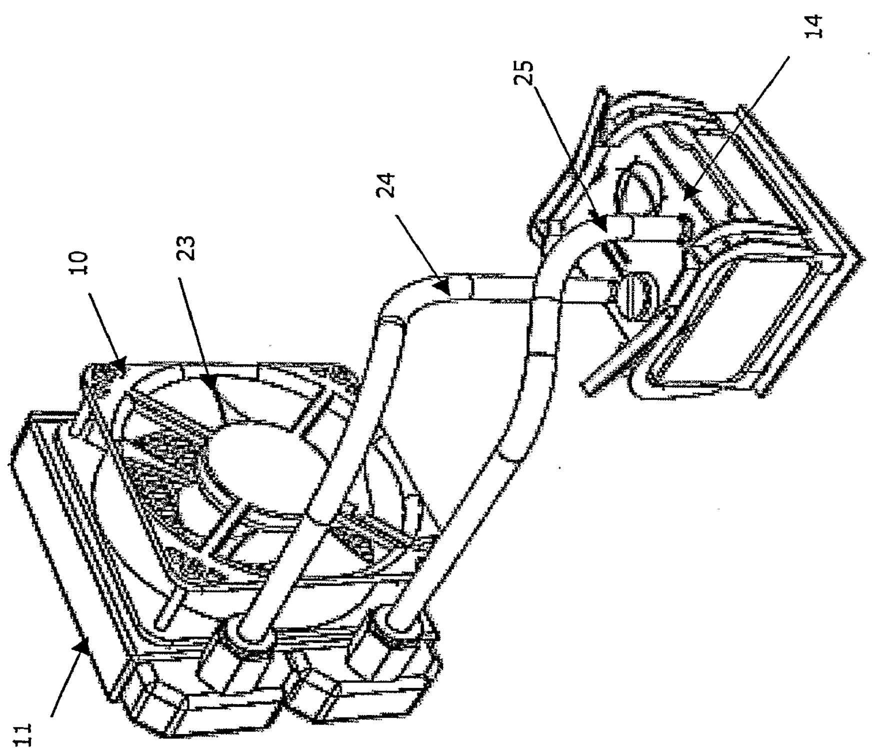

FIG. 8

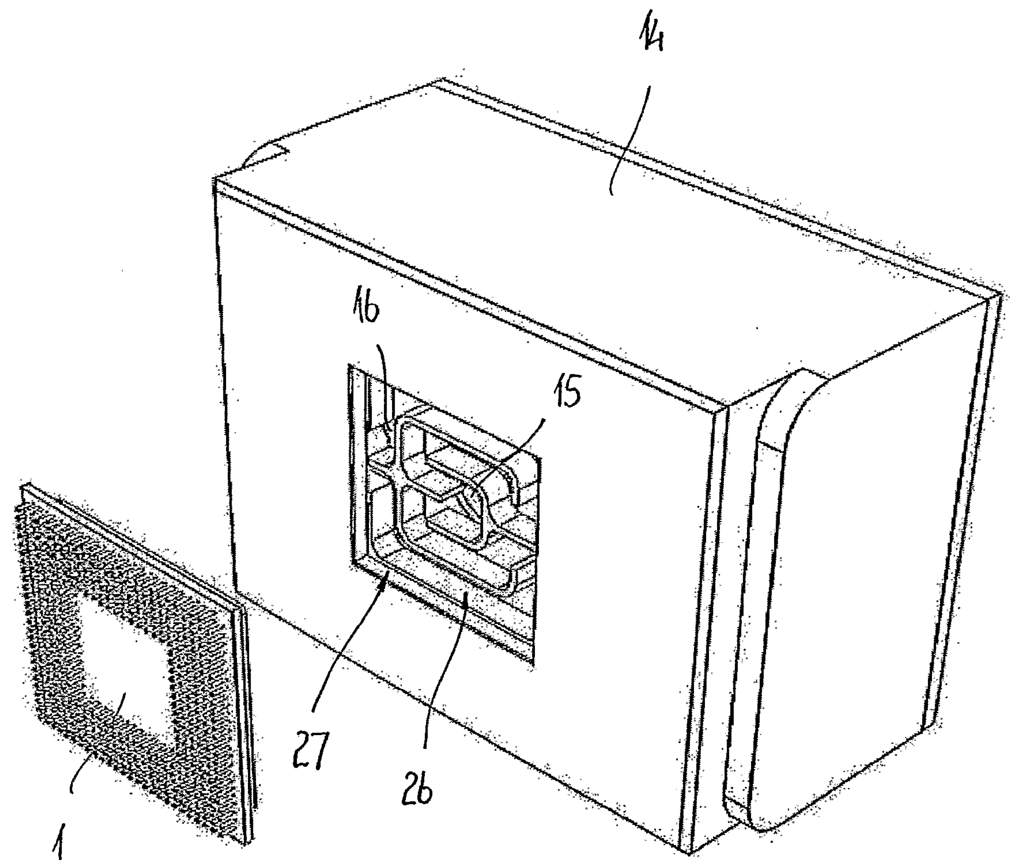

FIG. 9

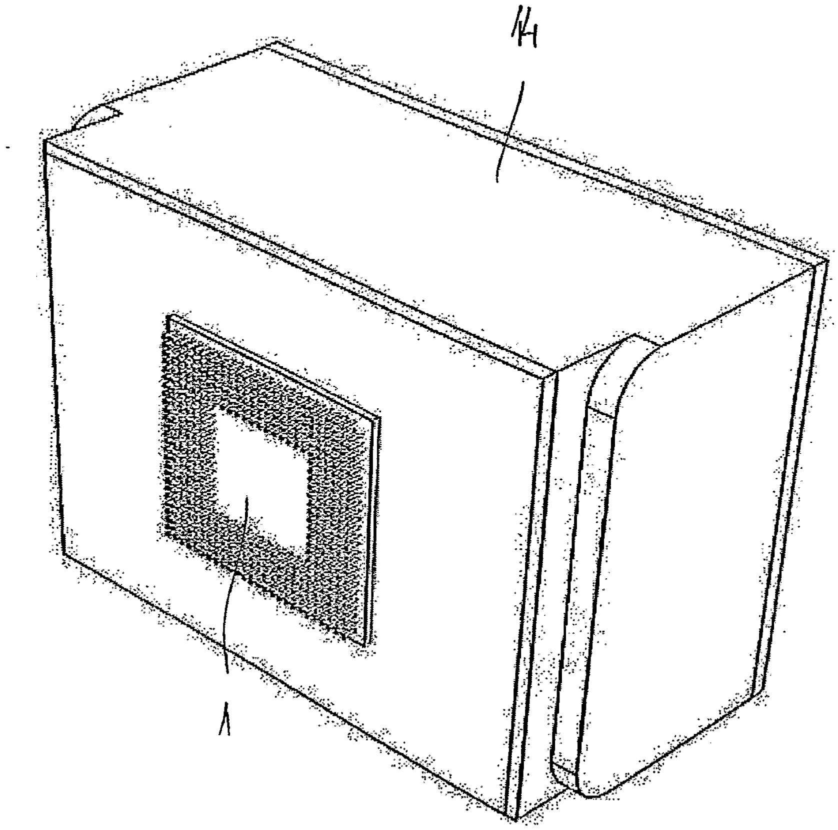

FIG. 10

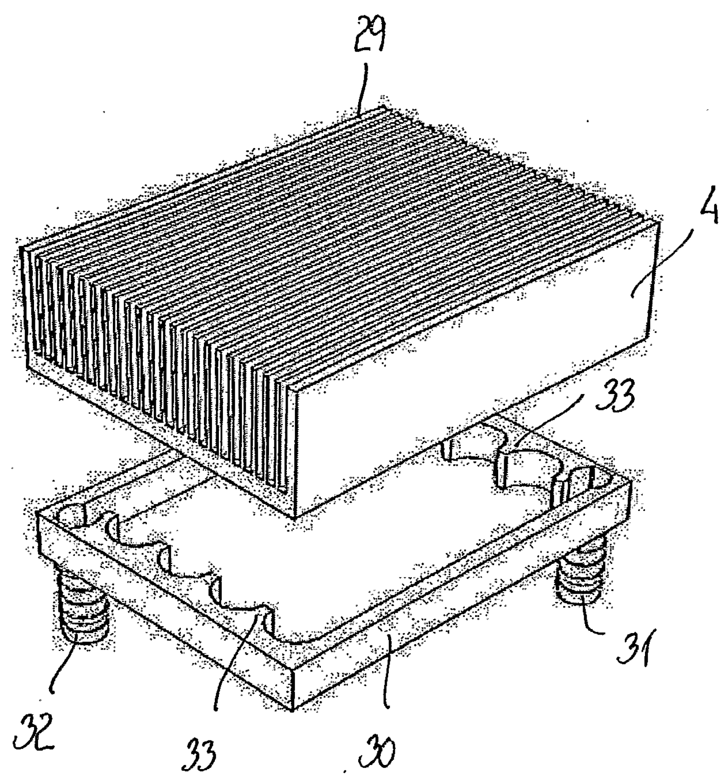

FIG. 11

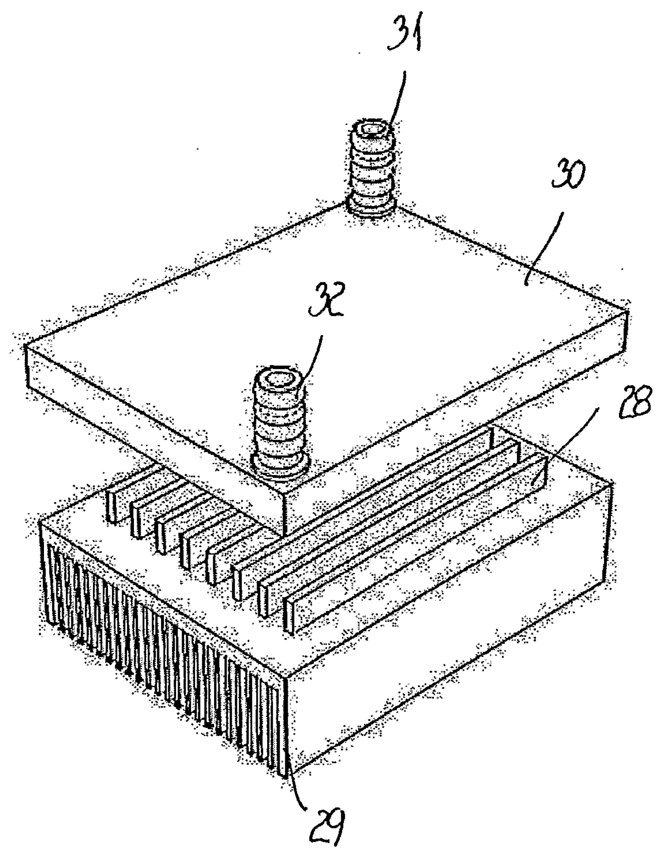

FIG. 12

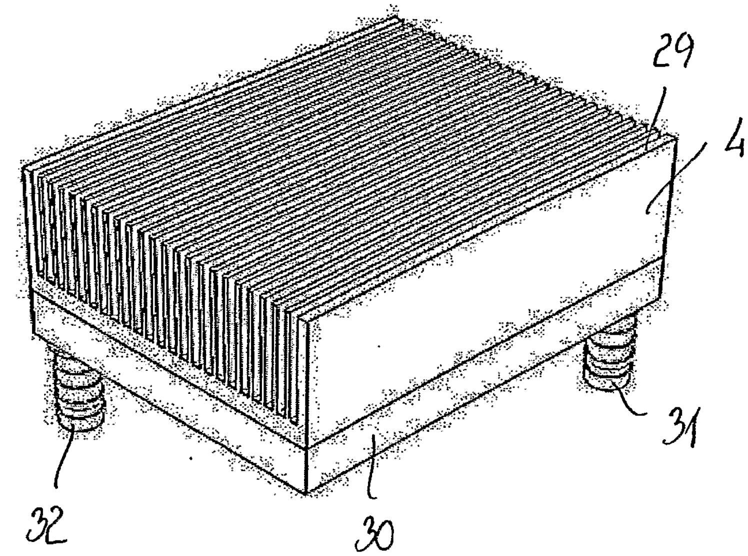

FIG. 13

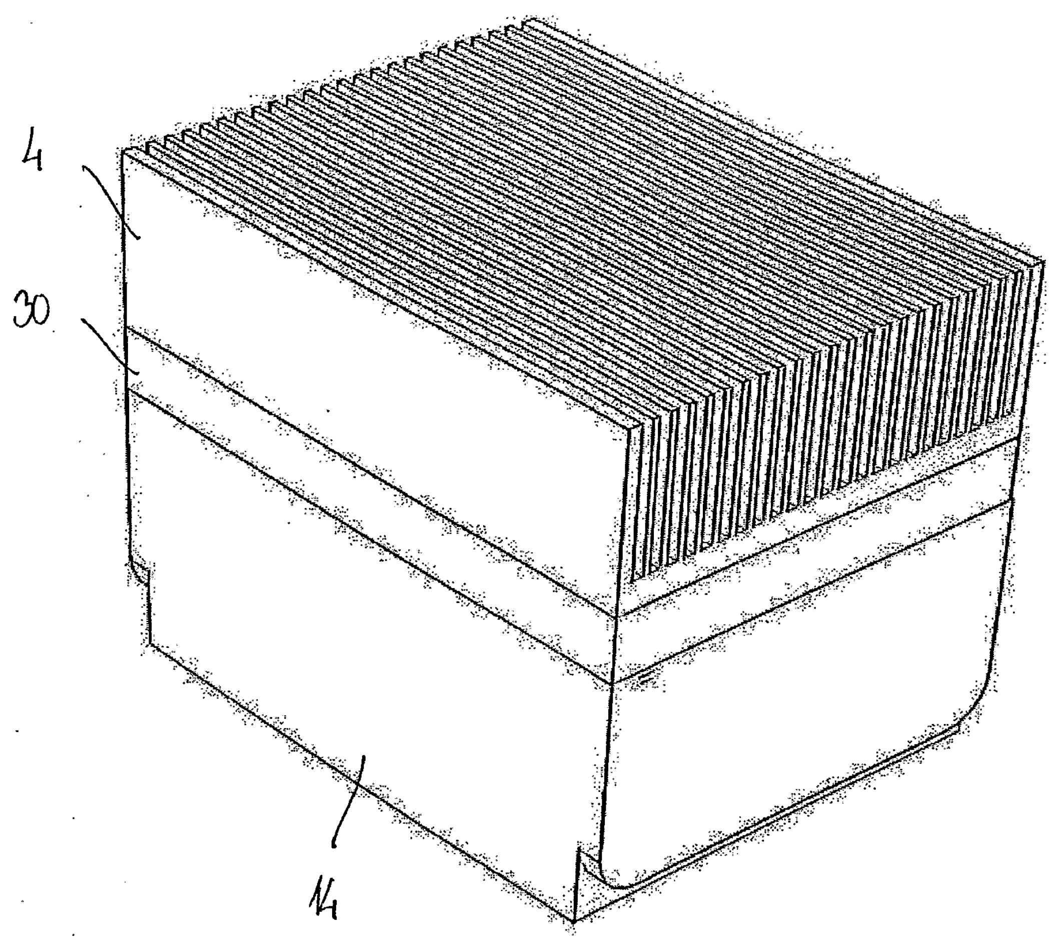

FIG. 14

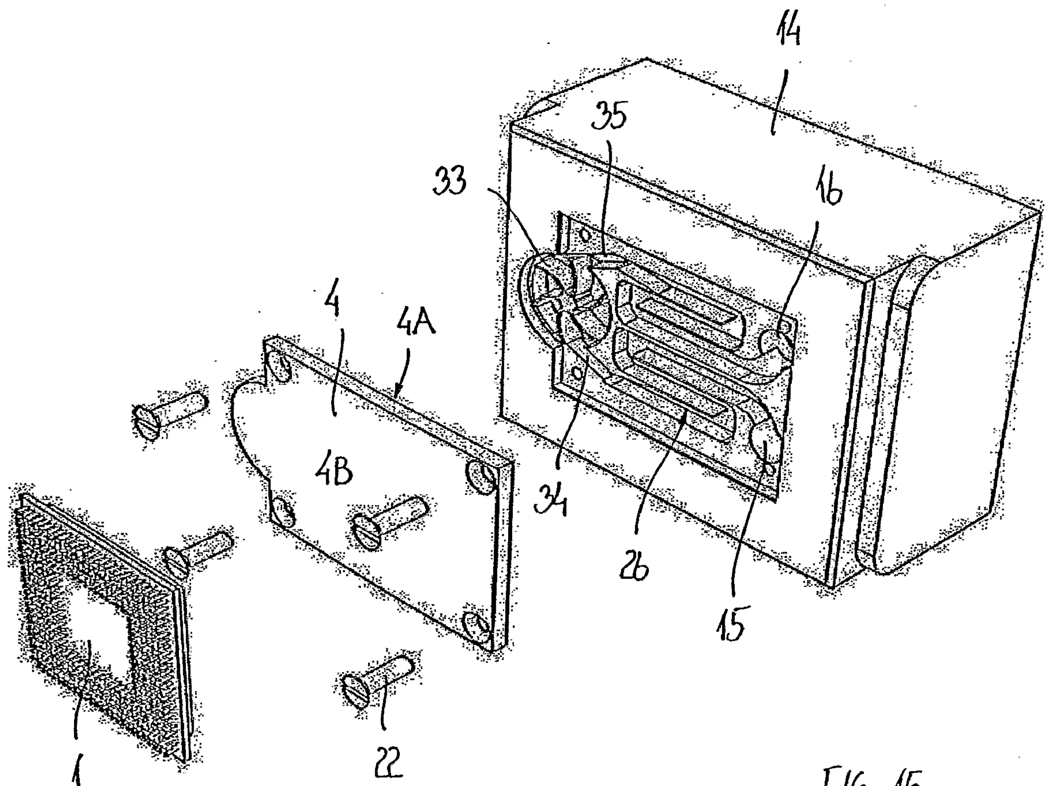

FIG. 15

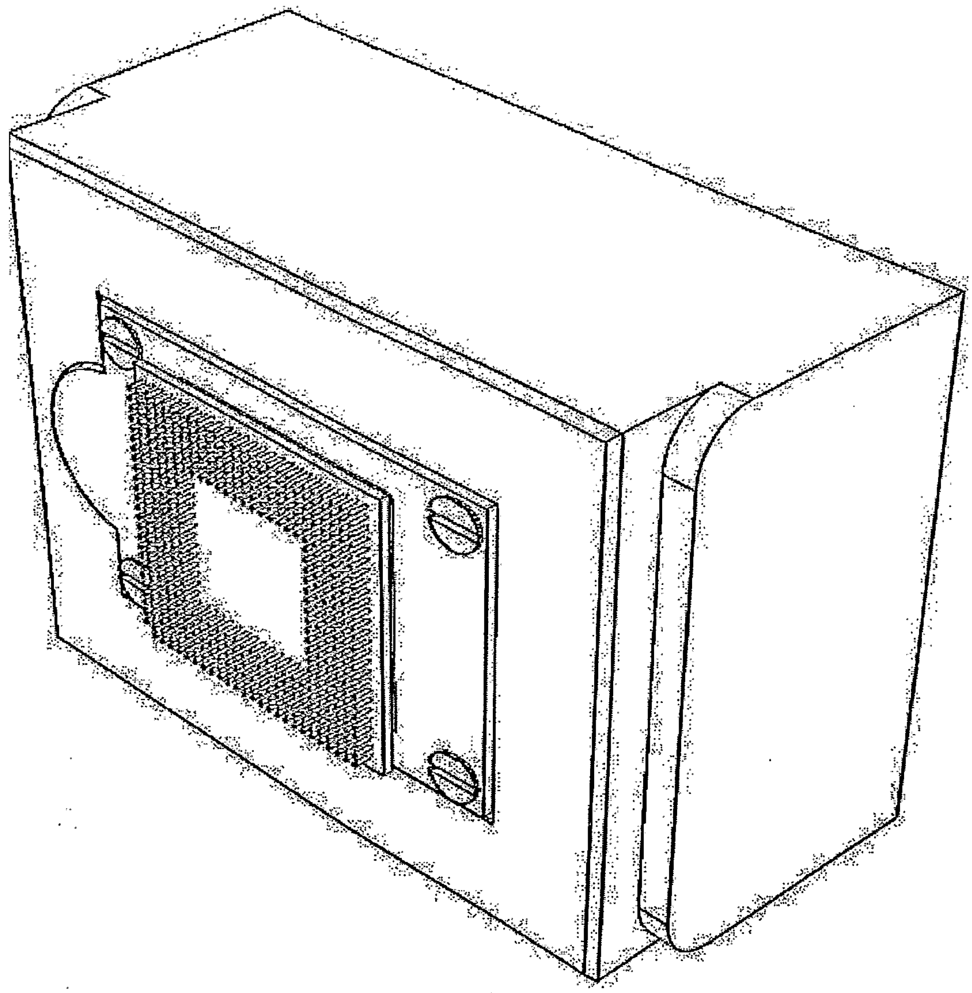

FIG. 1b

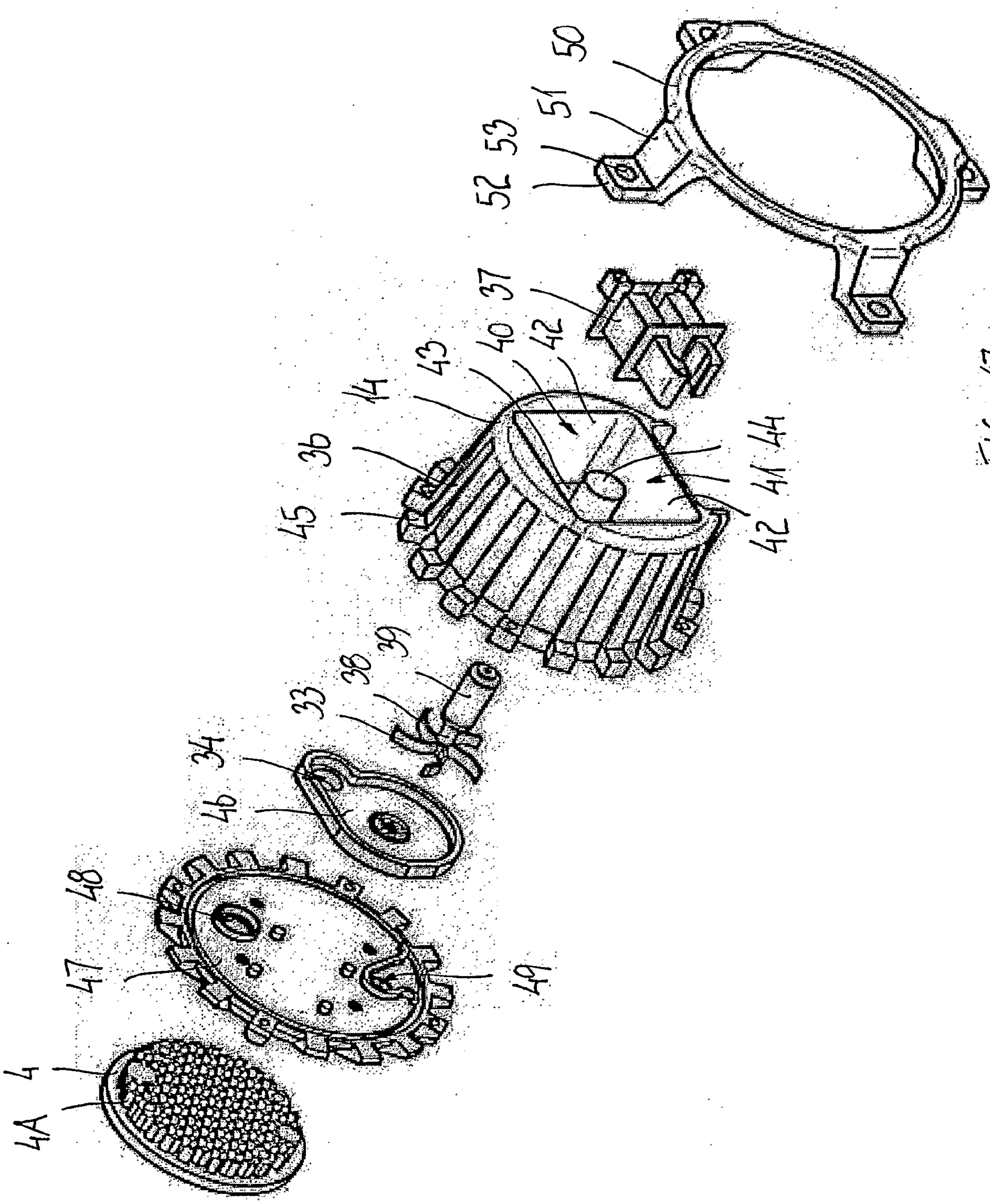

FIG. 17

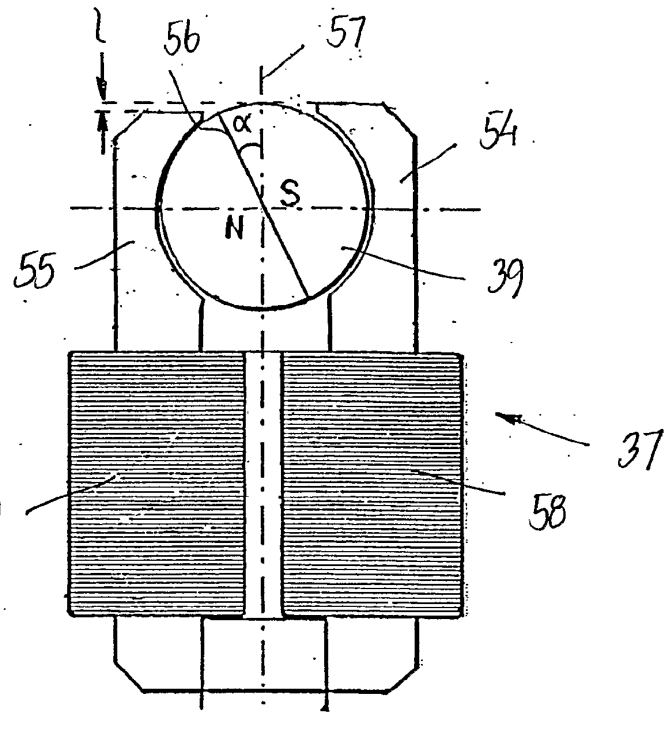

FIG. 18

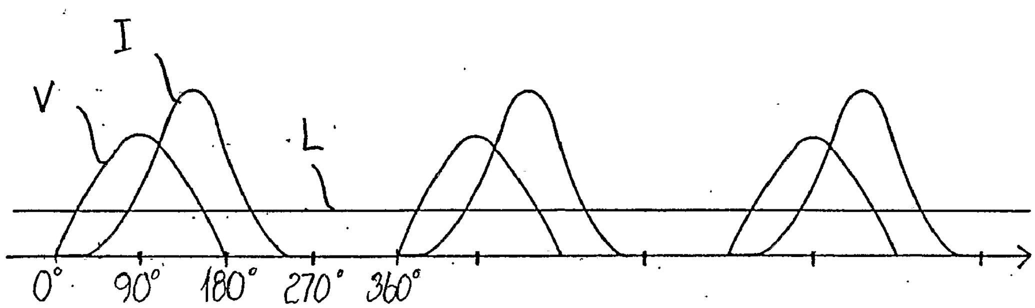

FIG. 19

Electronic Patent Application Fee Transmittal

Application Number:	95002386
Filing Date:	15-Sep-2012
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Filer:	Lloyd L. Pollard II
Attorney Docket Number:	COOL-1.012

Filed as Small Entity

inter partes reexam Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
filing appeal brief inter partes reexam	2404	1	1000	1000
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
		Total in USD ($)		**1000**

Electronic Acknowledgement Receipt

EFS ID:	20516673
Application Number:	95002386
International Application Number:	
Confirmation Number:	7254
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Customer Number:	22852
Filer:	Lloyd L. Pollard II
Filer Authorized By:	
Attorney Docket Number:	COOL-1.012
Receipt Date:	24-OCT-2014
Filing Date:	15-SEP-2012
Time Stamp:	23:02:46
Application Type:	inter partes reexam

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1000
RAM confirmation Number	5980
Deposit Account	501001
Authorized User	POLLARD, LLOYD L.

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Respondent Brief - Requester	Final_Response_Brief.pdf	2351028 91fede24949756b6911fec843dc507596d5f709f	no	27
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
2	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit_1.pdf	499283 9f87079a2a3c71d98eb31634c4458bed0078115e	no	31
Warnings:					
Information:					
3	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit_2.pdf	241137 697908a071d94c643ae7c8ab1300fe31769a951b	no	18
Warnings:					
Information:					
4	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit_3.pdf	674508 288857aec5c1c6681e8daaefe7af03fc7a264315	no	16
Warnings:					
Information:					
5	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit_4.pdf	118741 f7626df6d9ac8792736eeeb913a6697887f53abd	no	4
Warnings:					
Information:					
6	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit_5.pdf	478424 154d876ad70b8559ac276d320ebbc9841a9f36f0	no	14
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Information:					
7	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit_6.pdf	3138301 5b0e6c81bdd6c2d5890f6009bd2d95d4871f813a	no	61
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8	Fee Worksheet (SB06)	fee-info.pdf	29814 bcc6b5d1a4fd05a699e3a385a8da539fbffa4210	no	2

Warnings:	
Information:	
Total Files Size (in bytes):	7531236

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

EXHIBIT 7 TO RESPONDENT'S/REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of	:	Andre Sloth Eriksen
U.S. Patent No.	:	8,245,764
Application No.	:	13/269,234
Issue Date	:	August 21, 2012
Filing Date	:	October 7, 2011
Title	:	COOLING SYSTEM FOR A COMPUTER SYSTEM

REQUEST FOR *INTER PARTES* REEXAMINATION

FILED VIA ELECTRONIC FILING SYSTEM ON SEPTEMBER 14, 2012
COMMISSIONER FOR PATENTS

Mail Stop *Inter Partes* Reexam
ATTN: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to 35 U.S.C. §§ 311 *et seq.*, as amended by the Leahy-Smith America Invents Act, reexamination of all claims (i.e., claims 1 through 18) of United States Patent No. 8,245,764 (hereinafter "the '764 Patent") is requested.[1] The '764 Patent issued on August 21, 2012, to Eriksen and purportedly was assigned to Asetek A/S (hereinafter "Asetek") (collectively hereinafter the "Applicants") from U.S. Patent Application No. 13/269,234 (hereinafter, the "Application") filed on October 7, 2011 (hereinafter the "Application Date").

The '764 Patent is currently the subject of litigation in the case styled Asetek Holdings, Inc v. CoolIT Systems, Inc., Case No. 3:12-cv-4498, now pending in the United States District Court for the Northern District of California (hereinafter "the Concurrent Litigation"). The Concurrent Litigation does not preclude the present Request for Reexamination.

Requester CoolIT Systems Inc. ("Requester") respectfully submits that it shows herein a reasonable likelihood that at least one, and indeed all, of claims 1 through 18 ("the challenged claims") of the '764 Patent should be and will be cancelled or at least narrowed in view of the prior art. This reasonable likelihood that Requester will prevail (hereinafter, "Reasonable Likelihood") is based in part on previously uncited prior art that renders the claims invalid.[2] Accordingly, Requester respectfully asks that this Request for *Inter Partes* Reexamination (hereinafter "Request") be granted and that the claims be cancelled.

Pursuant to 37 C.F.R. § 1.915(b)(8), Requester CoolIT Systems Inc. is the sole real-party-in-interest.

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[1] A complete copy of the '764 Patent, including any certificates of correction, disclaimer or reexamination, is attached as Appendix A.

[2] All of the prior art cited herein against the challenged claims is listed in the Information Disclosure Statement attached as Appendix B.

I. REQUESTER SATISFIES THE "REASONABLE LIKELIHOOD" OF PREVAILING REQUIREMENT FOR *INTER PARTES* REEXAMINATION UNDER CHAPTER 31, 35 U.S.C., AS AMENDED BY THE ACT

Requester satisfies each requirement for *Inter Partes* reexamination of the '764 Patent pursuant to Chapter 31 of Title 35, United States Code, as amended September 16, 2011, by the Leah-Smith America Invents Act ("the Act").

Section 312(a) of Chapter 31, as amended by Section 6(c)(3)(A)(i)(I) of the Act, provides (emphasis added):

> (a) REEXAMINATION. – Not later than 3 months after the filing of a request for inter partes reexamination under section 311, the Director shall determine whether **the information presented in the request shows that there is a reasonable likelihood that the requester would prevail with respect to at least 1 of the claims challenged in the request**, with or without consideration of other patents or printed publications. A showing there is a reasonable likelihood that the requester would prevail with respect to at least 1 of the claims challenged in the request is not precluded by the fact that a patent or printed publication was previously cited by or to the Office or considered by the Office.

Requester herein demonstrates such Reasonable Likelihood, and more, by demonstrating that each challenged patent claim is fully anticipated by or obvious from one or more prior art references (Section IX). Requester relies upon the entirety of this Request to satisfy the required "reasonable likelihood" showing, but immediately below, Requester highlights how one particular reference (Laing) fully disclosed the "claimed invention" of '764 Patent claim 10, thus demonstrating a "reasonable likelihood" that at least claim 10 will be cancelled on account of this Request.

A. OVERVIEW OF THE '764 PATENT

The '764 Patent matured from U.S. Patent Application No. 13/269,234, filed October 7, 2011, as a purported continuation of U.S. Patent Application No. 11/919, 974 (the "Parent Application"), a national stage filing of International Patent Application No. PCT/DK2005/000310, filed May 6, 2005 (the "International Application").[3] The '764 Patent is generally directed to a liquid cooling system for a computer system.

The '764 Patent remains within its period of enforceability for reexamination purposes, has not expired due to non-payment of maintenance fees, and has yet to be held invalid or unenforceable by any court. Requester is unaware of any disclaimer or reexamination certificates for the '764 Patent.

THE '764 PATENT CONCERNS A LIQUID COOLING SYSTEM HAVING "VERTICALLY" SPACED "THERMAL EXCHANGE" AND "PUMP" CHAMBERS

As with conventional liquid cooling systems, the liquid cooling system described in the '764 Patent includes a reservoir, a heat exchanging interface for transferring heat to a cooling liquid, a radiator for dissipating heat from the cooling liquid, and a pump for circulating the cooling liquid through the cooling system. Appendix A, '764 Patent, 1:65-2:12. The alleged invention in the '764 Patent concerns a pump chamber vertically spaced from a thermal exchange chamber. Id. (claims 1, 10 and 15); Appendix D, Amendment dated April 6, 2012, pp. 8-14 and Examiner's Reasons for Allowability, pp. 2-3.

For example, the reservoir claimed in each independent claim has a thermal exchange chamber and a pump chamber. Appendix A, '764 Patent, claims 1, 10 and 15. The thermal exchange chamber and the pump chamber are coupled to each other, through one or more passages configured for fluid communication. *See* Appendix A, '764 Patent, 22:26-23:8, claim 10.

Nonetheless, the claimed vertically spaced thermal exchange and pump chambers were inadequately described when the International Application (also referred to herein as the "'761 Publication") was filed. Indeed, the subject matter the Patent Owner believed to be patentable was only adequately described well after the Parent Application was filed as a national stage of the International Application (also referred to herein as the "'761 Publication").

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[3] The Patent Owner's published International Application (WO 2006/119761) is prior art under 35 U.S.C. § 102(b) as to all claims, since subject matter purportedly conferring patentability to those claims was inadequately described in the International Application under § 112. NOTE: Requester raises § 112 issues in the Request solely for purposes of attempting to determine priority dates for claimed subject matter, and not as a basis for this Request, for that would be improper under the Act.

For example, FIG. 20 in the '764 Patent, reproduced below for convenience, first appears in the filed history of the Parent Application on January 9, 2009, almost four years after the International Application was filed and more than two years after it published. Appendix E, Preliminary Amendment dated January 9, 2009, p. 4. Yet FIG. 20 purports to illustrate a cross-sectional view of a reservoir housing having a reservoir with a pump chamber 46 vertically spaced from a thermal exchange chamber 47A, as claimed.

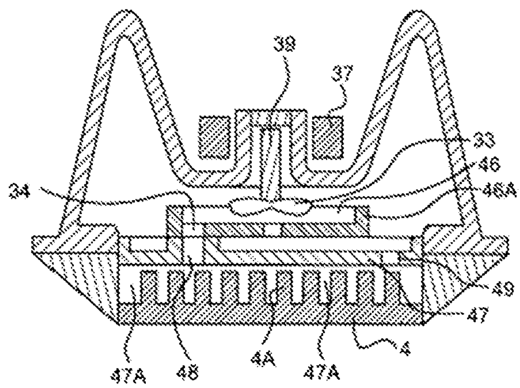

FIG. 20

FIGURE 1 - FIG. 20 IN '764 PATENT

For example, independent claim 10 of the '764 Patent purports to claim a cooling system of the type shown in FIG. 20. In particular, independent claim 10 recites (with annotations added to reflect features shown in new FIG. 20 as discussed in the '764 Patent's specification):

> A cooling system for a computer system, comprising:
> a centrifugal pump adapted to circulate a cooling liquid, the pump including:
> an impeller [33] exposed to the cooling liquid; and
> a stator [37] isolated from the cooling liquid;
> a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:
> a thermal exchange chamber [47A] adapted to be positioned in thermal contact with the heat-generating component;
> a separate pump chamber [46] vertically spaced apart from the thermal exchange chamber and
> coupled with the thermal exchange chamber through one or more passages ["outlet 34," 48, 49]configured for fluid

> communication between the pump chamber [46] and the thermal exchange chamber [47A], and wherein at least one of the one or more passages is offset from a center of the impeller.

The corresponding Notice of Allowance was predicated on the claimed "pump chamber vertically spaced from the thermal exchange chamber." *See*, Appendix D, Notice of Allowance dated May 23, 2012, pp. 2-3.

B. LAING DISCLOSES A COOLING SYSTEM HAVING VERTICALLY SPACED THERMAL EXCHANGE AND PUMP CHAMBERS AND ANTICIPATES CLAIM 10 OF THE '764 PATENT

But, the '764 Patent's idea of a pump chamber vertically separated from a thermal exchange chamber to circulate a cooling liquid is an old one, described in multiple prior art references that were not disclosed to or considered by the Patent Office when it granted the '764 Patent. As a first example, a previously published patent application, Oliver Laing's U.S. Publication No. 2004/0052663, described the same concept a number of years earlier, using strikingly similar language as the '764 Patent.

Laing's patent application was filed on May 7, 2003, and published on March 18, 2004, and thus qualifies as prior art to the '764 Patent under Section 102(b) (even if any claim might somehow enjoy priority from the International Application). Laing's publication – not considered by the Patent Office – described a "device for the local cooling" of, for example, a microprocessor.

An example of Laing's device is shown immediately below (with annotations reflecting Laing's terminology for convenience):

APPENDIX J - Applicant's International Publication No. WO 2006/119761 (hereinafter the "**International Application**" or the "**'761 Publication**")

IV. OVERVIEW OF THE TECHNOLOGICAL TEACHINGS APPLICANTS ARGUED WERE MISSING IN THE ART

U.S. Publication No. 2005/0069432 formed the basis for an anticipation rejection of independent claims 1 and 10 in the '764 Patent (corresponding to claims 1 and 12 in the application leading to the '764 Patent), and was the lead reference in an obviousness rejection of claim 15 in the '764 Patent (corresponding to claim 17 in the application). In the only substantive response to prior art rejections during prosecution of the '764 Patent, Applicants amended independent claim 1 and argued that the old and well-known vertically spaced thermal exchange and pump chambers recited in the claims are lacking from the lead reference, and that somehow such old features confer patentability to the claims. Appendix D, Amendment dated April 6, 2012, pp. 8-15. The Examiner did not object or respond that other references cited on the face of the '764 Patent disclose those allegedly missing features, as a different Examiner did in the Parent Application.

Despite claiming substantially overlapping subject matter, the Parent Application and the application leading to the '764 Patent were assigned to different examiners, with dramatically different outcomes for claims to such subject matter. Indeed, rejected and now cancelled, claim 113 from the Parent Application is identical to issued claim 15 in the '764 Patent, as Appendix K illustrates. In the Parent Application, the Examiner rejected claim 113 as being unpatentable over U.S. Patent No. 6,019,165 combined with U.S. Publication No. 2005/0083656.

Nonetheless, the Examiner in the '764 Patent proceeded to allow the claims, as amended, and conclusorily stated that the "thermal exchange chamber formed below the pump chamber and vertically space [*sic*: spaced] apart from the pump chamber" are lacking from the applied references. Appendix D, Notice of Allowability dated May 23, 2012, Reason for Allowance, pp. 2-3.

As explained below, Laing and other prior art references cited herein supply some or all of the very features Applicants alleged were lacking from the references applied during prosecution of the '764 Patent. Thus, these references would have been important to a reasonable Examiner in deciding patentability.

VII. Legal Standards for Reexamination – Claim Construction

During *inter partes* reexamination, claims are interpreted according to the "broadest reasonable interpretation" standard. *See* MPEP 2258(I)(G). The analysis in this Request is intended to comport with this standard.

According to the Patent Owner, Asetek A/S, an apparently wholly owned subsidiary of Asetek Holdings, Inc., one or more of the '764 Patent claims allegedly cover an independently developed, liquid-cooled heat sink. *See* Appendix I. Not only is the Patent Owner's asserted claim scope far beyond the contemplation of the '764 Patent's specification and original examination, but such assertions of an overly broad claim scope necessarily ensnares multiple anticipatory prior art references that were not considered during the original prosecution.

Whether the claims are interpreted in the overly broad manner proffered by Patent Owner, or under a narrower, more reasonable interpretation, the claims are unpatentable over the prior art described herein.

Because the standards of claim interpretation applied by the Federal Courts during patent litigation proceedings differ from the claim interpretation standard that must be used in the Patent Office during claim reexamination proceedings, any interpretations of terms in the claims discussed herein for the purpose of reexamination are not binding on Requester in any litigation related to the '764 Patent (or other patents) and do not necessarily correspond to the construction of claims under the legal standards that must be applied by the Federal Courts in litigation. *See In re Zletz*, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). In applying the particular prior art references identified herein, Requester neither admits nor acquiesces as to any interpretation of any claim of the '764 Patent asserted now or in the future in litigation before the Federal Courts, or in any other proceeding before any other tribunal. Requester reserves all rights to challenge in any proceeding, before any forum, any claim interpretations proferred by the Patent Owner in putting forth allegations of infringement against Requester.

VIII. PROSECUTION HISTORY OF THE '764 PATENT

The '764 Patent matured from U.S. Patent Application No. 13/269,234, filed October 7, 2011, as a purported continuation of U.S. Patent Application No. 11/919, 974 (the "Parent Application"), a national stage filing of International Patent Application No. PCT/DK2005/000310, filed May 6, 2005 (the "International Application"). As explained more fully below, the '764 Patent issued in error after an incomplete and faulty examination permitted a number of prior art references to escape proper consideration.

A. THE '764 PATENT CLAIMS ARE NOT ENTITLED TO AN EFFECTIVE FILING DATE EARLIER THAN THE ACTUAL FILING DATE (OCTOBER 7, 2011

On its face, the '764 Patent alleges priority to U.S. Patent Application No. 11/919,974 (hereinafter, the "Parent Application"), purportedly filed on November 6, 2007, claiming benefit of International Application No. PCT/DK2005/00310 (the "International Application"), filed on May 6, 2005, according to the face of the '764 Patent.

The Patent Owner amended the Parent Application no fewer than four times before filing the application leading to the '764 Patent. Notwithstanding substantially adding to the specification and drawings, and substantially revising the claims, compared to the original disclosure filed in the International Application, the application leading to the '764 Patent was filed as a purported "continuation" patent application rather than as a "continuation-in-part patent" application. Requester submits that neither the International Application nor the Parent Application, as filed, provided a written description or an enabling disclosure of the full scope of the purported "invention" recited in the challenged claims in the '764 Patent. As a consequent, the challenged claims are not entitled to the benefit of either of the earlier applications' filing dates.

The International Application included 36 claims and on filing the Parent Application on November 6, 2007, the Patent Owner substituted the original claims with claims 37-72. Appendix E, Preliminary Amendment dated November 6, 2007, p. 3.

On January 9, 2009, ***more than two years*** after the International Application published (i.e., November 16, 2006), claims 73-96 were substituted for claims 37-72, original FIG. 17 was amended ***and***

an entirely new drawing, FIG. 20, was added to the Parent Application. Appendix E, Preliminary Amendment dated January 9, 2009, p. 4. Patent Owner filed another Preliminary Amendment on March 10, 2011, cancelling claims 93-96 in connection with an ultimately denied Green Tech Petition. Appendix E, Preliminary Amendment dated March 10, 2011, p. 7.

Almost five years after the International Patent Application published, Applicant filed a Fourth Preliminary Amendment, ***substantially adding to the specification*** and substituting claims 97-116 for claims 73-92. Appendix E, Preliminary Amendment dated July 14, 2011, p. 8. ***In particular, the specification was amended to discuss features shown in new FIG. 20 (added more than two years after the International Application published)***. For example, paragraph [0166] was amended as follows (emphasis added to show new text):

> [0166]The reservoir housing 14 has a recess 40 in the centre on the upper side of the reservoir. The recess 37 is intended for accommodating a stator 37 of an electrical motor driving an impeller 33 of the pump, said impeller being attached to a shaft 38 of a rotor 39 of the electrical motor. The recess 40 has an orifice 41, four sidewalls 42, a bottom 43 and a circular jacket 44 extending from the bottom 43 of the recess 40 and outwards towards the orifice 41 of the recess 40. The interior (not shown) of the jacket 44 is intended for encompassing the rotor 39 of the pump. As shown in FIG. 20, the impeller 33 is housed in a recess on the underside of the reservoir housing 14, the recess being an extension of the interior of the jacket 44.

As well, Paragraph [0172] was amended as follows (emphasis added to show amendments):

> [0172]An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33. Thus, the pump functions as a centrifugal pump. The inlet if of the pump chamber 46 is the entire opening into the cavity that the pump chamber configures, said cavity being in direct communication with the interior of the reservoir housing 14 as such. An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading

> cooling liquid from the pump chamber 46 to a thermal exchange chamber 47A provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir housing 14. Thus, the area enclosed between the underside of the reservoir housing 14 and the heat exchange surface 4 constitutes an enclosed space for circulating the cooling liquid therethrough. The enclosed spaced is divided into two separate chambers by the impeller cover 46A and the intermediate member 47, as shown in FIG. 20. The impeller cover 46A interfaces with the recess on the underside of the reservoir 14 to define the pump chamber 46 which houses the impeller 33, while the intermediate member 47 and the heat exchange surface 4 together define the thermal exchange chamber 47A.

At least because FIG. 20 and the text emphasized above were added well after the Parent Application was filed as a U.S. national stage application, there is no evidence that the disclosure in the Parent application or the International Application ***at the time they were filed*** provided a written description of the purported invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to make and use the same.

Another line of amendments to the specification purportedly attempted to clarify that feature 14 shown in the drawings is a "reservoir housing" as opposed to a "reservoir." Apparently, Applicant recognized that the term "reservoir," as recited elsewhere in the specification and claims, refers to a "chamber" and that feature 14 is not a "chamber" but rather a "housing." *See, e.g.,* Appendix E, July 14, 2011, Preliminary Amendment, p. 8; "Marked-Up Copy of Substitute Specification," ¶¶ [0144], [0153], [0154], [0158]-[0160], [0164] (stating "The reservoir housing 14, as shown in FIGS. 17 and 20, is in the form of a double-sided chassis configured to mount an electrical motor. The reservoir housing 14 has basically the same features as the reservoir housing shown in FIG. 15-16." (emphasis added to show amendments)), [0166], [0168]-[0172], [0178], [0180]-[0182]. At the time of filing the International and Parent Applications, use of the term "reservoir" interchangeably to mean a "chamber" and a "housing" was confusing. Thus, Requester submits that the description of the purported "invention" was not set forth in sufficiently full, clear, concise and exact terms at the time either of the International Application or the Parent Application was filed. Moreover, such uncertain use of the term "reservoir" throughout the various claimings during prosecution of the International and the Parent Applications could not have pointed out and distinctly defined any subject matter sufficiently clearly as to put the public on notice as to the subject matter regarded by the Patent Owner regarded as his "invention."

As explained below, in Section VIII.B., Patent Owner and Examiner considered vertically separate thermal exchange and pump chambers somehow to confer patentability to claims 1-18 in the '764 Patent. *See* Appendix D, Amendment dated April 6, 2012, p. 8-10, and Notice of Allowability dated May 23, 2012, p. 2-3. Nonetheless, that is precisely the subject matter added to the Parent Application years after the U.S. national phase filing.

In the first Office Action, Examiner Duke rejected all claims as being anticipated by the WO 2006/119761, the publication of the International Application from which priority benefit in the '764 Patent is claimed. Appendix D, Office Action dated December 20, 2011, p. 2. In a Reply dated January 30, 2012, the Patent Owner alleged that the application leading to the '764 Patent is entitled to priority to the International Application, with no substantive analysis of whether claimed subject matter absent from the International Application might somehow be entitled to such priority.[4]

The subject matter added to the Parent Application after its actual filing date is not supported by the original filing, yet was relied on to confer patentability to each and every claim in the '764 Patent. As a consequence, no claim in the '764 Patent is entitled to priority from the Parent Application's filing date. Indeed, Requester submits that no claim is entitled to an effective filing date earlier than the actual date of filing the application leading to the '764 Patent.

For at least these reasons, none of the claims in the '764 Patent is entitled to priority from any earlier-filed applications. Accordingly, the Patent Office should declare for purposes of this

[4] As indicated in the Patent Owner's Reply and in the subsequent Office Action dated March 13, 2012, a conversation occurred between the Patent Owner's attorney and Examiner Duke, but whether the conversation dealt with substantive matters is unclear from the record. *See* Appendix D, Reply dated January 30, 2012, p. 2, and Office Action dated March 13, 2012, p. 2.

reexamination that the challenged patent claims' effective filing date is their actual filing date, i.e., October 7, 2011.[5]

B. SUMMARY OF PROSECUTION OF THE '764 PATENT

On filing the application leading to the '764 Patent, Applicant disclosed a number of prior art references before a first Office Action on the merits issued. Appendix D, Information Disclosure Statement filed October 7, 2011. The examiner appears on December 13, 2011, to have considered the Information Disclosure Statement listing U.S. Patent No. 5,731,954, filed August 22, 1996 (Cheon) and U.S. Patent No. 7,325,591, filed February 18, 2005 (Duan). Appendix D, Information Disclosure Statements.

In the first Office Action, Examiner Duke rejected all claims as being anticipated by the '761 Publication (i.e., the publication of the International Application from which priority benefit in the '764 Patent is alleged). Appendix D, Office Action dated December 20, 2011, p. 2. Given the anticipation position propounded by Examiner Duke, all prior art references then of record were presumably set aside in favor of the published International Application. Those references included U.S. Patent No. 7,325,591 (Duan) and U.S. Patent No. 5,731,954 (Cheon), collectively referred to below as the "Set-Aside References."

In responding to the anticipation rejection based on the '761 Publication, Patent Owner merely recited 35 U.S.C. § 120 followed by allegations of filing dates purportedly corresponding to the chain of applications listed in the '764 Patent, as well as a portion of a filing receipt reciting a claim of priority. Appendix D, Reply dated January 30, 2012. However, Patent Owner's reply omitted key information concerning the extent to which the specification, drawings and claims had been amended. Id.

[5] Requester does not raise any Section 112 issues as a basis for instituting a reexamination pursuant to this Request, for that would be improper under the Act. Rather, Section 112 issues are raised insofar as needed to determine those references qualifying as prior art to the claims. That said, nothing herein is deemed to be an admission by Requester that any claims satisfy any aspect of Section 112.

According to standard Patent Office procedure, the merits of an applicant's claim of priority are not considered during the original prosecution unless the applicant claims priority to a foreign application, or there is an interference. (MPEP § 201.15). Thus, Examiner Duke would not have considered the merits of whether the '761 Publication indeed was prior art, particularly since he was not responsible for examining the earlier applications that had been amended and was presented with Applicant's assertions that the application leading to the '764 Patent somehow was entitled to priority from the '761 Publication.

On that basis, Examiner Duke simply withdrew the anticipation rejections based on the '761 Publication, leaving no evidence that the merits of Patent Owners allegations of priority under Sections 120, 371 were ever considered in view of the substantial post-filing amendments.

After withdrawing the rejections based on the published International Application, the Examiner rejected claims 1-4, 6-9 and 11-16 for anticipation by U.S. Publication No. 2005/0069432 (Tomioka); claim 5 was rejected as being obvious from the combination of Tomioka and U.S. Publication No. 2005/0061482 (erroneously identified in the Office Action as Publication No. "2005/0069432," and referred to in this Request as "Lee"); claims 10, 17, 18 and 20 were rejected as being obvious from Tomioka and U.S. Patent No. 6,019,165 (Batchelder); and claim 19 was rejected for being obvious from Tomioka, Batchelder and Lee. Appendix D, Office Action dated March 13, 2012, pp. 2-9.

After apparently sending Examiner Duke an e-mail (not entered in the record), Patent Owner's attorney telephonically interviewed Examiner Duke and SPE Jules. Appendix D, Amendment dated April 6, 2012, pp. 8-9.

In the April 6, 2012, Amendment, Patent Owner argued that none of the applied references provided "a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber," as recited in amended claim 1 (emphasis shows amendment).[6] In support of that position, Patent Owner alleged that, rather than being vertically spaced apart chambers, Tomioka's

[6] Claim 10 (then pending claim 12) recited: "a separate pump chamber vertically spaced part [*sic*: apart] from the thermal exchange chamber …"; and claim 15 (then pending claim 17) recited: "the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction." *Id*. at pp. 9 and11.

thermal exchange chamber was "radially outwards of the pump chamber." *Id.* at pp. 9-10. Thus, whatever "vertically spaced apart" might mean, the Patent Owner took the position that it does not mean "radially outwards of the pump chamber."

Subsequently, the Examiner allowed all claims, emphasizing as a basis for allowability the claimed "thermal exchange chamber formed below the pump chamber and vertically space [*sic*: spaced] apart from the pump chamber."[7] Appendix D, Notice of Allowability dated May 23, 2012, Reason for Allowance, pp. 2-3.

As noted, the file history lacks any indication that the examiner considered the Set Aside References after withdrawing the rejections based on the International Application, even after new features were added to the claims. Indeed, neither the Patent Owner nor the Examiner subsequently mentioned any of the Set Aside References.

Thus, the newly discovered Laing and Hamman references have entirely escaped review. In addition, Duan and Cheon were not fully considered in view of the newly discovered references, or insofar as they appear to have been set aside. As well, whether the published International Application is prior art under 35 U.S.C. § 103(a) and (c) in view of the additions to the specification and drawings has entirely escaped review.

On that basis, the application matured into the '764 Patent.

IX. IDENTIFICATION OF THE REASONABLE LIKELIHOOD THAT REQUESTER WILL PREVAIL

The prior art references provided in this Request raise a Reasonable Likelihood as to claims 1 through 18 in the '764 Patent. This section summarizes the reasonable likelihood of prevailing raised by

[7] Despite claiming substantially overlapping subject matter, the Parent Application and the application leading to the '764 Patent were assigned to different examiners, with dramatically different outcomes for claims to that subject matter. Indeed, rejected and now cancelled, claim 113 from the Parent Application is identical to issued claim 15 in the '764 Patent, as Appendix K illustrates.

of ordinary skill in the art would have found using a flexible conduit obvious from a review of Duan and Cheon to provide flexibility in positioning the remote radiator.

Thus, the combination of limitations recited in claims 1-18 would have been obvious from a review of Duan and Cheon when viewed in a light not previously considered. Accordingly, Duan and Cheon present a substantial new question as to each of claims 1-18.

J. Reasonable Likelihood #10: Duan and Hamman

As noted above, Duan raises a Reasonable Likelihood with regard to claims 1-18. That argument will not be repeated here, and is incorporated by reference.

Even if including the aluminum or copper with Duan's bottom plate 31, or coupling Duan's radiator and reservoir with flexible conduits, might somehow have not been obvious to one of ordinary skill in the art after reviewing Duan, the Hamman reference cures any such deficiency. Hamman explicitly discloses a copper heat exchanger and flexible conduits for fluidly coupling a reservoir and a radiator.

Thus, each of claims 8, 9, 13 and 15-18 would have been obvious to one of ordinary skill in the art following a review of Duan and Hamman. Accordingly, Duan combined with Hamman raises a Reasonable Likelihood under 35 U.S.C. § 103 as to claims 8, 9, 13 and 15-19.

K. Reasonable Likelihood #11: Koga

The newly found Koga reference qualifies as prior art under 35 U.S.C. § 102(b), having been published on March 18, 2004, more than one year before the actual filing date of the Parent Application and more than seven years earlier than the actual filing date of the '764 Patent. Even if the claims in the '764 Patent ultimately might be deemed to be entitled to priority from the International Application, the newly found Koga reference presumptively qualifies as prior art under 35 U.S.C. § 102(a) and (e). Koga was cited by neither the Examiner nor the Applicants, and thus was not considered during prosecution of the '764 Patent.

Koga discloses each of the above-identified features Applicants said were lacking from the references applied during prosecution of the '764 Patent, namely vertically separated pump and thermal exchange chambers. Indeed, Koga discloses each and every feature arranged in the manner recited in claims 1-18. Thus, Koga anticipates each and every claim in the '764 Patent.

In particular, Koga discloses a cooling device for having a closed circulating channel for circulating coolant. Appendix I, Koga, Abstract. In the channel, a radiator and a contact heat-exchanger type centrifugal pump are provided. Id. Heat is absorbed by the coolant passing through the chambers in the pump housing and is rejected from a remotely positioned radiator. *See*, Koga, Abstract, FIGS. 7 and 8.

As shown in Figure 3, below, Koga's device 1A includes vertically separate pump and thermal exchange chambers. Appendix I, Koga, Specification, 9:10-47; FIG. 7. For example, the "sucking channel" 19 extends radially inward toward the shaft 17. Id. At least a portion of the channel 19 defines a thermal exchange chamber (e.g., a portion "above" the lead line from reference numeral 15B in FIG. 7) adapted to be positioned in thermal contact with the heat-generating component 2, precisely as claimed in the '764 Patent. Id. A separate pump chamber (e.g., Koga's "pump room" 15A, occupied by Koga's impeller 12) is vertically spaced apart from the thermal exchange chamber, e.g., by the horizontal wall having "protrusions" 24A. Id. As shown in Figure 3, below, the channel 19 terminates below the pump chamber 15A and defines a gap through which coolant 41 can flow from the channel 19 into the pump chamber, coupling the thermal exchange chamber and the pump chamber with each other through one or more passages configured for fluid communication between the pump chamber as claimed. Id. The gap adjacent the terminal end of the channel 19 is offset from a center of the impeller 12, as claimed. Id. As shown in Koga's FIG. 1, the outlet conduit 4 fluidly couples the reservoir 1A with the radiator 3, and thus also must fluidly couple the thermal exchange chamber with the pump chamber (e.g., fluid discharged from the pump chamber flows through the conduit 4, through the radiator 3 and into the channel 19 shown in FIG. 7). Id. at FIGS. 1 and 7. As shown in FIG. 8, the discharge channel 20 is positioned tangentially relative to the pump chamber. Id. at FIG. 8. As well, the stator 14 is positioned above a portion of Koga's double-sided chassis 11, the impeller 12 is positioned below the portion of the double-sided chassis 11 in contact with the coolant. Id. The wall 11 isolates the stator 14 from the coolant. Id. Koga discloses that the casing 15 can be formed of a material having a high thermal conductivity, such as, for example, aluminum or copper. Id. at 5:14-18. The thermal exchange chamber includes a plurality of pins or fins. Id. at FIG. 8. Koga discloses that the fluid coupling between the reservoir and the radiator can be flexible. Id. at 1:67-2:1.

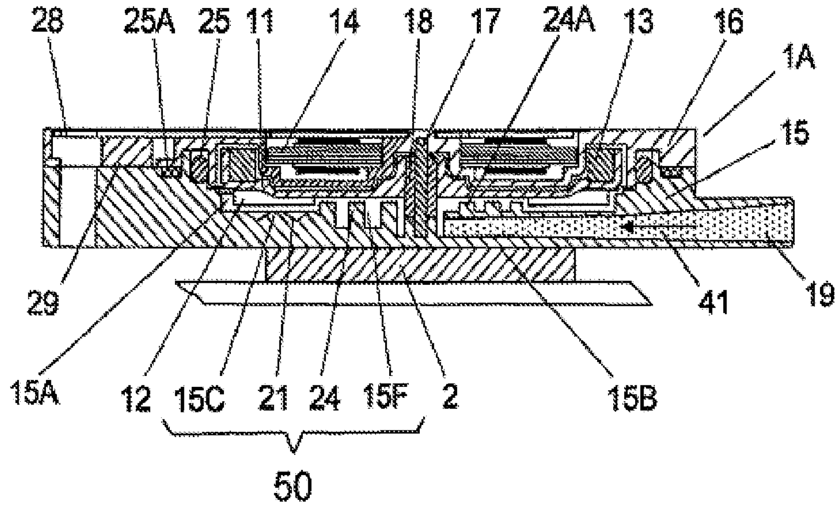

FIGURE 5 – KOGA'S FIG. 7

Specifically, Koga discloses a cooling system for a heat-generating component including a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid. The pump includes a stator and an impeller, with the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid. The cooling system also includes a reservoir adapted to pass the cooling liquid therethrough. The reservoir includes a pump chamber including the impeller and formed below the chassis. The pump chamber is defined by at least an impeller cover having one or more passages for the cooling liquid to pass through. A thermal exchange chamber is formed below the pump chamber and vertically spaced apart from the pump chamber. The pump chamber and the thermal exchange chamber are separate chambers that are fluidly coupled together by the one or more passages. The cooling system also includes a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber. The heat exchanging interface is configured to be placed in thermal contact with a surface of the heat-generating component. Koga's system also includes a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.

Koga's chassis shields the stator from the cooling liquid in the reservoir. The heat-exchanging interface includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side. The first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber. The features include at least one of pins or fins. A passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller. The fluid passage that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller. Koga's impeller includes a plurality of curved blades. Koga's heat-exchanging interface includes one of copper and aluminum. Koga discloses that the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir.

Thus, Koga's disclosure of a thermal exchange chamber vertically separated from a pump chamber provides for and overcomes the purported deficiencies of the prior art emphasized by Applicants during prosecution of the '764 Patent, without objection by the Examiner. Moreover, Koga discloses each and every feature claimed in the '764 Patent. Accordingly, none of claims 1-18 can be patentable over Koga.

Thus, by virtue of disclosing all limitations set forth in claims 1-18, Koga raises a Reasonable Likelihood under 35 U.S.C. § 102 as to those claims.

L. REASONABLE LIKELIHOOD #12: THE '761 PUBLICATION AND LAING

As noted above, each claim in the '764 Patent is entitled to an effective filing date no earlier than the actual filing date of the '764 Patent. For example, as explained above, the '761 Publication lacks sufficient written description under Section 112 for the vertically spaced pump chamber and thermal exchange chamber features claimed in claims 1-18 for those claims to enjoy priority from the filing date of the '761 Publication. To be clear, Requester does not presently raise the Section 112 issue as a basis for this Request, for that would be improper in a Request for *Inter Partes* Reexamination.

Rather, the Section 112 "written description" deficiency is raised to emphasize that none of the claims in the '764 Patent may be back dated to the filing date of the '761 Publication, regardless of whether the disclosure in the '761 Publication might have enabled one of ordinary skill in the art to make use the alleged "invention" ultimately claimed in the '764 Patent. See, e.g., Tronzo v. BioMet, Inc., 156

housing."*See* Appendix D, Amendment dated April 6, 2012 (amending specification to emphasize the distinction between "reservoir" and "reservoir housing"). Thus, claim 18 is nonsensical since a "reservoir" has no physical structure (i.e., the claimed "top wall"). Nonetheless, solely for purposes of construing claim 18 in this Request, the recited "top wall" will be construed to mean a "top wall" of a housing positioned adjacent the claimed reservoir.	

K. CLAIMS 1-18 ARE ANTICIPATED BY KOGA

As the claim chart below illustrates, Koga discloses each and every feature arranged as claimed in claims 1-18 in the '764 Patent. Thus, Koga anticipates claims 1-18.

U.S. Patent No. 8,245,764 Claim Language	Correspondence to Koga
1. A cooling system for a heat-generating component, comprising:	Koga discloses exactly this type of system. *See*, Appendix I, Koga, FIG. 1; Specification, 8:32-39.

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid,	Koga discloses exactly this limitation. Koga's casing 15 and 16 is a double-sided chassis adapted to mount a pump 1A. *See* Koga, FIG. 7. The pump 1A is configured to circulate a coolant. Id. at 9:52-54; 10:18-21.
the pump comprising a stator and an impeller,	Koga discloses exactly this limitation. Koga's pump 1A has a stator 14 and an impeller 11. Id. at 9:48-52; FIG. 7.
the impeller being positioned in a recess on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;	Koga discloses exactly this limitation. Koga's impeller 1 (FIG. 7) is positioned in a recess formed by the casing 16 (FIG. 7) on the underside of the casing. The corresponding stator 14, is positioned on the upper side of the casing 16 and is isolated from the coolant in the "pump room 15A".

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including: **Construction of "reservoir"**: "The reservoir serves as **a storage unit for excess liquid not capable of being contained in the remaining components**. The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid." ['764 Patent, 10:45-49.] Applicant purports that a "reservoir" is not a "reservoir housing."*See* Appendix D, Amendment dated April 6, 2012 (amending specification to emphasize the distinction between "reservoir" and "reservoir housing").	Koga discloses exactly this limitation. Koga's device 1A is adapted to pass the coolant 41 therethrough. Id. at 9:52-54; FIG. 7.
a pump chamber formed by the recess and including the impeller and formed below the chassis,	Koga discloses exactly this limitation. Koga's impeller 11, 13 (FIG. 7) is positioned in a recess formed by the casing 16 (FIG. 7) on the underside of the casing. The corresponding stator 14, is positioned on the upper side of the casing 16 and is isolated from the coolant in the "pump room 15A".

the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through;	Koga discloses exactly this limitation. Koga's pump chamber 15A is defined by at least the casings 15 and 16, forming an impeller cover as claimed. The casings define "sucking channel" 19 and discharge channel 20 for the cooling liquid to pass through. Id.
a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, **Construction of "vertically"** Based on Patent Owner's remarks in the reply dated April 6, 2012, "vertically spaced apart" purportedly is different than "radially outwards" in a plane of the impeller. Appendix D, Applicant's Reply dated April 6, 2012, pp. 8-10. For purposes of this Request, "vertically" is taken to mean "in a direction parallel to a rotational axis of the impeller."	Koga discloses exactly this limitation. An interior of the channel 19 defines a thermal exchange chamber as claimed. *See* Koga, Specification, 10:5-6; FIG. 7. The interior of the channel 19 is formed below the region occupied by the impeller 11 and is vertically spaced apart from that region. Id.

the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and **Construction of "coupled"** The Federal Circuit construed the phrase "coupled to," directing that it "should be construed broadly so as to allow an indirect attachment." <u>Bradford v. ConTeyor North America, Inc.</u> 2010 U.S. App. LEXIS 8869 (Fed. Cir., April 29, 2010).	Koga discloses exactly this limitation. As shown in FIG. 7, the region occupied by Koga's impeller11 is separated from the interior of the channel 19 by the upper wall of the channel 19. Koga's pump chamber 15A and thermal exchange chamber are fluidly coupled by the channels 19 and 20 (e.g., via the radiator 3). For example, the discharge channel 20 also fluidly couples the thermal exchange chamber (channel 19) and the pump chamber 15A insofar as coolant circulates from the pump chamber, through the channel 20, through the radiator 3 (FIG. 1) and returns to the thermal exchange chamber in the channel 19.
a heat-exchanging interface,	Koga discloses exactly this limitation. Koga's the lower portion of the casing 15 defines a heat-exchanging interface as claimed (e.g., the outer wall surface 15C contacts an upper surface of the component 2).
the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and	Koga discloses exactly this limitation. As shown, for example, in FIG. 7, the casing 15 forms a boundary wall of the thermal exchange chamber 19.
configured to be placed in thermal contact with a surface of the heat-generating component; and	Koga discloses exactly this limitation. The outer wall surface 15C of the casing 15 is configured to be placed in thermal contact with an upper surface of the component 2.

a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.	Koga discloses exactly this limitation. As shown in FIG. 1, Koga's system includes a heat radiator 3 fluidly coupled to the reservoir 1A and configured to dissipate heat from the coolant 41. *See*, Appendix I, Koga, Specification, 10:14-21.
2. The cooling system of claim 1, wherein the chassis shields the stator from the cooling liquid in the reservoir.	Koga discloses exactly this limitation. As shown in Koga's FIG. 7, a portion of the casing 16 is positioned between the stator 14 and the impeller 11, 13, shielding the stator 14 from coolant in the reservoir.
3. The cooling system of claim 1,	
wherein the heat-exchanging interface includes a first side and a second side opposite the first side, and	Koga discloses exactly this limitation. Koga's casing 15 has a first side (e.g., interior of channel 19) and a second side 15C opposite the first side.
wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and	Koga discloses exactly this limitation. The first side of the casing 15 contacts coolant in the channel 19.
the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.	Koga discloses exactly this limitation. Koga's outer wall surface 15C is configured to be in thermal contact with the component 2, as shown in FIG. 7. *See*, Appendix I, Koga, Specification 10:5-7.
4. The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-	Koga discloses exactly this limitation. Koga's inner surface of the casing 15 includes features adapted to increase heat transfer from the casing 15 to the coolant. *See*, Appendix I, Koga, FIG. 7 (protrusions 24, 24A), Specification, 9:34-39.

exchanging interface to the cooling liquid in the thermal exchange chamber.	
5. The cooling system of claim 4, wherein the features include at least one of pins or fins.	Koga discloses exactly this limitation. Koga's features 24, 24A are pins or fins. *See*, Id. at FIGS. 7 and 8.
6. The cooling system of claim 1, wherein a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller. **Construction of "coupled"** The Federal Circuit construed the phrase "coupled to," directing that it "should be construed broadly so as to allow an indirect attachment." Bradford v. ConTeyor North America, Inc. 2010 U.S. App. LEXIS 8869 (Fed. Cir., April 29, 2010).	Koga discloses exactly this limitation. As noted above, Koga's pump chamber 15A and thermal exchange chamber 19 are fluidly coupled by the opening adjacent the terminal end of the channel 19, as well as by the discharge channel 20. As shown in FIG. 8, the discharge channel 20 is offset from a center of the impeller 11, 13.
7. The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.	Koga discloses exactly this limitation. Koga's impeller 11 can include a plurality of curved blades 12. Id. at FIG. 4.

8. The cooling system of claim 1, wherein the heat-exchanging interface includes one of copper and aluminum.	Koga discloses exactly this limitation. Koga's casing 15 can be formed of copper or aluminum. Id. at 5:14-18 and 10:24
9. The cooling system of claim 1, wherein the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir.	Koga discloses exactly this limitation. Koga's radiator 3 can be fluidly coupled to the reservoir 1A using flexible conduits. *See*, Appendix I, Koga, Specification, 4:23-26 (stating "[c]irculating channel 4 is formed of flexible rubber having a low gas-permeability, such as butyl rubber tubing because this material allows flexible piping layout as well as preventing bubbles from entering into the tube"). Koga's radiator 3 is also configured to be positioned remote from the reservoir 1A. Id. at 8:32-39; FIGS. 1, 9 and 10.
10. A cooling system for a computer system, comprising:	Koga discloses exactly such a system.
a centrifugal pump adapted to circulate a cooling liquid, the pump including:	Koga discloses exactly this limitation. Koga's Abstract states "… a radiator and a contact-heat-exchanger type centrifugal pump are provided."
an impeller exposed to the cooling liquid; and	Koga discloses exactly this limitation. Koga's impeller 1 (FIG. 7) is exposed to the coolant in the pump chamber 15A.
a stator isolated from the cooling liquid;	Koga discloses exactly this limitation. Koga's stator 14 is isolated from the coolant in the "pump room 15A" by the wall of the casing 16 positioned between the stator 14 and the impeller 11, 13.

a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:	Koga discloses exactly this limitation. Koga's centrifugal pump 1A is configured to be thermally coupled to the heat generating component 2. *See*, Appendix I, Koga, Specification 10:5; FIG. 7.
a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;	Koga discloses exactly this limitation. Koga's channel 19 is adapted to be positioned in thermal contact with the component 2. Id. at FIG. 7.
a separate pump chamber	Koga discloses exactly this limitation. As shown in FIG. 7, the region occupied by Koga's impeller 11 (e.g., the "pump room 15A") is separated from the interior of the channel 19 by the upper wall of the channel 19.
vertically spaced apart from the thermal exchange chamber and **Construction of "vertically"** Based on Patent Owner's remarks in the reply dated April 6, 2012, "vertically spaced apart" purportedly is different than "radially outwards" in a plane of the impeller. Appendix D, Applicant's Reply dated April 6, 2012, pp. 8-10. For purposes of this Request, "vertically" is taken to mean	Koga discloses exactly this limitation. Koga's pump chamber 15A is vertically spaced from the channel 19.

"in a direction parallel to a rotational axis of the impeller."	
coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber, and **Construction of "coupled"** The Federal Circuit construed the phrase "coupled to," directing that it "should be construed broadly so as to allow an indirect attachment." <u>Bradford v. ConTeyor North America, Inc.</u> 2010 U.S. App. LEXIS 8869 (Fed. Cir., April 29, 2010).	Koga discloses exactly this limitation. Koga's pump chamber 15A and thermal exchange chamber 19 are fluidly coupled by the opening adjacent the terminal end of the channel 19, as well as by the discharge channel 20, allowing fluid communication between the pump chamber and thermal exchange chamber.
wherein at least one of the one or more passages is offset from a center of the impeller.	Koga discloses exactly this limitation. As shown in FIG. 7, the opening adjacent the terminal end of the channel 19, as well as the discharge channel 20, are offset from a center of the impeller.
11. The cooling system of claim 10, wherein a top wall of the reservoir physically separates the impeller from the stator.	Koga discloses exactly this limitation. Koga's stator 14 is isolated from the coolant in the "pump room 15A" by the top wall of the casing 16 positioned between the stator 14 and the impeller 11, 13.

12. The cooling system of claim 10, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component.	Koga discloses exactly this limitation. Koga's casing 15 thermally couples the interior of the channel 19 to the component 2. The outer wall 15C of the casing 15 is configured to be placed in thermal contact with the component 2.
13. The cooling system of claim 10, further including a heat radiator fluidly coupled to the reservoir using flexible conduits, wherein the heat radiator is configured to be positioned remote from the reservoir.	Koga discloses exactly this limitation. Koga's radiator 3 can be fluidly coupled to the reservoir 1A using flexible conduits. *See*, Appendix I, Koga, Specification, 4:23-26 (stating "[c]irculating channel 4 is formed of flexible rubber having a low gas-permeability, such as butyl rubber tubing because this material allows flexible piping layout as well as preventing bubbles from entering into the tube"). Koga's radiator 3 is also configured to be positioned remote from the reservoir 1A. Id. at 8:32-39; FIGS. 1, 9 and 10.
14. The cooling system of claim 10, wherein the fluid passage that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller.	Koga discloses exactly this limitation. As noted above, Koga's pump chamber 15A and thermal exchange chamber 19 are fluidly coupled by the opening adjacent the terminal end of the channel 19, as well as by the discharge channel 20, allowing fluid communication between the pump chamber and thermal exchange chamber. The discharge channel is positioned tangentially to the circumference of the impeller 11. *See*, Appendix I, Koga, FIG. 8.
15. A cooling system for a heat-generating component, comprising:	Koga discloses exactly such a system.
a pump adapted to circulate a cooling liquid, the pump including:	Koga discloses exactly this limitation. Koga's Abstract states "… a radiator and a contact-heat-exchanger type centrifugal pump are provided."

an impeller exposed to the cooling liquid; and	Koga discloses exactly this limitation. Koga's impeller 1 (FIG. 7) is exposed to the coolant in the pump chamber 15A.
a stator isolated from the cooling liquid;	Koga discloses exactly this limitation. Koga's stator 14 is isolated from the coolant in the "pump room 15A" by the wall of the casing 16 positioned between the stator 14 and the impeller 11, 13.
a reservoir including an impeller cover, an intermediate member and a heat exchange interface, **<u>Construction of "reservoir"</u>**: "The reservoir serves as **a storage unit for excess liquid not capable of being contained in the remaining components**. The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid." ['764 Patent, 10:45-49.] Applicant purports that a "reservoir" is not a "reservoir housing."*See* Appendix D, Amendment dated April 6, 2012 (amending specification to emphasize the distinction between "reservoir" and "reservoir housing").	Koga discloses exactly this limitation. Koga's reservoir 1A has casings 15 and 16, forming an impeller cover as claimed. An upper wall of the channel 19 defines an intermediate member. The lower portion of the casing defines a heat exchange interface of the reservoir 1A.
wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the	Koga discloses exactly this limitation. The casing 16 and the casing 15 define the claimed top wall of the reservoir and the impeller cover defining a pump chamber 15A for housing the impeller 11,

impeller, and	13.
the intermediate member and the heat exchange interface define a thermal exchange chamber,	Koga discloses exactly this limitation. The upper wall of the channel 19 defines the intermediate member, and the lower portion of the casing 15 defines the heat exchange interface. The channel 19 positioned between the upper wall (the claimed intermediate member) and the casing 15 (the claimed heat exchange interface) defines a thermal exchange chamber, as claimed.
the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together; and **Construction of "vertical"** Based on Patent Owner's remarks in the reply dated April 6, 2012, "vertically spaced apart" purportedly is different than "radially outwards" in a plane of the impeller. Appendix D, Applicant's Reply dated April 6, 2012, pp. 8-10. For purposes of this Request, "vertical" is taken to mean "in a direction parallel to a rotational axis of the impeller." **Construction of "coupled"** The Federal Circuit construed the phrase "coupled to," directing that it	Koga discloses exactly this limitation. The pump chamber 15A and the thermal exchange chamber 19 are spaced apart from each other in a vertical direction (e.g., the horizontal upper wall of the channel 19 separates the chambers from each other). The pump chamber 15A and the thermal exchange chamber 19 are fluidly coupled together by virtue of the opening adjacent the terminal end of the channel 19, as well as by the discharge channel 20, as noted above.

"should be construed broadly so as to allow an indirect attachment." Bradford v. ConTeyor North America, Inc. 2010 U.S. App. LEXIS 8869 (Fed. Cir., April 29, 2010).	
wherein a first side of the heat-exchanging interface is in contact with a cooling liquid in the thermal exchange chamber and	Koga discloses exactly this limitation. A first side of the casing 15 (the claimed heat-exchanging interface) is in contact with coolant 41 in the channel 19 (the claimed thermal exchange chamber), as claimed.
a second side of the heat-exchanging interface opposite the first side is configured to be placed in thermal contact with a surface of the heat-generating component; and	Koga discloses exactly this limitation. A second side of the casing 15 opposite the first side in contact with coolant 41 in the channel 19 (e.g., the outer wall surface 15C) is configured to be placed in thermal contact with the upper surface of the component 2.
a liquid-to-air heat exchanger fluidly coupled to the reservoir using flexible conduits, the heat exchanger being configured to be positioned remote from the reservoir.	Koga discloses exactly this limitation. Koga explains: "Radiator 3 radiates the heat collected from component 2 by coolant 41 to the outside." Id. at 4:9-11. Koga explains further: "A fan can be prepared for forcibly air-cooling radiator 3 so that a better cooling effect can be expected." Id. at 4:21-23. Thus, Koga's radiator 3 is a liquid-to-air heat exchanger. Koga's radiator 3 can be fluidly coupled to the reservoir 1A using flexible conduits. *See*, Appendix I, Koga, Specification, 4:23-26 (stating "[c]irculating channel 4 is formed of flexible rubber having a low gas-permeability, such as butyl rubber tubing because this material allows flexible piping layout as well as preventing bubbles from entering into the tube"). Koga's radiator 3 is also configured to be positioned remote from the reservoir 1A. Id. at 8:32-39; FIGS. 1, 9 and 10.
16. The cooling system of claim 15, wherein the impeller cover includes a	Koga discloses exactly this limitation. Koga's impeller cover 15, 16 includes an opening 20 radially offset from a

first opening radially offset from a center of the impeller and	center of the impeller 11, 13. Id. at FIG. 8.
the intermediate member includes a second passage that is aligned with the first opening,	Koga discloses exactly this limitation. Koga's intermediate member (e.g., the upper wall of the channel 19) defines an opening adjacent the terminal end of the channel 19, spaced from the shaft 17. The opening defines the claimed second passage, and is aligned with the radially offset opening 20. As Koga explains: "Coolant 41 is sucked through sucking channel 19 by spinning blades 12, and discharged from discharging channel 20." Id. at 9:4-5.
the first and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber. **Construction of "second opening"** For purposes of this Request, the recited "second opening" is assumed to mean the previously recited "second passage."	To the extent that the term "second opening" can be construed for purposes of this Request, Koga discloses exactly this limitation. In Koga, coolant passes from the pump chamber 15A, through the opening 20 and into the thermal exchange chamber 19. Id. at FIGS. 1 and 7. Coolant passes from the pump chamber 15A in proportion to the amount of coolant entering the thermal exchange chamber 19. Accordingly, Koga discloses that the openings are configured as claimed.
17. The cooling system of claim 15, wherein the first side of the heat-exchanging interface includes at least one of pins or fins.	Koga discloses exactly this limitation. Koga's features 24, 24A are pins or fins. *See*, Id. at FIGS. 7 and 8.
18. The cooling system of claim 15, wherein the top wall of the reservoir extends between the stator and the impeller and shields the stator from the cooling	Koga discloses exactly this limitation. The casing 16 extends between the stator 14 and shields the stator 14 from the coolant in the reservoir 1A.

liquid in the reservoir.	

L. Claims 1-18 are Obvious from the '761 Publication and Laing

As the claim chart below illustrates, the Published International Application (also referred to herein as the '761 Publication) discloses each and every feature arranged as claimed in claims 1-18 in the '764 Patent. Thus, the Published International Application anticipates claims 1-18.

U.S. Patent No. 8,245,764 Claim Language	Correspondence to the '761 Publication and Laing
1. A cooling system for a heat-generating component, comprising:	The Published International Application discloses exactly such a cooling system. *See*, Appendix J, Published International Application, FIG. 17; Specification, 2:5-6, 7. Laing also discloses exactly the type of cooling system claimed in the '234 Application. Laing's title states it clearly: "Device for the Local Cooling or Heating of an Object." Laing, Title. An example of an object cooled by Laing's device is a processor positioned on a circuit board 16. Laing, ¶ [0044]. Under MPEP 2143, various accepted rationale are set forth for making a *prima facie* case of obviousness under *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395-1397 (2007). In this instance, several of the rational apply, including but not limited to: (I) combining prior art elements according to known methods to yield predictable results; (II) simple substitution of one known element for another to obtain predictable results; or (III) some teaching, suggestion, or motivation to combine. All of these rationale apply here as detailed below. First, combining the '761 Publication's reservoir with Laing's reservoir having a pump chamber and a vertically separated thermal exchange chamber to cool a processor yields predictable results. Second, simply substituting Laing's reservoir for the '761 Publication's reservoir to cool a processor achieves predictable results. Third, Laing suggests providing a reservoir having a pump chamber and a vertically separated thermal exchange chamber to cool a processor.

EXHIBIT 8 TO RESPONDENT'S/REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 10/26/2012

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
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EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
10/26/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Transmittal of Communication to Third Party Requester *Inter Partes* Reexamination	Control No. 95/002,386	Patent Under Reexamination 8245764	
	Examiner JOSEPH KAUFMAN	Art Unit 3993	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above-identified reexamination prceeding. 37 CFR 1.903.

Prior to the filing of a Notice of Appeal, each time the patent owner responds to this communication, the third party requester of the *inter partes* reexamination may once file written comments within a period of 30 days from the date of service of the patent owner's response. This 30-day time period is statutory (35 U.S.C. 314(b)(2)), and, as such, it cannot be extended. See also 37 CFR 1.947.

If an *ex parte* reexamination has been merged with the *inter partes* reexamination, no responsive submission by any *ex parte* third party requester is permitted.

All correspondence relating to this inter partes reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of the communication enclosed with this transmittal.

ORDER GRANTING/DENYING REQUEST FOR **INTER PARTES** ***REEXAMINATION***	**Control No.** 95/002,386	**Patent Under Reexamination** 8245764
	Examiner JOSEPH KAUFMAN	**Art Unit** 3993

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

The request for *inter partes* reexamination has been considered. Identification of the claims, the references relied on, and the rationale supporting the determination are attached.

Attachment(s): ☐ PTO-892 ☒ PTO/SB/08 ☐ Other: _____

1. ☒ The request for *inter partes* reexamination is GRANTED.

   ☒ An Office action is attached with this order.

   ☐ An Office action will follow in due course.

2. ☐ The request for *inter partes* reexamination is DENIED.

This decision is not appealable. 35 U.S.C. 312(c). Requester may seek review of a denial by petition to the Director of the USPTO within ONE MONTH from the mailing date hereof. 37 CFR 1.927. EXTENSIONS OF TIME ONLY UNDER 37 CFR 1.183. In due course, a refund under 37 CFR 1.26(c) will be made to requester.

All correspondence relating to this *inter partes* reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of this Order.

DECISION ON REQUEST FOR INTER PARTES REEXAMINATION

The information presented in the request for *inter partes* reexamination shows that there is a reasonable likelihood that the requester would prevail with respect to at least one claim challenged in the request for the reasons set forth below. Specifically, the request for *inter partes* reexamination, with a filing date of 15 September 2012, has made a reasonable likelihood of prevailing (RLP) showing that claims 1-18 of United States Patent Number 8,245,764 to Eriksen are unpatentable.

Extensions of Time

Extensions of time under 37 CFR 1.136(a) will **not** be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexamination proceeding. Additionally, 35 U.S.C. 314(c) requires that *inter partes* reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.937). Patent owner extensions of time in *inter partes* reexamination proceedings are provided for in 37 CFR 1.956. Extensions of time are not available for third party requester comments, because a comment period of 30 days from service of patent owner's response is set by statute. 35 USC 314(b)(3).

Notification of Concurrent Proceedings

The patent owner is reminded of the continuing responsibility under 37 CFR 1.985 to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving the Eriksen patent throughout the course of this reexamination proceeding. The third party requester is also reminded of the ability to similarly apprise the Office of any such activity or proceeding throughout the course of this reexamination proceeding. See MPEP § 2686 and 2686.04.

Service of Papers

Any paper filed by either the patent owner or the third party requester ***must be served*** on the other party in the reexamination proceeding in the manner provided by 37 CFR 1.248. See 37 CFR 1.903 and MPEP 2666.06.

A Reasonable Likelihood of Prevailing (RLP)

The Third Party Requester requested reexamination of claims 1-18 of the Eriksen patent based upon the following proposed rejections:

A. Claims 10-12 and 14 are Anticipated by Laing.

B. Claim 13 is Obvious from Laing.

C. Claim 13 is Obvious from Laing and Hamman.

D. Claims 1-9 and 15-18 are Obvious from Laing and Cheon.

E. Claims 7, 9 and 15-18 are Obvious from Laing, Cheon and Hamman.

F. Claims 1-18 are Obvious from Hamman and Cheon.

G. Claims 1-7, 10-12 and 14 are Anticipated by Duan.

H. Claims 8, 9, 13 and 15-18 are Obvious from Duan.

I. Claims 1-18 are Obvious from Duan and Cheon.

J. Claims 8, 9, 13 and 15-18 are Obvious from Duan and Hamman.

K. Claims 1-18 are Anticipated by Koga.

L. Claims 1-18 are Obvious from the '761 Publication and Laing.

Analysis of the RLP Showing for Claims 1-18 Provided in the Request

Proposed Rejections A-E: Laing either alone or in view of the various modifying references.

It is **not** agreed that the request has made a RLP showing that claims 1-18 of the Eriksen patent are unpatentable based upon the teachings of Laing when Laing is employed as the base reference. All of the claims require that there be a pump chamber vertically spaced from a thermal exchange chamber. Laing does not show a separate pump chamber and thermal exchange chamber. As seen in Figure 1 of Laing, the pump and thermal exchange are located in the same chamber. Requester has taken an arbitrary structure to delineate chambers. The definition of a chamber, according to *Webster's New World Dictionary, Third Edition*, is "any enclosed space; compartment..." Therefore, one of ordinary skill in the art would not view the pump and thermal exchange to be in separate chambers.

As for the other references, Cheon does not show vertically spaced chambers. Requester has stated (for example on page 55 of the Request) that vertically is to mean, "…in a direction parallel to the rotational axis of the impeller". There is no basis to interpret vertically in such a manner. Patent Owner, under certain circumstances, may be his/her own lexicographer. There is no basis for Requester to do so, however.

Under any standard definition of vertical, Cheon does not show such a relationship between the pump and thermal exchange. Further, there is no indication that Cheon's device would be operable if turned on its side as inferred by Requester. Hamman does not cure the deficiencies of either Laing or Cheon. For these reasons, Laing, either alone or in combination, does not meet the RLP standard with regard to proposed rejections A-E.

Proposed Rejection F: Hamman in view of Cheon.

It is **not** agreed that the request has made a RLP showing that claims 1-18 of the Eriksen patent are unpatentable based upon the teachings of Hamman in view of Cheon. All of the claims require that there be a pump chamber vertically spaced from a thermal exchange chamber. Cheon does not show vertically spaced chambers. Requester has stated (for example on page 55 of the Request) that vertically is to mean, "…in a direction parallel to the rotational axis of the impeller". There is no basis to interpret vertically in such a manner. Patent Owner, under certain circumstances, may be his/her own lexicographer. There is no basis for Requester to do so, however. Under any standard definition of vertical, Cheon does not show such a relationship between the pump and thermal exchange. Further, there is no indication that Cheon's device would be operable if turned on its side as inferred by Requester. Hamman does not cure the deficiencies of Cheon. For these reasons, Hamman in view of Cheon does not meet the RLP standard with regard to proposed rejections F.

Proposed Rejections G-J: Duan either alone or in view of the various modifying references.

It is **not** agreed that the request has made a RLP showing that claims 1-18 of the Eriksen patent are unpatentable based upon the teachings of Duan when Duan is employed as the base reference. All of the claims require that there be a pump chamber vertically spaced from a thermal exchange chamber and that the stator is isolated from the cooling liquid. As seen in Figures 3 and 7 the thermal chamber surrounds the pump chamber and cannot therefore, be vertically spaced from it. Note specifically how the fluid exits the casing via ports 12. Further, as seen in Figure 7, there is an opening between the thermal chamber and the area where the stator is, providing fluid access to the stator.

As for the other references, Cheon does not show vertically spaced chambers. Requester has stated (for example on page 102 of the Request) that vertically is to mean, "…in a direction parallel to the rotational axis of the impeller". There is no basis to interpret vertically in such a manner. Patent Owner, under certain circumstances, may be his/her own lexicographer. There is no basis for Requester to do so, however. Under any standard definition of vertical, Cheon does not show such a relationship between the pump and thermal exchange. Further, there is no indication that Cheon's device would be operable if turned on its side as inferred by Requester. Hamman does not cure the deficiencies of either Duan or Cheon. For these reasons, Duan, either alone or in combination, does not meet the RLP standard with regard to proposed rejections G-J.

Proposed Rejections K: Claims 1-18 are anticipated over Koga et al.

It is agreed that the request has made a RLP showing that claims 1-18 of the Eriksen patent are unpatentable based upon the teachings of Koga et al. The examiner has reviewed the Koga et al. reference and the request for reexamination. The examiner deems that the request has made a RLP showing that Koga et al. teaches every limitation in claims 1-18. Specifically, see the analysis on pages 149-164 of the Request. For this reason, the Request has made a RLP showing that claims 1-18 of the Eriksen patent is unpatentable based upon the teachings of Koga et al.

Proposed Rejections L: Claims 1-18 are Obvious from the '761 Publication and Laing.

It is **not** agreed that the request has made a RLP showing that claims 1-18 of the Eriksen patent are unpatentable based upon the teachings of the ‘761 publication in view of Laing. All of the claims require that there be a pump chamber vertically spaced from a thermal exchange chamber. The '761 publication was not discussed as showing this feature. Further, Laing does not show a separate pump chamber and thermal exchange chamber. As seen in Figure 1 of Laing, the pump and thermal exchange are located in the same chamber. Requester has taken an arbitrary structure to delineate chambers. The definition of a chamber, according to *Webster's New World Dictionary, Third Edition*, is "any enclosed space; compartment..." Therefore, one of ordinary skill in the art would not view the pump and thermal exchange to be in separate chambers.

For these reasons, the ‘761 publication in view of Laing, does not meet the RLP standard with regard to proposed rejection L.

Conclusion

For the reasons given above, the information presented in the request for *inter partes* reexamination shows that there is a reasonable likelihood that the requester would prevail with respect to the following proposed rejections:

K. Claims 1-18 are Anticipated by Koga.

Accordingly, claims 1-18 of the Eriksen patent will be reexamined.

All correspondence relating to this *inter partes* reexamination proceeding should be directed:

By EFS: Registered users may submit via the electronic filing system EFS-Web, at https://efs.uspto.gov/efile/myportal/efs-registered
.

By Mail to: Mail Stop *Inter Partes* Reexam
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Commissioner for Patents
United States Patent & Trademark Office
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Alexandria, VA 22313-1450

By Fax to: (571) 273-9900
Central Reexamination Unit

By hand: Customer Service Window
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401 Dulany Street
Alexandria, VA 22314

For EFS-Web transmissions, 37 CFR 1.8(a)(1)(i)(C) and (ii) states that correspondence (except for a request for reexamination and a corrected or replacement request for reexamination) will be considered timely if (a) it is transmitted via the Office's electronic filing system in accordance with 37 CFR 1.6(a)(4), and (b) includes a certificate of transmission for each piece of correspondence stating the date of transmission, which is prior to the expiration of the set period of time in the Office action.

Any inquiry concerning this communication or earlier communications from the examiner, or as to the status of this proceeding, should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

Signed:

/Joseph A. Kaufman/
Joseph A. Kaufman
Primary Examiner
Art Unit 3993

Conferees

/RMF/

/EDL/

EXHIBIT 9 TO RESPONDENT'S/REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 10/26/2012

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
10/26/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Transmittal of Communication to Third Party Requester *Inter Partes* Reexamination	Control No. 95/002,386	Patent Under Reexamination 8245764	
	Examiner JOSEPH KAUFMAN	**Art Unit** 3993	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above-identified reexamination prceeding. 37 CFR 1.903.

Prior to the filing of a Notice of Appeal, each time the patent owner responds to this communication, the third party requester of the *inter partes* reexamination may once file written comments within a period of 30 days from the date of service of the patent owner's response. This 30-day time period is statutory (35 U.S.C. 314(b)(2)), and, as such, it cannot be extended. See also 37 CFR 1.947.

If an *ex parte* reexamination has been merged with the *inter partes* reexamination, no responsive submission by any *ex parte* third party requester is permitted.

All correspondence relating to this inter partes reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of the communication enclosed with this transmittal.

OFFICE ACTION IN INTER PARTES REEXAMINATION	Control No. 95/002,386	Patent Under Reexamination 8245764
	Examiner JOSEPH KAUFMAN	Art Unit 3993

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

Responsive to the communication(s) filed by:
Patent Owner on _____
Third Party(ies) on 15 September, 2012

RESPONSE TIMES ARE SET TO EXPIRE AS FOLLOWS:

For Patent Owner's Response:
2 MONTH(S) from the mailing date of this action. 37 CFR 1.945. EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.956.
For Third Party Requester's Comments on the Patent Owner Response:
30 DAYS from the date of service of any patent owner's response. 37 CFR 1.947. NO EXTENSIONS OF TIME ARE PERMITTED. 35 U.S.C. 314(b)(2).

All correspondence relating to this inter partes reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of this Office action.

This action is not an Action Closing Prosecution under 37 CFR 1.949, nor is it a Right of Appeal Notice under 37 CFR 1.953.

PART I. THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

1.☐ Notice of References Cited by Examiner, PTO-892
2.☐ Information Disclosure Citation, PTO/SB/08
3.☐ _____

PART II. SUMMARY OF ACTION:

1a. ☒ Claims 1-18 are subject to reexamination.
1b. ☐ Claims _____ are not subject to reexamination.
2. ☐ Claims _____ have been canceled.
3. ☐ Claims _____ are confirmed. [Unamended patent claims]
4. ☐ Claims _____ are patentable. [Amended or new claims]
5. ☒ Claims 1-18 are rejected.
6. ☐ Claims _____ are objected to.
7. ☐ The drawings filed on _____ ☐ are acceptable ☐ are not acceptable.
8. ☐ The drawing correction request filed on _____ is: ☐ approved. ☐ disapproved.
9. ☐ Acknowledgment is made of the claim for priority under 35 U.S.C. 119 (a)-(d). The certified copy has: ☐ been received. ☐ not been received. ☐ been filed in Application/Control No 95002386.
10. ☐ Other _____

Extensions of Time

Extensions of time under 37 CFR 1.136(a) will **not** be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexamination proceeding. Additionally, 35 U.S.C. 314(c) requires that *inter partes* reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.937). Patent owner extensions of time in *inter partes* reexamination proceedings are provided for in 37 CFR 1.956. Extensions of time are not available for third party requester comments, because a comment period of 30 days from service of patent owner’s response is set by statute. 35 USC 314(b)(3).

Notification of Concurrent Proceedings

The patent owner is reminded of the continuing responsibility under 37 CFR 1.985 to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving the Eriksen patent throughout the course of this reexamination proceeding. The third party requester is also reminded of the ability to similarly apprise the Office of any such activity or proceeding throughout the course of this reexamination proceeding. See MPEP § 2686 and 2686.04.

Service of Papers

Any paper filed by either the patent owner or the third party requester ***must be served*** on the other party in the reexamination proceeding in the manner provided by 37 CFR 1.248. See 37 CFR 1.903 and MPEP 2666.06.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Koga et al.

Requester has stated that Patent Owner is only eligible for the effective filing date of 7 October 2011 as the original application did not have Figure 20 or the passages in the specification to support the claimed subject matter. This material was added on 9 January 2009 and 14 July 2011. Therefore, the Examiner will use the effective filing date of 14 July 2011.

The Examiner incorporates by reference the claim charts on pages 149-164 of the Request.

Conclusion

All correspondence relating to this *inter partes* reexamination proceeding should be directed:

By EFS: Registered users may submit via the electronic filing system EFS-Web, at https://efs.uspto.gov/efile/myportal/efs-registered
.

By Mail to: Mail Stop *Inter Partes* Reexam

Attn: Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

By Fax to: (571) 273-9900
Central Reexamination Unit

By hand: Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

For EFS-Web transmissions, 37 CFR 1.8(a)(1)(i)(C) and (ii) states that correspondence (except for a request for reexamination and a corrected or replacement request for reexamination) will be considered timely if (a) it is transmitted via the Office's electronic filing system in accordance with 37 CFR 1.6(a)(4), and (b) includes a certificate of transmission for each piece of correspondence stating the date of transmission, which is prior to the expiration of the set period of time in the Office action.

Any inquiry concerning this communication or earlier communications from the examiner, or as to the status of this proceeding, should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

Signed:

/Joseph A. Kaufman/
Joseph A. Kaufman
Primary Examiner
Art Unit 3993

Conferees:

/RMF/

/EDL/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 10/26/2012
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
10/26/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Transmittal of Communication to Third Party Requester *Inter Partes* Reexamination	Control No.	Patent Under Reexamination	
	95/002,386	8245764	
	Examiner	Art Unit	
	JOSEPH KAUFMAN	3993	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above-identified reexamination prceeding. 37 CFR 1.903.

Prior to the filing of a Notice of Appeal, each time the patent owner responds to this communication, the third party requester of the *inter partes* reexamination may once file written comments within a period of 30 days from the date of service of the patent owner's response. This 30-day time period is statutory (35 U.S.C. 314(b)(2)), and, as such, it cannot be extended. See also 37 CFR 1.947.

If an *ex parte* reexamination has been merged with the *inter partes* reexamination, no responsive submission by any *ex parte* third party requester is permitted.

All correspondence relating to this inter partes reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of the communication enclosed with this transmittal.

U.S. Patent and Trademark Office
PTOL-2070 (Rev. 07-04)

Paper No. 20121017

ORDER GRANTING/DENYING REQUEST FOR INTER PARTES REEXAMINATION	Control No. 95/002,386	Patent Under Reexamination 8245764
	Examiner JOSEPH KAUFMAN	Art Unit 3993

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

The request for *inter partes* reexamination has been considered. Identification of the claims, the references relied on, and the rationale supporting the determination are attached.

Attachment(s): ☐ PTO-892 ☒ PTO/SB/08 ☐ Other: _____

1. ☒ The request for *inter partes* reexamination is GRANTED.

   ☒ An Office action is attached with this order.

   ☐ An Office action will follow in due course.

2. ☐ The request for *inter partes* reexamination is DENIED.

This decision is not appealable. 35 U.S.C. 312(c). Requester may seek review of a denial by petition to the Director of the USPTO within ONE MONTH from the mailing date hereof. 37 CFR 1.927. EXTENSIONS OF TIME ONLY UNDER 37 CFR 1.183. In due course, a refund under 37 CFR 1.26(c) will be made to requester.

All correspondence relating to this *inter partes* reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of this Order.

DECISION ON REQUEST FOR INTER PARTES REEXAMINATION

The information presented in the request for *inter partes* reexamination shows that there is a reasonable likelihood that the requester would prevail with respect to at least one claim challenged in the request for the reasons set forth below. Specifically, the request for *inter partes* reexamination, with a filing date of 15 September 2012, has made a reasonable likelihood of prevailing (RLP) showing that claims 1-18 of United States Patent Number 8,245,764 to Eriksen are unpatentable.

Extensions of Time

Extensions of time under 37 CFR 1.136(a) will **not** be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexamination proceeding. Additionally, 35 U.S.C. 314(c) requires that *inter partes* reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.937). Patent owner extensions of time in *inter partes* reexamination proceedings are provided for in 37 CFR 1.956. Extensions of time are not available for third party requester comments, because a comment period of 30 days from service of patent owner's response is set by statute. 35 USC 314(b)(3).

Notification of Concurrent Proceedings

The patent owner is reminded of the continuing responsibility under 37 CFR 1.985 to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving the Eriksen patent throughout the course of this reexamination proceeding. The third party requester is also reminded of the ability to similarly apprise the Office of any such activity or proceeding throughout the course of this reexamination proceeding. See MPEP § 2686 and 2686.04.

Service of Papers

Any paper filed by either the patent owner or the third party requester ***must be served*** on the other party in the reexamination proceeding in the manner provided by 37 CFR 1.248. See 37 CFR 1.903 and MPEP 2666.06.

A Reasonable Likelihood of Prevailing (RLP)

The Third Party Requester requested reexamination of claims 1-18 of the Eriksen patent based upon the following proposed rejections:

A. Claims 10-12 and 14 are Anticipated by Laing.

B. Claim 13 is Obvious from Laing.

C. Claim 13 is Obvious from Laing and Hamman.

D. Claims 1-9 and 15-18 are Obvious from Laing and Cheon.

E. Claims 7, 9 and 15-18 are Obvious from Laing, Cheon and Hamman.

F. Claims 1-18 are Obvious from Hamman and Cheon.

G. Claims 1-7, 10-12 and 14 are Anticipated by Duan.

H. Claims 8, 9, 13 and 15-18 are Obvious from Duan.

I. Claims 1-18 are Obvious from Duan and Cheon.

J. Claims 8, 9, 13 and 15-18 are Obvious from Duan and Hamman.

K. Claims 1-18 are Anticipated by Koga.

L. Claims 1-18 are Obvious from the '761 Publication and Laing.

Analysis of the RLP Showing for Claims 1-18 Provided in the Request

Proposed Rejections A-E: Laing either alone or in view of the various modifying references.

It is **not** agreed that the request has made a RLP showing that claims 1-18 of the Eriksen patent are unpatentable based upon the teachings of Laing when Laing is employed as the base reference. All of the claims require that there be a pump chamber vertically spaced from a thermal exchange chamber. Laing does not show a separate pump chamber and thermal exchange chamber. As seen in Figure 1 of Laing, the pump and thermal exchange are located in the same chamber. Requester has taken an arbitrary structure to delineate chambers. The definition of a chamber, according to *Webster's New World Dictionary, Third Edition*, is "any enclosed space; compartment..." Therefore, one of ordinary skill in the art would not view the pump and thermal exchange to be in separate chambers.

As for the other references, Cheon does not show vertically spaced chambers. Requester has stated (for example on page 55 of the Request) that vertically is to mean, "…in a direction parallel to the rotational axis of the impeller". There is no basis to interpret vertically in such a manner. Patent Owner, under certain circumstances, may be his/her own lexicographer. There is no basis for Requester to do so, however.

Under any standard definition of vertical, Cheon does not show such a relationship between the pump and thermal exchange. Further, there is no indication that Cheon's device would be operable if turned on its side as inferred by Requester. Hamman does not cure the deficiencies of either Laing or Cheon. For these reasons, Laing, either alone or in combination, does not meet the RLP standard with regard to proposed rejections A-E.

Proposed Rejection F: Hamman in view of Cheon.

It is **not** agreed that the request has made a RLP showing that claims 1-18 of the Eriksen patent are unpatentable based upon the teachings of Hamman in view of Cheon. All of the claims require that there be a pump chamber vertically spaced from a thermal exchange chamber. Cheon does not show vertically spaced chambers. Requester has stated (for example on page 55 of the Request) that vertically is to mean, "…in a direction parallel to the rotational axis of the impeller". There is no basis to interpret vertically in such a manner. Patent Owner, under certain circumstances, may be his/her own lexicographer. There is no basis for Requester to do so, however. Under any standard definition of vertical, Cheon does not show such a relationship between the pump and thermal exchange. Further, there is no indication that Cheon's device would be operable if turned on its side as inferred by Requester. Hamman does not cure the deficiencies of Cheon. For these reasons, Hamman in view of Cheon does not meet the RLP standard with regard to proposed rejections F.

Proposed Rejections G-J: Duan either alone or in view of the various modifying references.

It is **not** agreed that the request has made a RLP showing that claims 1-18 of the Eriksen patent are unpatentable based upon the teachings of Duan when Duan is employed as the base reference. All of the claims require that there be a pump chamber vertically spaced from a thermal exchange chamber and that the stator is isolated from the cooling liquid. As seen in Figures 3 and 7 the thermal chamber surrounds the pump chamber and cannot therefore, be vertically spaced from it. Note specifically how the fluid exits the casing via ports 12. Further, as seen in Figure 7, there is an opening between the thermal chamber and the area where the stator is, providing fluid access to the stator.

As for the other references, Cheon does not show vertically spaced chambers. Requester has stated (for example on page 102 of the Request) that vertically is to mean, "…in a direction parallel to the rotational axis of the impeller". There is no basis to interpret vertically in such a manner. Patent Owner, under certain circumstances, may be his/her own lexicographer. There is no basis for Requester to do so, however. Under any standard definition of vertical, Cheon does not show such a relationship between the pump and thermal exchange. Further, there is no indication that Cheon's device would be operable if turned on its side as inferred by Requester. Hamman does not cure the deficiencies of either Duan or Cheon. For these reasons, Duan, either alone or in combination, does not meet the RLP standard with regard to proposed rejections G-J.

Proposed Rejections K: Claims 1-18 are anticipated over Koga et al.

It is agreed that the request has made a RLP showing that claims 1-18 of the Eriksen patent are unpatentable based upon the teachings of Koga et al. The examiner has reviewed the Koga et al. reference and the request for reexamination. The examiner deems that the request has made a RLP showing that Koga et al. teaches every limitation in claims 1-18. Specifically, see the analysis on pages 149-164 of the Request. For this reason, the Request has made a RLP showing that claims 1-18 of the Eriksen patent is unpatentable based upon the teachings of Koga et al.

Proposed Rejections L: Claims 1-18 are Obvious from the '761 Publication and Laing.

It is **not** agreed that the request has made a RLP showing that claims 1-18 of the Eriksen patent are unpatentable based upon the teachings of the '761 publication in view of Laing. All of the claims require that there be a pump chamber vertically spaced from a thermal exchange chamber. The '761 publication was not discussed as showing this feature. Further, Laing does not show a separate pump chamber and thermal exchange chamber. As seen in Figure 1 of Laing, the pump and thermal exchange are located in the same chamber. Requester has taken an arbitrary structure to delineate chambers. The definition of a chamber, according to *Webster's New World Dictionary, Third Edition*, is "any enclosed space; compartment..." Therefore, one of ordinary skill in the art would not view the pump and thermal exchange to be in separate chambers.

For these reasons, the ‘761 publication in view of Laing, does not meet the RLP standard with regard to proposed rejection L.

Conclusion

For the reasons given above, the information presented in the request for *inter partes* reexamination shows that there is a reasonable likelihood that the requester would prevail with respect to the following proposed rejections:

K. Claims 1-18 are Anticipated by Koga.

Accordingly, claims 1-18 of the Eriksen patent will be reexamined.

All correspondence relating to this *inter partes* reexamination proceeding should be directed:

By EFS: Registered users may submit via the electronic filing system EFS-Web, at https://efs.uspto.gov/efile/myportal/efs-registered
.

By Mail to: Mail Stop *Inter Partes* Reexam
Attn: Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

By Fax to: (571) 273-9900
Central Reexamination Unit

By hand: Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

For EFS-Web transmissions, 37 CFR 1.8(a)(1)(i)(C) and (ii) states that correspondence (except for a request for reexamination and a corrected or replacement request for reexamination) will be considered timely if (a) it is transmitted via the Office's electronic filing system in accordance with 37 CFR 1.6(a)(4), and (b) includes a certificate of transmission for each piece of correspondence stating the date of transmission, which is prior to the expiration of the set period of time in the Office action.

Any inquiry concerning this communication or earlier communications from the examiner, or as to the status of this proceeding, should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

Signed:

/Joseph A. Kaufman/
Joseph A. Kaufman
Primary Examiner
Art Unit 3993

Conferees

/RMF/

/EDL/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	Not yet assigned
	Filing Date	2012-09-15
	First Named Inventor	Eriksen
	Art Unit	Not yet assigned
	Examiner Name	Not yet assigned
	Attorney Docket Number	COOL-1.012

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code1	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
JAK	1	6529376	B2	2003-03-04	Hamman	
JAK	2	5731954		1998-03-24	Cheon	
JAK	3	7325591	B2	2008-02-05	Duan	
JAK	4	7544049	B2	2009-06-09	Koga	

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code1	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
JAK	1	20040052663	A1	2004-03-18	Laing	

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number3	Country Code2 i	Kind Code4	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T5

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**	Application Number		Not yet assigned
	Filing Date		2012-09-15
	First Named Inventor	Eriksen	
	Art Unit		Not yet assigned
	Examiner Name	Not yet assigned	
	Attorney Docket Number		COOL-1.012

JAK	1	2006119761	WO	A1	2006-11-16	Asetek A/S		☐
If you wish to add additional Foreign Patent Document citation information please click the Add button								

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
	1		☐
If you wish to add additional non-patent literature document citation information please click the Add button			

EXAMINER SIGNATURE

Examiner Signature	/Joseph A. Kaufman/	Date Considered	17 October 2012

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

Reexamination	Application/Control No.	Applicant(s)/Patent Under Reexamination
	95/002,386	8245764
	Certificate Date	**Certificate Number**

Requester Correspondence Address: ☐ Patent Owner ☒ Third Party

GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

LITIGATION REVIEW ☒	JAK (examiner initials)	10/17/2012 (date)
Case Name		Director Initials
Asetek Holdings, Inc. et al. v. Coolit Systems Inc.; 3:12cv4498, US Dist. Ct. California Northern; open.		/EDL/ FOR IY

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	**NUMBER**
1. none	
2.	
3.	
4.	

Search Notes	Application/Control No. 95/002,386	Applicant(s)/Patent under Reexamination 8245764	
	Examiner JOSEPH KAUFMAN	Art Unit 3993	

SEARCHED			
Class	Subclass	Date	Examiner
none			

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
Reviewed patented file's prosecution history.	10/17/2012	JAK

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

EXHIBIT 10 TO RESPONDENT'S/REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 09/03/2013
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
09/03/2013	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Transmittal of Communication to Third Party Requester *Inter Partes* Reexamination	Control No. 95/002,386	Patent Under Reexamination 8245764	
	Examiner JOSEPH KAUFMAN	Art Unit 3993	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

GANZ LAW, P.C.
P.O. BOX 22O0
HILLSBORO, OR 97123

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above-identified reexamination prceeding. 37 CFR 1.903.

Prior to the filing of a Notice of Appeal, each time the patent owner responds to this communication, the third party requester of the *inter partes* reexamination may once file written comments within a period of 30 days from the date of service of the patent owner's response. This 30-day time period is statutory (35 U.S.C. 314(b)(2)), and, as such, it cannot be extended. See also 37 CFR 1.947.

If an *ex parte* reexamination has been merged with the *inter partes* reexamination, no responsive submission by any *ex parte* third party requester is permitted.

All correspondence relating to this inter partes reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of the communication enclosed with this transmittal.

U.S. Patent and Trademark Office
PTOL-2070 (Rev. 07-04)

Paper No. 20130814

ACTION CLOSING PROSECUTION (37 CFR 1.949)	Control No. 95/002,386	Patent Under Reexamination 8245764
	Examiner JOSEPH KAUFMAN	Art Unit 3993

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

Responsive to the communication(s) filed by:
Patent Owner on 26 December, 2012
Third Party(ies) on _____

Patent owner may once file a submission under 37 CFR 1.951(a) within 1 month(s) from the mailing date of this Office action. Where a submission is filed, third party requester may file responsive comments under 37 CFR 1.951(b) within 30-days (not extendable- 35 U.S.C. § 314(b)(2)) from the date of service of the initial submission on the requester. **Appeal cannot be taken from this action.** Appeal can only be taken from a Right of Appeal Notice under 37 CFR 1.953.

All correspondence relating to this inter partes reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of this Office action.

PART I. THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

1. ☐ Notice of References Cited by Examiner, PTO-892
2. ☐ Information Disclosure Citation, PTO/SB/08
3. ☐ _____

PART II. SUMMARY OF ACTION:

1a. ☒ Claims 1-30 are subject to reexamination.
1b. ☐ Claims _____ are not subject to reexamination.
2. ☐ Claims _____ have been canceled.
3. ☐ Claims _____ are confirmed. [Unamended patent claims]
4. ☐ Claims _____ are patentable. [Amended or new claims]
5. ☒ Claims 1-30 are rejected.
6. ☐ Claims _____ are objected to.
7. ☐ The drawings filed on _____ ☐ are acceptable ☐ are not acceptable.
8 ☐ The drawing correction request filed on _____ is: ☐ approved. ☐ disapproved.
9 ☐ Acknowledgment is made of the claim for priority under 35 U.S.C. 119 (a)-(d). The certified copy has: ☐ been received. ☐ not been received. ☐ been filed in Application/Control No _____
10. ☐ Other _____

Extensions of Time

Extensions of time under 37 CFR 1.136(a) will **not** be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexamination proceeding. Additionally, 35 U.S.C. 314(c) requires that *inter partes* reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.937). Patent owner extensions of time in *inter partes* reexamination proceedings are provided for in 37 CFR 1.956. Extensions of time are not available for third party requester comments, because a comment period of 30 days from service of patent owner's response is set by statute. 35 USC 314(b)(3).

Notification of Concurrent Proceedings

The patent owner is reminded of the continuing responsibility under 37 CFR 1.985 to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving the Eriksen patent throughout the course of this reexamination proceeding. The third party requester is also reminded of the ability to similarly apprise the Office of any such activity or proceeding throughout the course of this reexamination proceeding. See MPEP § 2686 and 2686.04.

Service of Papers

Any paper filed by either the patent owner or the third party requester ***must be served*** on the other party in the reexamination proceeding in the manner provided by 37 CFR 1.248. See 37 CFR 1.903 and MPEP 2666.06.

Non-Entry of Requester's Response

Requester was notified in the office correspondence mailed 7 May 2013 that as claims 1-18 were not amended, no new rejections over claims 1-18 were permissible. On page 17 of the response by Requester dated 22 May 2013, Requester proposes a new rejection that claims 1-18 are obvious over Koga et al. Therefore, Requester's response dated 22 May 2013 is improper, will not be considered in its entirety, and be expunged from the record.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Koga et al.

Requester has stated that Patent Owner is only eligible for the effective filing date of 7 October 2011 as the original application did not have Figure 20 or the passages in the specification to support the claimed subject matter. This material was added on 9 January 2009 and 14 July 2011. Therefore, the Examiner will use the effective filing date of 14 July 2011.

The Examiner incorporates by reference the claim charts on pages 149-164 of the Request.

New Examiner Rejections in Light of New Claims 19-30

Claims 19, 21-23, 25-27, 29 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Koga et al.

Koga et al. has been discussed in detail as noted in the above rejection. In addition, as seen in Figure 7, a passage directs cooling liquid from the pump chamber 15 directly to the thermal exchange chamber; an entire surface of the heat exchange interface that contacts the cooling liquid forms a boundary wall of the thermal exchange chamber as seen with either surface of 19 in Figure 7; and the pump and thermal exchange chambers are connected together by one of more passages as noted above and in Figure 7, and the reservoir has and inlet and outlet at 19 and 20 as seen in Figure 8.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 20, 24 and 28 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Koga et al.

Koga et al. has been discussed in detail above, but while showing at least one passage between the pump and thermal exchange chamber, is silent as to a plurality of passages between the two. It would have been obvious to one of ordinary skill in the art to provide a plurality of passages between the pump and thermal exchange chambers in order to further enhance communication between the two which would increase flow and thus be better able to cool the device.

Response to Arguments

Patent Owner: Patent Owner argues that portion 19 of Koga is not a chamber as required by the claims but a conduit. Patent Owner argues that the structure is not an "enclosed space or compartment".

Examiner: The Examiner disagrees that portion 19 does not comprise a chamber. As chambers can clearly have inlets and outlets, it is not clear how chamber 19 does not meet the conventional definition of a chamber. It is clearly an enclosed space and a compartment as would have been recognized by one of ordinary skill in the art.

Patent Owner: Patent Owner contends that the thermal chamber is not vertically spaced from the pump chamber.

Examiner: As seen in Koga et al., Figure 7, the chambers are vertically spaced apart. There is no basis for Patent Owner's contention that they are not. Chamber 19 lies below 15A.

Patent Owner: Patent Owner discusses references that did not meet the RLP standard.

Examiner: The arguments are not germane to the current proceeding.

Patent Owner: Patent Owner contends that claims 2-9, 11-14 and 16-18 are allowable for the same reasons as for the claims from which they depend. Further, Patent Owner contends that claim 4 does not show projections 24 and 24 A in the thermal exchange chamber 19.

Examiner: For the reasons noted above, the independent claims remain anticipated by Koga et al. Regarding claim 4 and by extension 5, looking at Figure 7 of Koga et al., pins 24 and 24A increase the surface area of the heat exchange unit 15B. 15B is the wall of the thermal exchange chamber. Therefore, the pins are the features that "are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber".

Patent Owner: Patent Owner contends that claims 19-30 are patentable over Koga.

Examiner: Patent Owner is directed to the new rejections proposed by the Examiner in the above section. The arguments are moot in light of these new rejections.

Patent Owner: Patent Owner contends that the priority date of the '764 patent is not relevant to the reexamination.

Examiner: The effective filing date of the Ericksen patent does determine whether or not Koga et al. is a reference under 102(e) or 102(b).

Conclusion

This is an ACTION CLOSING PROSECUTION (ACP); see MPEP § 2671.02.

(1) Pursuant to 37 CFR 1.951(a), the patent owner may once file written comments limited to the issues raised in the reexamination proceeding and/or present a proposed amendment to the claims which amendment will be subject to the criteria of 37 CFR 1.116 as to whether it shall be entered and considered. Such comments and/or proposed amendments must be filed within a time period of 30 days or one month (whichever is longer) from the mailing date of this action. Where the patent owner files such comments and/or a proposed amendment, the third party requester may once file comments under 37 CFR 1.951(b) responding to the patent owner's submission within 30 days from the date of service of the patent owner's submission on the third party requester.

(2) If the patent owner does not timely file comments and/or a proposed amendment pursuant to 37 CFR 1.951(a), then the third party requester is precluded from filing comments under 37 CFR 1.951(b).

(3) Appeal **cannot** be taken from this action, since it is not a final Office action.

All correspondence relating to this *inter partes* reexamination proceeding should be directed:

By EFS: Registered users may submit via the electronic filing system EFS-Web, at https://efs.uspto.gov/efile/myportal/efs-registered
.

By Mail to: Mail Stop *Inter Partes* Reexam
Attn: Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

By Fax to: (571) 273-9900

Central Reexamination Unit

By hand: Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

For EFS-Web transmissions, 37 CFR 1.8(a)(1)(i)(C) and (ii) states that correspondence (except for a request for reexamination and a corrected or replacement request for reexamination) will be considered timely if (a) it is transmitted via the Office's electronic filing system in accordance with 37 CFR 1.6(a)(4), and (b) includes a certificate of transmission for each piece of correspondence stating the date of transmission, which is prior to the expiration of the set period of time in the Office action.

Any inquiry concerning this communication or earlier communications from the examiner, or as to the status of this proceeding, should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

Signed:

/Joseph A. Kaufman/
Joseph A. Kaufman
Primary Examiner
Art Unit 3993

Conferees:

/RMF/

/EDL/

EXHIBIT 11 TO RESPONDENT'S/REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

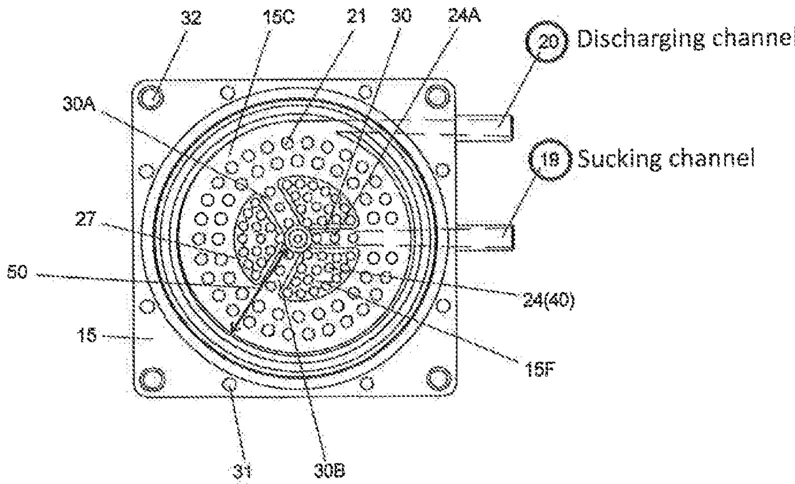

FIG.8

In the Office Action, pump room 15A of *Koga* is interpreted as the recited "pump chamber" of independent claims 1, 10, and 15. Request, pp. 151, 157, 160. And, sucking channel 19, that supplies coolant 41 to the pump room 15A (the alleged "pump chamber"), is interpreted as the recited vertically spaced apart "thermal exchange chamber" of independent claims 1, 10, and 15. See, Request, pp. 152, 157, 161. However, sucking channel 19 is not a "chamber" of *Koga*'s pump room 15A. As can be seen in FIG. 8 reproduced above, it is only a conduit that supplies coolant to the pump room 15A. As the Examiner correctly pointed out "[t]he definition of a chamber according to *Webster's New World Dictionary, Third Edition*, is 'any enclosed space; compartment…'." Order Granting/Denyinig Request for *Inter Partes* Reexamination, pp. 4, 7[5]. Sucking channel 19 is neither an "enclosed space" nor a "compartment" of pump room 15A. It is merely a tube that supplies coolant to the pump room 15A. Col. 8:65-67; *See* FIG. 8.

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[5] Consistently, The American Heritage® College Dictionary also defines a chamber as an "enclosed space or compartment American Heritage® College Dictionary, Third Edition, 2000, p. 232 (attached as Exhibit A). In contrast, a channel is defined as a "tubular passage for liquids: a conduit." See, Exhibit A, p. 234.

added subject matter "was relied on to confer patentability to each and every claim of the '764 Patent … no claim in the '764 Patent is entitled to priority from the [ ] filing date" of the International Application. *Request*, p. 18. Referring to these allegations, the Office Action states that "the Examiner will use the effective filing date of 14 July 2011." Office Action, p. 3.

The Patent Owner disagrees that the International Application does not provide support for the issued claims of the '764 patent. As clearly explained in the Supplemental Preliminary Amendment filed on January 9, 2009 during prosecution of the '974 application, FIG. 20 was only added to "help clearly identify ***previously presented*** subject matter." (emphasis added) Supplemental Preliminary Amendment in U.S. Patent Application No. 11/919,974 filed on January 9, 2009, p. 12. FIG. 20 did not add any new subject matter to the application. To the contrary, as will be explained below, the earliest parent of the '764 patent, the International Application, provides support for each and every claim of the '764 patent.

1. The priority date of the '764 patent is not relevant to this reexamination.

As a preliminary matter however, Asetek notes that the priority date of the '764 claims is not an issue relevant to this reexamination proceeding. Although Requester challenges the claimed priority date, all the prior art references relied upon in the Request predate the filing date of the International Application. That is, none of the prior art relied upon in the Request is an intervening reference. Patent Owner recognizes that the MPEP permits a third party requester to point out that the claims of a patent are not entitled to its claimed priority, and propose rejections using an intervening reference. M.P.E.P. § 2617. In such cases, the Patent Office addresses the priority issue to determine if the intervening reference qualifies as prior art for the reexamination. In this case, however, the availability of the references relied upon in the proposed rejections is not dependent on the priority date of the '764 patent. Therefore, the priority date of the '764 patent is not relevant to this reexamination proceeding.

The rules governing *inter partes* reexamination state that an issue not relevant to the reexamination, will not be resolved in the reexamination proceedings, and "[i]f such issues are raised … during a reexamination proceeding, the existence of such issues will be noted by the examiner in the next Office action." 37 C.F.R. § 1.906(c). Patent Owner believes that the remarks in the Office Action relating to the priority date are merely statements pointing out the existence of such issues, rather than an expression of the Examiner's opinion. However, since this statement may be misconstrued (and since a statement unconnected to an applied rejection cannot be corrected by appeal), Patent Owner respectfully requests the Examiner to retract this statement or further clarify this issue in the next Office Action.

2. The International Application provides § 112 support for claims 1-18 of the '764 patent.

During prosecution of the '234 application (that issued as the '764 patent), the Examiner considered whether the International Application provides support for the pending claims, and decided that it does. In fact, during this prosecution, all the pending claims were rejected as being anticipated by the International Application. Office Action dated 12/20/2011 (attached as Exhibit B). In this Office Action, the Examiner clearly identified portions of the International Application that he believed to disclose each and every aspect of the pending claims. *See*, Exhibit B, pp. 2-7. The '764 patent issued with claims similar to those that were rejected as being anticipated by the International Application. *See*, Reply to Office Action filed on April 6, 2012, pp. 2-7. That is, during prosecution of the '764 patent, the Examiner reviewed the International Application and decided that it provides adequate § 112 support for the '764

EXHIBIT 12 TO RESPONDENT'S/REQUESTER'S BRIEF UNDER 37 C.F.R. § 41.68

PATENT
Customer No. 22,852
Attorney Docket No. 10494.0003-00000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. national phase of PCT/DK2005/000310	)	
Inventor: André Sloth ERIKSEN	)	Group Art Unit: 3785
Application No.: 11/919,974	)	Examiner: Ruby, TRAVIS C.
371(c) Date: January 6, 2009	)	Confirmation No.: 9542
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

FOURTH PRELIMINARY AMENDMENT

Prior to the examination of the above application, please amend this application as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims beginning on page 3 of this paper.

Remarks/Arguments follow the amendment sections of this paper.

Attachments to this amendment include:

- Substitute Specification; and
- Marked-up copy of Substitute Specification.

AMENDMENTS TO THE SPECIFICATION:

Please amend the specification as follows:

Please replace the entire specification with the enclosed specification.

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1-96. (Canceled).

97. (New) A cooling system for a heat-generating component, comprising:

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator and an impeller, the impeller being positioned in a recess on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including:

a pump chamber formed by the recess and at least an impeller cover having one or more passages for the cooling liquid to pass through;

a thermal exchange chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and

a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component; and

a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.

98. (New) The cooling system of claim 97, wherein the chassis shields the stator from the cooling liquid in the reservoir.

99. (New) The cooling system of claim 97, wherein the heat-exchanging interface includes a first side and a second side opposite the first side, and wherein the

heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.

100. (New) The cooling system of claim 99, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.

101. (New) The cooling system of claim 100, wherein the features include at least one of pins or fins.

102. (New) The cooling system of claim 97, wherein the impeller is positioned in the pump chamber.

103. (New) The cooling system of claim 97, wherein a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller.

104. (New) The cooling system of claim 97, wherein the impeller includes a plurality of curved blades.

105. (New) The cooling system of claim 97, wherein the pump chamber and the thermal exchange chamber are spaced apart in a vertical direction.

106. (New) The cooling system of claim 97, wherein the heat-exchanging interface includes one of copper and aluminium.

107. (New) The cooling system of claim 97, wherein the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir.

108. (New) A cooling system for a computer system, comprising:

a centrifugal pump adapted to circulate a cooling liquid, the pump including:

an impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:

a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;

a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber, and wherein at least one of the one or more passages is offset from a center of the impeller.

109. (New) The cooling system of claim 108, wherein a top wall of the reservoir physically separates the impeller from the stator.

110. (New) The cooling system of claim 108, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component.

111. (New) The cooling system of claim 108, further including a heat radiator fluidly coupled to the reservoir using flexible conduits, wherein the heat radiator is configured to be positioned remote from the reservoir.

112. (New) The cooling system of claim 108, wherein the fluid passage that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller.

113. (New) A cooling system for a heat-generating component, comprising:

a pump adapted to circulate a cooling liquid, the pump including:

an impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir including an impeller cover, an intermediate member and a heat exchange interface, wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber, the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together; and

wherein a first side of the heat-exchanging interface is in contact with a cooling liquid in the thermal exchange chamber and a second side of the heat-exchanging interface opposite the first side is configured to be placed in thermal contact with a surface of the heat-generating component; and

a liquid-to-air heat exchanger fluidly coupled to the reservoir using flexible conduits, the heat exchanger being configured to be positioned remote from the reservoir.

114. (New) The cooling system of claim 113, wherein the impeller cover includes a first opening radially offset from a center of the impeller and the intermediate

member includes a second passage that is aligned with the first opening, the first and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber.

115. (New) The cooling system of claim 113, wherein the first side of the heat-exchanging interface includes at least one of pins or fins.

116. (New) The cooling system of claim 113, wherein the top wall of the reservoir extends between the stator and the impeller and shields the stator from the cooling liquid in the reservoir.

REMARKS

Under 37 C.F.R. § 1.125(b), Applicant submits the enclosed Substitute Specification in clean form without markings as to any amended material. This amendment is requested to clarify the originally filed written disclosure. The amendments to the specification find support in FIGS. 17 and 20. Applicant also includes a marked-up version of the Substitute Specification as an attachment to this amendment. Pursuant to 37 CFR §1.125(b), Applicant states that the substitute specification includes no new matter.

By this Preliminary Amendment, Applicant also amends the claims of the present application. Claims 1-72 and 93-96 were previously canceled. Claims 73-92 have now been canceled, and new claims 97-116 have been added. Therefore, claims 97-116 are currently pending. No new matter has been added by the amendments to the claims. The Examiner is respectfully requested to consider the above preliminary amendment prior to examination of the application.

If there is any fee due in connection with the filing of this Preliminary Amendment, please charge the fee to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: July 14, 2011

By: Ashatta

Arpita Bhattacharyya
Reg. No. 63,681

COOLING SYSTEM FOR A COMPUTER SYSTEM

BACKGROUND OF THE INVENTION

[0001]The present invention relates to a cooling system for a central processing unit (CPU) or other processing unit of a computer system. More specifically, the invention relates to a liquid-cooling system for a mainstream computer system such as a PC.

[0002]During operation of a computer, the heat created inside the CPU or other processing unit must be carried away fast and efficiently, keeping the temperature within the design range specified by the manufacturer. As an example of cooling systems, various CPU cooling methods exist and the most used CPU cooling method to date has been an air-cooling arrangement, wherein a heat sink in thermal contact with the CPU transports the heat away from the CPU and as an option a fan mounted on top of the heat sink functions as an air fan for removing the heat from the heat sink by blowing air through segments of the heat sink. This air-cooling arrangement is sufficient as long as the heat produced by the CPU is kept at today's level, however it becomes less useful in future cooling arrangements when considering the development of CPUs since the speed of a CPU is said to double perhaps every 18 months, thus increasing the heat production accordingly.

[0003]Another design used today is a CPU cooling arrangement where cooling liquid is used to cool the CPU by circulating a cooling liquid inside a closed system by means of a pumping unit, and where the closed system also comprises a heat exchanger past which the cooling liquid is circulated.

[0004]A liquid-cooling arrangement is more efficient than an air-cooling arrangement and tends to lower the noise level of the cooling arrangement in general. However, the liquid-cooling design consists of many components, which increases the total installation time, thus making it less desirable as a mainstream solution. With a trend of producing smaller and more compact PCs for the end-users, the greater amount of components in a typical liquid-cooling arrangement is also undesirable. Furthermore, the many components having to be coupled together incurs a risk of leakage of cooling liquid from the system.

SUMMARY OF INVENTION

[0005]It may be one object of the invention to provide a small and compact liquid-cooling solution, which is more efficient than existing air-cooling arrangements and which can be produced at a low cost enabling high production volumes. It may be another object to create a liquid-cooling arrangement, which is easy-to-use and implement, and which requires a low level of maintenance or no maintenance at all. It may be still another object of the present invention to create a liquid-cooling arrangement, which can be used with existing CPU types, and which can be used in existing computer systems.

[0006]This object may be obtained by a cooling system for a computer system, said computer system comprising: [0007]at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, [0008]a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, [0009]a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, [0010]a pump being provided as part of an integrate element, said integrate element comprising the heat exchanging interface, the reservoir and the pump, [0011]said pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, [0012]said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means.

[0013]By providing an integrate element, it is possible to limit the number of separate elements of the system. However, there is actually no need for limiting the number of elements, because often there is enough space within a cabinet of a computer system to encompass the different individual elements of the cooling system. Thus, it is surprisingly that, at all, any attempt is conducted of integrating some of the elements.

[0014]In possible embodiments according to this aspect of the invention, the entire pump is placed inside the reservoir with at least an inlet or an outlet leading to the liquid in the reservoir. In an alternative embodiment the pump is placed outside the reservoir in the immediate vicinity of the reservoir and wherein at least an inlet or an outlet is leading directly to the liquid in the reservoir. By placing the pump inside the reservoir or in the immediate vicinity outside the reservoir, the integrity of the combined reservoir, heat exchanger and pump is obtained, so that the element is easy to employ in new and existing computer systems, especially mainstream computer systems.

[0015]In a preferred embodiment, the pumping member of the pump and a driven part of the motor of the pump, such as a rotor of en electrical motor, is placed inside the reservoir embedded in the cooling liquid, and wherein a stationary part of the motor of the pump, such as a stator of an electrical motor, is placed outside the reservoir. By having the driven part of the motor placed inside the reservoir submerged in the cooling liquid and the stationary part of the motor outside the reservoir, there is no need for encapsulating the stationary part in a liquid-proof insulation. However, problems may occur having then stationary part driving the driven part. However, the present invention provide means for obtaining such action, although not at all evident how to solve this problem.

[0016]The object may also be obtained by a cooling system for a computer system, said computer system comprising: [0017]at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, [0018]a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, [0019]a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, [0020]a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, [0021]said cooling system being intended for thermal contact with the processing unit by means of existing fastening means associated with the processing unit, and [0022]said heat radiating means intended for radiating from the cooling liquid thermal energy, dissipated to the cooling liquid, to surroundings of the heat radiating means.

[0023]The use of existing fastening means has the advantage that fitting of the cooling system is fast and easy. However, once again there is no problem for the person skilled in the art to adopt specially adapted mounting means for any element of the cooling system, because there are numerous possibilities in existing cabinets of computer systems for mounting any kind of any number of elements, also elements of a cooling system.

[0024]In preferred embodiments according to this aspect of the invention, the existing fastening means are means intended for attaching a heat sink to the processing unit, or the existing fastening means are means intended for attaching a cooling fan to the processing unit, or the existing fastening means are means intended for attaching a heat sink together with a cooling fan to the processing unit. Existing fastening means of the kind mentioned is commonly used for air cooling of CPUs of computer systems, however, air cooling arrangements being much less complex than liquid cooling systems. Nevertheless, it has ingeniously been possible to develop a complex and effective liquid cooling system capable of utilising such existing fastening means for simple and less effective air cooling arrangements.

[0025]According to an aspect of the invention, the pump is selected from the following types: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. By adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

[0026]According to another aspect of the invention, driving means for driving the pump is selected among the following driving means: electrically operated rotary motor, piezo-electrically operated motor, permanent magnet operated motor, fluid-operated motor, capacitor-operated motor. As is the case when selecting the pump to pump the liquid, by adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

[0027]The object may also be obtained by a cooling system for a computer system, said computer system comprising: [0028]at least one unit such as a central processing unit

(CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, [0029]a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, [0030]a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, [0031]a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, and [0032]said cooling system further comprising a pump wherein the pump is driven by an AC electrical motor by a DC electrical power supply of the computer system, [0033]where at least part of the electrical power from said power supply is intended for being converted to AC being supplied to the electrical motor.

[0034]It may be advantageous to use an AC motor, such as a 12V AC motor, for driving the pump in order to obtain a stabile unit perhaps having to operate 24 hours a day, 365 days a year. However, the person skilled in the art will find it unnecessary to adopt as example a 12V motor because high voltage such as 220V or 110V is readily accessible as this is the electrical voltage used to power the voltage supply of the computer system itself. Although choosing to use a 12V motor for the pump, it has never been and will never be the choice of the person skilled in the art to use an AC motor. The voltage supplied by the voltage supply of the computer system itself is DC, thus this will be the type of voltage chosen by the skilled person.

[0035]In preferred embodiments according to any aspect of the invention, an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, or an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means, or an electrical motor is intended both for driving the pump for pumping the liquid, and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means.

[0036]By utilising a single electrical motor for driving more than one element of the cooling system according to any of the aspects of the invention, the lesser complexity and the reliability of the cooling system will be further enhanced.

[0037]The heat exchanging interface may be an element being separate from the reservoir, and where the heat exchanging interface is secured to the reservoir in a manner so that the heat exchanging interface constitutes part of the reservoir when being secured to the reservoir. Alternatively, the heat exchanging interface constitutes an integrate surface of the reservoir, and where the heat exchanging surface extends along an area of the surface of the reservoir, said area of surface being intended for facing the processing unit and said area of surface being intended for the close thermal contact with the processing unit. Even alternatively, the heat exchanging interface is constitutes by a free surface of the processing unit, and where the free surface is capable of establishing heat dissipation between the processing unit and the cooling liquid through an aperture provided in the reservoir, and where the aperture extends along an area of the surface of the reservoir, said surface being intended for facing the processing unit.

[0038]Possibly, an uneven surface such as pins or fins extending from the copper plate provide a network of channels across the inner surface of the heat exchanging interface. A network of channels ensure the cooling liquid being passed along the inner surface of the interface such as a copper plate in a way that maximises the retention time of the cooling liquid along the heat exchanging interface and in a way that optimises the thermal exchange between the heat exchanging interface and the cooling liquid as long as the cooling liquid is in thermal contact with heat exchanging interface.

[0039]Possibly, the cooling system may be provided with a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, [0040]a pumping means being intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, [0041]said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means, [0042]said heat exchanging interface constituting a heat exchanging surface being manufactured from a material suitable for heat conducting, and [0043]with a first side of the heat exchanging surface facing the central processing unit being substantially plane and [0044]with a second side of the heat exchanging surface facing the cooling liquid being substantially plane and [0045]said reservoir being manufactured from plastic, and channels or segments being provided in the reservoir for establishing a certain flow-path for the cooling liquid through the reservoir.

[0046]Providing a plane heat exchanging surface, both the first, inner side being in thermal contact with the cooling liquid and the second, outer side being in thermal contact with the heat generating processing unit, results in the costs for manufacturing the heat exchanging surface is reduced to an absolute minimum.

[0047]According to the above possible solution, an inlet of the pumping means is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

[0048]Alternatively, or additionally, an outlet of said pumping means being positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchange interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

[0049]However, a plane first, inner surface may also result in the cooling liquid passing the heat exchanging surface too fast. This may be remedied by providing grooves along the inner surface, thereby providing a flow path in the heat exchanging surface. This however results in the costs for manufacturing the heat exchanging surface increasing.

[0050]The solution to this problem has been dealt with by providing channels or segments in the reservoir housing in stead. The reservoir housing may be manufactured by injection moulding or by casting, depending on the material which the reservoir housing is made from. Proving channels or segments during moulding or casting of the reservoir housing is much more cost-effective than milling grooves along the inner surface of the heat exchanging surface.

[0051]Possibly, the cooling system may be provided with at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid, [0052]said cooling system being adapted such as to provide transfer of said heat from a heat dissipating surface to a heat radiating surface where [0053]said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

[0054]Heat dissipation from the processing unit to the cooling liquid must be very efficient to ensure proper cooling of the processing unit, Especially in the case, where the processing unit is a CPU, the surface for heat dissipation is limited by the surface area of the CPU. This may be remedied by utilising a heat exchanging surface being made of a material having a high thermal conductivity such as copper or aluminium and ensuring a proper thermal bondage between the heat exchanging interface and the CPU.

[0055]However, in a possible embodiment according to the features in the above paragraph, the heat dissipation takes place directly between the processing unit and the cooling liquid by providing an aperture in the reservoir housing, said aperture being adapted for taking up a free surface of the processing unit. Thereby, the free surface of the processing unit extends into the reservoir or constitutes a part of the boundaries of the reservoir, and the cooling liquid has direct access to the free surface of the processing unit.

[0056]A possible heat exchanging interface may be the direct contact between the heat generating unit such as a CPU and the cooling liquid, where [0057]at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit comprising [0058]at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid, [0059]said cooling system being adapted such as to provide transfer of said heat from a heat dissipating interface to a heat radiating surface where [0060]said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

[0061]The aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a the processing unit, said boundaries being liquid-proof when attached to the free surface of the processing unit so that the liquid may flow freely across the free surface without the risk of the liquid dissipating through the boundaries. Alternatively, but posing the same technical effect, the aperture of the reservoir is intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of the processing unit.

[0062]If a heat sink is provided as an aid in dissipating heat from the heat generating unit such as a CPU, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a heat sink. Alternatively, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of a heat sink. Alternatively,

[0063]Possibly, the heat exchanging interface may be provided as [0064]a first reservoir intended for being closed by attaching boundaries of an aperture in the first reservoir to, alternatively along, a free surface of a said processing unit, and [0065]a second reservoir intended for being closed by attaching boundaries of an aperture in the second reservoir to, alternatively along, a free surface of a to a free surface of a heat sink, and [0066]liquid conducting means provided between the first reservoir and the second reservoir.

[0067]The first reservoir may be closed by attaching said first reservoir to a heat exchanging surface element being in close thermal contact with the processing unit, said heat exchanging surface intended for dissipating heat from the processing unit to cooling liquid in the first reservoir, and wherein a second reservoir is closed by attaching said second reservoir to a surface of a heat sink, said heat sink intended for radiating heat from cooling liquid in the second reservoir to the exterior surroundings.

[0068]Also, the first reservoir and said second reservoir may be provided as a monolithic structure comprising both the first reservoir and the second reservoir and where both a heat dissipation from the processing unit to the cooling liquid in the first reservoir and heat radiation from the cooling liquid in the second reservoir to exterior surrounding is provided by the monolithic structure. The said monolithic structure may preferably be manufactured at least partly from plastic, preferably being manufactured fully in plastic, and said monolithic structure thus being manufactured by injection moulding.

[0069]Transfer of said cooling liquid from an outlet of the first reservoir to an inlet of the second reservoir, and from an outlet of the second reservoir to an inlet of the first reservoir, and circulating the cooling liquid within said liquid conducting means is provided by a pumping means being intended for pumping the cooling liquid.

[0070]One of said reservoirs of said monolithic structure may comprise said pumping means.

[0071]An inlet and/or an outlet and/or a pumping member of said pumping means, may be provided in the vicinity of said substantially plane side in order to provide a turbulence of flow and hereby improve the exchange of heat between said cooling liquid and substantially plane side, and the inlet of the pumping means may be provided within the first reservoir and the outlet may be provided within the second reservoir.

[0072]According to one aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilising a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface and a pumping means, said method of cooling comprising the steps of [0073]establishing, or defining, or selecting an operative status of the pumping means [0074]controlling the operation of the motor of the pumping means in response to the following parameters; the necessary direction of movement for obtaining a pumping action of a pumping member of the pumping means, the possible direction of movement of a driving part of the motor of the pumping means, and [0075]in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve the necessary direction of movement of the driving part of the motor for establishing the necessary direction of movement for obtaining he pumping action of the pumping member.

[0076]There may be pumping means, where the pumping member is only operationable in one direction but where the motor driving the pumping member is operationable in two directions. The solution to this problem is to either choose a pumping member operationable in both directions or to chose a motor being operationable in only one direction. According to the invention, a solution is provided where a one-way directional pumping member may be operated any a two-way directional motor. Despite the contradictory nature of this solution, advantages may however be present.

[0077]As example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and where said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor before applying a full-wave AC power signal.

[0078]As an alternative example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor after having applied the full-wave AC power signal.

[0079]In both the above examples, the advantages of the one-way impeller from a traditional DC pump together with the advantages of a motor from a traditional AC pump is obtained in the solution mentioned. The performance of an impeller of a DC pump is much better than the performance of an impeller from an AC pump. The motor from an AC pump is more reliable than a motor from a DC pump. The advantageous obtained is thus of synergetic nature, seeing that different advantages of the impeller of the DC pump and of the motor of the AC pump are different in nature.

[0080]According to another aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilising a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface, an air blowing fan, a pumping means, said method of cooling comprising the steps of [0081]applying one of the following possibilities of how to operate the computer system: establishing, or defining, or selecting an operative status of the computer system [0082]controlling the operation of at least one of the following means of the computer system; the pumping means and the air blowing fan in response to at least one of the following parameters; a surface temperature of the heat generating processing unit, an internal temperature of the heat generating processing unit, or a processing load of the CPU and [0083]in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve at least one of the following conditions; a certain cooling performance of the cooling system, a certain electrical consumption of the cooling system, a certain noise level of the cooling system.

[0084]Applying the above method ensures an operation of the computer system being in accordance with selected properties during the use of the computer system. For some applications, the cooling performance is vital such as may be the case when working with image files or when downloading large files from a network during which the processing units is highly loaded and thus generating much heat. For other applications, the electrical power consumption is more vital such as may be the case when utilising domestic computer systems or in large office building in environments where the electrical grid may be weak such as in third countries. In still other applications, the noise generated by the cooling system is to be reduced to a certain level, which may be the case in office buildings with white collar people working alone, or at home, if the domestic computer perhaps is situated in the living room, or at any other location where other exterior considerations have to be dealt with.

[0085]According to another aspect of the invention, a method is envisaged, said method being employed with cooling system further comprising a pumping means with an impeller for pumping the cooling liquid through a pumping housing, said pumping means being driven by an AC electrical motor with a stator and a rotor, and said pumping means being provided with a means for sensing a position of the rotor, and wherein the method comprises the following steps: [0086]initially establishing a preferred rotational direction of the rotor of the electrical motor [0087]before start of the electrical motor, sensing the angular position of the rotor [0088]during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor [0089]said selection being made according to the preferred rotational direction, and [0090]said application of the AC signal, such as an AC voltage, being performed by the computer system for applying the AC signal, such as an AC voltage, from the electrical power supply of the computer system during conversions of the electrical DC signal, such as a DC voltage, of the power supply to the AC signal, such as an AC voltage, for the electrical motor.

[0091]Adopting the above method according to the invention ensures the most efficient circulation of cooling liquid in the cooling system and at the same time ensures the lowest possible energy consumption of the electrical motor driving the impeller. The efficient circulation of the cooling liquid is obtained by means of an impeller being designed for rotation in one rotational direction only, thus optimising the impeller design with regard to the only one rotational direction as opposed to both rotational directions. The low energy consumption is achieved because of the impeller design being optimised, thus limiting the necessary rotational speed of the impeller for obtaining e certain amount of flow of the cooling liquid through the cooling system. A bonus effect of the lowest possible energy consumption being obtained is the lowest possible noise level of the pump also being obtained. The noise level of the pump is amongst other parameters also dependent on the design and the rotational speed of the impeller. Thus, an optimised impeller design and impeller speed will reduce the noise level to the lowest possible in consideration of ensuring a certain cooling capacity.

BRIEF DESCRIPTION OF THE FIGURES

[0092]The invention will hereafter be described with reference to the drawings, where

[0093]FIG. 1 shows an embodiment of the prior art. The figure shows the typical components in an air-cooling type CPU cooling arrangement.

[0094]FIG. 2 shows an embodiment of the prior art. The figure shows the parts of the typical air-cooling type CPU cooling arrangement of FIG. 1 when assembled.

[0095]FIG. 3 shows an embodiment of the prior art. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement.

[0096]FIG. 4 is an exploded view of the invention and the surrounding elements.

[0097]FIG. 5 shows the parts shown in the previous figure when assembled and attached to the motherboard of a computer system.

[0098]FIG. 6 is an exploded view of the reservoir from the previous FIGS. 4 and 5 seen from the opposite site and also showing the pump.

[0099]FIG. 7 is a cut-out view into the reservoir housing the pump and an inlet and an outlet extending out of the reservoir.

[0100]FIG. 8 is a view of the cooling system showing the reservoir connected to the heat radiator.

[0101]FIG. 9-10 are perspective views of a possible embodiment of reservoir housing providing direct contact between a CPU and a cooling liquid in a reservoir.

[0102]FIG. 11-13 are perspective views of a possible embodiment of heat sink and a reservoir housing constituting an integrated unit.

[0103]FIG. 14 is a perspective view of the embodiment shown in FIG. 9-10 and the embodiment shown in FIG. 11-13 all together constituting an integrated unit.

[0104]FIG. 15-16 are perspective view of a possible embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit

[0105]FIG. 17 is a perspective view of a preferred embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit,

[0106]FIG. 18 is a plane view of a possible, however preferred embodiment of an AC electrical motor for a pumping means of the cooling system according to the invention, and

[0107]FIG. 19 is a graph showing a method for starting a rotor of the electrical AC motor, said AC motor driving an impeller selected from a pump driven by a DC motor.

DETAILED DESCRIPTION OF THE INVENTION

[0108]FIG. 1 is an exploded view of an embodiment of prior art cooling apparatus for a computer system. The figure shows the typical components in an air-cooling type CPU cooling arrangement. The figure shows a prior art heat sink 4 intended for air cooling and provided with segments intersected by interstices, a prior art air fan 5 which is to be mounted on top of the heat sink by use of fastening means 3 and 6.

[0109]The fastening means comprises a frame 3 provided with holes intended for bolts, screws, rivets or other suitable fastening means (not shown) for thereby attaching the frame to a motherboard 2 of a CPU 1 or onto another processing unit of the computer system. The frame 3 is also provided with mortises provided in perpendicular extending studs in each corner of the frame, said mortises intended for taking up tenons of a couple of braces. The braces 6 are intended for enclosing the heat sink 4 and the air fan 5 so that the air fan and the heat sink thereby is secured to the frame. Using proper retention mechanisms, when the frame is attached to the motherboard of the CPU of other processing unit, and when the tenons of the braces are inserted into the mortises of the frame, the air fan and heat exchanger is pressed towards the CPU by using a force perpendicular to the CPU surface, said force being provided by lever arms.

[0110]FIG. 2 shows the parts of the typical air-cooling type CPU cooling arrangement of FIG. 1, when assembled. The parts are attached to each other and will be mounted on top of a CPU on a motherboard (not shown) of a computer system.

[0111]FIG. 3 shows another embodiment of a prior art cooling system. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement. The figure shows a prior art heat exchanger 7, which is in connection with a prior art liquid reservoir 8, a prior art liquid pump 9 and a heat radiator 11 and an air fan 10 provided together with the heat radiator. The prior art heat exchanger 7, which can be mounted on a CPU (not shown) is connected to a radiator and reservoir, respectively. The reservoir serves as a storage unit for excess liquid not capable of being contained in the remaining components. The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid. The heat radiator 11 serves as a means for removing the heat from the liquid by means of the air fan 10 blowing air through the heat radiator. All the components are in connection with each other via tubes for conducting the liquid serving as the cooling medium.

[0112]FIG. 4 is an exploded view of a cooling system according to an embodiment of the invention. Also elements not being part of the cooling system as such are shown. The figure shows a central processing unit CPU 1 mounted on a motherboard of a computer system 2. The figure also shows a part of the existing fastening means, i.e. amongst others the frame 3 with mortises provided in the perpendicular extending studs in each corner of the frame. The existing fastening means, i.e. the frame 3 and the braces 6, will during use be attached to the motherboard 2 by means of bolts, screws, rivets or other suitable fastening means extending through the four holes provided in each corner of the frame and extending through corresponding holes in the motherboard of the CPU. The frame 3 will still provide an opening for the CPU to enable the CPU to extend through the frame.

[0113]The heat exchanging interface 4 is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminium, and which will be in thermal contact with the CPU 1, when the cooling system is fastened to the motherboard 2 of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing 14, thus the heat exchanger 4 constitutes the part of the liquid reservoir housing facing the CPU. The reservoir may as example be made of plastic or of metal. The reservoir or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0114]If the reservoir is made of metal or any other material having a relative high heat conductivity compared to as example plastic, the heat exchanging interface as a separate element may be excluded because the reservoir itself may constitute a heat exchanger over an area, wherein the reservoir is in thermal contact with the processing unit. Alternatively to having the heat exchanging interface constitute part of the liquid reservoir housing, the liquid reservoir housing may be tightly attached to the heat exchanging interface by means of screws, glue, soldering, brazing or the like means for securing the heat exchanging interface to the housing and vice versa, perhaps with a sealant 5 provided between the housing and the heat exchanging interface.

[0115]Alternatively to providing a heat exchanging interface integrate with the reservoir containing the cooling liquid, it will be possible to exclude the heat exchanger and providing another means for dissipating heat from the processing unit to the cooling liquid in the reservoir, The other means will be a hole provided in the reservoir, said hole intended for being directed towards the processing unit. Boundaries of the hole will be sealed towards boundaries of the processing unit or will be sealed on top of the processing unit for thereby preventing cooling liquid from the reservoir from leaking. The only prerequisite to the sealing is that a liquid-tight connection is provided between boundaries of the hole and the processing unit or surrounding of the processing unit, such as a carrier card of the processing unit.

[0116]By excluding the heat exchanger, a more effective heat dissipation will be provided from the processing unit and to the cooling liquid of the reservoir, because the intermediate element of a heat exchanger is eliminated. The only obstacle in this sense is the provision of a sealing being fluid-tight in so that the cooling liquid in the reservoir is prevented from leaking.

[0117]The heat exchanging surface 4 is normally a copper plate. When excluding the heat exchanging surface 4, which may be a possibility not only for the embodiments shown in FIG. 4, but for all the embodiments of the invention, it may be necessary to provide the CPU with a resistant surface that will prevent evaporation of the cooling liquid and/or any damaging effect that the cooling liquid may pose to the CPU. A resistant surface may be provided the CPU from the CPU producer or it may be applied afterwards. A resistant surface to be applied afterwards may e.g. be a layer, such as an adhesive tape provided on the CPU. The adhesive tape may be made with a thin metal layer e.g. in order to prevent evaporation of the cooling liquid and/or any degeneration of the CPU itself.

[0118]Within the liquid reservoir, a liquid pump (not shown) is placed for pumping a cooling liquid from an inlet tube 15 connection being attached to the housing of the reservoir through the reservoir and past the heat exchanger in thermal contact with the CPU to an outlet tube connection 16 also being attached to the reservoir housing. The existing fastening means comprising braces 6 with four tenons and the frame 3 with four corresponding mortises will fasten the reservoir and the heat exchanger to the motherboard of the CPU. When fastening the two parts of the existing fastening means to each other the fastening will by means of the lever arms 18 create a force to assure thermal contact between the CPU 1 mounted on the motherboard and the heat exchanger 4 being provided facing the CPU.

[0119]The cooling liquid of the cooling system may be any type of cooling liquid such as water, water with additives such as anti-fungicide, water with additives for improving heat conducting or other special compositions of cooling liquids such as electrically non-conductive liquids or liquids with lubricant additives or anti-corrosive additives.

[0120]FIG. 5 shows the parts shown in FIG. 4 when assembled and attached to the motherboard of a CPU of a computer system 2. The heat exchanger and the CPU is in close thermal contact with each other. The heat exchanger and the remainder of the reservoir housing 14 is fastened to the motherboard 2 by means of the existing fastening means being secured to the motherboard of the CPU and by means of the force established by the lever arms 18 of the existing fastening means. The tube inlet connection 15 and the tube outlet connection 16 are situated so as to enable connection of tubes to the connections.

[0121]FIG. 6 is an exploded view of the reservoir shown in previous FIG. 4 and FIG. 5 and seen from the opposite site and also showing the pump 21 being situated inside the reservoir. Eight screws 22 are provided for attaching the heat exchanging surface 4 to the remainder of the reservoir. The heat exchanging surface is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see FIG. 4). However, also the inner surface (not shown, see FIG. 7) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the octagonal shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

[0122]A sealant in form of a gasket 13 is used for the connection between the reservoir housing 14 and the heat exchanging surface forming a liquid tight connection. The pump is intended for being placed within the reservoir. The pump has a pump inlet 20 through which the cooling liquid flows from the reservoir and into the pump, and the pump has a pump outlet 19 through which the cooling liquid is pumped from the pump and to the outlet connection. The figure also shows a lid 17 for the reservoir. The non-smooth inner walls of the reservoir and the fact that the pump is situated inside the reservoir will provide a swirling of the cooling liquid inside the reservoir.

[0123]However, apart from the non-smooth walls of the reservoir and the pump being situated inside the reservoir, the reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir (see FIG. 9-10 and FIG. 15). Channel or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. By providing channels or segments inside the reservoir, a flow will be provided forcing the cooling liquid to pass the heat exchanging surface, and the amount of time increased of the cooling liquid being resident inside the reservoir, thus enhancing heat dissipation. If channels or segments are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

[0124]The cooling liquid enters the reservoir through the tube inlet connection 15 and enters the pump inlet 20, and is pumped out of the pump outlet 19 connected to the outlet connection 16. The connection between the reservoir and the inlet tube connection and the outlet tube connection, respectively, are made liquid tight. The pump may not only be a self-contained pumping device, but may be made integrated into the reservoir, thus making the reservoir and a pumping device one single integrated component. This single integrated element of the reservoir and the pumping device may also be integrated, thus making the reservoir, the pumping device and the heat exchanging surface one single integrated unit. This may as example be possible if the reservoir is made of a metal such as aluminium. Thus, the choice of material provides the possibility of constituting both the reservoir and a heat exchanging surface having a relatively high heat conductivity, and possibly also renders the possibility of providing bearings and the like constructional elements for a motor and a pumping wheel being part of the pumping device.

[0125]In an alternative embodiment, the pump is placed in immediate vicinity of the reservoir, however outside the reservoir. By placing the pump outside, but in immediate vicinity of the reservoir, still an integrate element may be obtained. The pump or the inlet or the outlet is preferably positioned so as to obtain a turbulence of flow in the immediate vicinity of the heat exchanging interface, thereby promoting increased heat dissipation between the heat exchanging interface end the cooling liquid. even in the alternative, a pumping member such as an impeller (see FIG. 15-16) may be provided in the immediate vicinity of the heat exchanging surface. The pumping member itself normally introduces a turbulence of flow, and thereby the increased heat dissipation is promoted irrespective of the position of the pump itself, or the position of the inlet or of the outlet to the reservoir or to the pump.

[0126]The pump may be driven by an AC or a DC electrical motor. When driven by an AC electrical motor, although being technically and electrically unnecessary in a computer system, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the pump.

The pump may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. However, in the embodiment shown, the pump is driven by a 12V AC electrical motor.

[0127]Control of the pump in case the pump is driven by an AC electrical motor, preferably takes place by means of the operative system or an alike means of the computer system itself, and where the computer system comprises means for measuring the CPU load and/or the CPU temperature. Using the measurement performed by the operative system or alike system of the computer system eliminates the need for special means for operating the pump. Communication between the operative system or alike system and a processor for operating the pump may take place along already established communication links in the computer system such as a USB-link. Thereby, a real-time communication between the cooling system and the operative system is provided without any special means for establishing the communication.

[0128]In the case of the motor driving the pump is an AC electrical motor, the above method of controlling the pump may be combined with a method, where said pumping means is provided with a means for sensing a position of the rotor of the electrical motor, and wherein the following steps are employed: Initially establishing a preferred rotational direction of the rotor of the electrical motor, before start of the electrical motor, sensing the angular position of the rotor, during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor, said selection being made according to the preferred rotational direction, and said application of the AC voltage being performed by the computer system for applying the AC voltage from the electrical power supply of the computer system during conversion of the electrical DC voltage of the power supply to AC voltage for the electrical motor. By the operative system of the computer system itself generating the AC voltage for the electrical motor, the rotational direction of the pump is exclusively selected by the computer system, non-depending on the applied voltage of the public grid powering the computer system.

[0129]Further control strategies utilising the operative system or alike system of the computer system may involve balancing the rotational speed of the pump as a function of the cooling capacity needed. If a lower cooling capacity is needed, the rotational speed of the pump, may be limited, thereby limiting the noise generating by the motor driving the pump.

[0130]In the case an air fan is provided in combination with a heat sink as shown in FIG. 1, of the air fan is provided in combination with the heat radiator, the operative system or alike system of the computer system may be designed for regulating the rotational speed of the pump, and thus of the motor driving the pump, and the rotational speed of the air fan, and thus the motor driving the air fan. The regulation will take into account the cooling capacity needed, but the regulation will at the same time take into account which of the two cooling means, i.e. the pump and the air fan, is generating the most noise. Thus, it the air fan generally is generating more noise than the pump, then the regulation will reduce the rotational speed of the air fan before reducing the rotational speed of the pump, whenever a lower cooling capacity is needed. Thereby, the noise level of the entire cooling system is lowered as much as possible. If the opposite is the case, i.e. the pump generally generating more noise than the air fan, then the rotational speed of the pump will be reduced before reducing the rotational speed of the air fan.

[0131]Even further control strategies involve controlling the cooling capacity in dependence on the type of computer processing taking place. Some kind of computer processing, such as word-processing, applies a smaller load on the processing units such as the CPU than other kinds of computer processing, such as image processing. Therefore, the kind of processing taking place on the computer system may be used as an indicator of the cooling capacity. It may even be possible as part of the operative system or similar system to establish certain cooling scenarios, depending on the kind of processing intended by the user. If the user selects as example word-processing, a certain cooling strategy is applied based on a limited need for cooling. If the user selects as example image-processing, a certain cooling strategy is applied based on an increased need for cooling. Two or more different cooling scenarios may be established depending on the capacity and the control possibilities and capabilities of the cooling system and depending on the intended use of the computer system, either as selected by a user during use of the computer system or as selected when choosing hardware during build-up of the computer system, i.e. before actual use of the computer system.

[0132]The pump is not being restricted to a mechanical device, but can be in any form capable of pumping the cooling liquid through the system. However, the pump is preferably one of the following types of mechanical pumps: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. Similarly, the motor driving the pumping member need not be electrical but may also be a piezo-electrically operated motor, a permanent magnet operated motor, a fluid-operated motor or a capacitor-operated motor. The choice of pump and the choice of motor driving the pump id dependent on many different parameters, and it is up to the person skilled in the art to choose the type of pump and the type of motor depending on the specific application. As example, some pumps and some motors are better suited for small computer systems such as lab-tops, some pumps and some motors are better suited for establishing i high flow of the cooling liquid and thus a high cooling effect, and even some pumps and motors are better suited for ensuring a low-noise operation of the cooling system.

[0133]FIG. 7 is a cut-out view into the reservoir, when the reservoir and the heat exchanging surface 4 is assembled and the pump 21 is situated inside the reservoir. The reservoir is provided with the tube inlet connection (not seen from the figure) through which the cooling liquid enters the reservoir. Subsequently, the cooling liquid flows through the reservoir passing the heat exchanging surface and enters the inlet of the pump. After having been passed through the pump, the cooling liquid is passed out of the outlet of the pump and further out through the tube outlet connection 16. The figure also shows a lid 17 for the reservoir. The flow of the cooling liquid inside the reservoir and trough the pump may be further optimised in order to use as little energy as possible for pumping the cooling liquid, but still having a sufficient amount of heat from the heat exchanging surface being dissipated in the cooling liquid. This further optimisation can be established by changing the length and shape of the tube connection inlet within the reservoir, and/or by changing the position of the pump inlet, and/or for instance by having the pumping device placed in the vicinity and in immediate thermal contact with the heat exchanging surface and/or by providing channels or segments inside the reservoir.

[0134]In this case, an increased turbulence created by the pumping device is used to improve the exchange of heat between the heat exchanging surface and the cooling liquid. Another or an additional way of improving the heat exchange is to force the cooling liquid to pass through specially adapted channels or segments being provided inside the reservoir or by making the surface of the heat exchanging surface plate inside the reservoir uneven or by adopting a certain shape of a heat sink with segments. In the figure shown, the inner surface of the heat exchanging surface facing the reservoir is plane.

[0135]FIG. 8 is a perspective view of the cooling system showing the reservoir housing 14 with the heat exchanging surface (not shown) and the pump (not shown) inside the reservoir. The tube inlet connection and the tube outlet connection are connected to a heat radiator by means of connecting tubes 24 and 25 through which the cooling liquid flows into and out of the reservoir and the heat radiator, respectively. Within the heat radiator 11, the cooling liquid passes a number of channels for radiating the heat, which has been dissipated into the cooling liquid inside the reservoir, and to the surroundings of the heat exchanger. The air fan 10 blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir.

[0136]According to the invention, the heat radiator 11 may be provided alternatively. The alternative heat radiator is constituted by a heat sink, such as a standard heat sink made of extruded aluminium with fins on a first side and a substantially plane second side. An air-fan may be provided in connection with the fins along the first side. Along the second side of the heat sink a reservoir is provided with at least one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the substantial plane side of the heat sink. When closing the reservoir in such a way a surface of the heat sink is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the at least one aperture. This alternative way of providing the heat radiator may be used in the embodiment shown in FIG. 8 or may be used as a heat radiator for another use and/or for another embodiment of the invention.

[0137]A pumping means for pumping the cooling liquid trough the reservoir may or may not be provided inside the reservoir at the heat sink. The reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir. Channels or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. If channels or segments in the reservoir are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

[0138]By means of the alternative heat radiator, the heat radiator 11 is not provided as is shown in the figure with the rather expensive structure of channels leading the cooling liquid along ribs connecting the channels for improved surface of the structure. Instead, the heat radiator is provided as described as a unit constituted by a heat sink with or without a fan and a reservoir, and thereby providing a simpler and thereby cheaper heat radiator than the heat radiator 11 shown in the figure.

[0139]The alternative heat radiator provided as an unit constituted by a heat sink and a reservoir, may be used solely, with or without a pump inside the reservoir and with or without the segments or channels, for being placed in direct or indirect thermal contact with a heat generating processing unit such as CPU or with the heat exchanging surface, respectively. These embodiments of the invention may e.g. be used for a reservoir, where the cooling liquid along a first side within the reservoir is in direct heat exchanging contact with the heat generating processing unit such as a CPU and the cooling liquid along a second side within the reservoir is in direct heat exchanging contact with a heat sink. Such a reservoir may be formed such as to provide a larger area of heat exchanging surface towards the heat generating processing unit such as a CPU than the area of the heat exchanging surface facing the heat sink. This may e.g. have the purpose of enlarging the area of the heat exchanging surface so as to achieve an improved heat dissipation form e.g. the CPU to the heat sink than that of a conventional heat sink without a reservoir attached. Conventional heat sinks normally only exchanges heat with the CPU through the area as given by the area of the top side of the CPU. A system comprising a liquid reservoir and a heat sink with a fan provided has been found to be a simple, cost optimised system with an improved heat dissipation than that of a standard heat sink with a fan, but without the reservoir. In another embodiment of the invention, which may be derived from FIG. 8, the air fan and the heat radiator is placed directly in alignment of the reservoir. Thereby, the reservoir housing 14, the air fan 10 and the radiator 11 constitute an integrate unit. Such an embodiment may provide the possibility of omitting the connection tubes, and passing the cooling liquid directly from the heat radiator to the reservoir via an inlet connection of the reservoir, and directly from the reservoir to the heat radiator via an outlet connection of the reservoir. Such an embodiment may even render the possibility of both the pumping device of the liquid pump inside the reservoir and the electrical motor for the propeller of the air fan 23 of the heat radiator 11 being driven by the same electrical motor, thus making this electrical motor the only motor of the cooling system.

[0140]When placing the heat radiator on top of the air fan now placed directly in alignment with the reservoir and connecting the heat radiator directly to the inlet connection and outlet connection of the reservoir, a need for tubes will not be present. However, if the heat radiator and the reservoir is not in direct alignment with each other, but tubes may still be needed, but rather than tubes, pipes made of metal such as copper or aluminium may be employed, such pipes being impervious to any possible evaporation of cooling liquid. Also, the connections between such pipes and the heat radiator and the reservoir, respectively, may be soldered so that even the connections are made impervious to evaporation of cooling liquid.

[0141]In the derived embodiment just described, an integrated unit of the reservoir, the heat exchanging surface and the pumping device will be given a structure establishing improved heat radiating characteristics because the flow of air of the air fan may also be directed along outer surfaces of the reservoir. If the reservoir is made of a metal, the metal will be cooled by the air passing the reservoir after having passed or before passing the heat radiator. If the reservoir is made of metal, and if the reservoir is provided with segments on the outside surface of the reservoir, such cooling of the reservoir by the air will be further improved. Thereby, the integrated unit just described will be applied improved heat radiating characteristics, the heat radiation function normally carried out by the heat radiator thus being supplemented by one or more of the further elements of the cooling system, i.e. the reservoir, the heat exchanging surface, the liquid pump and the air fan.

[0142]FIG. 9-10 show an embodiment of a reservoir housing 14, where channels 25 are provided inside the reservoir for establishing a forced flow of the cooling liquid inside the reservoir. The channels 25 in the reservoir housing 14 lead from an inlet 15 to an outlet 16 like a maze between the inlet and the outlet. The reservoir housing 14 is provided with an aperture 27 having outer dimensions corresponding to the dimensions of a free surface of the processing unit 1 to be cooled. In the embodiment shown, the processing unit to be cooled is a CPU 1.

[0143]When channels 26 are provided inside the reservoir, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps manufactured by injection moulding, or is to be made of metal such as aluminium, perhaps manufactured by extrusion or by die casting.

[0144]The reservoir housing 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0145]The CPU 1 is intended for being positioned in the aperture 27, as shown in FIG. 10, so that outer boundaries of the CPU are engaging boundaries of the aperture. Possibly, a sealant (not shown) may be provided along the boundaries of the CPU and the aperture for ensuring a fluid tight engagement between the boundaries of the CPU and the boundaries of the aperture. When the CPU 1 is positioned in the aperture 27, the free surface (not shown) of the CPU is facing the reservoir, i.e. the part of the reservoir having the channels provided. Thus, when positioned in the aperture 27 (see FIG. 10), the free surface of the CPU 1 is having direct contact with cooling liquid flowing through the channels 26 in the reservoir.

[0146]When cooling liquid is forced from the inlet 15 along the channels 26 to the outlet 16, the whole of the free surface of the CPU 1 will be passed over by the cooling liquid, thus ensuring a proper and maximised cooling of the CPU. The configuration of the channels may be designed and selected according to any one or more provisions, i.e. high heat dissipation, certain flow characteristics, ease of manufacturing etc. Accordingly, the channels may have another design depending on any desire or requirement and depending on the type of CPU and the size and shape of the free surface of the CPU. Also. other processing units than a CPU may exhibit different needs for heat dissipation, and may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the channels. If the processing unit is very elongate, such as a row of microprocessors, one or a plurality of parallel channels may be provided, perhaps just having a common inlet and a common outlet.

[0147]FIG. 11-13 show an embodiment of a heat sink 4, where segments 28 are provided at a first side 4A of the heat sink, and fins 29 for dissipating heat to the surroundings are provided at the other, second side 4B of the heat sink. An intermediate reservoir housing 30 is provided having a recessed reservoir at the one side facing the first side 4A of the heat sink. The recessed reservoir 30 has an inlet 31 and an outlet 32 at the other side opposite the side facing the heat sink 4.

[0148]When segments 28 are provided on the first side 4A of the heat sink, the shape of the segments may be decisive of whether the reservoir, which is made from metal such as aluminium or copper, is to be made by extrusion or is to be made by other manufacturing processes such as die casting. Especially when the segments 28 are linear and are parallel with the fins 29, as shown in the embodiment, extrusion is a possible and cost-effective means of manufacturing the heat sink 4.

[0149]The intermediate reservoir 30 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0150]The recessed reservoir is provided with a kind of serration 33 along opposite sides of the reservoir, and the inlet 31 and the outlet 32, respectively, are provided at opposite corners of the intermediate reservoir 30. The segments 28 provided at the first side 4A of the heat sink, i.e. the side facing the intermediate reservoir 30, are placed so that when the heat sink is assembled with the intermediate reservoir housing (see FIG. 13) the segments 29 run from one serrated side of the reservoir to the other serrated side of the reservoir.

[0151]When cooling liquid is forced from the inlet 31 through the reservoir, along channels (not shown) formed by the segments 29 of the heat sink 4 and to the outlet 32, the whole of the first side 4A of the heat sink will be passed over by the cooling liquid, thus ensuring a proper and maximised heat dissipation between the cooling liquid and the heat sink. The configuration of the segments on the first side 4A of the heat sink and the configuration of the serrated sides of the intermediate reservoir housing may be designed and selected according to any provisions. Accordingly, the segments may have another design, perhaps being wave-shaped or also a serrated shape, depending on any desired flow characteristics of the cooling liquid and depending on the type of heat sink and the size and shape of the reservoir.

[0152]Also other types of heat sinks, perhaps circular shaped heat sinks may exhibit different needs for heat dissipation, may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the segments and the intermediate reservoir. If the heat sink and the reservoir are circular or oval, a spiral-shaped segmentation or radially extending segments may be provided, perhaps having the inlet or the outlet in the centre of the reservoir. If an impeller of the pump is provided, as shown in FIG. 15-16, the impeller of the pump may be positioned in the centre of a spiral-shaped segmentation or in the centre of radially extending segments.

[0153]FIG. 14 shows the reservoir housing 14 shown in FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 shown in FIG. 11-13 being assembled for thereby constituting an integrated monolithic unit. It is not absolutely necessary to assemble the reservoir housing 14 of FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 of FIG. 11-13 in order to obtain a properly functioning cooling system. The inlet 15 and the outlet 16 of the reservoir housing 14 of FIG. 9-10 may be connected to the outlet 32 and the inlet 31, respectively, of the intermediate reservoir of FIG. 11-13 by means of tubes or pipes.

[0154]The reservoir housing 14 of FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 of FIG. 11-13 may then be positioned in the computer system at different locations. However, by assembling the reservoir housing 14 of FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 of FIG. 11-13 a very compact monolithic unit is obtained, also obviating the need for tubes or pipes. Tubes or pipes may involve an increased risk of leakage of cooling liquid or may require soldering or other special working in order to eliminate the risk of leakage of cooling liquid. By eliminating the need for tubes or pipes, any leakage and any additional working is obviated when assembling the cooling system.

[0155]FIG. 15-16 show a possible embodiment of a reservoir according to the invention. The reservoir is basically similar to the reservoir shown in FIG. 9-10. However, an impeller 33 of the pump of the cooling system is provided in direct communication with the channels 26. Also, in the embodiment shown, a heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed between the channels 26 inside the reservoir and the CPU 1 as the processing unit.

[0156]The heat exchanging surface 4 is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU 1 (see FIG. 4). However, also the inner surface (not shown, see FIG. 7) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

[0157]The provision of the heat exchanging surface 4 need not be a preferred embodiment, seeing that the solution incorporating the aperture (see FIG. 9-10) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging surface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging surface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

[0158]In the embodiment shown, the heat exchanging surface 4 is secured to the reservoir by means of bolts 22. Other convenient fastening means may be used. The heat exchanging surface 4 and thus the reservoir housing 14 may be fastened to the CPU 1 or other processing unit by any suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging surface. One such means may be the fastening means shown in FIG. 4 and FIG. 5 or similar fastening means already provided as part of the computer system.

[0159]When channels 26 are provided inside the reservoir housing 14, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

[0160]The reservoir housing 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0161]The impeller 33 (see FIG. 14) of the pump is positioned in a separate recess of the channels 26, said separate recess having a size corresponding to the diameter of the impeller of the pump. The recess is provided with an inlet 34 and an outlet 35 being positioned opposite an inlet 31 and an outlet 32 of cooling liquid to and from, respectively, the channels 26. The impeller 33 of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

[0162]The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. In a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

[0163]The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer system supplying DC electrical power, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump. However, in the embodiment shown, the impeller of the pump is driven by a 12V electrical motor.

[0164]FIG. 17 shows a preferred possible embodiment of a reservoir according to the invention. The reservoir housing 14, as shown in FIGS. 17 and 20, is in the form of a double-sided chassis configured to mount an electrical motor. The reservoir housing 14 has basically the same features as the reservoir housing shown in FIG. 15-16. In the embodiment shown, the reservoir substantially has a conical, circular configuration and is provided with stiffening ribs 36 extending axially along the exterior of the reservoir housing 14.

[0165]Other shapes such as cylindrical, circular, or conical rectangular or cylindrical, rectangular or even oval or triangular shapes may be adopted, when designing and possibly injection moulding or casting the reservoir. The dimension of the embodiment shown is approximately 55 mm in diameter and also 55 mm in axial extension.

[0166]The reservoir housing 14 has a recess 40 in the centre on the upper side of the reservoir. The recess 37 is intended for accommodating a stator 37 of an electrical motor driving an impeller 33 of the pump, said impeller being attached to a shaft 38 of a rotor 39 of the electrical motor. The recess 40 has an orifice 41, four sidewalls 42, a bottom 43 and a circular jacket 44 extending from the bottom 43 of the recess 40 and outwards towards the orifice 41 of the recess 40. The interior (not shown) of the jacket 44 is intended for encompassing the rotor 39 of the pump. As shown in FIG. 20, the impeller 33 is housed in a recess on the underside of the reservoir housing 14, the recess being an extension of the interior of the jacket 44.

[0167]Thereby, a liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system.

[0168]Along an outer circumferential extension, the reservoir housing 14 is provided with protrusions 45 extending outwardly from the circumferential extension. The protrusions are intended for cooperating with a clip (see description below) for fastening the reservoir housing 14 to the CPU or other processing unit of the computer system. The protrusions 45 are shown as a plurality of singular protrusions. Alternatively, the protrusions may be only one continuous protrusion extending outwardly and around the circumferential extension.

[0169]The reservoir housing 14 may also be provided with an inlet (not shown) and an outlet (not shown) for the cooling liquid. The inlet and the outlet are provided along a surface of the reservoir facing downward and inwards when seen in the perspective view of the drawing. The inlet and the outlet lead to a radiator (not shown) intended for cooling the cooling liquid after having been heated by the processing unit via a heat exchanging surface (see description below).

[0170]The radiator may be placed nearby or distant from the reservoir housing 14, depending on the set-up of the computer system. In one possible embodiment, the radiator is placed in the immediate vicinity of the reservoir, thereby possible excluding any tubing extending between the radiator and the inlet and the outlet, respectively. Such embodiment provides a very compact configuration of the entire cooling system, namely a monolithic configuration where all elements needed for the cooling system are incorporated in one unit.

[0171]In an alternative embodiment, the reservoir housing 14 itself also constitutes the radiator of the cooling system. In such embodiment, an inlet and an outlet are not needed. If the reservoir is made of a metal such as copper or aluminium or other material having a high thermal conductance, the cooling liquid, after having been heated by the processing unit via a heat exchanging surface 8 see description below) may radiate the heat via the exterior surface of the reservoir housing 14 itself. In such embodiment, the ribs 36 along the exterior surface of the reservoir housing 14 may also, or may in stead, function as cooling fins. In such embodiment, the fins will have a smaller dimension than the transverse dimension of the ribs 14 shown in FIG. 17, and the number of fins will be greater than the number of fins shown in FIG. 17.

[0172]An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33. Thus, the pump functions as a centrifugal pump. The inlet ~~if~~ of the pump chamber 46 is the entire opening into the cavity that the pump chamber configures, said cavity being in direct communication with the interior of the reservoir housing 14 as such. An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber 47A provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir housing 14. Thus, the area enclosed between the underside of the reservoir housing 14 and the heat exchange surface 4 constitutes an enclosed space for circulating the cooling liquid therethrough. The enclosed spaced is divided into two separate chambers by the impeller cover 46A and the intermediate member 47, as shown in FIG. 20. The impeller cover 46A interfaces with the recess on the underside of the reservoir 14 to define the pump chamber 46 which houses the impeller 33, while the intermediate member 47 and the heat exchange surface 4 together define the thermal exchange chamber 47A.

[0173]In the embodiment shown, a heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47.

[0174]The heat exchanging interface 4 is preferably made from a copper plate having a plane outer surface (not shown) at the opposite side as the side shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see FIG. 4). The inner surface facing the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47 is provided with pins 4A extending from the base of the copper plate and into the thermal exchange chamber (not shown) at the opposite side of intermediate member 47. The pins 4A constitutes an uneven surface and may either be provided during casting of the copper plate or may be provided by means of milling or other machining process of a copper plate. The pins provide a network of channels across the inner surface of the heat exchanging interface, along which network the cooling liquid is intended to flow.

[0175]Alternatively, also the inner surface of the copper plate facing the reservoir is plane. In this alternative embodiment, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown. No milling or other machining process of the inner and/or the outer surface need be provided, when both the outer surface and the inner surface is plane.

[0176]The provision of the heat exchanging interface 4 need not be a preferred embodiment, seeing that the solution incorporating the aperture (see FIG. 9-10) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging interface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging interface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

[0177]In the embodiment shown, the heat exchanging interface 4 is secured to the intermediate member 47 by means of gluing or other means ensuring a proper and liquid-tight fastening of the heat exchanging interface with the intermediate member. Any other suitable and convenient means (not shown) for securing the heat exchanging interface to the intermediate member may be envisaged.

[0178]The heat exchanging interface and thus the reservoir is fastened to the top of the CPU by means of a clip 50. The clip 50 has a circular configuration and has four legs 51 extending axially from the circular configuration. The four legs 51 are provided with footing 52 and the footings 52 are provided with holes 53. The clip 50 is intended for being displaced around the exterior of the reservoir housing 14 and further axially to the protrusions 45 of the reservoir housing 14.

[0179]The clip 50, after having been placed around the reservoir housing 14, is fastened to the motherboard of the computer system by means of bolts (not shown) or the like fastening means extending through the holes 53 in the footings 52 and further though corresponding holes in the motherboard. The corresponding holes in the motherboard are preferably holes already available in the motherboard in the vicinity of the CPU and the socket of the CPU, respectively. Accordingly, the legs 51 and the footings 52 of the clip 50 are specially designed in accordance with the already provided holes in the motherboard.

[0180]Alternatively, the heat exchanging interface 4 and thus the reservoir housing 14 may be fastened to the CPU or other processing unit by any other suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging interface. One such means may be the fastening means shown in FIG. 4 and FIG. 5 or similar fastening means already provided as part of the computer system.

[0181]When stiffening and/or cooling fins 36 are provided at the exterior of the reservoir housing 14, the shape of and the number of fins may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting. Also, the purpose of the fins i.e. just for stiffening the reservoir, or also or in stead for cooling purposes, may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

[0182]The reservoir housing 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0183]The impeller 33 of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

[0184]The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. In a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

[0185]The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V AC power or 220V AC power. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by either an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer system supplying DC electrical power, this may be nevertheless be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump.

[0186]In every aspect of the invention, where an AC motor is used for driving an impeller from a DC motor, although this way of configuring a pump is contradictory, the following preferred mode of operation is established for alleviating the disadvantages:

[0187]In order to be able to control direction of rotation of the impeller attached to the rotor and to optimise the conditions of maximum average torque value during starting, i.e. from zero speed up to the synchronous speed, an electronic control circuit is used. The electronic control circuit comprises a processing unit, which drives a static power switch, constituted for example by a triac arranged in series between the alternating-voltage power, which is obtained form the DC power supply of the computer system, and the AC motor. The same series network also includes a detector for the current I which flows through the triac and then through the AC motor. The output of the current detector is an input signal for the electronic processing unit.

[0188]The electronic control circuit may also comprise a number or sensors suitable for detecting the position and polarity of the permanent magnets comprised in the rotor of the AC motor, both when the rotor is moving and when it is in particular operating conditions, or when it is motionless or stalled at zero speed. The number of position sensors may be Hall sensors, encoders or optical or electromechanical sensors capable of establishing and/or measuring the position of the rotor. The output signal from the number of position sensors is an input signal for the electronic processing unit.

[0189]Alternatively, the output signal from the position sensor may be phase shifted by means of an electronic phase shifting circuit before the output signal is sent to the input of the electronic processing unit.

[0190]A third signal may be input to the processing unit, said third signal enabling the processing unit to detect the polarity of the AC voltage applied to the AC motor. However, the third signal is not compulsory.

[0191]The signals input to the electronic processing unit are converted into digital form and after being processed by the processing unit, an output signal is provided by the processing unit. The output signal is used for closing or opening the static switch constituted by a triac arranged in series with the AC motor.

[0192]In the electronic processing unit, the current signal provided by the current sensor enters a zero-crossing detector which provides in output a logical "1" signal indicating that said current approaches zero with a positive or negative deviation from the zero value of said current. This deviation depends on the type of motor used and on its application, as well as on the type of static power switch being used. The signal arriving from the position sensor enters a phase-shift and processing circuit the output whereof is 1 or 0 according to the position and polarity of the rotor.

[0193]In the electronic processing unit, the phase shifted position signal as well as the signal processed from the AC voltage, enter an electronic logic XOR gate which outputs a "1" signal if the digital value of the AC voltage is equal to "0" and the digital value of the phase shifted position signal is equal to "1" or the digital value of the AC voltage is equal to "1" and the digital value of the phase shifted position signal is equal to "0".

[0194]The output of the zero-crossing detector and the output of the XOR gate, thus in digital form, enter an electronic logic AND gate which provides in output the control signal for closing or opening the static power switch.

[0195]The AND gate with two inputs and the signal processing system allow determining two conditions: 1) the AC voltage signal is positive, the current is proximate to zero, and the rotor rotation angle is between 0 degrees and 180 degrees; 2) the AC voltage signal is negative, the current is proximate to zero, and the rotor rotation angle is between 180 degrees and 360 degrees. These two conditions provide the same rotation direction of the rotor of the AC motor.

[0196]FIG. 18 shows an embodiment of an AC motor in which one stator pole 54 is longer than the other stator pole 55 by an amount indicated by I. With this configuration the permanent-magnet rotor 39 with an ideal line 56 separating the north N and the south S of the rotor, is positioned so that the ideal line 56 do not coincide with the median axis 57 of the stator 37, but so that the ideal line 56 is tilted by a certain angle .alpha. in respect to the median 57 of the stator 37.

[0197]Two energising windings 58, 59 are provided on the two poles 54,55 of the stator 37, respectively, and the energising windings are connected in series and are powered, through terminals (not shown), by an AC power source. With this configuration of the AC motor, the motor is able to start more easily in an intended rotational direction of the rotor.

[0198]In a preferred embodiment of the invention, the control electronics supplies the AC motor with only a half-wave voltage signal during start up, thereby providing torque pulses to the rotor. Since only a half-wave voltage signal is supplied to the motor, the torque pulses are always unidirectional and will therefore force the rotor to start rotating in a required direction. The required direction of rotation is determined by the design of the impeller attached to the rotor and by polarity of the half-wave voltage signal.

[0199]After some amount of time, in which a number of half-wave voltage signals has been supplied to the motor, the rotor will stop rotating at a certain position e.g. as shown in the figure. Thus, the rotor is brought into a determined steady state position that is independent of its start position. Subsequent to this process, the AC motor is supplied with a full-wave voltage signal that will accelerate the rotor until the motor enters synchronous operation, that is, when the rotor rotates with the same cyclic frequency as the frequency of the AC voltage source.

[0200]The initial polarity of the AC voltage signal is determinative for the resulting direction of rotation of the rotor, thus if the initial voltage is positive with an increasing amplitude, the rotor will start rotating in one direction, whereas if the voltage is negative with a decreasing amplitude, the rotor will start rotating in an opposite direction.

[0201]The number of half-waves required for bringing the rotor into a determined steady state position, where the rotor stops rotating, depends on the characteristics of the motor such as moment of inertia and the external load applied to the rotor. Thus, the number of half-waves required is based on empirical analysis of a particular motor in particular load conditions.

[0202]The half-wave voltage signal and the corresponding half-wave current signal supplied to the motor will have an appearance as shown in FIG. 19.

[0203]In an alternative embodiment the control electrics used to drive the AC motor shown if FIG. 18 is configured so that that the control electronics dictates the AC motor to stop at a predetermined position by supplying the motor with a number of half-wave voltage signals subsequent to the synchronous operation in which the motor was supplied with a full-wave voltage signal. Thus, at the time the motor needs to be started again, the rotor is already in a position so that only the polarity of the full-wave AC voltage signal supplied to the motor must be chosen so that the resulting direction of rotation of the rotor is in conformity with the terminal position of the rotor at the last operation.

[0204]According to this method, the initial step of bringing the rotor into a determined steady state position by supplying the motor with a number of half-wave voltage signals is not required. Even in the alternative, it will be possible to both terminate the full-wave power supply with a number of half-wave voltage signals as well as commencing the full-wave power supply by initially supplying the motor with a number of half-wave signals. However, this is more cumbersome, but nevertheless more safe.

[0205]FIG. 19 shows a voltage signal V and a current signal I applied to the AC motor as well as the position signal of the rotor. Initially the rotor stands still, which is represented by the straight line L. The electronic control circuit controls the static power switch so that the voltage signal V and the current signal I are present as half-waves. Thus, the rotor receives torque pulses due to the current-voltage combination; these pulses are always one-way directional and tend to start the rotor moving in the required direction. Subsequent to the start-up phase, the rotor enters into its synchronous operation.

[0206]Thus, an AC signal is generated, preferably a 12 V AC signal, possibly by means of digital electric pulses from the 12 V DC power supply of the computer's power supply. Based on a possible sensor output relating to the impeller position, a decision is made of how to initiate the AC power signal, i.e. with a negative or positive half-wave, and by doing making sure the impeller starts in the same rotational direction each time and thus the performance benefits of the AC pump is similar to those of a DC pump.

[0207]Alternatively, the magnetic field sensor is omitted, and instead of reading the impeller position, the impeller is forced to be in the same position every time the impeller starts. To be sure the impeller is in a defined position before start, a signal is supplied to the stator of the AC motor for a defined period of time. The signal is supplied perhaps three times in a row according to the curvature of the electrical power source. The pulses must be within the same half-wave part of a signal period. The frequency of the pulsed signal is arbitrary, but may be 50/60 Hz, although, despite the fact that under normal circumstances an AC pump being driven by the AC signal from the power outlet of the public electrical power network and transformed from 230/115 V to 12V would not function, as there is no chance of changing the sine signal from the public network.

[0208]By this way the impeller will be forced to the right polarity before start, and the pump will start turning the impeller in a defined way of rotation when the power signal full-wave is supplied. The full-wave power signal, which is supplied, must start in the opposite signal half-wave amplitude than that of the initial half-wave pulses, that was supplied before start of the full-wave power signal.

[0209]The invention has been described with reference to specific embodiments and with reference to specific utilisation, it is to be noted that the different embodiments of the invention may be manufactured, marketed, sold and used separately or jointly in any combination of the plurality of embodiments. In the above detailed description of the invention, the description of one embodiment, perhaps with reference to one or more figures, may be incorporated into the description of another embodiment, perhaps with reference to another or more other figures, and vice versa. Accordingly, any separate embodiment described in the text and/or in the drawings, or any combination of two or more embodiments is envisaged by the present application.

COOLING SYSTEM FOR A COMPUTER SYSTEM

BACKGROUND OF THE INVENTION

[0001]The present invention relates to a cooling system for a central processing unit (CPU) or other processing unit of a computer system. More specifically, the invention relates to a liquid-cooling system for a mainstream computer system such as a PC.

[0002]During operation of a computer, the heat created inside the CPU or other processing unit must be carried away fast and efficiently, keeping the temperature within the design range specified by the manufacturer. As an example of cooling systems, various CPU cooling methods exist and the most used CPU cooling method to date has been an air-cooling arrangement, wherein a heat sink in thermal contact with the CPU transports the heat away from the CPU and as an option a fan mounted on top of the heat sink functions as an air fan for removing the heat from the heat sink by blowing air through segments of the heat sink. This air-cooling arrangement is sufficient as long as the heat produced by the CPU is kept at today's level, however it becomes less useful in future cooling arrangements when considering the development of CPUs since the speed of a CPU is said to double perhaps every 18 months, thus increasing the heat production accordingly.

[0003]Another design used today is a CPU cooling arrangement where cooling liquid is used to cool the CPU by circulating a cooling liquid inside a closed system by means of a pumping unit, and where the closed system also comprises a heat exchanger past which the cooling liquid is circulated.

[0004]A liquid-cooling arrangement is more efficient than an air-cooling arrangement and tends to lower the noise level of the cooling arrangement in general. However, the liquid-cooling design consists of many components, which increases the total installation time, thus making it less desirable as a mainstream solution. With a trend of producing smaller and more compact PCs for the end-users, the greater amount of components in a typical liquid-cooling arrangement is also undesirable. Furthermore, the many components having to be coupled together incurs a risk of leakage of cooling liquid from the system.

SUMMARY OF INVENTION

[0005]It may be one object of the invention to provide a small and compact liquid-cooling solution, which is more efficient than existing air-cooling arrangements and which can be produced at a low cost enabling high production volumes. It may be another object to create a liquid-cooling arrangement, which is easy-to-use and implement, and which requires a low level of maintenance or no maintenance at all. It may be still another object of the present invention to create a liquid-cooling arrangement, which can be used with existing CPU types, and which can be used in existing computer systems.

[0006]This object may be obtained by a cooling system for a computer system, said computer system comprising: [0007]at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, [0008]a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, [0009]a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, [0010]a pump being provided as part of an integrate element, said integrate element comprising the heat exchanging interface, the reservoir and the pump, [0011]said pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means,

[0012]said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means.

[0013]By providing an integrate element, it is possible to limit the number of separate elements of the system. However, there is actually no need for limiting the number of elements, because often there is enough space within a cabinet of a computer system to encompass the different individual elements of the cooling system. Thus, it is surprisingly that, at all, any attempt is conducted of integrating some of the elements.

[0014]In possible embodiments according to this aspect of the invention, the entire pump is placed inside the reservoir with at least an inlet or an outlet leading to the liquid in the reservoir. In an alternative embodiment the pump is placed outside the reservoir in the immediate vicinity of the reservoir and wherein at least an inlet or an outlet is leading directly to the liquid in the reservoir. By placing the pump inside the reservoir or in the immediate vicinity outside the reservoir, the integrity of the combined reservoir, heat exchanger and pump is obtained, so that the element is easy to employ in new and existing computer systems, especially mainstream computer systems.

[0015]In a preferred embodiment, the pumping member of the pump and a driven part of the motor of the pump, such as a rotor of en electrical motor, is placed inside the reservoir embedded in the cooling liquid, and wherein a stationary part of the motor of the pump, such as a stator of an electrical motor, is placed outside the reservoir. By having the driven part of the motor placed inside the reservoir submerged in the cooling liquid and the stationary part of the motor outside the reservoir, there is no need for encapsulating the stationary part in a liquid-proof insulation. However, problems may occur having then stationary part driving the driven part. However, the present invention provide means for obtaining such action, although not at all evident how to solve this problem.

[0016]The object may also be obtained by a cooling system for a computer system, said computer system comprising: [0017]at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, [0018]a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, [0019]a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, [0020]a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, [0021]said cooling system being intended for thermal contact with the processing unit by means of existing fastening means associated with the processing unit, and [0022]said heat radiating means intended for radiating from the cooling liquid thermal energy, dissipated to the cooling liquid, to surroundings of the heat radiating means.

[0023]The use of existing fastening means has the advantage that fitting of the cooling system is fast and easy. However, once again there is no problem for the person skilled in the art to adopt specially adapted mounting means for any element of the cooling system, because there are numerous possibilities in existing cabinets of computer systems for mounting any kind of any number of elements, also elements of a cooling system.

[0024]In preferred embodiments according to this aspect of the invention, the existing fastening means are means intended for attaching a heat sink to the processing unit, or the existing fastening means are means intended for attaching a cooling fan to the processing unit, or the existing fastening means are means intended for attaching a heat sink together with a cooling fan to the processing unit. Existing fastening means of the kind mentioned is commonly used for air cooling of CPUs of computer systems, however, air cooling arrangements being much less complex than liquid cooling systems. Nevertheless, it has ingeniously been possible to develop a complex and effective liquid cooling system capable of utilising such existing fastening means for simple and less effective air cooling arrangements.

[0025]According to an aspect of the invention, the pump is selected from the following types: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. By adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

[0026]According to another aspect of the invention, driving means for driving the pump is selected among the following driving means: electrically operated rotary motor, piezo-electrically operated motor, permanent magnet operated motor, fluid-operated motor, capacitor-operated motor. As is the case when selecting the pump to pump the liquid, by adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

[0027]The object may also be obtained by a cooling system for a computer system, said computer system comprising: [0028]at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, [0029]a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, [0030]a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, [0031]a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, and [0032]said cooling system further comprising a pump wherein the pump is driven by an AC electrical motor by a DC electrical power supply of the computer system, [0033]where at least part of the electrical power from said power supply is intended for being converted to AC being supplied to the electrical motor.

[0034]It may be advantageous to use an AC motor, such as a 12V AC motor, for driving the pump in order to obtain a stabile unit perhaps having to operate 24 hours a day, 365 days a year. However, the person skilled in the art will find it unnecessary to adopt as example a 12V motor because high voltage such as 220V or 110V is readily accessible as this is the electrical voltage used to power the voltage supply of the computer system itself. Although choosing to use a 12V motor for the pump, it has never been and will never be the choice of the person skilled in the art to use an AC motor. The voltage supplied by the voltage supply of the computer system itself is DC, thus this will be the type of voltage chosen by the skilled person.

[0035]In preferred embodiments according to any aspect of the invention, an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, or an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means, or an electrical motor is intended both for driving the pump for pumping the liquid, and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means.

[0036]By utilising a single electrical motor for driving more than one element of the cooling system according to any of the aspects of the invention, the lesser complexity and the reliability of the cooling system will be further enhanced.

[0037]The heat exchanging interface may be an element being separate from the reservoir, and where the heat exchanging interface is secured to the reservoir in a manner so that the heat exchanging interface constitutes part of the reservoir when being secured to the reservoir. Alternatively, the heat exchanging interface constitutes an integrate surface of the reservoir, and where the heat exchanging surface extends along an area of the surface of the reservoir, said area of surface being intended for facing the processing unit and said area of surface being intended for the close thermal contact with the processing unit. Even alternatively, the heat exchanging interface is constitutes by a free surface of the processing unit, and where the free surface is capable of establishing heat dissipation between the processing unit and the cooling liquid through an aperture provided in the reservoir, and where the aperture extends along an area of the surface of the reservoir, said surface being intended for facing the processing unit.

[0038]Possibly, an uneven surface such as pins or fins extending from the copper plate provide a network of channels across the inner surface of the heat exchanging interface. A network of channels ensure the cooling liquid being passed along the inner surface of the interface such as a copper plate in a way that maximises the retention time of the cooling liquid along the heat exchanging interface and in a way that optimises the thermal exchange between the heat exchanging interface and the cooling liquid as long as the cooling liquid is in thermal contact with heat exchanging interface.

[0039]Possibly, the cooling system may be provided with a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, [0040]a pumping means being intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, [0041]said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means, [0042]said heat exchanging interface constituting a heat exchanging surface being manufactured from a material suitable for heat conducting, and [0043]with a first side of the heat exchanging surface facing the central processing unit being substantially plane and [0044]with a second side of the heat exchanging surface facing the cooling liquid being substantially plane and [0045]said reservoir being manufactured from plastic, and channels or segments being provided in the reservoir for establishing a certain flow-path for the cooling liquid through the reservoir.

[0046]Providing a plane heat exchanging surface, both the first, inner side being in thermal contact with the cooling liquid and the second, outer side being in thermal contact with the heat generating processing unit, results in the costs for manufacturing the heat exchanging surface is reduced to an absolute minimum.

[0047]According to the above possible solution, an inlet of the pumping means is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

[0048]Alternatively, or additionally, an outlet of said pumping means being positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchange interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

[0049]However, a plane first, inner surface may also result in the cooling liquid passing the heat exchanging surface too fast. This may be remedied by providing grooves along the inner surface, thereby providing a flow path in the heat exchanging surface. This however results in the costs for manufacturing the heat exchanging surface increasing.

[0050]The solution to this problem has been dealt with by providing channels or segments in the reservoir housing in stead. The reservoir housing may be manufactured by injection moulding or by casting, depending on the material which the reservoir housing is made from. Proving channels or segments during moulding or casting of the reservoir housing is much more cost-effective than milling grooves along the inner surface of the heat exchanging surface.

[0051]Possibly, the cooling system may be provided with at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid, [0052]said cooling system being adapted such as to provide transfer of said heat from a heat dissipating surface to a heat radiating surface where [0053]said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

[0054]Heat dissipation from the processing unit to the cooling liquid must be very efficient to ensure proper cooling of the processing unit, Especially in the case, where the processing unit is a CPU, the surface for heat dissipation is limited by the surface area of the CPU. This may be remedied by utilising a heat exchanging surface being made of a material having a high thermal conductivity such as copper or aluminium and ensuring a proper thermal bondage between the heat exchanging interface and the CPU.

[0055]However, in a possible embodiment according to the features in the above paragraph, the heat dissipation takes place directly between the processing unit and the cooling liquid by providing an aperture in the reservoir housing, said aperture being adapted for taking up a free surface of the processing unit. Thereby, the free surface of the processing unit extends into the reservoir or constitutes a part of the boundaries of the reservoir, and the cooling liquid has direct access to the free surface of the processing unit.

[0056]A possible heat exchanging interface may be the direct contact between the heat generating unit such as a CPU and the cooling liquid, where [0057]at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit comprising [0058]at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid, [0059]said cooling system being adapted such as to provide transfer of said heat from a heat dissipating interface to a heat radiating surface where [0060]said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

[0061]The aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a the processing unit, said boundaries being liquid-proof when attached to the free surface of the processing unit so that the liquid may flow freely across the free surface without the risk of the liquid dissipating through the boundaries. Alternatively, but posing the same technical effect, the aperture of the reservoir is intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of the processing unit.

[0062]If a heat sink is provided as an aid in dissipating heat from the heat generating unit such as a CPU, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a heat sink. Alternatively, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of a heat sink. Alternatively,

[0063]Possibly, the heat exchanging interface may be provided as [0064]a first reservoir intended for being closed by attaching boundaries of an aperture in the first reservoir to, alternatively along, a free surface of a said processing unit, and [0065]a second reservoir intended for being closed by attaching boundaries of an aperture in the second reservoir to, alternatively along, a free surface of a to a free surface of a heat sink, and

[0066]liquid conducting means provided between the first reservoir and the second reservoir.

[0067]The first reservoir may be closed by attaching said first reservoir to a heat exchanging surface element being in close thermal contact with the processing unit, said heat exchanging surface intended for dissipating heat from the processing unit to cooling liquid in the first reservoir, and wherein a second reservoir is closed by attaching said second reservoir to a surface of a heat sink, said heat sink intended for radiating heat from cooling liquid in the second reservoir to the exterior surroundings.

[0068]Also, the first reservoir and said second reservoir may be provided as a monolithic structure comprising both the first reservoir and the second reservoir and where both a heat dissipation from the processing unit to the cooling liquid in the first reservoir and heat radiation from the cooling liquid in the second reservoir to exterior surrounding is provided by the monolithic structure. The said monolithic structure may preferably be manufactured at least partly from plastic, preferably being manufactured fully in plastic, and said monolithic structure thus being manufactured by injection moulding.

[0069]Transfer of said cooling liquid from an outlet of the first reservoir to an inlet of the second reservoir, and from an outlet of the second reservoir to an inlet of the first reservoir, and circulating the cooling liquid within said liquid conducting means is provided by a pumping means being intended for pumping the cooling liquid.

[0070]One of said reservoirs of said monolithic structure may comprise said pumping means.

[0071]An inlet and/or an outlet and/or a pumping member of said pumping means, may be provided in the vicinity of said substantially plane side in order to provide a turbulence of flow and hereby improve the exchange of heat between said cooling liquid and substantially plane side, and the inlet of the pumping means may be provided within the first reservoir and the outlet may be provided within the second reservoir.

[0072]According to one aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilising a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface and a pumping means, said method of cooling comprising the steps of [0073]establishing, or defining, or selecting an operative status of the pumping means [0074]controlling the operation of the motor of the pumping means in response to the following parameters; the necessary direction of movement for obtaining a pumping action of a pumping member of the pumping means, the possible direction of movement of a driving part of the motor of the pumping means, and [0075]in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve the necessary direction of movement of the driving part of the motor for establishing the necessary direction of movement for obtaining he pumping action of the pumping member.

[0076]There may be pumping means, where the pumping member is only operationable in one direction but where the motor driving the pumping member is operationable in two directions. The solution to this problem is to either choose a pumping member operationable in both directions or to chose a motor being operationable in only one direction. According to the invention, a solution is provided where a one-way directional pumping member may be operated any a two-way directional motor. Despite the contradictory nature of this solution, advantages may however be present.

[0077]As example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and where said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor before applying a full-wave AC power signal.

[0078]As an alternative example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor after having applied the full-wave AC power signal.

[0079]In both the above examples, the advantages of the one-way impeller from a traditional DC pump together with the advantages of a motor from a traditional AC pump is obtained in the solution mentioned. The performance of an impeller of a DC pump is much better than the performance of an impeller from an AC pump. The motor from an AC pump is more reliable than a motor from a DC pump. The advantageous obtained is thus of synergetic nature, seeing that different advantages of the impeller of the DC pump and of the motor of the AC pump are different in nature.

[0080]According to another aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilising a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface, an air blowing fan, a pumping means, said method of cooling comprising the steps of [0081]applying one of the following possibilities of how to operate the computer system: establishing, or defining, or selecting an operative status of the computer system [0082]controlling the operation of at least one of the following means of the computer system; the pumping means and the air blowing fan in response to at least one of the following parameters; a surface temperature of the heat generating processing unit, an internal temperature of the heat generating processing unit, or a processing load of the CPU and [0083]in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve at least one of the following conditions; a certain cooling performance of the cooling system, a certain electrical consumption of the cooling system, a certain noise level of the cooling system.

[0084]Applying the above method ensures an operation of the computer system being in accordance with selected properties during the use of the computer system. For some applications, the cooling performance is vital such as may be the case when working with image files or when downloading large files from a network during which the processing units is highly loaded and thus generating much heat. For other applications, the electrical power consumption is more vital such as may be the case when utilising domestic computer systems or in large office building in environments where the electrical grid may be weak such as in third countries. In still other applications, the noise generated by the cooling system is to be reduced to a certain level, which may be the case in office buildings with white collar people working alone, or at home, if the domestic computer perhaps is situated in the living room, or at any other location where other exterior considerations have to be dealt with.

[0085]According to another aspect of the invention, a method is envisaged, said method being employed with cooling system further comprising a pumping means with an impeller for pumping the cooling liquid through a pumping housing, said pumping means being driven by an AC electrical motor with a stator and a rotor, and said pumping means being provided with a means for sensing a position of the rotor, and wherein the method comprises the following steps: [0086]initially establishing a preferred rotational direction of the rotor of the electrical motor [0087]before start of the electrical motor, sensing the angular position of the rotor [0088]during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor [0089]said selection being made according to the preferred rotational direction, and [0090]said application of the AC signal, such as an AC voltage, being performed by the computer system for applying the AC signal, such as an AC voltage, from the electrical power supply of the computer system during conversions of the electrical DC signal, such as a DC voltage, of the power supply to the AC signal, such as an AC voltage, for the electrical motor.

[0091]Adopting the above method according to the invention ensures the most efficient circulation of cooling liquid in the cooling system and at the same time ensures the lowest possible energy consumption of the electrical motor driving the impeller. The efficient circulation of the cooling liquid is obtained by means of an impeller being designed for rotation in one rotational direction only, thus optimising the impeller design with regard to the only one rotational direction as opposed to both rotational directions. The low energy consumption is achieved because of the impeller design being optimised, thus limiting the necessary rotational speed of the impeller for obtaining e certain amount of flow of the cooling liquid through the cooling system. A bonus effect of the lowest possible energy consumption being obtained is the lowest possible noise level of the pump also being obtained. The noise level of the pump is amongst other parameters also dependent on the design and the rotational speed of the impeller. Thus, an optimised impeller design and impeller speed will reduce the noise level to the lowest possible in consideration of ensuring a certain cooling capacity.

BRIEF DESCRIPTION OF THE FIGURES

[0092]The invention will hereafter be described with reference to the drawings, where

[0093]FIG. 1 shows an embodiment of the prior art. The figure shows the typical components in an air-cooling type CPU cooling arrangement.

[0094]FIG. 2 shows an embodiment of the prior art. The figure shows the parts of the typical air-cooling type CPU cooling arrangement of FIG. 1 when assembled.

[0095]FIG. 3 shows an embodiment of the prior art. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement.

[0096]FIG. 4 is an exploded view of the invention and the surrounding elements.

[0097]FIG. 5 shows the parts shown in the previous figure when assembled and attached to the motherboard of a computer system.

[0098]FIG. 6 is an exploded view of the reservoir from the previous FIGS. 4 and 5 seen from the opposite site and also showing the pump.

[0099]FIG. 7 is a cut-out view into the reservoir housing the pump and an inlet and an outlet extending out of the reservoir.

[0100]FIG. 8 is a view of the cooling system showing the reservoir connected to the heat radiator.

[0101]FIG. 9-10 are perspective views of a possible embodiment of reservoir housing providing direct contact between a CPU and a cooling liquid in a reservoir.

[0102]FIG. 11-13 are perspective views of a possible embodiment of heat sink and a reservoir housing constituting an integrated unit.

[0103]FIG. 14 is a perspective view of the embodiment shown in FIG. 9-10 and the embodiment shown in FIG. 11-13 all together constituting an integrated unit.

[0104]FIG. 15-16 are perspective view of a possible embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit

[0105]FIG. 17 is a perspective view of a preferred embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit,

[0106]FIG. 18 is a plane view of a possible, however preferred embodiment of an AC electrical motor for a pumping means of the cooling system according to the invention, and

[0107]FIG. 19 is a graph showing a method for starting a rotor of the electrical AC motor, said AC motor driving an impeller selected from a pump driven by a DC motor.

DETAILED DESCRIPTION OF THE INVENTION

[0108]FIG. 1 is an exploded view of an embodiment of prior art cooling apparatus for a computer system. The figure shows the typical components in an air-cooling type CPU cooling arrangement. The figure shows a prior art heat sink 4 intended for air cooling and provided with segments intersected by interstices, a prior art air fan 5 which is to be mounted on top of the heat sink by use of fastening means 3 and 6.

[0109]The fastening means comprises a frame 3 provided with holes intended for bolts, screws, rivets or other suitable fastening means (not shown) for thereby attaching the frame to a motherboard 2 of a CPU 1 or onto another processing unit of the computer system. The frame 3 is also provided with mortises provided in perpendicular extending studs in each corner of the frame, said mortises intended for taking up tenons of a couple of braces. The braces 6 are intended for enclosing the heat sink 4 and the air fan 5 so that the air fan and the heat sink thereby is secured to the frame. Using proper retention mechanisms, when the frame is attached to the motherboard of the CPU of other processing unit, and when the tenons of the braces are inserted into the mortises of the frame, the air fan and heat exchanger is pressed towards the CPU by using a force perpendicular to the CPU surface, said force being provided by lever arms.

[0110]FIG. 2 shows the parts of the typical air-cooling type CPU cooling arrangement of FIG. 1, when assembled. The parts are attached to each other and will be mounted on top of a CPU on a motherboard (not shown) of a computer system.

[0111]FIG. 3 shows another embodiment of a prior art cooling system. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement. The figure shows a prior art heat exchanger 7, which is in connection with a prior art liquid reservoir 8, a prior art liquid pump 9 and a heat radiator 11 and an air fan 10 provided together with the heat radiator. The prior art heat exchanger 7, which can be mounted on a CPU (not shown) is connected to a radiator and reservoir, respectively. The reservoir serves as a storage unit for excess liquid not capable of being contained in the remaining components. The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid. The heat radiator 11 serves as a means for removing the heat from the liquid by means of the air fan 10 blowing air through the heat radiator. All the components are in connection with each other via tubes for conducting the liquid serving as the cooling medium.

[0112]FIG. 4 is an exploded view of a cooling system according to an embodiment of the invention. Also elements not being part of the cooling system as such are shown. The figure shows a central processing unit CPU 1 mounted on a motherboard of a computer system 2. The figure also shows a part of the existing fastening means, i.e. amongst others the frame 3 with mortises provided in the perpendicular extending studs in each corner of the frame. The existing fastening means, i.e. the frame 3 and the braces 6, will during use be attached to the motherboard 2 by means of bolts, screws, rivets or other suitable fastening means extending through the four holes provided in each corner of the frame and extending through corresponding holes in the motherboard of the CPU. The frame 3 will still provide an opening for the CPU to enable the CPU to extend through the frame.

[0113]The heat exchanging interface 4 is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminium, and which will be in thermal contact with the CPU 1, when the cooling system is fastened to the motherboard 2 of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing 14, thus the heat exchanger 4 constitutes the part of the liquid reservoir housing facing the CPU. The reservoir may as example be made of plastic or of metal. The reservoir or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0114]If the reservoir is made of metal or any other material having a relative high heat conductivity compared to as example plastic, the heat exchanging interface as a separate element may be excluded because the reservoir itself may constitute a heat exchanger over an area, wherein the reservoir is in thermal contact with the processing unit. Alternatively to having the heat exchanging interface constitute part of the liquid reservoir housing, the liquid reservoir housing may be tightly attached to the heat exchanging interface by means of screws, glue, soldering, brazing or the like means for securing the heat exchanging interface to the housing and vice versa, perhaps with a sealant 5 provided between the housing and the heat exchanging interface.

[0115]Alternatively to providing a heat exchanging interface integrate with the reservoir containing the cooling liquid, it will be possible to exclude the heat exchanger and providing another means for dissipating heat from the processing unit to the cooling liquid in the reservoir, The other means will be a hole provided in the reservoir, said hole intended for being directed towards the processing unit. Boundaries of the hole will be sealed towards boundaries of the processing unit or will be sealed on top of the processing unit for thereby preventing cooling liquid from the reservoir from leaking. The only prerequisite to the sealing is that a liquid-tight connection is provided between boundaries of the hole and the processing unit or surrounding of the processing unit, such as a carrier card of the processing unit.

[0116]By excluding the heat exchanger, a more effective heat dissipation will be provided from the processing unit and to the cooling liquid of the reservoir, because the intermediate element of a heat exchanger is eliminated. The only obstacle in this sense is the provision of a sealing being fluid-tight in so that the cooling liquid in the reservoir is prevented from leaking.

[0117]The heat exchanging surface 4 is normally a copper plate. When excluding the heat exchanging surface 4, which may be a possibility not only for the embodiments shown in FIG. 4, but for all the embodiments of the invention, it may be necessary to provide the CPU with a resistant surface that will prevent evaporation of the cooling liquid and/or any damaging effect that the cooling liquid may pose to the CPU. A resistant surface may be provided the CPU from the CPU producer or it may be applied afterwards. A resistant surface to be applied afterwards may e.g. be a layer, such as an adhesive tape provided on the CPU. The adhesive tape may be made with a thin metal layer e.g. in order to prevent evaporation of the cooling liquid and/or any degeneration of the CPU itself.

[0118]Within the liquid reservoir, a liquid pump (not shown) is placed for pumping a cooling liquid from an inlet tube 15 connection being attached to the housing of the reservoir through the reservoir and past the heat exchanger in thermal contact with the CPU to an outlet tube connection 16 also being attached to the reservoir housing. The existing fastening means comprising braces 6 with four tenons and the frame 3 with four corresponding mortises will fasten the reservoir and the heat exchanger to the motherboard of the CPU. When fastening the two parts of the existing fastening means to each other the fastening will by means of the lever arms 18 create a force to assure thermal contact between the CPU 1 mounted on the motherboard and the heat exchanger 4 being provided facing the CPU.

[0119]The cooling liquid of the cooling system may be any type of cooling liquid such as water, water with additives such as anti-fungicide, water with additives for improving heat conducting or other special compositions of cooling liquids such as electrically non-conductive liquids or liquids with lubricant additives or anti-corrosive additives.

[0120]FIG. 5 shows the parts shown in FIG. 4 when assembled and attached to the motherboard of a CPU of a computer system 2. The heat exchanger and the CPU is in close thermal contact with each other. The heat exchanger and the remainder of the reservoir <u>housing</u> 14 is fastened to the motherboard 2 by means of the existing fastening means being secured to the motherboard of the CPU and by means of the force established by the lever arms 18 of the existing fastening means. The tube inlet connection 15 and the tube outlet connection 16 are situated so as to enable connection of tubes to the connections.

[0121]FIG. 6 is an exploded view of the reservoir shown in previous FIG. 4 and FIG. 5 and seen from the opposite site and also showing the pump 21 being situated inside the reservoir. Eight screws 22 are provided for attaching the heat exchanging surface 4 to the remainder of the reservoir. The heat exchanging surface is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see FIG. 4). However, also the inner surface (not shown, see FIG. 7) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the octagonal shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

[0122]A sealant in form of a gasket 13 is used for the connection between the reservoir housing 14 and the heat exchanging surface forming a liquid tight connection. The pump is intended for being placed within the reservoir. The pump has a pump inlet 20 through which the cooling liquid flows from the reservoir and into the pump, and the pump has a pump outlet 19 through which the cooling liquid is pumped from the pump and to the outlet connection. The figure also shows a lid 17 for the reservoir. The non-smooth inner walls of the reservoir and the fact that the pump is situated inside the reservoir will provide a swirling of the cooling liquid inside the reservoir.

[0123]However, apart from the non-smooth walls of the reservoir and the pump being situated inside the reservoir, the reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir (see FIG. 9-10 and FIG. 15). Channel or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. By providing channels or segments inside the reservoir, a flow will be provided forcing the cooling liquid to pass the heat exchanging surface, and the amount of time increased of the cooling liquid being resident inside the reservoir, thus enhancing heat dissipation. If channels or segments are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

[0124]The cooling liquid enters the reservoir through the tube inlet connection 15 and enters the pump inlet 20, and is pumped out of the pump outlet 19 connected to the outlet connection 16. The connection between the reservoir and the inlet tube connection and the outlet tube connection, respectively, are made liquid tight. The pump may not only be a self-contained pumping device, but may be made integrated into the reservoir, thus making the reservoir and a pumping device one single integrated component. This single integrated element of the reservoir and the pumping device may also be integrated, thus making the reservoir, the pumping device and the heat exchanging surface one single integrated unit. This may as example be possible if the reservoir is made of a metal such as aluminium. Thus, the choice of material provides the possibility of constituting both the reservoir and a heat exchanging surface having a relatively high heat conductivity, and possibly also renders the possibility of providing bearings and the like constructional elements for a motor and a pumping wheel being part of the pumping device.

[0125]In an alternative embodiment, the pump is placed in immediate vicinity of the reservoir, however outside the reservoir. By placing the pump outside, but in immediate vicinity of the reservoir, still an integrate element may be obtained. The pump or the inlet or the outlet is preferably positioned so as to obtain a turbulence of flow in the immediate vicinity of the heat exchanging interface, thereby promoting increased heat dissipation between the heat exchanging interface end the cooling liquid. even in the alternative, a pumping member such as an impeller (see FIG. 15-16) may be provided in the immediate vicinity of the heat exchanging surface. The pumping member itself normally introduces a turbulence of flow, and thereby the increased heat dissipation is promoted irrespective of the position of the pump itself, or the position of the inlet or of the outlet to the reservoir or to the pump.

[0126]The pump may be driven by an AC or a DC electrical motor. When driven by an AC electrical motor, although being technically and electrically unnecessary in a computer system, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the pump. The pump may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. However, in the embodiment shown, the pump is driven by a 12V AC electrical motor.

[0127]Control of the pump in case the pump is driven by an AC electrical motor, preferably takes place by means of the operative system or an alike means of the computer system itself, and where the computer system comprises means for measuring the CPU load and/or the CPU temperature. Using the measurement performed by the operative system or alike system of the computer system eliminates the need for special means for operating the pump. Communication between the operative system or alike system and a processor for operating the pump may take place along already established communication links in the computer system such as a USB-link. Thereby, a real-time communication between the cooling system and the operative system is provided without any special means for establishing the communication.

[0128]In the case of the motor driving the pump is an AC electrical motor, the above method of controlling the pump may be combined with a method, where said pumping means is provided with a means for sensing a position of the rotor of the electrical motor, and wherein the following steps are employed: Initially establishing a preferred rotational direction of the rotor of the electrical motor, before start of the electrical motor, sensing the angular position of the rotor, during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor, said selection being made according to the preferred rotational direction, and said application of the AC voltage being performed by the computer system for applying the AC voltage from the electrical power supply of the computer system during conversion of the electrical DC voltage of the power supply to AC voltage for the electrical motor. By the operative system of the computer system itself generating the AC voltage for the electrical motor, the rotational direction of the pump is exclusively selected by the computer system, non-depending on the applied voltage of the public grid powering the computer system.

[0129]Further control strategies utilising the operative system or alike system of the computer system may involve balancing the rotational speed of the pump as a function of the cooling capacity needed. If a lower cooling capacity is needed, the rotational speed of the pump, may be limited, thereby limiting the noise generating by the motor driving the pump.

[0130]In the case an air fan is provided in combination with a heat sink as shown in FIG. 1, of the air fan is provided in combination with the heat radiator, the operative system or alike system of the computer system may be designed for regulating the rotational speed of the pump, and thus of the motor driving the pump, and the rotational speed of the air fan, and thus the motor driving the air fan. The regulation will take into account the cooling capacity needed, but the regulation will at the same time take into account which of the two cooling means, i.e. the pump and the air fan, is generating the most noise. Thus, it the air fan generally is generating more noise than the pump, then the regulation will reduce the rotational speed of the air fan before reducing the rotational speed of the pump, whenever a lower cooling capacity is needed. Thereby, the noise level of the entire cooling system is lowered as much as possible. If the opposite is the case, i.e. the pump generally generating more noise than the air fan, then the rotational speed of the pump will be reduced before reducing the rotational speed of the air fan.

[0131]Even further control strategies involve controlling the cooling capacity in dependence on the type of computer processing taking place. Some kind of computer processing, such as word-processing, applies a smaller load on the processing units such as the CPU than other kinds of computer processing, such as image processing. Therefore, the kind of processing taking place on the computer system may be used as an indicator of the cooling capacity. It may even be possible as part of the operative system or similar system to establish certain cooling scenarios, depending on the kind of processing intended by the user. If the user selects as example word-processing, a certain cooling strategy is applied based on a limited need for cooling. If the user selects as example image-processing, a certain cooling strategy is applied based on an increased need for cooling. Two or more different cooling scenarios may be established depending on the capacity and the control possibilities and capabilities of the cooling system and depending on the intended use of the computer system, either as selected by a user during use of the computer system or as selected when choosing hardware during build-up of the computer system, i.e. before actual use of the computer system.

[0132]The pump is not being restricted to a mechanical device, but can be in any form capable of pumping the cooling liquid through the system. However, the pump is preferably one of the following types of mechanical pumps: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. Similarly, the motor driving the pumping member need not be electrical but may also be a piezo-electrically operated motor, a permanent magnet operated motor, a fluid-operated motor or a capacitor-operated motor. The choice of pump and the choice of motor driving the pump id dependent on many different parameters, and it is up to the person skilled in the art to choose the type of pump and the type of motor depending on the specific application. As example, some pumps and some motors are better suited for small computer systems such as lab-tops, some pumps and some motors are better suited for establishing i high flow of the cooling liquid and thus a high cooling effect, and even some pumps and motors are better suited for ensuring a low-noise operation of the cooling system.

[0133]FIG. 7 is a cut-out view into the reservoir, when the reservoir and the heat exchanging surface 4 is assembled and the pump 21 is situated inside the reservoir. The reservoir is provided with the tube inlet connection (not seen from the figure) through which the cooling liquid enters the reservoir. Subsequently, the cooling liquid flows through the reservoir passing the heat exchanging surface and enters the inlet of the pump. After having been passed through the pump, the cooling liquid is passed out of the outlet of the pump and further out through the tube outlet connection 16. The figure also shows a lid 17 for the reservoir. The flow of the cooling liquid inside the reservoir and trough the pump may be further optimised in order to use as little energy as possible for pumping the cooling liquid, but still having a sufficient amount of heat from the heat exchanging surface being dissipated in the cooling liquid. This further optimisation can be established by changing the length and shape of the tube connection inlet within the reservoir, and/or by changing the position of the pump inlet, and/or for instance by having the pumping device placed in the vicinity and in immediate thermal contact with the heat exchanging surface and/or by providing channels or segments inside the reservoir.

[0134]In this case, an increased turbulence created by the pumping device is used to improve the exchange of heat between the heat exchanging surface and the cooling liquid. Another or an additional way of improving the heat exchange is to force the cooling liquid to pass through specially adapted channels or segments being provided inside the reservoir or by making the surface of the heat exchanging surface plate inside the reservoir uneven or by adopting a certain shape of a heat sink with segments. In the figure shown, the inner surface of the heat exchanging surface facing the reservoir is plane.

[0135]FIG. 8 is a perspective view of the cooling system showing the reservoir housing 14 with the heat exchanging surface (not shown) and the pump (not shown) inside the reservoir. The tube inlet connection and the tube outlet connection are connected to a heat radiator by means of connecting tubes 24 and 25 through which the cooling liquid flows into and out of the reservoir and the heat radiator, respectively. Within the heat radiator 11, the cooling liquid passes a number of channels for radiating the heat, which has been dissipated into the cooling liquid inside the reservoir, and to the surroundings of the heat exchanger. The air fan 10 blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir.

[0136]According to the invention, the heat radiator 11 may be provided alternatively. The alternative heat radiator is constituted by a heat sink, such as a standard heat sink made of extruded aluminium with fins on a first side and a substantially plane second side. An air-fan may be provided in connection with the fins along the first side. Along the second side of the heat sink a reservoir is provided with at least one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the substantial plane side of the heat sink. When closing the reservoir in such a way a surface of the heat sink is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the at least one aperture. This alternative way of providing the heat radiator may be used in the embodiment shown in FIG. 8 or may be used as a heat radiator for another use and/or for another embodiment of the invention.

[0137]A pumping means for pumping the cooling liquid trough the reservoir may or may not be provided inside the reservoir at the heat sink. The reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir. Channels or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. If channels or segments in the reservoir are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

[0138]By means of the alternative heat radiator, the heat radiator 11 is not provided as is shown in the figure with the rather expensive structure of channels leading the cooling liquid along ribs connecting the channels for improved surface of the structure. Instead, the heat radiator is provided as described as a unit constituted by a heat sink with or without a fan and a reservoir, and thereby providing a simpler and thereby cheaper heat radiator than the heat radiator 11 shown in the figure.

[0139]The alternative heat radiator provided as an unit constituted by a heat sink and a reservoir, may be used solely, with or without a pump inside the reservoir and with or without the segments or channels, for being placed in direct or indirect thermal contact with a heat generating processing unit such as CPU or with the heat exchanging surface, respectively. These embodiments of the invention may e.g. be used for a reservoir, where the cooling liquid along a first side within the reservoir is in direct heat exchanging contact with the heat generating processing unit such as a CPU and the cooling liquid along a second side within the reservoir is in direct heat exchanging contact with a heat sink. Such a reservoir may be formed such as to provide a larger area of heat exchanging surface towards the heat generating processing unit such as a CPU than the area of the heat exchanging surface facing the heat sink. This may e.g.

have the purpose of enlarging the area of the heat exchanging surface so as to achieve an improved heat dissipation form e.g. the CPU to the heat sink than that of a conventional heat sink without a reservoir attached. Conventional heat sinks normally only exchanges heat with the CPU through the area as given by the area of the top side of the CPU. A system comprising a liquid reservoir and a heat sink with a fan provided has been found to be a simple, cost optimised system with an improved heat dissipation than that of a standard heat sink with a fan, but without the reservoir. In another embodiment of the invention, which may be derived from FIG. 8, the air fan and the heat radiator is placed directly in alignment of the reservoir. Thereby, the reservoir housing 14, the air fan 10 and the radiator 11 constitute an integrate unit. Such an embodiment may provide the possibility of omitting the connection tubes, and passing the cooling liquid directly from the heat radiator to the reservoir via an inlet connection of the reservoir, and directly from the reservoir to the heat radiator via an outlet connection of the reservoir. Such an embodiment may even render the possibility of both the pumping device of the liquid pump inside the reservoir and the electrical motor for the propeller of the air fan 23 of the heat radiator 11 being driven by the same electrical motor, thus making this electrical motor the only motor of the cooling system.

[0140]When placing the heat radiator on top of the air fan now placed directly in alignment with the reservoir and connecting the heat radiator directly to the inlet connection and outlet connection of the reservoir, a need for tubes will not be present. However, if the heat radiator and the reservoir is not in direct alignment with each other, but tubes may still be needed, but rather than tubes, pipes made of metal such as copper or aluminium may be employed, such pipes being impervious to any possible evaporation of cooling liquid. Also, the connections between such pipes and the heat radiator and the reservoir, respectively, may be soldered so that even the connections are made impervious to evaporation of cooling liquid.

[0141]In the derived embodiment just described, an integrated unit of the reservoir, the heat exchanging surface and the pumping device will be given a structure establishing improved heat radiating characteristics because the flow of air of the air fan may also be directed along outer surfaces of the reservoir. If the reservoir is made of a metal, the metal will be cooled by the air passing the reservoir after having passed or before passing the heat radiator. If the reservoir is made of metal, and if the reservoir is provided with segments on the outside surface of the reservoir, such cooling of the reservoir by the air will be further improved. Thereby, the integrated unit just described will be applied improved heat radiating characteristics, the heat radiation function normally carried out by the heat radiator thus being supplemented by one or more of the further elements of the cooling system, i.e. the reservoir, the heat exchanging surface, the liquid pump and the air fan.

[0142]FIG. 9-10 show an embodiment of a reservoir housing 14, where channels 25 are provided inside the reservoir for establishing a forced flow of the cooling liquid inside the reservoir. The channels 25 in the reservoir housing 14 lead from an inlet 15 to an outlet 16 like a maze between the inlet and the outlet. The reservoir housing 14 is provided with an aperture 27 having outer dimensions corresponding to the dimensions of a free surface of the processing unit 1 to be cooled. In the embodiment shown, the processing unit to be cooled is a CPU 1.

[0143]When channels 26 are provided inside the reservoir, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps manufactured by injection moulding, or is to be made of metal such as aluminium, perhaps manufactured by extrusion or by die casting.

[0144]The reservoir housing 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0145]The CPU 1 is intended for being positioned in the aperture 27, as shown in FIG. 10, so that outer boundaries of the CPU are engaging boundaries of the aperture. Possibly, a sealant (not shown) may be provided along the boundaries of the CPU and the aperture for ensuring a fluid tight engagement between the boundaries of the CPU and the boundaries of the aperture. When the CPU 1 is positioned in the aperture 27, the free surface (not shown) of the CPU is facing the reservoir, i.e. the part of the reservoir having the channels provided. Thus, when positioned in the aperture 27 (see FIG. 10), the free surface of the CPU 1 is having direct contact with cooling liquid flowing through the channels 26 in the reservoir.

[0146]When cooling liquid is forced from the inlet 15 along the channels 26 to the outlet 16, the whole of the free surface of the CPU 1 will be passed over by the cooling liquid, thus ensuring a proper and maximised cooling of the CPU. The configuration of the channels may be designed and selected according to any one or more provisions, i.e. high heat dissipation, certain flow characteristics, ease of manufacturing etc. Accordingly, the channels may have another design depending on any desire or requirement and depending on the type of CPU and the size and shape of the free surface of the CPU. Also. other processing units than a CPU may exhibit different needs for heat dissipation, and may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the channels. If the processing unit is very elongate, such as a row of microprocessors, one or a plurality of parallel channels may be provided, perhaps just having a common inlet and a common outlet.

[0147]FIG. 11-13 show an embodiment of a heat sink 4, where segments 28 are provided at a first side 4A of the heat sink, and fins 29 for dissipating heat to the surroundings are provided at the other, second side 4B of the heat sink. An intermediate reservoir housing 30 is provided having a recessed reservoir at the one side facing the first side 4A of the heat sink. The recessed reservoir 30 has an inlet 31 and an outlet 32 at the other side opposite the side facing the heat sink 4.

[0148]When segments 28 are provided on the first side 4A of the heat sink, the shape of the segments may be decisive of whether the reservoir, which is made from metal such as aluminium or copper, is to be made by extrusion or is to be made by other manufacturing processes such as die casting. Especially when the segments 28 are linear and are parallel with the fins 29, as shown in the embodiment, extrusion is a possible and cost-effective means of manufacturing the heat sink 4.

[0149]The intermediate reservoir 30 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0150]The recessed reservoir is provided with a kind of serration 33 along opposite sides of the reservoir, and the inlet 31 and the outlet 32, respectively, are provided at opposite corners of the intermediate reservoir 30. The segments 28 provided at the first side 4A of the heat sink, i.e. the side facing the intermediate reservoir 30, are placed so that when the heat sink is assembled with the intermediate reservoir housing (see FIG. 13) the segments 29 run from one serrated side of the reservoir to the other serrated side of the reservoir.

[0151]When cooling liquid is forced from the inlet 31 through the reservoir, along channels (not shown) formed by the segments 29 of the heat sink 4 and to the outlet 32, the whole of the first side 4A of the heat sink will be passed over by the cooling liquid, thus ensuring a proper and maximised heat dissipation between the cooling liquid and the heat sink. The configuration of the segments on the first side 4A of the heat sink and the configuration of the serrated sides of the intermediate reservoir housing may be designed and selected according to any provisions. Accordingly, the segments may have another design, perhaps being wave-shaped or also a serrated shape, depending on any desired flow characteristics of the cooling liquid and depending on the type of heat sink and the size and shape of the reservoir.

[0152]Also other types of heat sinks, perhaps circular shaped heat sinks may exhibit different needs for heat dissipation, may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the segments and the intermediate reservoir. If the heat sink and the reservoir are circular or oval, a spiral-shaped segmentation or radially extending segments may be provided, perhaps having the inlet or the outlet in the centre of the reservoir. If an impeller of the pump is provided, as shown in FIG. 15-16, the impeller of the pump may be positioned in the centre of a spiral-shaped segmentation or in the centre of radially extending segments.

[0153]FIG. 14 shows the reservoir housing 14 shown in FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 shown in FIG. 11-13 being assembled for thereby constituting an integrated monolithic unit. It is not absolutely necessary to assemble the reservoir housing 14 of FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 of FIG. 11-13 in order to obtain a properly functioning cooling system. The inlet 15 and the outlet 16 of the reservoir housing 14 of FIG. 9-10 may be connected to the outlet 32 and the inlet 31, respectively, of the intermediate reservoir of FIG. 11-13 by means of tubes or pipes.

[0154]The reservoir <u>housing</u> 14 of FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 of FIG. 11-13 may then be positioned in the computer system at different locations. However, by assembling the reservoir <u>housing</u> 14 of FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 of FIG. 11-13 a very compact monolithic unit is obtained, also obviating the need for tubes or pipes. Tubes or pipes may involve an increased risk of leakage of cooling liquid or may require soldering or other special working in order to eliminate the risk of leakage of cooling liquid. By eliminating the need for tubes or pipes, any leakage and any additional working is obviated when assembling the cooling system.

[0155]FIG. 15-16 show a possible embodiment of a reservoir according to the invention. The reservoir is basically similar to the reservoir shown in FIG. 9-10. However, an impeller 33 of the pump of the cooling system is provided in direct communication with the channels 26. Also, in the embodiment shown, a heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed between the channels 26 inside the reservoir and the CPU 1 as the processing unit.

[0156]The heat exchanging surface 4 is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU 1 (see

FIG. 4). However, also the inner surface (not shown, see FIG. 7) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

[0157]The provision of the heat exchanging surface 4 need not be a preferred embodiment, seeing that the solution incorporating the aperture (see FIG. 9-10) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging surface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging surface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

[0158]In the embodiment shown, the heat exchanging surface 4 is secured to the reservoir by means of bolts 22. Other convenient fastening means may be used. The heat exchanging surface 4 and thus the reservoir <u>housing</u> 14 may be fastened to the CPU 1 or other processing unit by any suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging surface. One such means may be the fastening means shown in FIG. 4 and FIG. 5 or similar fastening means already provided as part of the computer system.

[0159]When channels 26 are provided inside the reservoir housing 14, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

[0160]The reservoir housing 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0161]The impeller 33 (see FIG. 14) of the pump is positioned in a separate recess of the channels 26, said separate recess having a size corresponding to the diameter of the impeller of the pump. The recess is provided with an inlet 34 and an outlet 35 being positioned opposite an inlet 31 and an outlet 32 of cooling liquid to and from, respectively, the channels 26. The impeller 33 of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

[0162]The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. In a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

[0163]The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer system supplying DC electrical power, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump. However, in the embodiment shown, the impeller of the pump is driven by a 12V electrical motor.

[0164]FIG. 17 shows a preferred possible embodiment of a reservoir according to the invention. <u>The reservoir housing 14, as shown in FIGS. 17 and 20, is in the form of a double-sided chassis configured to mount an electrical motor.</u> The reservoir <u>housing</u> 14 has basically the same features as the reservoir <u>housing</u> shown in FIG. 15-16. In the embodiment shown, the reservoir substantially has a conical, circular configuration and is provided with stiffening ribs 36 extending axially along the exterior of the reservoir housing 14.

[0165]Other shapes such as cylindrical, circular, or conical rectangular or cylindrical, rectangular or even oval or triangular shapes may be adopted, when designing and possibly injection moulding or casting the reservoir. The dimension of the embodiment shown is approximately 55 mm in diameter and also 55 mm in axial extension.

[0166]The reservoir housing 14 has a recess 40 in the centre on the upper side of the reservoir. The recess 37 is intended for accommodating a stator 37 of an electrical motor driving an impeller 33 of the pump, said impeller being attached to a shaft 38 of a rotor 39 of the electrical motor. The recess 40 has an orifice 41, four sidewalls 42, a bottom 43 and a circular jacket 44 extending from the bottom 43 of the recess 40 and outwards towards the orifice 41 of the recess 40. The interior (not shown) of the jacket 44 is intended for encompassing the rotor 39 of the pump. As shown in FIG. 20, the impeller 33 is housed in a recess on the underside of the reservoir housing 14, the recess being an extension of the interior of the jacket 44.

[0167]Thereby, a liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket

44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system.

[0168]Along an outer circumferential extension, the reservoir housing 14 is provided with protrusions 45 extending outwardly from the circumferential extension. The protrusions are intended for cooperating with a clip (see description below) for fastening the reservoir housing 14 to the CPU or other processing unit of the computer system. The protrusions 45 are shown as a plurality of singular protrusions. Alternatively, the protrusions may be only one continuous protrusion extending outwardly and around the circumferential extension.

[0169]The reservoir housing 14 may also be provided with an inlet (not shown) and an outlet (not shown) for the cooling liquid. The inlet and the outlet are provided along a surface of the reservoir facing downward and inwards when seen in the perspective view of the drawing. The inlet and the outlet lead to a radiator (not shown) intended for cooling the cooling liquid after having been heated by the processing unit via a heat exchanging surface (see description below).

[0170]The radiator may be placed nearby or distant from the reservoir housing 14, depending on the set-up of the computer system. In one possible embodiment, the radiator is placed in the immediate vicinity of the reservoir, thereby possible excluding any tubing extending between the radiator and the inlet and the outlet, respectively.

Such embodiment provides a very compact configuration of the entire cooling system, namely a monolithic configuration where all elements needed for the cooling system are incorporated in one unit.

[0171]In an alternative embodiment, the reservoir housing 14 itself also constitutes the radiator of the cooling system. In such embodiment, an inlet and an outlet are not needed. If the reservoir is made of a metal such as copper or aluminium or other material having a high thermal conductance, the cooling liquid, after having been heated by the processing unit via a heat exchanging surface 8 see description below) may radiate the heat via the exterior surface of the reservoir housing 14 itself. In such embodiment, the ribs 36 along the exterior surface of the reservoir housing 14 may also, or may in stead, function as cooling fins. In such embodiment, the fins will have a smaller dimension than the transverse dimension of the ribs 14 shown in FIG. 17, and the number of fins will be greater than the number of fins shown in FIG. 17.

[0172]An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33. Thus, the pump functions as a centrifugal pump. The inlet ~~if~~ of the pump chamber 46 is the entire opening into the cavity that the pump chamber configures, said cavity being in direct communication with the interior of the reservoir housing 14 as such. An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber 47A provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir housing 14. Thus, the area enclosed between the underside of the reservoir housing 14 and the heat exchange surface 4 constitutes an enclosed space for circulating the cooling liquid therethrough. The enclosed spaced is divided into two separate chambers by the impeller cover 46A and the intermediate member 47, as shown in FIG. 20. The impeller cover 46A interfaces with the recess on the underside of the reservoir 14 to define the pump chamber 46 which houses the impeller 33, while the intermediate member 47 and the heat exchange surface 4 together define the thermal exchange chamber 47A.

[0173]In the embodiment shown, a heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47.

[0174]The heat exchanging interface 4 is preferably made from a copper plate having a plane outer surface (not shown) at the opposite side as the side shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see FIG. 4). The inner surface facing the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47 is provided with pins 4A extending from the base of the copper plate and into the thermal exchange chamber (not shown) at the opposite side of intermediate member 47. The pins 4A constitutes an uneven surface and may either be provided during casting of the copper plate or may be provided by means of milling or other machining process of a copper plate. The pins provide a network of channels across the inner surface of the heat exchanging interface, along which network the cooling liquid is intended to flow.

[0175]Alternatively, also the inner surface of the copper plate facing the reservoir is plane. In this alternative embodiment, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown. No milling or other machining process of the inner and/or the outer surface need be provided, when both the outer surface and the inner surface is plane.

[0176]The provision of the heat exchanging interface 4 need not be a preferred embodiment, seeing that the solution incorporating the aperture (see FIG. 9-10) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging interface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging interface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

[0177]In the embodiment shown, the heat exchanging interface 4 is secured to the intermediate member 47 by means of gluing or other means ensuring a proper and liquid-tight fastening of the heat exchanging interface with the intermediate member. Any other suitable and convenient means (not shown) for securing the heat exchanging interface to the intermediate member may be envisaged.

[0178]The heat exchanging interface and thus the reservoir is fastened to the top of the CPU by means of a clip 50. The clip 50 has a circular configuration and has four legs 51 extending axially from the circular configuration. The four legs 51 are provided with footing 52 and the footings 52 are provided with holes 53. The clip 50 is intended for being displaced around the exterior of the reservoir housing 14 and further axially to the protrusions 45 of the reservoir housing 14.

[0179]The clip 50, after having been placed around the reservoir housing 14, is fastened to the motherboard of the computer system by means of bolts (not shown) or the like fastening means extending through the holes 53 in the footings 52 and further though corresponding holes in the motherboard. The corresponding holes in the motherboard are preferably holes already available in the motherboard in the vicinity of the CPU and the socket of the CPU, respectively. Accordingly, the legs 51 and the footings 52 of the clip 50 are specially designed in accordance with the already provided holes in the motherboard.

[0180]Alternatively, the heat exchanging interface 4 and thus the reservoir housing 14 may be fastened to the CPU or other processing unit by any other suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging interface. One such means may be the fastening means shown in FIG. 4 and FIG. 5 or similar fastening means already provided as part of the computer system.

[0181]When stiffening and/or cooling fins 36 are provided at the exterior of the reservoir <u>housing</u> 14, the shape of and the number of fins may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting. Also, the purpose of the fins i.e. just for stiffening the reservoir, or also or in stead for cooling purposes, may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

[0182]The reservoir <u>housing</u> 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

[0183]The impeller 33 of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

[0184]The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. In a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

[0185]The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V AC power or 220V AC power. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by either an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer system supplying DC electrical power, this may be nevertheless be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump.

[0186]In every aspect of the invention, where an AC motor is used for driving an impeller from a DC motor, although this way of configuring a pump is contradictory, the following preferred mode of operation is established for alleviating the disadvantages:

[0187]In order to be able to control direction of rotation of the impeller attached to the rotor and to optimise the conditions of maximum average torque value during starting, i.e. from zero speed up to the synchronous speed, an electronic control circuit is used. The electronic control circuit comprises a processing unit, which drives a static power switch, constituted for example by a triac arranged in series between the alternating-voltage power, which is obtained form the DC power supply of the computer system, and the AC motor. The same series network also includes a detector for the current I which flows through the triac and then through the AC motor. The output of the current detector is an input signal for the electronic processing unit.

[0188]The electronic control circuit may also comprise a number or sensors suitable for detecting the position and polarity of the permanent magnets comprised in the rotor of the AC motor, both when the rotor is moving and when it is in particular operating conditions, or when it is motionless or stalled at zero speed. The number of position sensors may be Hall sensors, encoders or optical or electromechanical sensors capable of establishing and/or measuring the position of the rotor. The output signal from the number of position sensors is an input signal for the electronic processing unit.

[0189]Alternatively, the output signal from the position sensor may be phase shifted by means of an electronic phase shifting circuit before the output signal is sent to the input of the electronic processing unit.

[0190]A third signal may be input to the processing unit, said third signal enabling the processing unit to detect the polarity of the AC voltage applied to the AC motor. However, the third signal is not compulsory.

[0191]The signals input to the electronic processing unit are converted into digital form and after being processed by the processing unit, an output signal is provided by the processing unit. The output signal is used for closing or opening the static switch constituted by a triac arranged in series with the AC motor.

[0192]In the electronic processing unit, the current signal provided by the current sensor enters a zero-crossing detector which provides in output a logical "1" signal indicating that said current approaches zero with a positive or negative deviation from the zero value of said current. This deviation depends on the type of motor used and on its application, as well as on the type of static power switch being used. The signal arriving from the position sensor enters a phase-shift and processing circuit the output whereof is 1 or 0 according to the position and polarity of the rotor.

[0193]In the electronic processing unit, the phase shifted position signal as well as the signal processed from the AC voltage, enter an electronic logic XOR gate which outputs a "1" signal if the digital value of the AC voltage is equal to "0" and the digital value of the phase shifted position signal is equal to "1" or the digital value of the AC voltage is equal to "1" and the digital value of the phase shifted position signal is equal to "0".

[0194]The output of the zero-crossing detector and the output of the XOR gate, thus in digital form, enter an electronic logic AND gate which provides in output the control signal for closing or opening the static power switch.

[0195]The AND gate with two inputs and the signal processing system allow determining two conditions: 1) the AC voltage signal is positive, the current is proximate to zero, and the rotor rotation angle is between 0 degrees and 180 degrees; 2) the AC voltage signal is negative, the current is proximate to zero, and the rotor rotation angle is between 180 degrees and 360 degrees. These two conditions provide the same rotation direction of the rotor of the AC motor.

[0196]FIG. 18 shows an embodiment of an AC motor in which one stator pole 54 is longer than the other stator pole 55 by an amount indicated by I. With this configuration the permanent-magnet rotor 39 with an ideal line 56 separating the north N and the south S of the rotor, is positioned so that the ideal line 56 do not coincide with the median axis 57 of the stator 37, but so that the ideal line 56 is tilted by a certain angle .alpha. in respect to the median 57 of the stator 37.

[0197]Two energising windings 58, 59 are provided on the two poles 54,55 of the stator 37, respectively, and the energising windings are connected in series and are powered, through terminals (not shown), by an AC power source. With this configuration of the

AC motor, the motor is able to start more easily in an intended rotational direction of the rotor.

[0198]In a preferred embodiment of the invention, the control electronics supplies the AC motor with only a half-wave voltage signal during start up, thereby providing torque pulses to the rotor. Since only a half-wave voltage signal is supplied to the motor, the torque pulses are always unidirectional and will therefore force the rotor to start rotating in a required direction. The required direction of rotation is determined by the design of the impeller attached to the rotor and by polarity of the half-wave voltage signal.

[0199]After some amount of time, in which a number of half-wave voltage signals has been supplied to the motor, the rotor will stop rotating at a certain position e.g. as shown in the figure. Thus, the rotor is brought into a determined steady state position that is independent of its start position. Subsequent to this process, the AC motor is supplied with a full-wave voltage signal that will accelerate the rotor until the motor enters synchronous operation, that is, when the rotor rotates with the same cyclic frequency as the frequency of the AC voltage source.

[0200]The initial polarity of the AC voltage signal is determinative for the resulting direction of rotation of the rotor, thus if the initial voltage is positive with an increasing amplitude, the rotor will start rotating in one direction, whereas if the voltage is negative with a decreasing amplitude, the rotor will start rotating in an opposite direction.

[0201]The number of half-waves required for bringing the rotor into a determined steady state position, where the rotor stops rotating, depends on the characteristics of the motor such as moment of inertia and the external load applied to the rotor. Thus, the number of half-waves required is based on empirical analysis of a particular motor in particular load conditions.

[0202]The half-wave voltage signal and the corresponding half-wave current signal supplied to the motor will have an appearance as shown in FIG. 19.

[0203]In an alternative embodiment the control electrics used to drive the AC motor shown if FIG. 18 is configured so that that the control electronics dictates the AC motor to stop at a predetermined position by supplying the motor with a number of half-wave voltage signals subsequent to the synchronous operation in which the motor was supplied with a full-wave voltage signal. Thus, at the time the motor needs to be started again, the rotor is already in a position so that only the polarity of the full-wave AC voltage signal supplied to the motor must be chosen so that the resulting direction of rotation of the rotor is in conformity with the terminal position of the rotor at the last operation.

[0204]According to this method, the initial step of bringing the rotor into a determined steady state position by supplying the motor with a number of half-wave voltage signals is not required. Even in the alternative, it will be possible to both terminate the full-wave power supply with a number of half-wave voltage signals as well as commencing the full-wave power supply by initially supplying the motor with a number of half-wave signals. However, this is more cumbersome, but nevertheless more safe.

[0205]FIG. 19 shows a voltage signal V and a current signal I applied to the AC motor as well as the position signal of the rotor. Initially the rotor stands still, which is represented by the straight line L. The electronic control circuit controls the static power switch so that the voltage signal V and the current signal I are present as half-waves. Thus, the rotor receives torque pulses due to the current-voltage combination; these pulses are always one-way directional and tend to start the rotor moving in the required direction. Subsequent to the start-up phase, the rotor enters into its synchronous operation.

[0206]Thus, an AC signal is generated, preferably a 12 V AC signal, possibly by means of digital electric pulses from the 12 V DC power supply of the computer's power supply. Based on a possible sensor output relating to the impeller position, a decision is made of how to initiate the AC power signal, i.e. with a negative or positive half-wave, and by doing making sure the impeller starts in the same rotational direction each time and thus the performance benefits of the AC pump is similar to those of a DC pump.

[0207]Alternatively, the magnetic field sensor is omitted, and instead of reading the impeller position, the impeller is forced to be in the same position every time the impeller starts. To be sure the impeller is in a defined position before start, a signal is supplied to the stator of the AC motor for a defined period of time. The signal is supplied perhaps three times in a row according to the curvature of the electrical power source. The pulses must be within the same half-wave part of a signal period. The frequency of the pulsed signal is arbitrary, but may be 50/60 Hz, although, despite the fact that under normal circumstances an AC pump being driven by the AC signal from the power outlet of the public electrical power network and transformed from 230/115 V to 12V would not function, as there is no chance of changing the sine signal from the public network.

[0208]By this way the impeller will be forced to the right polarity before start, and the pump will start turning the impeller in a defined way of rotation when the power signal full-wave is supplied. The full-wave power signal, which is supplied, must start in the opposite signal half-wave amplitude than that of the initial half-wave pulses, that was supplied before start of the full-wave power signal.

[0209]The invention has been described with reference to specific embodiments and with reference to specific utilisation, it is to be noted that the different embodiments of the invention may be manufactured, marketed, sold and used separately or jointly in any combination of the plurality of embodiments. In the above detailed description of the invention, the description of one embodiment, perhaps with reference to one or more figures, may be incorporated into the description of another embodiment, perhaps with reference to another or more other figures, and vice versa. Accordingly, any separate embodiment described in the text and/or in the drawings, or any combination of two or more embodiments is envisaged by the present application.

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

ASETEK HOLDINGS, INC., *et al.*,

Plaintiffs,

v.

COOLIT SYSTEMS INC.,

Defendant.

____/

ASETEK HOLDINGS, INC., *et al.*,

Plaintiff,

v.

COOLER MASTER CO., LTD., *et al.*,

Defendants.

____/

No. C-12-4498 EMC

AND

No. C-13-0457 JST

ORDER RE CLAIM CONSTRUCTION FOR ASETEK'S PATENTS

Asetek is the owner of two patents: the '362 patent and the '764 patent. In this Court's case, Asetek has accused CoolIT of infringing the patents in suit. In Judge Tigar's case (No. C-13-0457 JST), Asetek has accused Cooler Master of infringing the patents in suit. This order addresses claim construction for the '362 and '764 patents in both the instant case as well as Judge Tigar's case.[1] A separate order shall provide claim construction on CoolIT's patent (the '456 patent).

[1] The parties in both cases agreed to have this Court address claim construction for both cases.

I. LEGAL STANDARD

Claim construction is a question of law to be determined by the Court. *See Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) ("hold[ing] that in a case tried to a jury, the court has the power and obligation to construe as a matter of law the meaning of language used in the patent claim"). "The purpose of claim construction is to 'determin[e] the meaning and scope of the patent claims asserted to be infringed.'" *O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1360 (Fed. Cir. 2008).

> Words of a claim are generally given their ordinary and customary meaning, which is the meaning a term would have to a person of ordinary skill in the art after reviewing the intrinsic record at the time of the invention. "In some cases, the ordinary meaning of claim language . . . may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words." However, in many cases, the meaning of a claim term as understood by persons of skill in the art is not readily apparent.

Id.

> Because the meaning of a claim term as understood by persons of skill in the art is often not immediately apparent, and because patentees frequently use terms idiosyncratically, the court looks to "those sources available to the public that show what a person of skill in the art would have understood disputed claim language to mean." Those sources include "the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art."

Phillips v. AWH Corp., 415 F.3d 1303, 1314 (Fed. Cir. 2005). As a general matter, extrinsic evidence such as dictionaries and expert testimony is considered less reliable than intrinsic evidence (*i.e.*, the patent and its prosecution history). *See id.* at 1317-19 (noting that "extrinsic evidence may be useful to the court, but it is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence").

II. REPRESENTATIVE CLAIMS

As noted above, the two Asetek patents in suit are the '362 patent and the '764 patent. Although the two patents are not directly related, the parties have agreed that "certain similar claim terms in the two patents should be construed to have the same meaning." Docket No. 127 (Mot. at 3).

Claims 1 and 14 of the '362 patent and claim 1 of the '764 patent are representative claims. The text of those claims is provided below (with terms to be construed in bold).

A. <u>Claim 1 of the '363 Patent</u>

> **1.** A cooling system for a computer system processing unit, comprising:
>
> an integrated element including a heat exchanging interface, a **reservoir**, and a pump, wherein
>
> the reservoir is configured to receive a cooling liquid from outside the reservoir through an inlet and pass the cooling liquid to the outside through an outlet, the reservoir including an upper chamber and a lower chamber, the upper chamber and the lower chamber being **vertically displaced chambers** that are separated from each other by at least a horizontal wall and **fluidly coupled** together by a plurality of **substantially circular passages**, at least one of the plurality of substantially circular passages being positioned on the horizontal wall, a boundary wall of the lower chamber being formed by the heat exchanging interface;
>
> the heat exchanging interface is adapted to provide separable thermal contact between the processing unit and the cooling liquid such that the heat is dissipated from the processing unit to the cooling liquid as the cooling liquid passes through the lower chamber of the reservoir; and
>
> the pump is adapted to direct the cooling liquid through the upper chamber and the lower chamber of the reservoir, the pump including a motor having a rotor, a stator and an impeller having a plurality of curved blades, the impeller being positioned within the reservoir;
>
> a heat radiator spaced apart from the integrated element, the heat radiator being fluidly coupled to the outlet and inlet of the reservoir, the heat radiator being configured to circulate the cooling liquid therethrough and exhaust heat from the cooling liquid; and
>
> a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump.

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B. Claim 14 of the '362 Patent

> **14.** A cooling system for a processing unit positioned on a motherboard of a computer, comprising:
>
> a **reservoir** configured to be coupled to the processing unit positioned on the motherboard at a first location, the reservoir being adapted to pass a cooling liquid therethrough, wherein the reservoir includes an upper chamber and a lower chamber, the upper chamber and the lower chamber being separate chambers containing cooling liquid that are separated by at least a horizontal wall and **fluidly coupled** together by one or more passageways, at least one of the one or more passageways being a **substantially circular passageway** positioned on the horizontal wall, the reservoir further including a heat exchanging interface configured to be placed in separable thermal contact with the processing unit, the heat exchanging interface being removably attached to the reservoir such that the heat exchanging interface forms a boundary wall of the lower chamber of the reservoir;
>
> a heat radiator configured to be positioned at a second location **horizontally spaced apart** from the first location when the reservoir is coupled to the processing unit;
>
> a fan adapted to direct air to the heat radiator to dissipate heat from the cooling liquid to surrounding atmosphere;
>
> a pump configured to circulate the cooling liquid between the reservoir and the heat radiator, the pump including a motor having a rotor, a stator, and an impeller having curved blades, the impeller being mechanically coupled to the rotor and at least partially submerged in the cooling liquid in the reservoir, wherein a speed of the impeller is configured to be varied independent of the speed of the fan.

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C. Claim 1 of the '764 Patent

> **1.** A cooling system for a heat-generating component, comprising:
>
> a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator and an impeller, the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;
>
> a **reservoir** adapted to pass the cooling liquid therethrough, the reservoir including:
>
> a pump chamber including the impeller and formed below the chassis, the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through;
>
> a thermal exchange chamber formed below the pump chamber and **vertically spaced apart** from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are **fluidly coupled** together by the one or more passages; and
>
> a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component; and
>
> a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.

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III. DISCUSSION

A. "reservoir"

Asetek	CoolIT	Cooler Master	Court
a single receptacle	region of the integrated element not in normal fluid flow and available to accommodate fluid expansion; or, alternatively, fluid containing portion of the device that includes a region not in the normal fluid flow and available to accommodate fluid expansion	the portions of the integrated element through which cooling liquid flows when the cooling system is operating	a receptacle or chamber for holding a liquid or fluid

1. "integrated element"

CoolIT and Cooler Master's constructions are problematic to the extent both incorporate the term "integrated element" (*i.e.*, a reservoir is part of an integrated element). As Asetek points out, the term "integrated element" (1) is not used in any of the claims of the '764 patent and (2) shows up only in claim 1, and claims dependent on claim 1, in the '362 patent. *See* '362 patent, claim 1 (describing "[a] cooling system for a computer system processing unit, comprising: an integrated element including a heat exchanging interface, a reservoir, and a pump"). Thus, while a reservoir can be a part of an integrated element, it need not be. When it is, the claim language so provides.

Furthermore, the term "integrated element" is itself a confusing term and therefore a construction incorporating that term would not be helpful to the jury. In this regard, the Court takes note that "integrated element" does not necessarily mean that the reservoir, pump, and heat exchanging interface must all be part of a single component. For example, the '362 and '764 patents make note that

> [t]he pump may not only be a self-contained pumping device, but *may* be made integrated into the reservoir, thus making the reservoir and pumping device one single integrated component. This single integrated element of the reservoir and the pumping device *may* also

> be integrated, thus making the reservoir, the pumping device and the heating exchanging surface one single integrated unit.

'362 patent, col. 10:52-59 (emphasis added); '764 patent, col. 13:18-25 (stating the same); *see also* '362 patent, col. 2:25-35 (stating that, in the preferred embodiment, "the pump is placed inside the reservoir" and that "[i]n an alternative embodiment the pump is placed outside the reservoir in the immediate vicinity of the reservoir" – with both placements making "the element . . . easy to employ in new and existing computer systems"); 764 patent, col. 2:20-31 (making a similar point).

2. <u>"not in normal fluid flow and available to accommodate fluid expansion"</u>

CoolIT's construction is also problematic to the extent it offers a limitation – *i.e.*, "not in normal fluid flow and available to accommodate fluid expansion" – that is not justified by the intrinsic evidence. CoolIT argues that the limitation is appropriate based on the following excerpt from the specification:

> FIG. 3 shows another embodiment of a prior art cooling system. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement. The figure shows a prior art heat exchanger 7, which is in connection with a prior art liquid reservoir 8, a prior art liquid pump 9 and a heat radiator 11 and an air fan 10 provided together with the heat radiator. . . . *The reservoir serves as a storage unit for excess liquid not capable of being contained in the remaining components. The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid.*

'362 patent, col. 8:5-17; '764 patent, col. 10:37-49 (emphasis added).

But this position is fundamentally flawed because the statement above concerns the prior art, and not the present invention. *See* Docket No. 148 (Reply at 4). Indeed, the statement above specifically refers to a "*prior art* liquid reservoir" (emphasis added). That there is a difference between (1) a prior art reservoir and (2) a reservoir that is part of the invention claimed is underscored by the fact that a prior art reservoir was used, in part, as a means for venting the system of any air entrapped in the system. But a reservoir that is part of the invention claimed does not serve that purpose as it is part of a closed/sealed system.

Furthermore, CoolIT's position runs counter to the language used in the patent claims. The claims in both the '362 patent and '764 patent indicate that the reservoir is an integral part of fluid flow for cooling. *See, e.g.*, '362 patent, claim 1 (providing that "the reservoir is configured to receive a cooling liquid from outside the reservoir through an inlet and pass the cooling liquid to the outside through an outlet"); '362 patent, claim 14 (providing that the reservoir is "adapted to pass a cooling liquid therethrough"); '764 patent, claim 1 (providing that "a reservoir [is] adapted to pass the cooling liquid therethrough"). Nothing about the patents suggests that there is a portion of the reservoir that is not involved in the fluid flow.

Finally, CoolIT's suggestion that the construction of "reservoir' should include a reference to "excess fluid created by fluid expansion" is completely unwarranted. Nothing in the patents makes mention of fluid expansion at all. Docket No. 136 (CoolIT's Resp. Br. at 7). Rather, that is one of the issues that is the subject of CoolIT's own invention, the '456 patent, not Asetek's patents.

3. <u>"through which cooling liquid flows when the cooling system is operating"</u>

As for the limitation proposed by Cooler Master – *i.e.*, "through which cooling liquid flows when the cooling system is operating" – the Court finds it unnecessary as it is largely redundant of the surrounding claim language. *Cf. Atser Research Techs., Inc. v. Raba-Kistner Consultants, Inc.*, No. SA-07-CA-93-H, 2009 U.S. Dist. LEXIS 25294, at *31-32 (W.D. Tex. Mar. 2, 2009) (rejecting defendant's construction of the term "client computer" because it "includ[ed] the surrounding words of the claim" which was "redundant and unnecessary").

4. <u>"single receptacle"</u>

Finally, Asetek's construction – *i.e.*, "single receptacle" – is lacking in that it does not provide any information as to what the function or purpose of a reservoir is. To the extent Asetek puts a premium on the word "single," that word is unnecessary because the fact that the claim term is "reservoir" (singular) and not "reservoirs" (plural) indicates that a reservoir is only one receptacle and not many. Also, it is clear from the surrounding claim language that a reservoir is a single receptacle made up of an upper and lower chamber (the '362 patent) or a pump chamber and a thermal exchange chamber (the '764 patent).

5. <u>Dictionary Definition</u>

Although a dictionary definition is extrinsic evidence, the Court concludes that it best captures what a "reservoir" is based on the language of the patents, including the specifications and claims. That is, a "reservoir" for purposes of the '362 and '764 patents is "a receptacle or chamber for holding a liquid or fluid." Notably, CoolIT expressly stated at the hearing that it would not object to this construction, which is a dictionary definition supplied by CoolIT in its papers. *See* Docket No. 136-4 (Ex. 4). In addition, in its papers, Asetek itself relied on a similar dictionary definition. *See* Docket No. 10 (Asetek's Op. Br. at 10) ("The dictionary definition of 'reservoir' provided by Asetek is 'a part of an apparatus in which a liquid is held.'").

B. <u>"fluidly coupled" ('362 patent) or "coupled" ('764 patent)</u>

Asetek	**CoolIT**	**Cooler Master**	**Court**
fluidly communicating (directly or indirectly)	connected such that fluid can flow directly from one element into the other	[same as CoolIT]	fluidly connected

The parties agree that the term "fluidly coupled" or "coupled" does not appear anywhere in the specifications of the two patents at issue – *i.e.*, the term shows up only in the claims. As to the claims, the term "fluidly coupled" or "coupled" basically shows up in two different contexts:

- The fluid coupling of the two chambers in the reservoir; and
- The fluid coupling of the reservoir to the heat radiator (*i.e.*, fan).

See, e.g., '362 patent, claim 1 (describing "the reservoir including an upper chamber and a lower chamber, the upper chamber and the lower chamber being vertically displaced chambers that are separated from each other by at least a horizontal wall and fluidly coupled together by a plurality of substantially circular passages"); '362 patent, claim 1 (describing "a heat radiator spaced apart from the integrated element, the heat radiator being fluidly coupled to the outlet and inlet of the reservoir"); '764 patent, claim 1 (describing "the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages"); '764 patent, claim 1 (describing "a heat radiator fluidly coupled to the reservoir").

The basic dispute between the parties is whether "coupled" should be construed to require a direct connection (Defendants' position) whether "coupled" should be more broadly construed to cover either a direct or an indirect connection (Asetek's position).

Looking at the phrase "coupled" in isolation, the Court agrees with Asetek that "common usage of the term . . . supports both direct and indirect connections." *Silicon Image, Inc. v. Genesis Microchip, Inc.*, No. 3:01cv266, 2002 U.S. Dist. LEXIS 28916, at *88 (E.D. Va. Dec. 10, 2002). Furthermore, the fact that the specifications of the patents show only direct connections is not dispositive. "[E]ven where a patent describes *only a single embodiment*, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction." *Innova/Pure Water, Inc. v. Safari Water Filtration Sys.*, 381 F.3d 1111, 1117 (Fed. Cir. 2004) (internal quotation marks omitted; emphasis added); *see also Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1328 (Fed. Cir. 2002) (noting that "[t]he record is devoid of 'clear statements of scope' limiting the term appearing in claim 1 to having 'a single pair of legs'")

The case cited by Cooler Master – *In re Abbott Diabetes Care Inc.*, 696 F.3d 1142 (Fed. Cir. 2012) – is not to the contrary. There, the court held that the PTO erred in broadly construing the claim "electrochemical sensor" to include sensors with external wires and cable leads because (1) "every embodiment disclosed in the specification shows an electrochemical sensor without external cables or wires" *and* (2) "the specification contains only disparaging remarks with respect to the external cables and wires of the prior-art sensors." *Id.* at 1149. No such disparagement of indirect coupling is contained in the specification at issue in the case at bar.

Thus, in principle, the Court concludes that the term "coupled" – in isolation – could support either direct or indirect connections.

That being said, the term "coupled" as used in the patents is not in isolation but is usually accompanied by a phrase specifying the means of the connection. For example, claim 1 of the '362 patent describes "the reservoir including an upper chamber and a lower chamber, the upper chamber and the lower chamber being vertically displaced chambers that are separated from each other by at least a horizontal wall and fluidly coupled together *by a plurality of substantially circular passages*." '362 patent, claim 1 (emphasis added). Where the means of connection are specified, the Court concludes that that is the exclusive means by which the coupling can be accomplished. Thus, for claim 1 of the '362 patent, the chambers must only be connected by a plurality of substantially circular passages and nothing more. The heat radiator, for example, could not be inserted as a part of the connection without violating the language of the claim. *See* Docket No. 136 (CoolIT's Resp. Br. at 12) ("Asetek amended its infringement contentions to argue that the two separate chambers could be 'coupled' – indirectly – through the outlet tube, *the radiator*, and the inlet tube.")[2] (emphasis added).

Notably, the court in *City of Aurora v. PS Systems, Inc.*, No. 07-cv-2371-PAB-BNB, 2010 U.S. Dist. LEXIS 61935 (D. Colo. June 2, 2010), reached a similar conclusion when presented with a similar set for facts. In *Aurora*, the court examined, *inter alia*, a claim that specified that the patented system included "'at least one aquifer well coupled to the underground reservoir *by piping*.'" *Id.* at *41. The court took note that

> [t]he parties first disagree about the implications of the term "coupled." The City of Aurora insists that, in the context of this patent, the term "couple" signifies a direct connection between the aquifer well and the underground water storage reservoir. Defendant patentees, citing to a District of Delaware case, urge that the connection may be direct or indirect and, in fact, may be so indirect as to encompass infiltration ditches and ponds above the underground reservoir [*e.g.*, an infiltration pond could establish the necessary link between the aquifer well and the reservoir].

Id. at *41-42. The court ultimately found in the city's favor rather than the defendant-patentees', explaining as follows:

> There are two cases, of which the Court is aware, which define the term "coupled." The case cited by defendants, *Silicon Graphics, Inc. [v. nVidia Corp.]*, held that "the ordinary meaning [of couple] in this context is 'coupled or connected, directly or indirectly.'" 58 F. Supp. 2d at 346. In *Bradford Co. v. ConTeyor North America, Inc.*, 603 F.3d 1262, 2010 WL 1711307, at *3, 6-7 (Fed. Cir. 2010), the Federal Circuit recently held that the phrase "coupled to" means "linked together, connected or joined" and often deserves a broad construction to include indirect means of connection.

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[2] To the extent Asetek relies on the Tilton declaration to assert that there could be indirect coupling via the radiator, *see* Docket No. 148 (Tilton Decl. ¶ 9) (emphasis added), the Court rejects that reliance for several reasons. First, Asetek failed to identify Dr. Tilton as a witness in the parties' Joint Claim Construction and Prehearing Statement. *See* Pat. L.R. 4-3(e) (providing that, in the parties' Joint Claim Construction and Prehearing Statement, they are to include information as to "[w]hether any party proposes to call one or more witnesses at the Claim Construction Hearing, the identity of each such witness, and for each witness, a summary of his or her testimony, including for any expert, each opinion to be offered related to claim construction"). Second, Dr. Tilton's opinion is directly contrary to the language of the claims which mentions coupling via passages only, and nothing more.

> The distinction between a direct and an indirect connection, which was the focus in *Bradford* and *Silicon Graphics, Inc.*, is not particularly helpful in the present case. Both of those cases dealt with the question of whether two items would qualify as "coupled" if they were indirectly joined through a third, intermediary structure. *See Bradford Co.*, 603 F.3d 1262, 2010 WL 1711307, at *7; *Silicon Graphics, Inc.*, 58 F. Supp. 2d 331, 345-46. Unlike the patents in *Bradford* or *Silicon Graphics*, Claim 1 of the '218 Patent identifies the specific means by which the two primary items – here, the aquifer and the underground reservoir – are to be coupled. Claim 1 explains that they are coupled "by piping." The specification makes clear that "piping" includes the entire mechanical system of wells, wellheads, pumps, pump houses, valves, and pipe configurations. Additional intermediary steps or diversions may well be contemplated under Claim 1. *However, one skilled in the art would not understand "piping," as the term is used in the '218 Patent, to include infiltration ponds or infiltration ditches.* Therefore, such infiltration structures may not serve as the element which connects the underground reservoir.

Id. at *42-43 (emphasis added).

Because "coupled" in isolation could support indirect connections but "coupled" as used in the patents often specifies the means for connection, the Court concludes that a construction incorporating terms such as "direct" or "indirect" would not be helpful to the jury. Accordingly, the Court shall simply construe "fluidly coupled" to mean "fluidly connected." The parties, however, should be mindful of the Court's ruling here that, where a means of coupling is specified, that is the exclusive means of connection.

C. "substantially circular passages"

Asetek	CoolIT	Cooler Master	Court
generally circular passages	indefinite and lacks written description; or circular passages	indefinite and lacks written description; or circular holes	plain and ordinary meaning

As indicated by the chart above, both CoolIT and Cooler Master make an initial challenge to the term "substantially circular passages" on the ground that it is indefinite and lacks written description. *See* 35 U.S.C. § 112(a)-(b) (providing that "[t]he specification shall contain a written description of the invention" and that "[t]he specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention").

The Court, however, shall not entertain invalidity arguments at this juncture of the proceedings. Invalidity defenses are usually addressed at summary judgment, not as a part of claim construction. *See, e.g.*, *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1307 (Fed. Cir. 2008) (stating that "[c]ompliance with the written description requirement is a question of fact [that] is amenable to summary judgment in cases where no reasonable fact finder could return a verdict for the nonmoving party"); *ASM America, Inc. v. Genus, Inc.*, No. C-01-2190 EDL, 2002 U.S. Dist. LEXIS 15348, at *42 (N.D. Cal. Aug. 15, 2002) ("conclud[ing] that the Federal Circuit's statements that indefiniteness is intertwined with claim construction mean only that the Court must attempt to determine what a claim means before it can determine whether the claim is invalid for indefiniteness, and not that the Court must determine indefiniteness during the claim construction proceedings").[3] This approach is particularly warranted given that Judge Tigar is the assigned judge for the Cooler Master case.

The Court therefore restricts itself to the issue of claim construction. Here, Asetek asks that the term "substantially circular passages" be construed as "generally circular passages," while CoolIT proposes "circular passages" and Cooler Master "circular holes."

The Court agrees with Asetek that both of Defendants' constructions are problematic because they effectively "read the word 'substantially' out of the claim." Docket No. 127 (Asetek's Op. Br. at 18). Cooler Master protests that it "does not contend that the required circle needs to be proven geometrically to be perfect to meet the claim limitation, but rather it must look circular to one of ordinary skill in the art." Docket No. 137 (Cooler Master's Resp. Br. at 17). However, Cooler Master's proposed construction of the term does not make this point clear in any way. Similarly, to the extent CoolIT argues that "[t]he claims require passages that are shaped *like* a circle, as opposed to some other geometric shape such as a square, rectangle, or triangle," Docket

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[3] *Cf. 3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1333 (Fed. Cir. 2013) (stating that, "[i]n order to be indefinite, reasonable efforts at claim construction must *result in a definition* that does not provide sufficient particularity or clarity to inform a skilled artisan of the bounds of the claim") (emphasis added).

No. 136 (CoolIT's Resp. Br. at 12) (emphasis added), its proposed construction does not suggest this point in any fashion.

The Court also rejects Cooler Master's suggestion that "passages" should be construed to mean "holes." According to Cooler Master "holes" is more readily understandable than "passages," *see* Docket No. 137 (Resp. Br. at 17), but the term "passages" is not a confusing term. Moreover, the connotation of the two words is somewhat different, and nothing in the patents suggests that "passages" and "holes" are equivalent. Because nothing in the patents indicates that "passages" suggests that it should be interpreted other than in its plain and ordinary meaning, the Court shall not construe the term any further.

Likewise, the Court need not construe the term "substantially" any further.

D. "vertically displaced chambers" ('362 patent) or "vertically spaced apart ('764 patent)"

Asetek	CoolIT	Cooler Master	Court
vertically arranged (with reference to each other and the heat exchanging interface) chambers	indefinite and lacks written description; or the upper chamber is farther away from the heat exchanging interface and separated from the lower chamber by at least a horizontal wall	indefinite and lacks written description; or the upper chamber/pump chamber being farther away from the heat exchanging interface, and separated from the lower chamber/heat exchanging chamber by at least a horizontal/intermediat e wall	vertically arranged (with reference to each other and the heat exchanging interface) chambers

As above, the Court shall not entertain the invalidity arguments presented by Defendants.

Turning to construction, the Court finds both CoolIT and Cooler Master's constructions problematic because they, in effect, read out the "vertical" requirement. As Asetek argues, "defining a distance alone [*i.e.*, farther away] does not clarify spatial orientation." Docket No. 148 (Reply at 20); *see also* Docket No. 127 (Asetek's Op. Br. at 22) (stating that "merely stating the upper/pump chamber is 'farther away from the heat exchanging interface' does not provide the directional orientation that would assist a jury in understanding 'vertically' in the claims"). To the extent CoolIT and Cooler Master's concern is that Asetek is trying to avoid a construction that puts the lower/thermal exchange chamber closer to the heat exchanging interface, that concern is unwarranted. Asetek does not dispute that that has to be the case. *See* Docket No. 148 (Reply at 19-20) (arguing that it "has never taken the position" that the two chambers could be transposed; also stating that the lower/thermal exchange chamber "contains the heat exchange interface"). In any event, the claims on their face demand such. *See, e.g.*, '362 patent, claim 1 (referring to "a boundary wall of the lower chamber being formed by the heat exchanging interface")

Finally, CoolIT and Cooler Master's constructions which make reference to a separation by a horizontal or intermediate wall are not appropriate because, as Asetek notes, (1) for the '362 patent, such language is "redundant of other claim language, which already states the upper and the lower chambers are 'separated . . . by at least a horizontal wall.'" Docket No. 127 (Asetek's Op. Br. at 22) (quoting claim 1); and (2) for the '764 patent, there is no such limitation in the patent at all – *i.e.*, there is only a requirement that the chambers be separate. *See, e.g.*, '764 patent, claim 1 (making no reference to a horizontal or intermediate wall).

Accordingly, the Court adopts Asetek's construction as the more appropriate construction.

E. <u>"horizontally spaced apart"</u>

Asetek	**CoolIT**	**Cooler Master**	**Court**
spaced apart in the horizontal direction (with reference to the vertically displaced/spaced apart chambers)	plain ordinary meaning	indefinite and lacks written description; or being placed at different locations on a horizontal plane	spaced apart in the horizontal direction (with reference to the vertically displaced/spaced apart chambers)

As above, the Court shall not entertain the invalidity arguments presented by Defendants.

Turning to construction, the Court takes note that the main dispute here is really between Asetek and Cooler Master. That dispute boils down to whether "horizontal" means exactly horizontal (*i.e.*, on the same horizontal plane). Cooler Master takes this position, while Asetek maintains that horizontal could also mean, in effect, "roughly" horizontal. The "horizontal" relationship at issue is that between the "reservoir . . . at a first location" and "a heat radiator . . . at a second location." '764 patent, claim 14 (referring to a "heat radiator configured to be positioned at a second location horizontally spaced apart from the first location").

Cooler Master's position is dependent on the premise that both the reservoir and radiator are located on the motherboard – *i.e.*, Cooler Master asserts that, because the motherboard is a board and because both the reservoir and radiator must be on the motherboard, the reservoir and radiator must be exactly horizontal from one another. *See* Docket No. 137 (Cooler Master's Resp. Br. at 18).

The problem for Cooler Master is that there is limited support for its contention that the radiator must be on the motherboard. For example, although Cooler Master takes the position that the language of claim 14 of the '362 patent supports its position, the Court does not agree. Claim 14 of the '362 patent provides in relevant part as follows:

> **14.** A cooling system for a processing unit positioned on a motherboard of a computer, comprising:
>
> a reservoir configured to be coupled to the processing unit positioned on the motherboard at a first location . . .
>
> a heat radiator configured to be positioned at a second location horizontally spaced apart from the first location when the reservoir is coupled to the processing unit . . . .

In its papers, Cooler Master argues that "[t]he use of 'second' as the modifier in relation to the 'first' location on the motherboard compels a conclusion that the second location must also be on the motherboard." Docket No. 137 (Cooler Master's Resp. Br. at 18). But Cooler Master has not read the text of claim 14 correctly. Claim 14 does not refer to a CPU (central processing unit) positioned at a "first location on the motherboard." Rather, claim 14 describes a CPU positioned "on the motherboard at a first location." Thus, claim 14 simply reflects that the motherboard is at a first location, not that there is a first and second location on the motherboard. Thus, consistent with the claim language, the radiator could be at a second location apart from the motherboard.

In addition, FIG. 8 of the '362 patent suggests that the radiator does not have to be on the same exact horizontal plane as the reservoir. *See* '362 patent, FIG. 8.

Cooler Master's best argument is based on the prosecution history, but even here there are problems. In its responsive brief, Cooler Master points out that,

> [i]n the March 21, 2012 Reply to Office action, the [patent] applicant amended claims 83 and 86 (which were later issued as claims 14 and 17 of the '362 patent) in order to overcome the examiner's rejection. In the response, the inventor explained that "amended independent claim 83 recites a cooling system for a processing unit positioned on a motherboard of a computer, including a reservoir configured to be coupled to the processing unit positioned on the motherboard at a first location, . . . , and a heat radiator configured to be positioned *at a second location of the motherboard* horizontally spaced apart from the first location when the reservoir is coupled to the processing unit."

Docket No. 137 (Cooler Master's Resp. Br. at 19) (emphasis in original); *see also* Docket No. 137-7 (Carman Decl., Ex. E) (Reply to Office Action at 5-7, 12-13).

While "'the prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be,'" *Abbott Labs. v. Sandoz, Inc.*, 566 F.3d 1282, 1289 (Fed. Cir. 2009), here, the added language regarding a second location of the motherboard was deleted before issuance of the patent (a point that no party contests). Admittedly, there is nothing in the record as to why this language was deleted. However, as a matter of common sense, the deletion seems unremarkable – *i.e.*, while the CPU must be on the motherboard (and thus the reservoir/heat exchanging interface which are attached to the CPU), there is no obvious or apparent functional need for the heat radiator to be on the motherboard as well. Indeed, because the heat radiator and its fan must exhaust heat from within a chassis to the outside, it would make little sense to require the radiator and fan to be placed on the motherboard rather than mounted, *e.g.*, on the chassis wall. In any event, the lack of any reason for the deletion simply makes the prosecution history ambiguous at best. The Federal Circuit has expressly held that "[i]t is inappropriate to limit a broad definition of a claim term based on prosecution history that is itself ambiguous." *Inverness Medical Switzerland GmbH v. Warner Lambert Co.*, 309 F.3d 1373, 1382 (Fed. Cir. 2002); *see also Harris Corp. v. Federal Express Corp.*, 502 Fed. Appx. 957, 964 (Fed. Cir. 2013) (stating that, "[a]s a general rule, prosecution history cannot overcome the natural reading of the claim when the alleged disavowal is ambiguous"); *SunRace Roots Enter. Co., Ltd. v. SRAM Corp.*, 336 F.3d 1298, 1306 (Fed. Cir. 2003) (stating that, "'[a]lthough [it] is correct that the prosecution history is always relevant to claim construction, it is also true that the prosecution history may not be used to infer the intentional narrowing of a claim absent the applicant's clear disavowal of claim coverage'").

Accordingly, the Court adopts the construction proposed by Asetek, and not Cooler Master. The Court declines to rest on plain and ordinary meaning as proposed by CoolIT as here there is ambiguity as to whether "horizontal" means exactly horizontal.

IV. CONCLUSION

The disputed claim terms of the patents-in-suit are hereby construed as set forth above.

IT IS SO ORDERED.

Dated: December 3, 2013

EDWARD M. CHEN
United States District Judge

Electronic Acknowledgement Receipt

EFS ID:	20516680
Application Number:	95002386
International Application Number:	
Confirmation Number:	7254
Title of Invention:	COOLING SYSTEM FOR A COMPUTER SYSTEM
First Named Inventor/Applicant Name:	8245764
Customer Number:	22852
Filer:	Lloyd L. Pollard II
Filer Authorized By:	
Attorney Docket Number:	COOL-1.012
Receipt Date:	24-OCT-2014
Filing Date:	15-SEP-2012
Time Stamp:	23:08:08
Application Type:	inter partes reexam

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Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit_7.pdf	526807 22b0d4847bf686ac237cfaa9575ce3fa78d8ba99	no	36

Warnings:

Information:

2	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit_8.pdf	352961 fe2f492d34f1a26fb59ccbd21267741476f57b39	no	12
Warnings:					
Information:					
3	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit_9.pdf	632295 6702eb598d82ff35dca19f420df9f9f10c2692aa	no	22
Warnings:					
Information:					
4	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit_10.pdf	333175 57e7df00c7ad6e90ffc9cc3e12f4fb865fbd854d	no	11
Warnings:					
Information:					
5	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit_11.pdf	487930 6a2cc1f312c8acf4a812b8af15e89f16617b0bc1	no	4
Warnings:					
Information:					
6	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Exhibit_12.pdf	5784581 102b3b36c0c99b5be0446574cb78cdb07578660a	no	134
Warnings:					
Information:					
7	Reexam - Affidavit/Decl/Exhibit Filed by 3rd Party	Order_Claim_Construction.pdf	1489686 193463f55f72627e182881b5511e9b64ad30ea25	no	18
Warnings:					
Information:					
		Total Files Size (in bytes):	9607435		

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re *Inter Partes* Reexamination of:	)	
	)	
André Sloth ERIKSEN	)	Group Art Unit: 3993
	)	
U.S. Patent No.: 8,245,764 B2	)	Examiner: Joseph A. KAUFMAN
Filed: October 7, 2011	)	
Issued: August 21, 2012	)	
	)	
For: COOLING SYSTEM FOR A COMPUTER	)	Confirmation No.: 7254
SYSTEM	)	
	)	
Reexamination Proceeding	)	
Control No. 95/002,386	)	
Filed: September 15, 2012	)	

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Alexandria, VA 22313-1450

APPELLANT'S/PATENT OWNER'S APPEAL BRIEF UNDER 37 C.F.R. § 41.67

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I. INTRODUCTION

This is an appeal from the rejections of claims 1-30 set forth in a Right of Appeal Notice ("RAN") mailed on June 30, 2014, in the reexamination of U.S. Patent No. 8,245,764 ("the '764 patent," Ex. 1). A Notice of Appeal was filed on July 24, 2014. The deadline for filing Patent Owner's/Appellant's Appeal Brief is September 24, 2014. *See* 37 C.F.R. § 41.66. Thus, this Appeal Brief is timely filed. The number of pages in this Appeal Brief is less than thirty (30) pages, and therefore, it is in compliance with 37 C.F.R. § 1.943. Patent Owner/Appellant submits concurrently herewith an a fee of $2,000.00 as required under 37 C.F.R. § 41.20(b)(2)(ii).

If additional fees are required, or if the enclosed payment is insufficient, please charge the required fees to Deposit Account No. 06-0916.

II. REAL PARTY IN INTEREST

The real party in interest for this appeal is Asetek Danmark A/S, having a principal place of business at Assensvej 2, DK-9220 Aalborg East, Denmark.

III. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences before the Patent Trial and Appeal Board.

The '764 patent is currently involved in the following litigations: 1) Asetek Holdings, Inc. v. CoolIT Systems, Inc., Civil Action No. 3:12-CV-04498-EMC, and 2) Asetek Holdings, Inc. v. CMI USA, Inc., Civil Action No. 3:13-CV-00457-JST. Both the litigations are pending in the U.S. District Court of the Northern District of California.

IV. STATUS OF CLAIMS

Claims 1-30 are pending, of which claims 1-18 are original patented claims, and claims 19-30 were added during the reexamination. No claim is confirmed or allowed. No claim is canceled. The rejections of claims 1-30 are appealed.

V. STATUS OF AMENDMENTS

Claims 19-30 were added in the Response to Office Action filed on December 26, 2012.

No other claim amendments were submitted during reexamination.

VI. SUMMARY OF CLAIMED SUBJECT MATTER

Claims 1, 10, and 15 are the independent claims on appeal and they are the only independent claims in the '764 patent.

Independent claim 1 is directed to a liquid cooling system for a heat generating component. *See, e.g.,* Ex. 1 ['764 patent], Abstract, 1:11-15. The cooling system comprises, among other things, a pump configured to circulate cooling liquid through the system, a reservoir through which the cooling liquid flows, and a heat radiator connected to the reservoir with tubing and configured to dissipate the heat collected by the cooling liquid from the heat-generating component. *See, e.g., id.* at 1:61-2:12. The pump is mounted on a double-side chassis, with the stator of the pump motor being positioned on the upper side of the chassis, and the impeller being mounted on the underside of the chassis. *See, e.g., id.* at 21:12-21, 21:28-32, 21:41-51, Fig. 17, and Fig. 20. This allows the stator to be isolated from the cooling liquid while the impeller is positioned in the cooling liquid. *Id.* The reservoir comprises dual chambers—a pump chamber which houses the impeller, and a thermal exchange chamber formed below the pump chamber and fluidly connected to it. *See, e.g., id.* at 22:26-53. A heat-exchanging interface forms a lower boundary wall of the reservoir. *See, e.g., id.* at 22:54-23:8, 11:3-10. The heat exchanging interface has two sides—a first side of the heat-exchanging interface is in contact with the cooling liquid in the thermal exchange chamber, and the opposite side is configured to be in thermal contact with the heat-generating component. *See, e.g., id.* at 22:54-23:8, 11:3-10, Fig. 15, Fig. 17, and Fig. 20. Thus, the pump and the reservoir are combined into a single cooling unit, which is configured to be mounted on a heat generating component. *See, e.g., id.* at 20:19-30, Fig. 15, Fig. 17, and Fig. 20.

Claims 4, 6, and 19, which depend from claim 1, are being argued separately under the provisions of 37 C.F.R. § 41.67(c)(1)(vii). Claim 4 recites that the side of the heat-exchanging interface that contacts the cooling liquid comprises features, e.g., pins and/or fins, that are adapted to enhance heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber. *See, e.g., id.* at 22:60-23:8, Fig. 17, Fig. 20. Claim 6 recites that a passage that allows fluid flow between the pump chamber and the thermal exchange chamber is offset from a center of the impeller. *See, e.g., id.* at Fig. 17, 22:33-43. Claim 19 further recites that the system includes a passage that allows cooling liquid to flow from the pump chamber directly into the thermal exchange chamber. *Id.*

Independent claim 10 is directed to a cooling system for a computer. *See, e.g.,* Ex. 1 ['764 patent], Abstract, 1:11-15. The cooling system comprises a centrifugal pump configured to circulate cooling liquid through the system, and a reservoir configured to be thermally coupled to a heat-generating component (e.g., a CPU) of the computer system. *See, e.g., id.* at 1:61-2:12, 22:26-30. The motor of the pump comprises a stator that is isolated from the cooling liquid flowing through the reservoir, and an impeller that is exposed to the cooling liquid. *See, e.g., id.* at 21:12-15, 21:28-32, 21:41-51, Fig. 17, and Fig. 20. The reservoir comprises dual chambers—a thermal exchange chamber configured to be positioned in thermal contact with the heat-generating component, and a pump chamber formed above the thermal exchange chamber and fluidly connected to it through at least one passage that is offset from the center of the impeller. *See, e.g., id.* at Fig. 17, Fig. 20, 22:26-53.

Claim 23, which depend from claim 10, is being argued separately under the provisions of 37 C.F.R. § 41.67(c)(1)(vii). Claim 23 recites that the system includes a passage that allows cooling liquid to flow from the pump chamber directly into the thermal exchange chamber. *See, e.g., id.* at 22:33-43

Independent claim 15 is directed to a liquid cooling system for a heat generating component. *See, e.g.,* Ex. 1 ['764 patent], Abstract, 1:11-15. The cooling system comprises, among other things, a pump configured to circulate cooling liquid through the system, a reservoir configured to be thermally coupled to a heat-generating computer (e.g., a CPU) of the computer system, and a liquid-to-air heat exchanger (i.e., a heat radiator) connected to the reservoir with tubing and configured to dissipate the heat collected by the cooling liquid from the heat-generating component. *See, e.g., id.* at 1:61-2:12, 22:26-30. The motor of the centrifugal pump comprises a stator that is isolated from the cooling liquid flowing through the reservoir, and an impeller that is exposed to the cooling liquid. *See, e.g., id.* at 21:12-15, 21:28-32, 21:41-51, Fig. 17, and Fig. 20. The reservoir comprises dual chambers—a pump chamber, which houses the impeller, is defined by a top wall of the reservoir and an impeller cover, and a thermal exchange chamber formed below the pump chamber, is defined by an intermediate member and a heat-exchanging interface. *See, e.g., id.* at 22:26-53, Fig. 17, and Fig. 20. The heat exchanging interface has two sides—a first side of the heat-exchanging interface is in contact with the cooling liquid in the thermal exchange chamber, and the opposite side is configured to be in thermal contact with the heat-generating component. *See, e.g., id.* at 22:54-23:8, 11:3-10, Fig. 15, Fig. 17, and Fig. 18.

Claims 16 and 17, which depend from claim 15, are being argued separately under the provisions of 37 C.F.R. § 41.67(c)(1)(vii). Claim 16 recites that the reservoir comprises two openings/passages to direct cooling liquid from the pump chamber into the thermal exchange chamber. *See, e.g., id.* at Fig. 17, 22:26-43. A first opening is on the impeller cover and is offset from a center of the impeller, and a second opening/passage is on the intermediate member and is aligned with the first opening on the impeller cover. *Id.* Claim 17 recites that the side of the heat-exchanging interface that contacts the cooling liquid (in the thermal exchange chamber) comprises pins and/or fins. *See, e.g., id.* at 22:60-23:8, Fig. 17, Fig. 20.

VII. ISSUES TO BE REVIEWED ON APPEAL

The issues to be reviewed in this appeal are:

1. Rejection of claims 1-30 under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 7,544,049 to *Koga* et al. ("*Koga,*" Ex. 2).
2. Rejection of claims 20, 24, and 28 under 35 U.S.C. § 103(a) as unpatentable over *Koga.*
3. Entitlement of claims 1-30 to the priority date of PCT Application No. PCT/DK2005/000310 ("the International Application," Ex. 3) filed on May 6, 2005.

VIII. ARGUMENTS

Claims 1-30 are rejected over *Koga,* which Patent Owner appeals. These rejections should be reversed at least for the reasons discussed in the Responses of December 26, 2012 ("First Response," Ex. 4) and October 3, 2013 ("Second Response," Ex. 5) (collectively, "Responses"), the declaration of Dr. Donald Tilton, dated October 1, 2013 ("Tilton Decl.," Ex. 6), and for the reasons explained below.

A. Summary of the '764 patent

The '764 patent is directed to a liquid cooling system for a heat-generating component, such as a central processing unit (CPU) of a computer. *See, e.g.,* Ex. 1 ['764 patent], Abstract, 1:11-15. Figures 17 and 20 of the '764 patent represent exemplary cooling units of the claimed invention. As evident from the patent claims and the figures, the claimed invention comprises, among other features, a "reservoir" that includes *dual chambers*, referred to as the "pump chamber" and "thermal exchange chamber" in the '764 patent. *See, e.g., id* at 22:26-53, and Fig. 20 (annotated below). The chambers are vertically spaced apart and are fluidly coupled via at least one passage. *Id.* A lower boundary wall of the "thermal exchange chamber," referred to as the "heat-exchange interface" in the '764 patent, is placed in thermal contact with the CPU and it allows for heat dissipation from the heat-generating component to the cooling liquid in the thermal exchange chamber. *Id.* at Fig. 15, Fig. 20, 22:54-23:8. The claimed invention of the '764 patent is a fundamentally different approach to liquid cooling than prior art liquid cooling devices, such as, *Koga,* because **the pumping and the thermal exchange functions of the "reservoir" of the claimed invention is divided into two vertically separated chambers— the pumping being performed in the "pump chamber" and the heat dissipation/thermal exchange being performed in the "thermal exchange chamber."** This allows the pumping and the thermal exchange functions to be independently optimized in the separate chambers. In contrast to the dual-chamber approach of the claimed invention, *Koga* discloses a prior-art *single chamber* approach where both the pumping and the thermal exchange are performed in the same compartment (i.e., pump room 15A) in order to reduce the height of the cooling device. *See, e.g.*, Ex. 2 [Koga], 6:26-36, 3:28-30; 4:3-9.

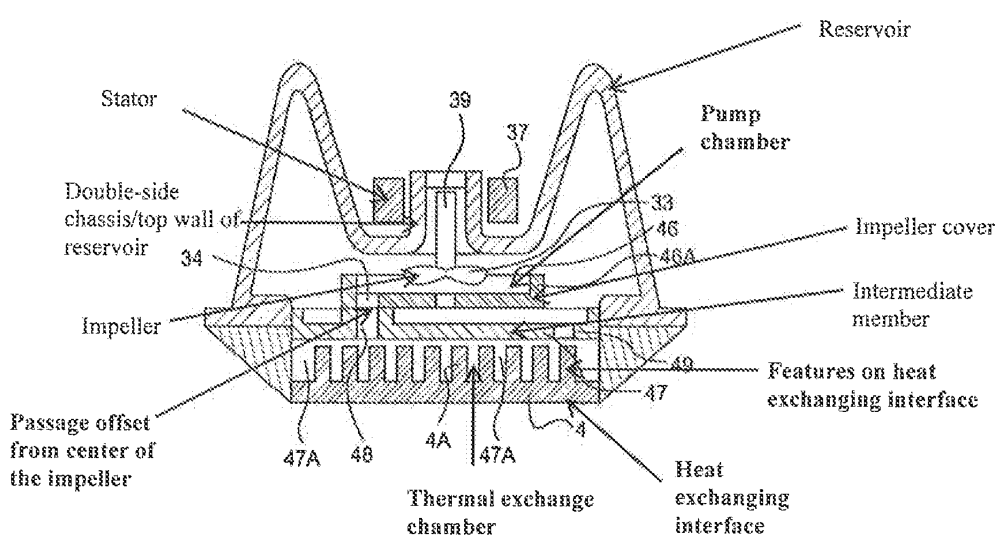


FIG. 20 of the '764 patent

B. Summary of the *Koga* Reference

Patent Owner is appealing the rejection of the '764 patent claims under 35 U.S.C. §102(b) as anticipated by *Koga*, or as being obvious under 35 U.S.C. §103(a) over *Koga*.

Koga discloses a cooling device that comprises a conventional centrifugal pump 1 and a radiator 3 in a closed loop. *See, e.g.,* Ex. 2 [Koga], 3:13-16, Fig. 1, Abstract, and Title. Centrifugal pump 1 is placed in contact with a heat-generating electronic component 2 so that "the coolant ***in the pump*** collects the heat off the electronic component due to its heat exchanger function, and the radiator of the cooling device dissipates the heat." *See, e.g., id.* at 3:16-20 (emphasis added). Centrifugal pump 1 comprises a pump room 15A formed between a base wall and a cover wall opposite the base wall. *See, e.g., id.* at Abstract, 4:38-43; Ex. 6 [Tilton Decl.], ¶7. Pump room 15A houses a pump impeller 11. *See, e.g.,* Ex. 2 [Koga], Abstract, 4:30-34, 4:38-43. The base wall comprises an outer surface, referred to as heat-receiving plane 15B in *Koga*, which is placed in thermal contact with heat-generating component 2 to collect heat off the component. *See, e.g., id.* at 4:38-43, 8:47-53, 10:33-39, Figs. 3 and 8; Ex. 6 [Tilton Decl.], ¶¶7, 8. The base wall further comprises an inner surface, referred to as inner wall face 50 in *Koga*, which faces an interior of pump room 15A. *See, e.g.,* Ex. 2 [Koga], Abstract, 3:22-25; Ex. 6 [Tilton Decl.], ¶8. The inner wall face 50 of pump room 15A comprises a recessed region 15E/15F and radially outer surface 15C, which include a plurality of protrusions 24 and dimples 21, respectively. *See, e.g.,* Ex. 2 [Koga], Abstract, 3:25-27, 4:45-51, 6:26-29, 6:50-53, Fig. 3, Fig. 5, Fig. 7, and Fig. 8. Protrusions 24 extend towards impeller 11 (within pump room 15A) and they facilitate heat transfer by increase the surface area of recess 15E/15F. *See, e.g., id.* at 6:26-33. A conduit (e.g., sucking channel 19) is provided between the heat-receiving plane 15B and the inner wall face 50 of the base wall to direct coolant to the center of the pump room. *See, e.g., id.* at Abstract, 3:22-25, 4:57-67; Ex. 6 [Tilton Decl.], ¶9.

Centrifugal pump 1 of *Koga* comprises a *single* chamber—pump room 15A—which performs the *dual function* of housing the impeller and providing an enclosed volume for the coolant to collect and absorb thermal energy dissipated from heat-generating component 2. Ex. 2 [Koga], Abstract, 6:26-33, 6:50-62, 8:11-39, 9:52-10:21; Ex. 6 [Tilton Decl.], ¶7. *Koga* does not disclose a "thermal exchange chamber." In fact, nowhere does *Koga* disclose so much as a "reservoir" separate from the pump, let alone disclose a "reservoir" including a "pump chamber" *and* a separate "thermal exchange chamber." Thermal exchange in the *Koga* device takes place in pump room 15A. *See, e.g.,* Ex. 2 [Koga], 6:50-62; 8:11-39, 9:52-10:21; Ex. 6 [Tilton Decl.], ¶7. The fact that thermal exchange takes place in pump room 15A is further evident from the fact that inner wall face 50 of pump room 15A comprises dimples 21 and protrusions 24 to facilitate heat transfer from the heat-generating component 2 to coolant 41 in pump room 15A. *See* Ex. 2 [Koga], Abstract, 3:25-27, 6:26-33, 6:50-62; Ex. 6 [Tilton Decl.], ¶8. Because there is no other chamber or compartment in the *Koga* device aside from pump room 15A, the Examiner strains to support the *separate* "thermal exchange chamber" element of the claimed invention by referring to sucking channel 19 as the "thermal exchange chamber." Ex. 7 [RAN] at 6. Patent Owner disagrees with the characterization of sucking channel 19 as a "thermal exchange chamber." Throughout the specification of *Koga*, sucking channel 19 is represented as nothing more than a conduit to deliver coolant to pump room 15A. *See* Ex. 6 [Tilton Decl.], ¶¶9-11. Specifically, *Koga* states the following:

> Sucking channel 19 *sucks* coolant 41, and discharging channel 20 discharges coolant 41. … Sucking groove 26 is provided together with sucking channel 19 unitarily along a direction common to channel 19 and groove 26, and extends toward the rotational center of impeller 11.

> … Sucking groove 26 guides coolant 41 sucked through sucking channel 19 to near the rotational center of impeller 11.

Ex. 2 [Koga], 4:57-67 (emphasis added).

***Koga* neither refers to sucking channel 19 as a "thermal exchange chamber," nor does *Koga* disclose or suggest that sucking channel 19 is configured or intended to perform any thermal exchange function.** Indeed, as discussed in detail below and as opined by Patent Owner's expert, Dr. Tilton, sucking channel 19 cannot perform as a "thermal exchange chamber" because it cannot remove any appreciable amount of heat from heat-generating component 2. Ex. 6 [Tilton Decl.], ¶¶11, 12.

C. *Koga* is not enabling prior art

The Federal Circuit has established that an anticipatory prior art reference must enable a skilled artisan to make the claimed invention without undue experimentation. *Clearvalue, Inc. v. Pearl River Polymers, Inc.*, 668 F.3d 1340, 1344 (Fed. Cir. 2012) (an anticipating reference "must describe … each and every claim limitation and enable one of skill in the art to practice an embodiment of the claimed invention without undue experimentation.") (citation and quotation mark omitted); *Elan Pharm., Inc. v. Mayo Foundation for Medical and Education Research*, 346 F.3d 1051, 1054, (Fed. Cir. 2003) ("It is insufficient to name or describe the desired subject matter, if it cannot be produced without undue experimentation."). The Federal Circuit has further clarified that "[w]hile reference to the patent application is appropriate for purposes of determining what the claimed invention is, i.e., what falls within the scope of the claims, the anticipation exercise *must assess* the enabling nature of a prior art reference in light of the proposed claims." *In re Morsa*, 713 F.3d 104, 110 (Fed. Cir. 2013) (emphasis added). The Federal Circuit has further determined that affidavits or declarations are not always required when submitting arguments concerning lack of enablement of prior art reference. *Id.* Here, the Examiner has failed to assess enablement of the claimed invention of the '764 patent by *Koga*.

As discussed above in Section B, and further explained in Section E.1.a below, nowhere does *Koga* disclose a thermal exchange chamber. *Koga's* sucking channel 19, which the Examiner equates to the recited "thermal exchange chamber," is simply a conduit to deliver cooling liquid to pump room 15A. Ex. 2 [Koga], 4:57-67; Ex. 6 [Tilton Decl.], ¶¶9-11. Also, *Koga* repeatedly teaches that thermal exchange takes place in pump room 15A (and not in any other thermal exchange chamber). Ex. 2 [Koga], 6:26-33, 6:50-62, 8:11-39, 9:52-10:21; Ex. 6 [Tilton Decl.], ¶11. Given the complete lack of disclosure about a separate thermal exchange chamber in *Koga*, combined with the disclosure that pump room 15A serves the thermal exchange functions of *Koga's* cooling device, a person of ordinary skill in the art could not have practiced or produced the claimed invention based solely on the reading of *Koga*. *See, e.g.*, Ex. 6 [Tilton Decl.], ¶¶10-13. The Examiner has not addressed this at all. The Examiner's only reasoning for referring to sucking channel 19 as a "thermal exchange chamber" is that sucking channel 19 is "an enclosed space and a compartment" having "a separate volume, and inlet and outlet." Ex. 7 [RAN] at 6. **The Examiner has not addressed whether sucking channel 19 would be able to perform any thermal exchange.** The record is silent as to how and why a person of ordinary skill in the art, looking at sucking channel 19 (whose purpose, according to *Koga*, is to suck cooling liquid into pump room 15A), could have been enabled to make a "reservoir" having "a pump chamber" and "a thermal exchange chamber."

In sum, *Koga* is not enabling prior art and should not be used as an anticipatory reference, because *Koga* does not enable a skilled artisan to make a "reservoir" having "a pump chamber" and "a thermal exchange chamber" without undue experimentation. The Examiner's failure to address enablement of the claimed invention by *Koga* is an independent reason why the Board should reverse the rejections under *Koga*.

D. The Maintained Rejections Are Based on an Improper Construction of the Claim Term "Thermal Exchange Chamber"

All of the independent claims in the '764 patent (claims 1, 10, and 15) recite a "thermal exchange chamber." As a result, every claim of the '764 patent expressly recites, or incorporates by virtue of its dependency, the "thermal exchange chamber" feature. *See* Appendix IX, "Claims Under Appeal." All of the Examiner's rejections under *Koga* depend primarily on his assertion that *Koga*'s sucking channel 19 equates to the "thermal exchange chamber" recited in the claims of the '764 patent. Ex. 7 [RAN] at 6. Specifically, the Examiner asserts that "[t]he chamber [sucking channel 19] of *Koga* is an enclosed space and a compartment as would have been recognized by one of ordinary skill in the art." *Id.* The claims of the '764 patent, however, recite a "thermal exchange chamber," not just any "chamber," as interpreted by the Examiner. As Patent Owner has explained previously (*see* Ex. 5 [Second Response], pp. 4-5) even if sucking channel 19 is considered a "chamber," it still cannot be equated to a "thermal exchange chamber" because *Koga* does not disclose or suggest that sucking channel 19 is *configured* or intended to perform any heat transfer function. In spite of this, the Examiner has continued to construe *only* the term "chamber" and has applied that incomplete construction to reject the claims over the prior art. Ex. 7 [RAN] at 6-7. The Examiner's construction of only the term "chamber" ignores claim limitations expressly reciting a "thermal exchange chamber," and therefore, cannot be reasonable.

The Examiner's interpretation of the "thermal exchange chamber" as *any* chamber is further dispelled by the specification of the '764 patent. Exemplary figures 17 and 20 of the '764 patent, and the associated text, disclose that thermal exchange chamber 47A (bounded by heat exchanging interface 4 at the bottom) spans across the footprint of reservoir 14 and incorporates a bulk of the surface area of heat-exchanging interface 4. The specification of the '764 patent further states that:

> The heat exchanging interface 4 is preferably made from a copper plate having a plane outer surface (not shown) at the opposite side as the side shown in the figure, said *outer surface being intended for abutting the free surface of the heat generating component* such as the CPU (see FIG. 4). The inner surface facing the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47 is provided with pins 4A extending from the base of the copper plate and into the thermal exchange chamber (not shown) at the opposite side of intermediate member 47. .... The pins provide a *network of channels across the inner surface of the heat exchanging interface*, along which network the cooling liquid is intended to flow.

Ex. 1 ['764 patent], 22:60-23:8 (emphasis added).

Thus, the specification of the '764 patent teaches that the "thermal exchange chamber" is a chamber that is designed to encompass the surface area of the heat exchanging interface that is in thermal contact with the heat-generating component. The '764 patent further teaches that the "thermal exchange chamber" comprises features (e.g., pins 4A) to create a network of fluid channels that facilitate heat dissipation from the heat-generating component to the liquid flowing through the "thermal exchange chamber." The Examiner ignores these basic requirements of a "thermal exchange chamber" as taught by the '764 patent.

The M.P.E.P. states that [d]uring reexamination, claims are given the broadest reasonable interpretation *consistent with the specification* and limitations in the specification are not read into the claims." M.P.E.P. § 2258(I)(G) (emphasis added). Even under the most aggressive application of the "broadest reasonable interpretation" standard, a claim element cannot be construed so as to ignore claim limitations and the teachings of the specification. *In re Suitco Surface, Inc.*, 603 F. 3d 1255, 1260 (Fed. Cir. 2010) (explaining that although the USPTO is to give claims their broadest reasonable construction, "[t]he broadest-construction rubric coupled with the term 'comprising' does not give the PTO an unfettered license to interpret claims to embrace anything remotely related to the claimed invention. Rather, claims should always be read in light of the specification and teachings in the underlying patent."). Here, the Examiner's construction of the term "chamber" is contrary to the express language of the claim requiring not merely a "chamber," but a "thermal exchange chamber." The specification also clearly requires a "thermal exchange chamber" as a feature of the cooling system, not simply any compartment or enclosed region, as has been construed by the Examiner. Therefore, the Examiner's construction is unreasonably broad in light of the claims and the specification.

Further, the USPTO, in applying the broadest reasonable interpretation of claim elements, is bounded by what would be reasonable from the perspective of one of ordinary skill in the art. *See In re Buszard*, 504 F.3d 1364, 65-66 (Fed. Cir. 2007) (The Federal Circuit found that the Board's interpretation that equated a "flexible" polyurethane foam with a crushed "rigid" foam was not reasonable because persons experienced in the field of polyurethane foams knew that a flexible mixture is different from a rigid foam mixture). Here, the Examiner's interpretation of the "thermal exchange chamber" as *any* compartment or enclosed region is simply not reasonable from the perspective of one of ordinary skill in the art, because not all chambers or compartments are configured to perform heat exchange. In particular, a person of ordinary skill in the art would not consider the small diameter sucking channel of *Koga* as a "thermal exchange chamber" of a cooling device whose primary purpose is heat exchange. *See* Ex. 6 [Tilton Decl.], ¶¶ 11-13. Therefore, the Examiner's construction of "thermal exchange chamber" is technically flawed *and* legally erroneous.

For at least the above reasons, the Board should reverse the rejections, all of which rely on improper claim construction, and confirm all pending claims.

E. The rejection under 35 U.S.C. §102(b) is erroneous and should be reversed (issue 1)

The Examiner rejected claims 1-30 under 35 U.S.C. § 102(b) as allegedly anticipated by *Koga.* In addition to the fact that *Koga* is not enabling prior art and the Examiner's construction of "thermal exchange chamber" is improper, the anticipation rejection under *Koga* should be reversed because *Koga* does not disclose each and every limitation of claims 1-30, as discussed below.

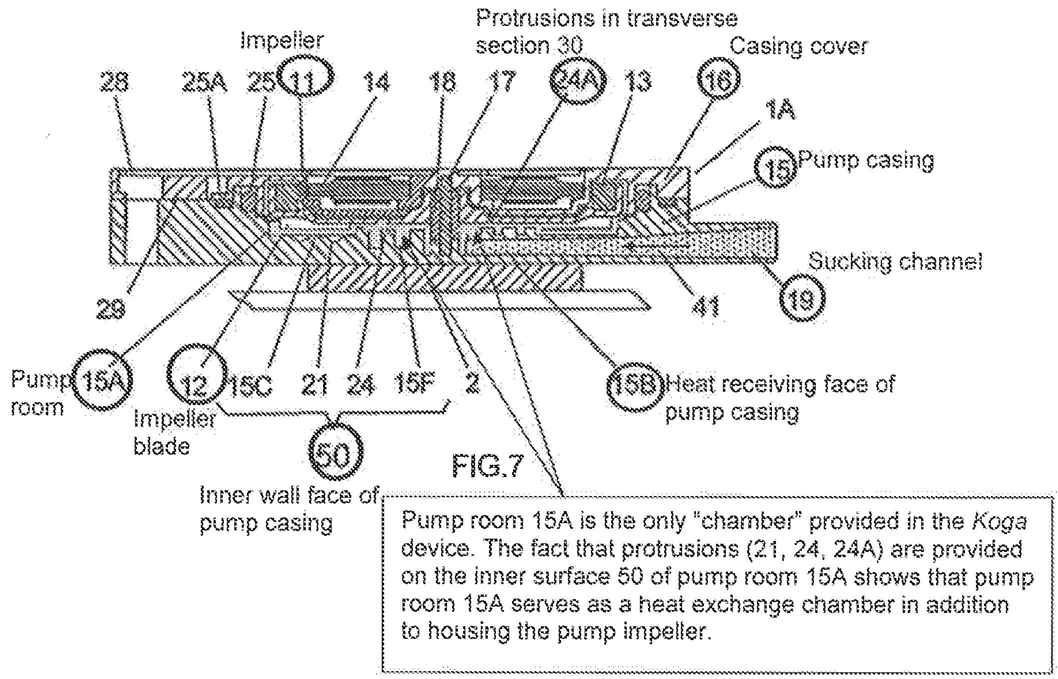
1. Independent claim 1

Independent claim 1 recites a cooling system for a heat-generating component, comprising, *inter alia*, a reservoir having "*a thermal exchange chamber* formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being *separate chambers* that are fluidly coupled together by the one or more passages." (Emphasis added.) As discussed in detail below, *Koga* does not disclose a "thermal exchange chamber" separate from the "pump chamber" because sucking channel 19 of *Koga* is not a "thermal exchange chamber" as would be understood by a person of ordinary skill in the art.

(a) *Koga* does not expressly or inherently disclose a thermal exchange chamber separate from the pump chamber

The Examiner equates the "pump chamber" and the "thermal exchange chamber," recited in claim 1, to the pump room 15A and sucking channel 19 of *Koga,* respectively. Ex. 7 [RAN] at 6. For a prior art reference to anticipate a claim, "[t]he identical invention must be shown in as complete detail as is contained in the … claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1126, 1236 (Fed. Cir. 1989). Ambiguous prior art cannot anticipate patent claims. To anticipate, a disclosure "must describe the patented subject matter with sufficient *clarity and detail* to establish that the subject matter existed in the prior art and that such existence would be recognized by persons of ordinary skill in the field of the invention." *Crown Operations Int'l, Ltd. v. Solutia Inc.,* 289 F.3d 1367, 1375 (Fed. Cir. 2002) (emphasis added). In this case, *Koga* does not disclose (or even remotely suggest) that sucking channel 19 performs as a heat exchanging chamber, let alone disclose it "with sufficient clarity and detail." *See Crown Operations Int'l,* 289 F.3d at 1375.

Koga represents sucking channel 19 as simply a conduit to deliver coolant to the rotational center of the impeller. *See* Ex. 2 [Koga], 4:57-67; *see also* Ex. 6 [Tilton Decl.] ¶¶9-11. Indeed, nowhere does *Koga* disclose a "thermal exchange chamber" *separate* and distinct from the "pump chamber." The purpose of *Koga*'s invention is to downsize and slim-down the cooling device so that it can be mounted in a compact portable electronic apparatus, such as notebook-size computer. Ex. 2 [Koga], 3:28-30; 4:3-9. To this end, *Koga* teaches combining the pumping and the heat exchange functionalities of the cooling device into a *single* chamber (i.e., pump room 15A). *Id.* at 6:26-33, 6:50-62, 8:11-39, 9:52-10:21; Ex. 6 [Tilton Decl.], ¶11. FIG. 7 of *Koga*, annotated below, illustrates that pump room 15A (shown in yellow) is the *only* chamber provided in the cooling device of *Koga*, and it performs the dual function of collecting and absorbing thermal energy dissipated from heat-generating component 2 (and thus act as a thermal exchange chamber of sorts), as well as housing impeller 11 (and thus acts as a pump chamber of sorts).



In fact, *Koga* teaches that the cooling device be designed in such a way that sucking channel 19 does not extend over heat-generating component 2, in order to allow heat-receiving face 15B of the base wall of the *Koga* device and the upper surface of heat-generating component 2 to be in better contact with each other to allow efficient transfer of heat into pump room 15A through the base wall. Specifically, *Koga* teaches that:

> The shape of heat-receiving plane 15B and the shape of an upper surface of component 2 complement each other three-dimensionally, *so that sucking-channel 19 does not extend over component 2*. This structure allows heat-receiving plane 15B and the upper surface of component 2 to solidly contact with each other, so that heat can be transferred efficiently.

Ex. 2 [Koga], 8:47-53, 10: 33-40. (Emphasis added.)

Given the teaching in *Koga* not to position sucking channel 19 in contact with the electronic component, combined with *Koga*'s complete lack of disclosure about a thermal exchange chamber separate from pump room 15A, a person of ordinary skill in the art would not have considered sucking channel 19 as a thermal exchange chamber of the *Koga* device.

Koga also does not inherently disclose a thermal exchange chamber. "In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990). The Examiner did not provide any such basis or technical reasoning here. The Federal Circuit has explained that inherent anticipation "requires that the missing descriptive material is 'necessarily present,' not merely probably or possible present, in the prior art." *Trintec Indus., Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 1295 (Fed. Cir. 2002) (quoting *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). To be inherent, an undisclosed feature must "necessarily and inevitably" flow from practice of what is disclosed. *Schering Corp. v. Geneva Pharm., Inc.*, 339 F.3d 1373, 1378 (Fed. Cir. 2003); *In re Rijckaert*, 9 F.3d 1531, 1534 (Fed. Cir. 1993) (finding no inherency based on what would result due to optimization of conditions, which was necessarily present in the prior art).

Here, the Examiner has not provided any analysis to show that a thermal exchange chamber would "necessarily and inevitably" flow from the practice of *Koga*'s cooling device. *Schering Corp.*, 339 F.3d at 1378. Indeed, the Examiner has not provided any "objective evidence or cogent technical reasoning to support the conclusion of inherency." *Ex parte Levy*, 17 USPQ2d at 1464. This failure to provide such evidence or technical rationale is fatal to the reliance on the doctrine of inherency. Furthermore, *Koga* itself explicitly discloses the opposite conclusion—that sucking channel 19 should not extend over the heat-generating component 2.

See Ex. 2 [Koga] at 8:47-53, 10:33-40. *Koga* cannot, therefore, "necessarily and inevitably" inherently disclose something contrary. *Schering Corp.*, 339 F.3d at 1378.

As the Federal Circuit has further explained, a prior art reference does not inherently anticipate if the teachings of the prior art can be practiced in a way that yields a product lacking the allegedly inherent property. *See Glaxo Inc. v. Novopharm Ltd.*, 52 F.3d 1043, 1047-48 (Fed. Cir. 1995) (finding no inherent anticipation where practicing prior art example could yield crystals of either the claimed polymorphic form or a different polymorph). Here, *Koga* teaches that pump room 15A performs the pumping and thermal exchange function. Ex. 2 [Koga], 6:26-33, 6:50-62, 8:11-39, 9:52-10:21; Ex. 6 [Tilton Decl.], ¶11. That is, *Koga* can be practiced in a way that yields a product lacking the separate "thermal exchange chamber" feature. Accordingly, *Koga* does not inherently disclose the "thermal exchange chamber" feature recited in claim 1 of the '764 patent.

In sum, the Examiner has improperly characterized sucking channel 19 as a "thermal exchange chamber." The *Koga* device comprises a *single* "chamber"—pump room 15A—and *not* "a pump chamber" *and* "a thermal exchange chamber."

(b) Sucking channel 19 of *Koga* cannot function as a "thermal exchange chamber."

Even if the Examiner's strained construction of "chamber" to read on sucking channel 19 is somehow accepted, sucking channel 19 nevertheless cannot be considered a "thermal exchange chamber," as recited in claim 1, because it would not be able to transfer any appreciable amount of heat from the component to be cooled. This is because—1) sucking channel 19 is simply a flow-through conduit that would not allow the coolant to accumulate and absorb heat from the heat generating component (*see* Ex. 6 [Tilton Decl.], ¶11), and 2) the surface area of sucking channel 19 in any thermal contact with heat-generating component 2 would be negligible compared to the total surface area of the heat-receiving face 15B of pump casing 15 (*see id.* at [Tilton Decl.], ¶12). Figures 5 and 8 of *Koga* (Fig. 8 annotated below) clearly show that sucking channel 19 is a narrow conduit inserted between heat-receiving face 15B and inner wall face 50 of the base wall. *See* Ex. 2 [Koga], 4:58-67. Because of the narrow width of the channel, the outer surface area of the channel in any contact with component 2 would be very small. Ex. 6 [Tilton Decl.], ¶12. Thus, sucking channel 19 cannot transfer any appreciable amount of heat from component 2, and therefore, it cannot be considered a "thermal exchange chamber."

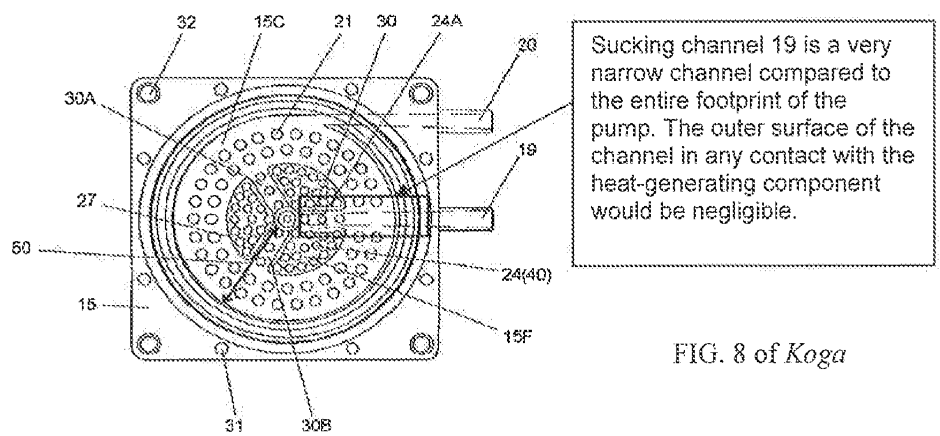


FIG. 8 of *Koga*

At least due to the above reasons, the Examiner's interpretation of sucking channel 19 as the "thermal exchange chamber" should fail as unreasonable. **Neither does *Koga* disclose sucking channel 19 as a thermal exchange chamber, nor can sucking channel 19 inherently perform the thermal exchange function of the *Koga* device.** Accordingly, at least the limitation "a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages," recited in independent claim 1, is not disclosed by *Koga*.

2. Dependent claims 2-9 and 19-22

Dependent claims 2-9 and 19-22 depend from independent claim 1, and are not anticipated by *Koga* at least due their dependence from claim 1.

Additionally, Patent Owner respectfully submits that at least claims 4, 6, and 19, which depend from claim 1, recite further limitations that are not disclosed by *Koga*.

a. Claim 4

Claim 4 recites that "the first side [the side that contacts the cooling liquid] of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber." The Examiner equates sucking channel 19 to the "thermal exchanging chamber" recited in claim 1, and thus under the Examiner's argument, the lower boundary wall of sucking channel 19 constitutes the heat-exchanging interface.[1] **But nowhere does *Koga* disclose that an inner wall surface of sucking channel 19, i.e., the side that contacts the coolant, comprises features to increase heat transfer to the coolant.** In fact, inclusion of such features would impede the flow of coolant through the narrow sucking channel 19 to pump room 15A. Ex. 6 [Tilton Decl.], ¶13. FIG. 7, annotated below, further shows that sucking channel 19 is sandwiched between inner wall face 50 of pump room 15A and heat-receiving plane 15B of the base wall, and therefore, sucking channel 19 does not comprise any features to help in the transfer of heat. *See, e.g.*, Ex. 2 [Koga], Fig. 7, 4:57-67.

[1] Claim 1 of the '764 patent recites that the "heat exchanging interface" forms "a boundary wall of the thermal exchange chamber," and is "configured to be placed in thermal contact with a surface of the heat-generating component."

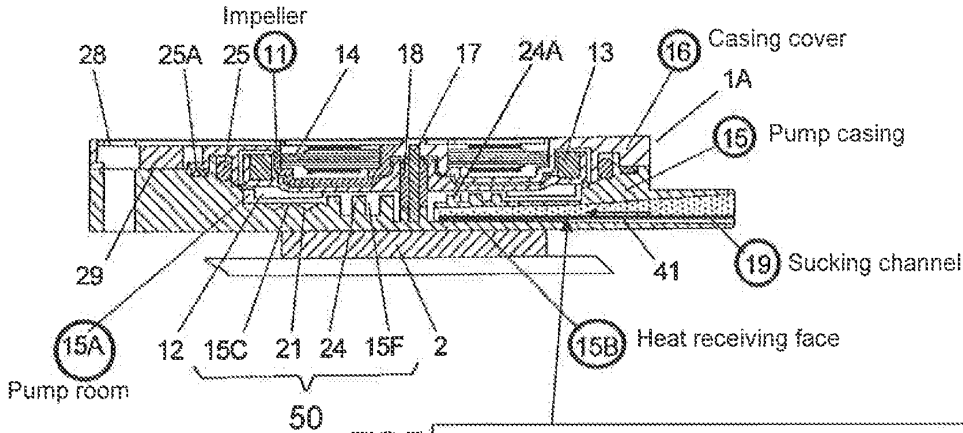


FIG.7

If sucking channel 19 is the "thermal exchange chamber" per the Examiner's argument, then this inner surface (shown in bold) of sucking channel 19 should have included dimples/protrusion to facilitate heat transfer to the coolant inside the channel. Protrusions 24/24A are instead provided on the inner wall 50 of pump room 15A.

The Examiner asserts that "pins 24 and 24A increase the surface area of the heat exchange unit 15B." Ex. 7 [RAN] at 7. The Examiner's position is flatly incorrect because heat-receiving plane 15B is the *outer* surface of the base wall of pump casing 15. *See, e.g.,* Ex. 2 [Koga], 4:38-41. Contrary to the Examiner's misreading of *Koga*, dimples and/or protrusions are provided on the inner surface 50 of pump room 15A to facilitate heat transfer from heat-generating component 2 to coolant 41 in pump room 15A. *See id.* at 3:25-27 ("On the inner wall of the pump room, a recess is provided. In this recess, protrusions extending toward the impeller or dimples are provided.").

Koga discloses throughout its specification that dimples 21 and/or protrusions 24/24A are provided in pump room 15A (with the protrusions extending towards impeller 11). Specifically, *Koga* states that:

> On radially outer wall surface 15C of the *pump room 15A*, a large number of dimples 21 are formed. A recess (recessed area) 15E defines a radially inner wall surface on a bottom of the *pump room*

> *15A* that faces toward impeller 11, and has a large number of protrusions 24 projected from the radially outer wall surface and toward impeller 11. Recess 15E, slope 27, and radially outer wall surface 15C together define an inner wall face 50 of casing 15.

Ex. 2 [Koga], 4:43-51 (emphasis added); *see also Koga,* Figs. 3 and 5.

> [R]ecess 15E is provided around the center of *inner wall face 50 of the pump room* of casing 15, and cylindrical protrusions (surface-area-increasing parts) 24 extend from the bottom face of recess 15E *toward impeller 11.*

Id. at 6:26-29 (emphasis added).

> Recess 15F *of the pump room* is disposed one step down from radially outer wall surface 15C of casing 15. Cylindrical protrusions 24 extend from a bottom face of recess 15F *toward impeller 11.*

Id. at 9:3-6 (emphasis added), *see also Koga,* Figs. 7 and 8.

In sum, the inner wall face 50 of pump room 15A comprises a recess 15E/15F and a radially outer wall surface 15C, which comprise protrusions 24 and dimples 21, respectively. **Nowhere does *Koga* disclose any dimples, protrusions, or any other features on an inner surface of sucking channel 19**. The Examiner nevertheless strains to support his position on this "features" element by referring to the protrusions 24 and 24A provided on recess 15F.[2] Recess 15F, however, forms a part of the inner face of pump room 15A, not sucking channel 19. Ex. 2 [Koga], 9:3-7, Figs. 7 and 8.

Thus, contrary to the Examiner's position, nowhere does *Koga* disclose that "the first side [i.e., the side that contacts the cooling liquid] of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber." Accordingly, claim 4 is not anticipated by *Koga*. Claim 5, which depends from claim 4, is also not anticipated at least due to its dependence from claim 4.

[2] The Examiner incorrectly states that protrusions 24 and 24A are provided on heat-receiving plane 15B. Ex. 7 [RAN] at 7.

The absence of heat transfer features inside sucking channel 19 (and as opposed to pump room 15A) further indicates that sucking channel 19 is not a "thermal exchange chamber" under any reasonable interpretation of the term.

b. Claim 6

Claim 6 recites that "a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller." The Request, which the Examiner has incorporated by reference, refers to discharging channel 20 as the passage that is "offset from a center of the impeller." Ex. 8 [Request] at 155. The Examiner has not directly addressed this limitation of claim 6. Patent Owner respectfully submits that discharging channel 20 cannot be reasonably referred to as a "passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber," because discharging channel 20 connects to circulating line 4, and not to sucking channel 19 (which the Examiner equates to the "thermal exchange chamber"). Ex. 2 [Koga], 5:54-57, Figs. 5 and 8. Even though fluid coupling may sometimes include indirect attachment, in the case of the *Koga* device, discharging channel 20 leads to radiator 3 (via circulating line 4) where the coolant is released and heat from the coolant is dissipated, and radiator 3 then connects to sucking channel 19; there is no direct or indirect connection between discharging channel 20 and sucking channel 19. That is, discharging channel 20 is not a passage that fluidly couples pump room 15A to sucking channel 19 (the alleged "thermal exchange chamber"). The only passage that connects sucking channel 19 to pump room 15A is sucking inlet 19A provided at the rotational *center* of impeller 11. *See id.* at 5:51-57, Fig. 5. Thus, contrary to the Examiner's and the Requester's assertions, nowhere does *Koga* disclose or suggest that a passage fluidly coupling the "pump chamber" and the "thermal exchange chamber" is "offset from a center of the impeller." Accordingly, claim 6 is not anticipated by *Koga*.

3. Independent claim 10 and dependent claims 11-14 and 23-26

Independent claim 10 recites a cooling system comprising, *inter alia*, a reservoir having "a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber," and "at least one of the one or more passages is offset from a center of the impeller." At least these limitations of claim 10 are not disclosed by *Koga*. As discussed above with regard to independent claim 1, *Koga* fails to disclose a "thermal exchange chamber" separate from pump room 15A, because sucking channel 19 of *Koga*, which the Examiner alleges satisfies the recitation of a "thermal exchange chamber," is neither disclosed as a thermal exchange chamber, nor can it inherently perform any thermal exchange.

Further, as discussed above with regard to claim 6, the *only* passage that fluidly connects sucking channel 19 to pump room 15A is sucking inlet 19A provided at the rotational *center* of impeller 11. *See* Ex. 2 [Koga], 5:51-57, Fig. 5. Nowhere does *Koga* disclose or suggest that a passage fluidly coupling the "pump chamber" and the "thermal exchange chamber" is "offset from a center of the impeller." Therefore, at least the above-identified limitations of claim 10 are not disclosed by *Koga* under any reasonable interpretation. Accordingly, claim 10, and claims 11-14 and 23-26, which depend from claim 10, are not anticipated by *Koga*.

4. Claims 19 and 23

Claims 19 and 23 state that "the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber." The

Examiner has not addressed this limitation at all, beyond stating that "as seen in Figure 7, a passage directs cooling liquid from the pump chamber 15 directly to the thermal exchange chamber." Ex. 7 [RAN] at 4. The Examiner's position is technically flawed and further demonstrates his lack of understanding of *Koga*. The only passage that connects sucking channel 19 (the alleged "thermal exchange chamber") to pump room 15A is sucking inlet 19A provided at the rotational center of impeller 11. *See* Ex. 2 [Koga], 5:51-57, Fig. 5. However, coolant through sucking inlet 19A *flows* from sucking channel 19 *to* pump room 15A (and not in the opposite direction). *Id.* at 4:57-67. Claims 19 and 23, on the other hand, recite "a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber." Nowhere does *Koga* disclose a passage that allows coolant to *directly* flow from pump room 15A to sucking channel 19. Accordingly, claims 19 and 23 are not anticipated by *Koga*.

5. Independent claim 15 and dependent claims 16-18 and 27-30

Independent claim 15 recites a cooling system, comprising, *inter alia,* "a reservoir including an impeller cover, an intermediate member and a heat exchange interface, wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber, the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together." At least this limitation of claim 15 is not disclosed by *Koga*.

Although not identical, independent claim 15 recites features similar to independent claims 1 and 10. As in claims 1 and 10, claim 15 recites a "pump chamber" that is vertically spaced apart from the "thermal exchange chamber." That is, the "pump chamber" and the "thermal exchange chamber" are separate chambers within the "reservoir." As discussed above with regard to claims 1 and 10, *Koga* fails to disclose a "thermal exchange chamber" separate from pump room 15A of *Koga*. Additionally, claim 15 recites that "a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber." Neither the Request nor the Office Actions identify an "impeller cover" *and* an "intermediate member" in the cooling device of *Koga*. The Request, which the Examiner has incorporated, asserts that casing 15 and casing cover (cover wall) 16 form the impeller cover and "the upper wall of the channel 19 defines the intermediate member." Ex. 8 [Request] at 160-61; *see also* Ex. 7 [RAN] at 7. Patent Owner disagrees, because *Koga* clearly describes that sucking channel 19 is inserted between heat-receiving plane 15B and inner wall face 50 of the base wall of pump casing 15. *See* Ex. 2 [Koga], Abstract, 4:58-60 ("Sucking channel 19 is disposed between heat-receiving plane 15B and inner wall face 50."). **Per the Examiner's and the Requester's interpretation, if casing cover 16 is equated to a "top wall of the reservoir," and the casing 15 to the "impeller cover," then sucking channel 19 does not have an upper wall that is separate and distinct from the inner wall face 50 of the pump casing 15**. *See, e.g.*, Ex. 2 [Koga], Figs. 3 and 7, 4:51-53 ("Casing cover (cover wall) 16 accommodates impeller 11, and forms pump room 15A together with casing 15."). Figures 3 and 7 of *Koga* clearly show that the upper wall of sucking channel 19 is the same as casing cover 15. Thus, nowhere does *Koga* disclose a *separate* "intermediate member." The use of different terms in a claim indicates that different elements are required. *See CAE Screen Plates, Inc. v. Heinrich Fiedler GMBH & Co. KG*, 224 F.3d 1308, 1317 (Fed. Cir. 2000) ("In the absence of any evidence to the contrary, we must presume that the use of these different terms in the claims connotes different meanings.") (citation omitted). Here, the Request and the Office Actions have failed to identify an "intermediate member" in the *Koga* device, and have applied casing 15 as both the "impeller cover" and the "intermediate member" in their analysis. Accordingly, *Koga* fails to disclose the limitation "intermediate member and the heat exchange interface define a thermal exchange chamber."

For at least the above reasons, *Koga* fails to anticipate independent claim 15. Claims 16-18 and 27-30, which depend from claim 30, are also not anticipated by *Koga* at least due to their dependence from claim 15.

6. Claim 16

Claim 16 recites that "the impeller cover includes a first opening radially offset from a center of the impeller and the intermediate member includes a second passage that is aligned with the first opening, the first and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber." The Examiner has not specifically addressed this limitation. The Request identifies discharging channel 20 as an opening in casing 15 (the alleged "impeller cover") and sucking inlet 19A (at terminal end of sucking channel 19) as an opening in the "intermediate member." Ex. 8 [Request] at 162-63. The Requester's and the Examiner's interpretations are incorrect, because 1) discharging channel 20 and sucking inlet 19A are *both* formed on casing 15 (*see* Ex. 2 [Koga], Figs. 5 and 8), while claim 16 requires a "first opening" to be formed on the "impeller cover" and a "second passage" to be formed on the "intermediate member," and 2) discharging channel 20 and sucking inlet 19A are not aligned (*see id.*). As discussed with regard to claim 6, discharging channel 20 is not a passage that fluidly couples pump room 15A to sucking channel 19. Moreover, sucking inlet 19A and discharging channel 20 both open into and exit from pump room 15A at different locations, and therefore, they could not possibly be aligned under any reasonable interpretation of the term "aligned." *See id.* at Fig. 3, 9:52-54 ("Coolant 41 is sucked through sucking channel 19 by spinning impeller 11, namely blades 12, and discharged from discharge channel 20."). Accordingly, claim 16 is not anticipated by *Koga*.

7. Claim 17

Claim 17 recites that "the first side of the heat-exchanging interface includes at least one of pins or fins." As discussed with regard to claim 4, nowhere does *Koga* disclose any heat transfer features, such as pins and/or fins, on an inner surface (i.e., the side that contacts the coolant) of sucking channel 19. Contrary to the Examiner's assertions, dimples and/or protrusions are provided on the inner surface 50 of pump room 15A to facilitate heat transfer from heat-generating component 2 to coolant 41 in pump room 15A. *See* Ex. 2 [Koga], 3:25-27 ("On the inner wall of the pump room, a recess is provided. In this recess, protrusions extending toward the impeller or dimples are provided."). Accordingly, claim 17 is not anticipated by *Koga*.

8. Conclusion regarding the anticipation rejection over *Koga*

As stated in the M.P.E.P., for a prior art reference to anticipate a claim under 35 U.S.C. § 102, the reference must teach each and every element of the claim. M.P.E.P. § 2131. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Here, as discussed above in Sections 1-7, the Examiner has failed to show that each and every limitation of claims 1-30 are disclosed by *Koga*.

Overall, the strained interpretations of the Requester and the Examiner are simply not reasonable because, from the perspective of one of ordinary skill in the art, a small diameter sucking channel cannot be reasonably said to serve a heat exchange function in a device whose primary purpose is heat exchange. If the Requester's and the Examiner's interpretation of "thermal exchange chamber" were credible, then any compartment/enclosed space of a cooling device that may absorb an incidental amount of heat (e.g., the inlet and outlet conduits, etc.) could be considered a "thermal exchange chamber." That would not be a reasonable interpretation of the claim term "thermal exchange chamber" in view of the specification of the '764 patent. Therefore, *Koga* cannot be shoehorned into the role of an anticipating reference. Accordingly, Patent Owner respectfully requests the Board to reverse the rejection of claims 1-30 under 35 U.S.C. § 102(b) as anticipated by *Koga*.

F. The rejection under 35 U.S.C. §103(a) is erroneous and should be reversed (issue 2)

The Examiner rejected claims 20, 24, and 28 under 35 U.S.C. § 103(a) as being unpatentable over *Koga*. Ex. 7 [RAN] at 5. The Examiner admits that *Koga* fails to teach a plurality of passages between the pump chamber and the thermal exchange chamber, but contends that "[i]t would have been obvious to one of ordinary skill in the art to provide a plurality of passages between the pump and thermal exchange chambers to order to further enhance communication between the two which would increase flow and thus be better able to cool the device." *Id.* The Examiner offers no explanation as to how the narrow and single-outlet sucking channel 19 (allegedly the "thermal exchange chamber") might be modified to "increase flow" by providing more passages. The Examiner's argument is especially confounding because *Koga* requires sucking channel 19 to deliver fluid to the rotational center of the impeller in pump room 15A. Ex. 2 [Koga], col. 4, ll. 57–67; Ex. 6 [Tilton Decl.], ¶9. Adding more outlets to the channel would upset the very purpose of the sucking channel and disrupt the functioning of the centrifugal pump which requires the liquid inlet to be at the rotational center of the impeller. The

Examiner has not addressed this at all, even though Patent Owner specifically explained this in the Second Response. *See* Ex. 5 [Second Response] at 14. Again, therefore, Patent Owner respectfully points out the unreasonableness of the Requester's and the Examiner's interpretation.

Moreover, Patent Owner respectfully submits that claims 20, 24, and 28 depend from independent claims 1, 10, and 15, respectively. As discussed in Section E, above, *Koga* fails to disclose, teach, or suggest at least one limitation of independent claims 1, 10, and 15. Therefore, claims 20, 24, and 28 are patentable over *Koga* at least due to their dependence from one of the independent claims 1, 10, and 15.

For at least the above-stated reasons, Patent Owner respectfully requests the Board to reverse the rejection of claims 20, 24, and 28 under 35 U.S.C. § 103(a).

G. Priority Claim (issue 3)

U.S. Application No. 13/269,234 (the '234 application), which issued as the '764 patent, is a continuation of U.S. Patent Application No. 11/919,974 (the '974 application). The '974 application is a national stage entry of PCT Application No. PCT/DK2005/000310 ("the International Application," Ex. 3) filed on May 6, 2005. The Requester alleges that since Fig. 20 and its description were added to the specification of the '974 application after the filing of the International Application, the '764 patent in not entitled to the effective filing date of the International Application. Referring to these allegations, the Examiner states that "the Examiner will use the effective filing date of 14 July 2011." Ex. 7 [RAN] at 3-4.

The Patent Owner disagrees that the International Application does not provide support for the issued claims of the '764 patent. Figure 20 was added during prosecution of the '974 application only to "help clearly identify previously presented subject matter." *See* Ex. 9

[Preliminary Amendment in the '974 application] at 12. Figure 20 did not add any new subject matter to the application. To the contrary, the International Application provides support for each and every claim of the '764 patent, as was shown in the claim charts provided in the First Response and the Second Response, which are incorporated herein by reference in their entireties. *See* Ex. 4 [First Response] at pp. 27-31; Ex. 5 [Second Response] at pp. 15-32.

With regard to the Examiner's specific allegation that there is no support for the "vertical spacing between the thermal exchange chamber and the pump chamber," (Ex. 7 [RAN] at 8-9), Patent Owner submits that the embodiment depicted in Fig. 17 of the '764 patent, and the associated text at col. 22, ll. 26-43 (also present in the International Application at p. 29, ll. 21-28) clearly show that pump chamber 46 (formed by impeller cover 46A) is positioned vertically above thermal exchange chamber 47A (formed between intermediate member 47 and heat exchange interface 4).

Patent Owner respectfully requests the Board to consider the claim charts presented in the Responses and to accord the '764 patent the priority date of May 6, 2005.

IX. CONCLUSION

For the reasons discussed above, Patent Owner respectfully requests that the Patent Trial and Appeal Board reverse all rejections, and confirm claim of priority to the International Application.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: September 24, 2014

By: ____________________
Eric P. Raciti
Reg. No. 41,475

X. CLAIMS UNDER APPEAL

Pursuant to 37 C.F.R. § 41.67(c)(1)(viii), the following is a copy of claims 1-30 of U.S. Patent No. 8,245,764 that are to be reviewed on appeal.

1. (Original) A cooling system for a heat-generating component, comprising::

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator and an impeller, the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including

a pump chamber including the impeller and formed below the chassis, the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through

a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and

a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component; and

a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.

2. (Original) The cooling system of claim 1, wherein the chassis shields the stator from the cooling liquid in the reservoir.

3. (Original) The cooling system of claim 1, wherein the heat-exchanging interface

includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.

4. (Original) The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.

5. (Original) The cooling system of claim 4, wherein the features include at least one of pins or fins.

6. (Original) The cooling system of claim 1, wherein a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller.

7. (Original) The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.

8. (Original) The cooling system of claim 1, wherein the heat-exchanging interface includes one of copper and aluminum.

9. (Original) The cooling system of claim 1, wherein the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir.

10. (Original) A cooling system for a computer system, comprising:

a centrifugal pump adapted to circulate a cooling liquid, the pump including:

an impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:

a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;

a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber, and wherein at least one of the one or more passages is offset from a center of the impeller.

11. (Original) The cooling system of claim 10, wherein a top wall of the reservoir physically separates the impeller from the stator.

12. (Original) The cooling system of claim 10, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component.

13. (Original) The cooling system of claim 10, further including a heat radiator fluidly coupled to the reservoir using flexible conduits, wherein the heat radiator is configured to be positioned remote from the reservoir.

14. (Original) The cooling system of claim 10, wherein the fluid passage that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller.

15. (Original) A cooling system for a heat-generating component, comprising:

a pump adapted to circulate a cooling liquid, the pump including:

an impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir including an impeller cover, an intermediate member and a heat exchange interface, wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber, the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together; and

wherein a first side of the heat-exchanging interface is in contact with a cooling liquid in the thermal exchange chamber and a second side of the heat-exchanging interface opposite the first side is configured to be placed in thermal contact with a surface of the heat-generating component; and

a liquid-to-air heat exchanger fluidly coupled to the reservoir using flexible conduits, the heat exchanger being configured to be positioned remote from the reservoir.

16. (Original) The cooling system of claim 15, wherein the impeller cover includes a first opening radially offset from a center of the impeller and the intermediate member includes a second passage that is aligned with the first opening, the first and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber.

17. (Original) The cooling system of claim 15, wherein the first side of the heat-exchanging interface includes at least one of pins or fins.

18. (Original) The cooling system of claim 15, wherein the top wall of the reservoir extends between the stator and the impeller and shields the stator from the cooling liquid in the reservoir.

19. (Previously Added) The cooling system of claim 1, wherein the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly

into the thermal exchange chamber.

20. (Previously Added) The cooling system of claim 1, wherein the one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber.

21. (Previously Added) The cooling system of claim 1, wherein an entire surface of the heat-exchanging interface in contact with the cooling liquid in the reservoir forms the boundary wall of the thermal exchange chamber.

22. (Previously Added) The cooling system of claim 1, wherein the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

23. (Previously Added) The cooling system of claim 10, wherein the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

24. (Previously Added) The cooling system of claim 10, wherein the one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber.

25. (Previously Added) The cooling system of claim 12, wherein an entire surface of the heat-exchange interface in contact with the cooling liquid in the reservoir forms a boundary wall of the thermal exchange chamber.

26. (Previously Added) The cooling system of claim 10, wherein the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

27. (Previously Added) The cooling system of claim 15, wherein the pump chamber

and the thermal exchange chamber are fluidly coupled together by one or more passages, the one or more passages including a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

28. (Previously Added) The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by a plurality of passages positioned within the reservoir that open into the thermal exchange chamber.

29. (Previously Added) The cooling system of claim 15, wherein an entire surface of the heat-exchanging interface in contact with the cooling liquid in the reservoir forms a boundary wall of the thermal exchange chamber.

30. (Previously Added) The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by one or more passages, and the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

XI. EVIDENCE APPENDIX

Pursuant to 37 C.F.R. § 41.67(c)(1)(ix), Appellant/Patent Owner submits the following evidence relied upon in its Appeal Brief:

Exhibit No.	Description	Comments
1	U.S. Patent No. 8,245,764 to Eriksen ("the '764 patent").	Patent currently under appeal.
2	U.S. Patent No. 7,544,049 to Koga et al. ("Koga").	§ 102(b) reference used by the Requester and the Examiner.
3	PCT Application No. PCT/DK2005/000310 ("the International Application") filed on May 6, 2005.	The '764 patent claims priority to this International Application.
4	Patent Owner's Response of December 26, 2012 ("First Response").	Patent Owner's comments in reply to Reexam Office Action dated September 26, 2012.
5	Patent Owner's Response of October 3, 2013 ("Second Response").	Patent Owner's comments in reply to Action Closing Prosecution dated September 3, 2013.
6	Declaration under 37 C.F.R. § 1.132 by Dr. Donald Tilton, executed October 1, 2013 (Tilton Decl.").	Submitted on October 3, 2013, along with Patent Owner's Response to Action Closing Prosecution. The Declaration was entered and responded to by the Examiner in the Right to Appeal Notice dated June 30, 2014.
7	Right to Appeal Notice dated June 30, 2014 ("RAN").	Right of Appeal Notice under 37 C.F.R. § 1.953 issued by the Examiner in the current Reexamination proceeding.
8	*Inter Partes* Reexamination Request filed on September 15, 2012.	Cover page and pages 149-164 of the Request (relevant to the *Koga* reference) are included.
9	Supplemental Preliminary Amendment in the '974 application filed on January 9, 2009 ("Preliminary Amendment in the '974 application").	Supplemental Preliminary Amendment in U.S. Patent Application No. 11/919,974. U.S. Application No. 13/269,234, which issued as the '764 patent, is a continuation of U.S. Patent Application No. 11/919,974.

XII. RELATED PROCEEDINGS APPENDIX

Pursuant to 37 C.F.R. § 41.67(c)(1)(x), Appellant/Patent Owner submits the following decisions from the 1) Asetek Holdings, Inc. v. CoolIT Systems, Inc., Civil Action No. 3:12-CV-04498-EMC (N.D. Cal.), and 2) Asetek Holdings, Inc. v. CMI USA, Inc., Civil Action No. 3:13-CV-00457-JST (N.D. Cal.):

Order Re Claim Construction for the Asetek Patents (U.S. Patent Nos. 8,240,362 and 8,245,764) dated December 3, 2013 (combined claim construction order for both litigations).

Control No. 95/002,386
Attorney Docket No. 10494.8000-00000

CERTIFICATE OF SERVICE

The undersigned certifies that on this 24th day of September 2014, service of a true and complete copy of the "APPELLANT'S/PATENT OWNER'S APPEAL BRIEF" was served in its entirety via certified U.S. mail on counsel for the third party requester, at the following address:

Ganz Law P.C.
P.O. Box 2200
Hillsboro, OR 97123

with sufficient postage affixed, and with delivery confirmation requested.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: September 24, 2014

By:____________________
Eric P. Raciti
Reg. No. 41,475

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

In re *Inter Partes* Reexamination of:	)	
	)	
André Sloth ERIKSEN	)	Group Art Unit: 3993
	)	
U.S. Patent No.: 8,245,764 B2	)	Examiner: Joseph A. KAUFMAN
Filed: October 7, 2011	)	
Issued: August 21, 2012	)	
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	Confirmation No.: 7254
	)	
Reexamination Proceeding	)	
Control No. 95/002,386	)	
Filed: September 15, 2012	)	

Mail Stop *Inter Partes* Reexam
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

TRANSMITTAL LETTER

Enclosed please find the following:

1. Patent Owner's Appeal Brief (45 pages total), including Claims Appendix (6 pages), Evidence Appendix (1 page), and Related Proceedings Appendix (1 page).
2. Payment in the amount of $2,000.00 to cover the fee for the Appeal Brief.
3. Nine (9) exhibits listed in the Evidence Appendix.
4. Claim Construction Order from related litigations (listed in the Related Proceedings Appendix).
5. Certificate of Service.

Please charge any additional fees to Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, L.L.P.

Dated: September 24, 2014

By: ______________________
Eric P. Raciti
Reg. No. 41,475

EXHIBIT 1

US008245764B2

(12) **United States Patent**
Eriksen

(10) **Patent No.: US 8,245,764 B2**
(45) **Date of Patent: Aug. 21, 2012**

(54) COOLING SYSTEM FOR A COMPUTER SYSTEM

(75) Inventor: **André Sloth Eriksen**, Aalborg C (DK)

(73) Assignee: **Asetek A/S**, Bronderslev (DK)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **13/269,234**

(22) Filed: **Oct. 7, 2011**

(65) **Prior Publication Data**

US 2012/0061058 A1 Mar. 15, 2012

Related U.S. Application Data

(63) Continuation of application No. 11/919,974, filed as application No. PCT/DK2005/000310 on May 6, 2005.

(51) **Int. Cl.**
F28F 7/00 (2006.01)
H05K 7/20 (2006.01)

(52) **U.S. Cl.** **165/80.4**; 361/699

(58) **Field of Classification Search** 165/80.2, 165/80.4, 104.21, 104.31, 104.33; 361/699, 361/702, 720; 417/423.1
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,810,509	A	5/1974	Kun	
4,563,620	A	1/1986	Komatsu	
4,898,579	A	2/1990	Groshong et al.	
5,708,564	A	1/1998	Lin	
5,731,954	A	3/1998	Cheon	
5,784,257	A	7/1998	Tata	
5,825,622	A	10/1998	Rife et al.	
5,890,880	A	4/1999	Lustwerk	
5,901,037	A	5/1999	Hamilton et al.	
6,019,165	A *	2/2000	Batchelder	165/80.3
6,166,907	A	12/2000	Chien	
6,263,957	B1	7/2001	Chen et al.	
6,305,463	B1	10/2001	Salmonson	
6,343,478	B1	2/2002	Chang	
6,415,860	B1	7/2002	Kelly et al.	
6,447,270	B1	9/2002	Schmidt et al.	
6,551,734	B1	4/2003	Simpkins et al.	
6,668,911	B2	12/2003	Bingler	
6,725,682	B2	4/2004	Scott	
6,749,012	B2	6/2004	Gwin et al.	
6,892,802	B2	5/2005	Kelly et al.	
6,967,841	B1	11/2005	Chu et al.	

(Continued)

FOREIGN PATENT DOCUMENTS

EP 0574823 A2 12/1993

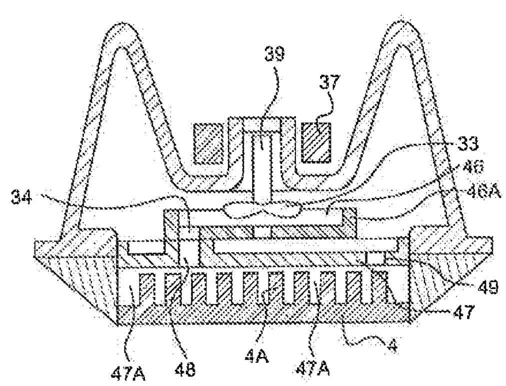
(Continued)

Primary Examiner — Frantz Jules
Assistant Examiner — Emmanuel Duke
(74) *Attorney, Agent, or Firm* — Finnegan, Henderson, Farabow, Garrett & Dunner, LLP

(57) **ABSTRACT**

The invention relates to a cooling system for a computer system, said computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid. The cooling system has a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid. Different embodiments of the heat exchanging system as well as means for establishing and controlling a flow of cooling liquid and a cooling strategy constitutes the invention of the cooling system.

18 Claims, 12 Drawing Sheets



U.S. PATENT DOCUMENTS

6,972,954	B2	12/2005	Minamitani et al.
7,215,546	B2	5/2007	Hata et al.
7,298,617	B2	11/2007	Campbell et al.
7,325,588	B2	2/2008	Malone et al.
7,325,591	B2	2/2008	Duan et al.
7,359,197	B2	4/2008	Stefanoski et al.
2003/0010050	A1	1/2003	Scott
2003/0151895	A1	8/2003	Zuo
2004/0052048	A1	3/2004	Wu et al.
2004/0052049	A1	3/2004	Wu et al.
2004/0105232	A1	6/2004	Ito et al.
2005/0061482	A1 *	3/2005	Lee et al. 165/96
2005/0069432	A1 *	3/2005	Tomioka 417/423.1
2005/0083656	A1	4/2005	Hamman
2006/0113066	A1	6/2006	Mongia et al.

FOREIGN PATENT DOCUMENTS

EP	0610826	A2	8/1994
WO	WO 01/25881	A	4/2001
WO	WO 2005/017468	A2	2/2005
WO	WO 2005/045654	A2	5/2005
WO	PCT/DK2005/000310	*	11/2006

* cited by examiner

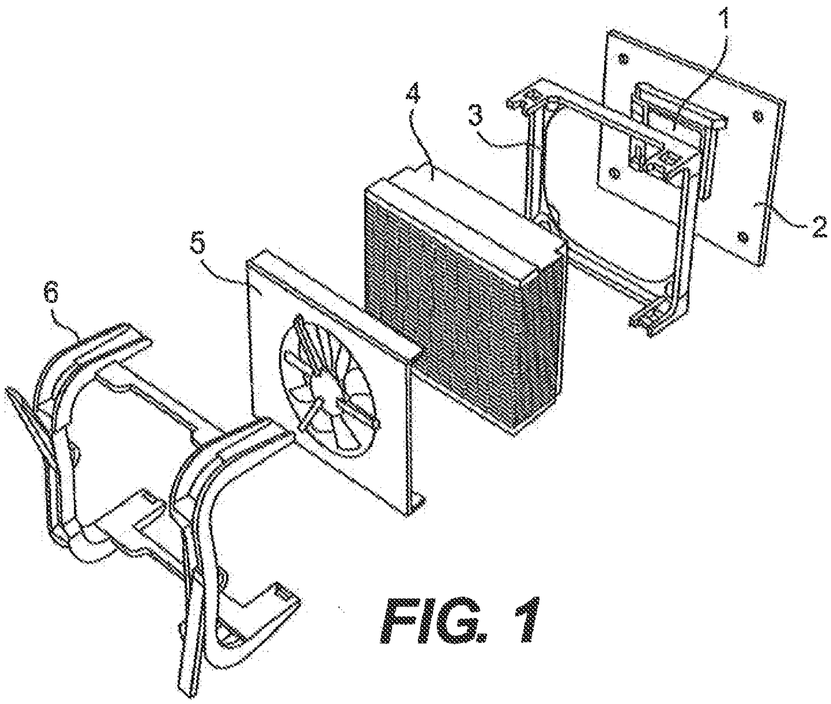


FIG. 1

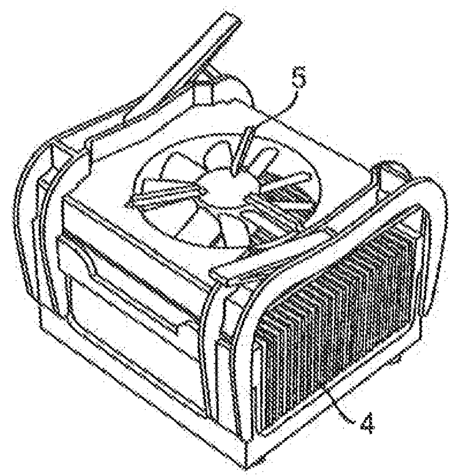


FIG. 2

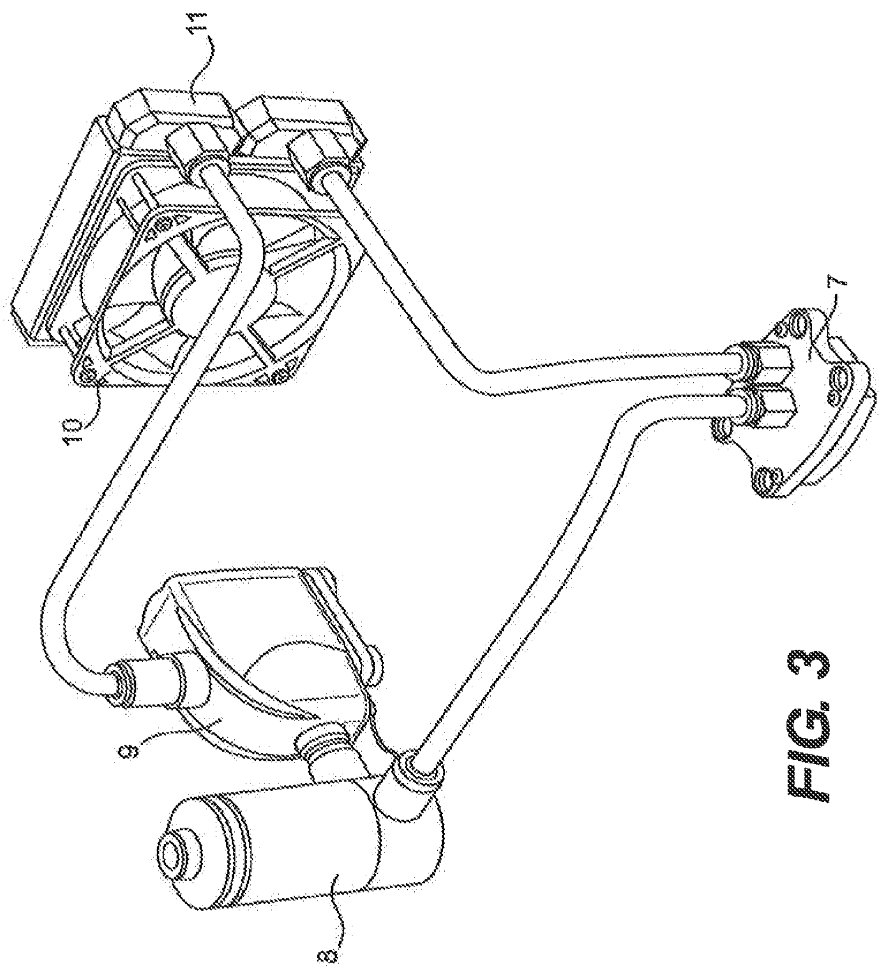


FIG. 3

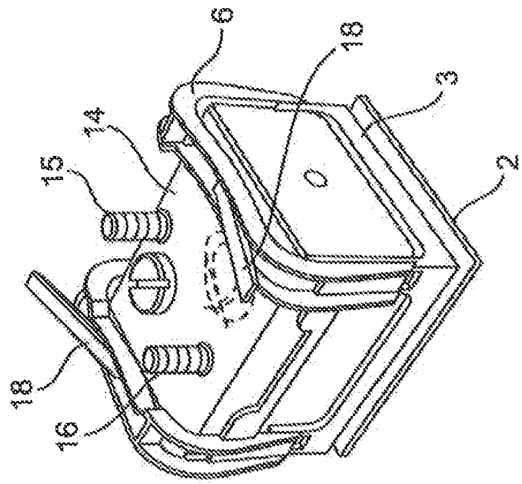


FIG. 5

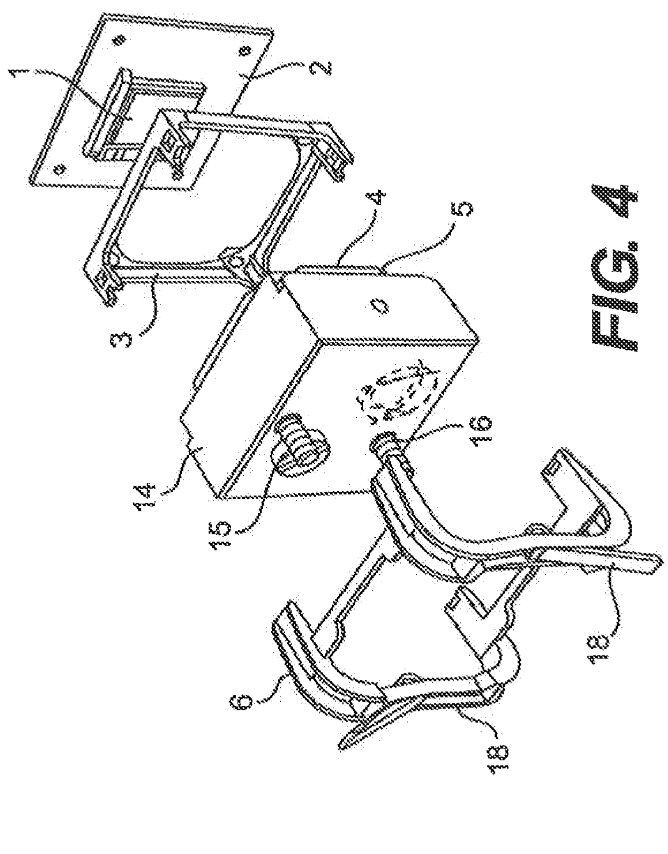


FIG. 4

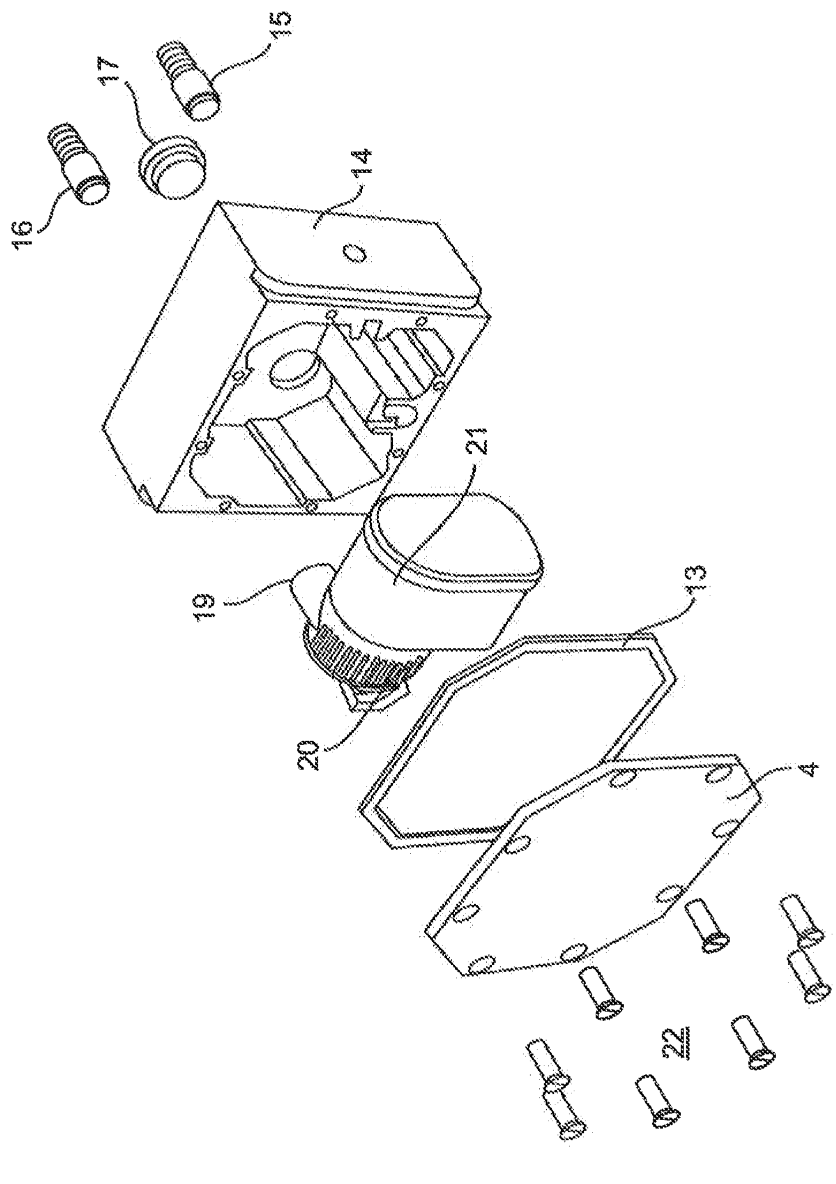


FIG. 6

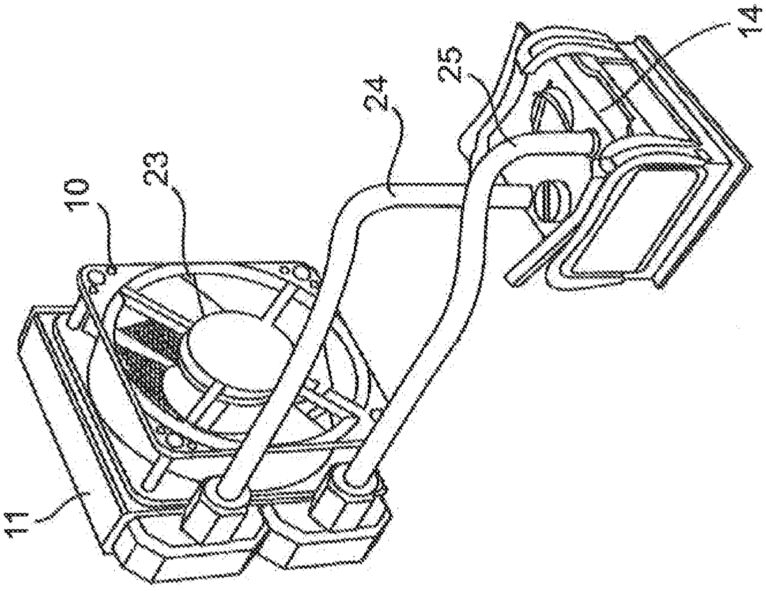


FIG. 7

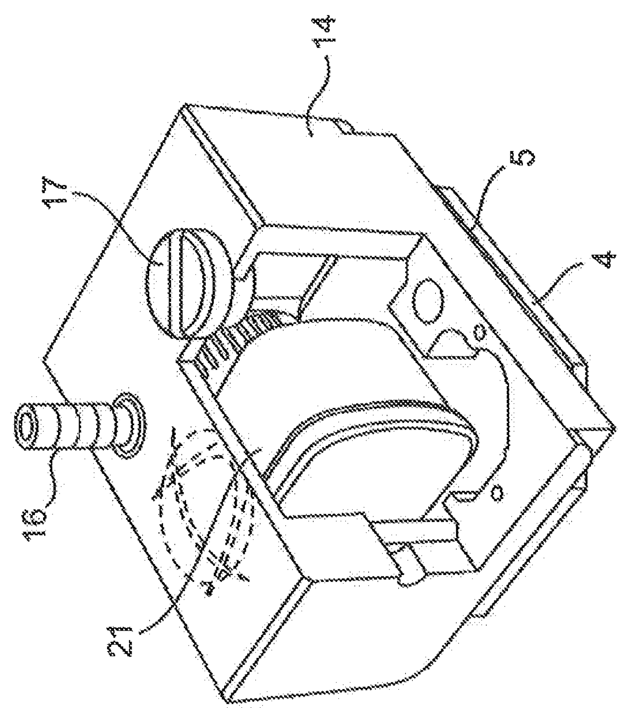


FIG. 8

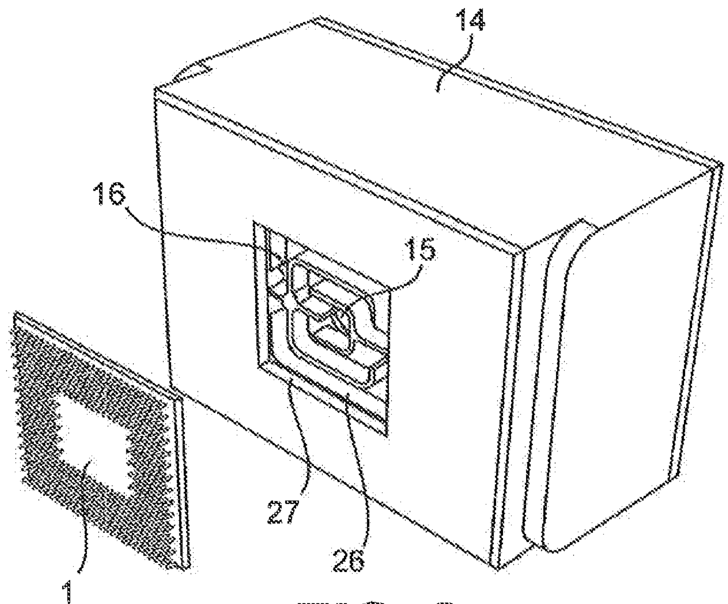


FIG. 9

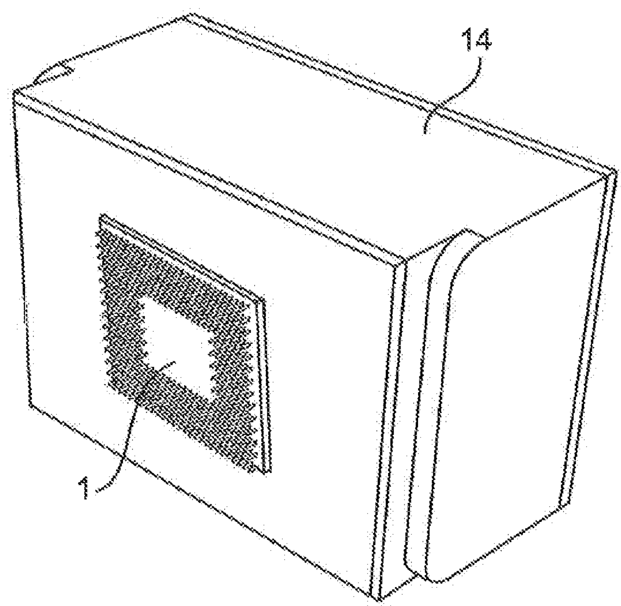


FIG. 10

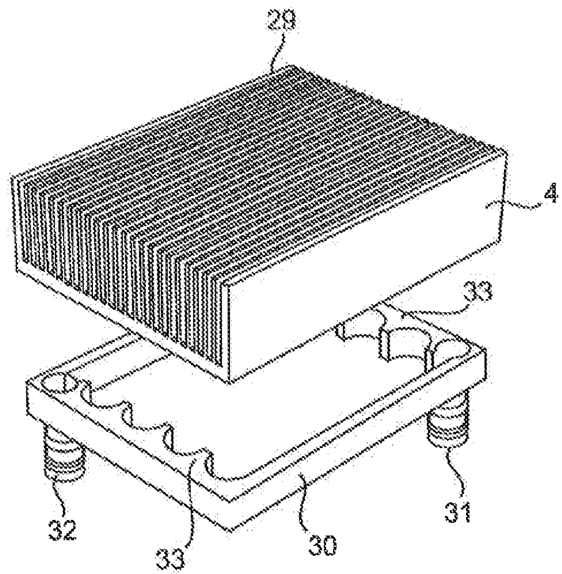


FIG. 11

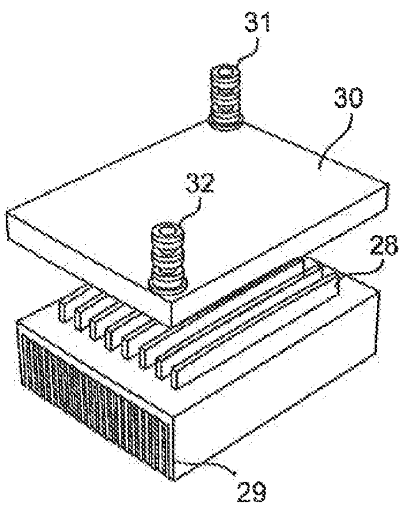


FIG. 12

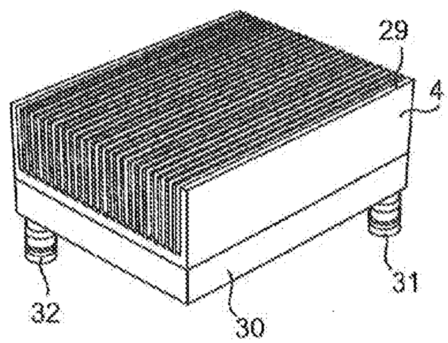


FIG. 13

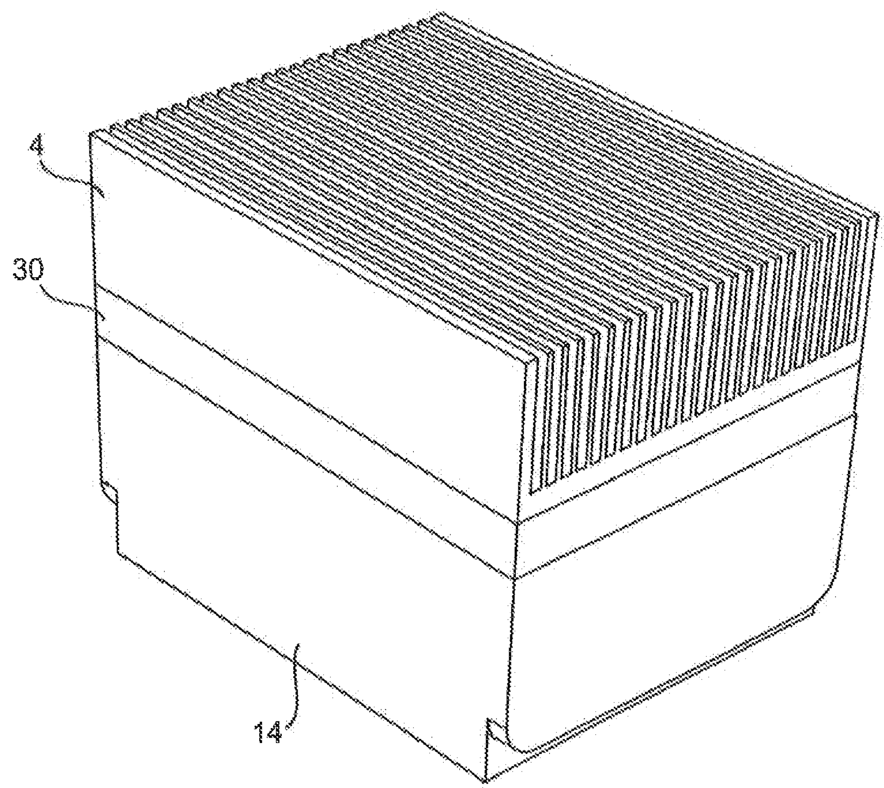


FIG. 14

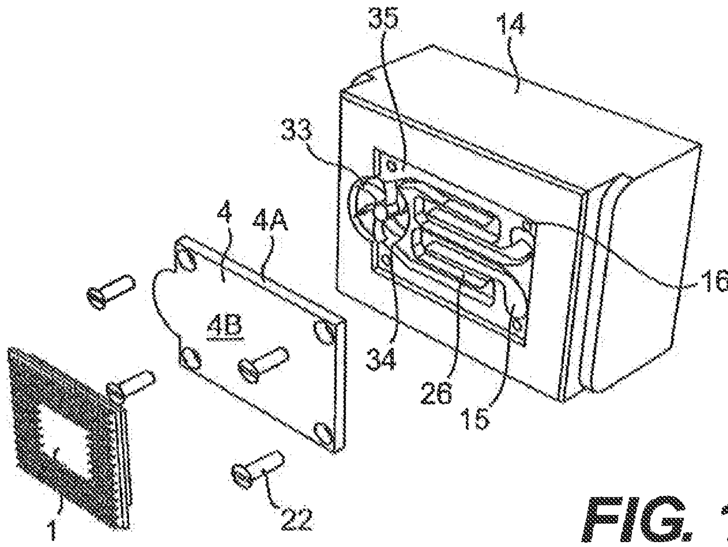


FIG. 15

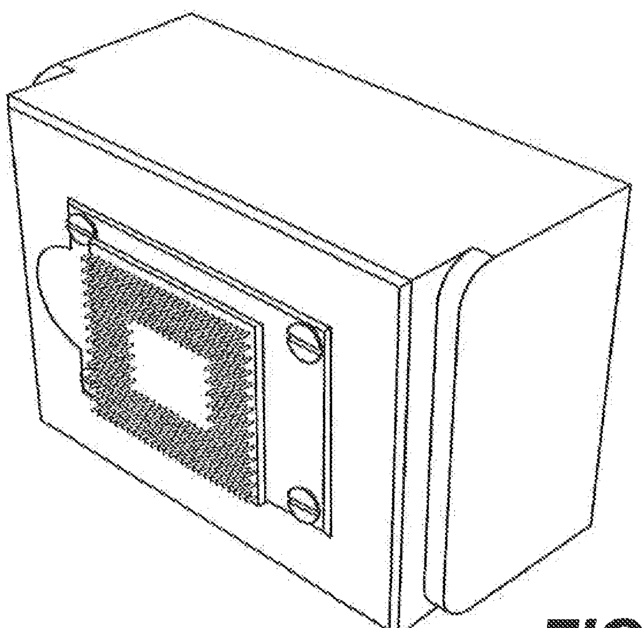


FIG. 16

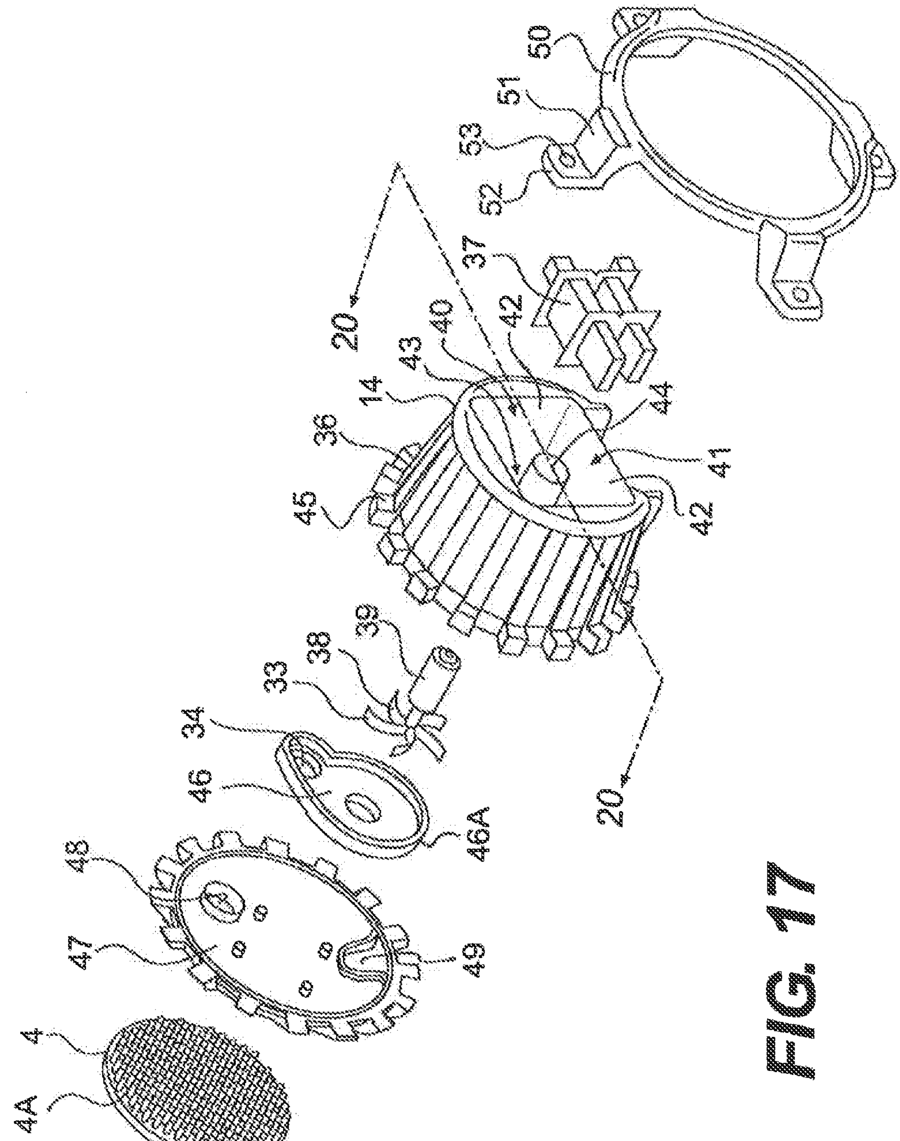

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FIG. 17

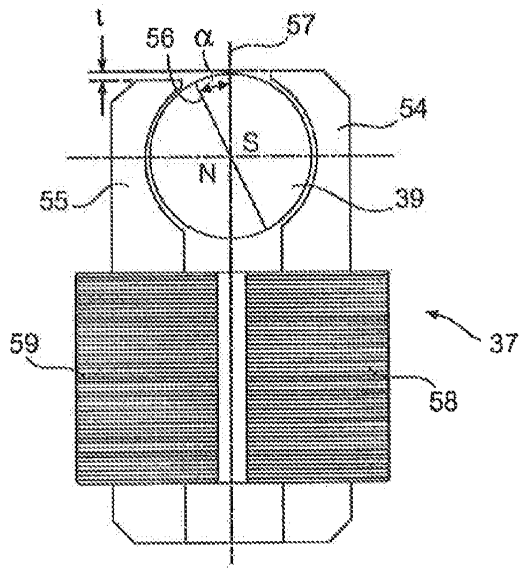

FIG. 18

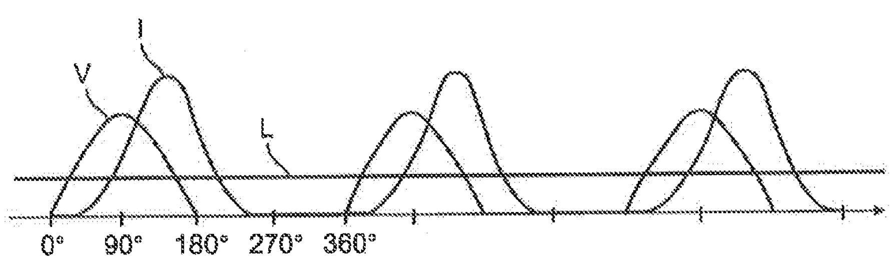

FIG. 19

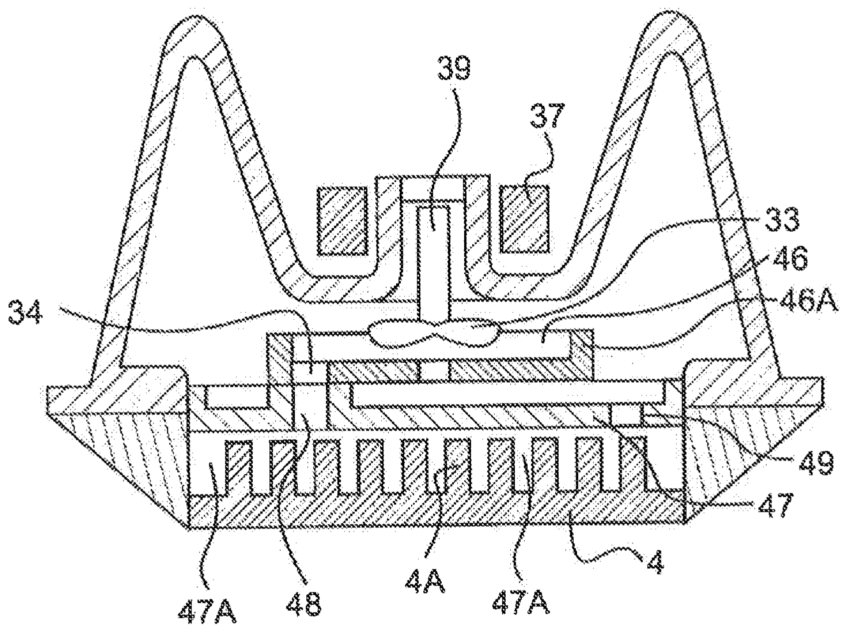

FIG. 20

COOLING SYSTEM FOR A COMPUTER SYSTEM

This application is a continuation of U.S. application Ser. No. 11/919,974, filed Jan. 6, 2009, which is a U.S. National Phase Application of PCT/DK2005/000310, filed May 6, 2005, which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

The present invention relates to a cooling system for a central processing unit (CPU) or other processing unit of a computer system. More specifically, the invention relates to a liquid-cooling system for a mainstream computer system such as a PC.

During operation of a computer, the heat created inside the CPU or other processing unit must be carried away fast and efficiently, keeping the temperature within the design range specified by the manufacturer. As an example of cooling systems, various CPU cooling methods exist and the most used CPU cooling method to date has been an air-cooling arrangement, wherein a heat sink in thermal contact with the CPU transports the heat away from the CPU and as an option a fan mounted on top of the heat sink functions as an air fan for removing the heat from the heat sink by blowing air through segments of the heat sink. This air-cooling arrangement is sufficient as long as the heat produced by the CPU is kept at today's level, however it becomes less useful in future cooling arrangements when considering the development of CPUs since the speed of a CPU is said to double perhaps every 18 months, thus increasing the heat production accordingly.

Another design used today is a CPU cooling arrangement where cooling liquid is used to cool the CPU by circulating a cooling liquid inside a closed system by means of a pumping unit, and where the closed system also comprises a heat exchanger past which the cooling liquid is circulated.

A liquid-cooling arrangement is more efficient than an air-cooling arrangement and tends to lower the noise level of the cooling arrangement in general. However, the liquid-cooling design consists of many components, which increases the total installation time, thus making it less desirable as a mainstream solution. With a trend of producing smaller and more compact PCs for the end-users, the greater amount of components in a typical liquid-cooling arrangement is also undesirable. Furthermore, the many components having to be coupled together incurs a risk of leakage of cooling liquid from the system.

SUMMARY

It may be one object of the invention to provide a small and compact liquid-cooling solution, which is more efficient than existing air-cooling arrangements and which can be produced at a low cost enabling high production volumes. It may be another object to create a liquid-cooling arrangement, which is easy-to-use and implement, and which requires a low level of maintenance or no maintenance at all. It may be still another object of the present invention to create a liquid-cooling arrangement, which can be used with existing CPU types, and which can be used in existing computer systems.

This object may be obtained by a cooling system for a computer system, said computer system comprising: at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the

processing unit to the cooling liquid, a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pump being provided as part of an integrate element, said integrate element comprising the heat exchanging interface, the reservoir and the pump, said pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means.

By providing an integrate element, it is possible to limit the number of separate elements of the system. However, there is actually no need for limiting the number of elements, because often there is enough space within a cabinet of a computer system to encompass the different individual elements of the cooling system. Thus, it is surprisingly that, at all, any attempt is conducted of integrating some of the elements.

In possible embodiments according to this aspect of the invention, the entire pump is placed inside the reservoir with at least an inlet or an outlet leading to the liquid in the reservoir. In an alternative embodiment the pump is placed outside the reservoir in the immediate vicinity of the reservoir and wherein at least an inlet or an outlet is leading directly to the liquid in the reservoir. By placing the pump inside the reservoir or in the immediate vicinity outside the reservoir, the integrity of the combined reservoir, heat exchanger and pump is obtained, so that the element is easy to employ in new and existing computer systems, especially mainstream computer systems.

In a preferred embodiment, the pumping member of the pump and a driven part of the motor of the pump, such as a rotor of an electrical motor, is placed inside the reservoir embedded in the cooling liquid, and wherein a stationary part of the motor of the pump, such as a stator of an electrical motor, is placed outside the reservoir. By having the driven part of the motor placed inside the reservoir submerged in the cooling liquid and the stationary part of the motor outside the reservoir, there is no need for encapsulating the stationary part in a liquid-proof insulation. However, problems may occur having then stationary part driving the driven part. However, the present invention provide means for obtaining such action, although not at all evident how to solve this problem.

The object may also be obtained by a cooling system for a computer system, said computer system comprising: at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, said cooling system being intended for thermal contact with the processing unit by means of existing fastening means associated with the processing unit, and said heat radiating means intended for radiating from the cooling liquid thermal energy, dissipated to the cooling liquid, to surroundings of the heat radiating means.

The use of existing fastening means has the advantage that fitting of the cooling system is fast and easy. However, once again there is no problem for the person skilled in the art to adopt specially adapted mounting means for any element of the cooling system, because there are numerous possibilities in existing cabinets of computer systems for mounting any kind of any number of elements, also elements of a cooling system.

In preferred embodiments according to this aspect of the invention, the existing fastening means are means intended for attaching a heat sink to the processing unit, or the existing fastening means are means intended for attaching a cooling fan to the processing unit, or the existing fastening means are means intended for attaching a heat sink together with a cooling fan to the processing unit. Existing fastening means of the kind mentioned is commonly used for air cooling of CPUs of computer systems, however, air cooling arrangements being much less complex than liquid cooling systems. Nevertheless, it has ingeniously been possible to develop a complex and effective liquid cooling system capable of utilizing such existing fastening means for simple and less effective air cooling arrangements.

According to an aspect of the invention, the pump is selected from the following types: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible finer pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. By adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

According to another aspect of the invention, driving means for driving the pump is selected among the following driving means: electrically operated rotary motor, piezo-electrically operated motor, permanent magnet operated motor, fluid-operated motor, capacitor-operated motor. As is the case when selecting the pump to pump the liquid, by adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

The object may also be obtained by a cooling system for a computer system, said computer system comprising: at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, and said cooling system further comprising a pump wherein the pump is driven by an AC electrical motor by a DC electrical power supply of the computer system, where at least part of the electrical power from said power supply is intended for being converted to AC being supplied to the electrical motor.

It may be advantageous to use an AC motor, such as a 12V AC motor, for driving the pump in order to obtain a stabile unit perhaps having to operate 24 hours a day, 365 days a year. However, the person skilled in the art will find it unnecessary to adopt as example a 12V motor because high voltage such as 220V or 110V is readily accessible as this is the electrical voltage used to power the voltage supply of the computer system itself. Although choosing to use a 12V motor for the pump, it has never been and will never be the choice of the person skilled in the art to use an AC motor. The voltage supplied by the voltage supply of the computer system itself is DC, thus this will be the type of voltage chosen by the skilled person.

In preferred embodiments according to any aspect of the invention, an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, or an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means, or an electrical motor is intended both for driving the pump for pumping the liquid, and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means.

By utilizing a single electrical motor for driving more than one element of the cooling system according to any of the aspects of the invention, the lesser complexity and the reliability of the cooling system will be further enhanced.

The heat exchanging interface may be an element being separate from the reservoir, and where the heat exchanging interface is secured to the reservoir in a manner so that the heat exchanging interface constitutes part of the reservoir when being secured to the reservoir. Alternatively, the heat exchanging interface constitutes an integrate surface of the reservoir, and where the heat exchanging surface extends along an area of the surface of the reservoir, said area of surface being intended for facing the processing unit and said area of surface being intended for the close thermal contact with the processing unit. Even alternatively, the heat exchanging interface is constitutes by a free surface of the processing unit, and where the free surface is capable of establishing heat dissipation between the processing unit and the cooling liquid through an aperture provided in the reservoir, and where the aperture extends along an area of the surface of the reservoir, said surface being intended for facing the processing unit.

Possibly, an uneven surface such as pins or fins extending from the copper plate provide a network of channels across the inner surface of the heat exchanging interface. A network of channels ensure the cooling liquid being passed along the inner surface of the interface such as a copper plate in a way that maximizes the retention time of the cooling liquid along the heat exchanging interface and in a way that optimizes the thermal exchange between the heat exchanging interface and the cooling liquid as long as the cooling liquid is in thermal contact with heat exchanging interface.

Possibly, the cooling system may be provided with a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pumping means being intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means, said heat exchanging interface constituting a heat exchanging surface being manufactured from a material suitable for heat conducting, and with a first side of the heat exchanging surface facing the central processing unit being substantially plane and with a second side of the heat exchanging surface facing the cooling liquid being substantially plane and said reservoir being manufactured from plastic, and channels or segments being provided in the reservoir for establishing a certain flow-path for the cooling liquid through the reservoir.

Providing a plane heat exchanging surface, both the first, inner side being in thermal contact with the cooling liquid and the second, outer side being in thermal contact with the heat generating processing unit, results in the costs for manufacturing the heat exchanging surface is reduced to an absolute minimum.

According to the above possible solution, an inlet of the pumping means is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

Alternatively, or additionally, an outlet of said pumping means being positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchange interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

However, a plane first, inner surface may also result in the cooling liquid passing the heat exchanging surface too fast. This may be remedied by providing grooves along the inner surface, thereby providing a flow path in the heat exchanging surface. This however results in the costs for manufacturing the heat exchanging surface increasing.

The solution to this problem has been dealt with by providing channels or segments in the reservoir housing instead. The reservoir housing may be manufactured by injection molding or by casting, depending on the material which the reservoir housing is made from. Proving channels or segments during molding or casting of the reservoir housing is much more cost-effective than milling grooves along the inner surface of the heat exchanging surface.

Possibly, the cooling system may be provided with at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid, said cooling system being adapted such as to provide transfer of said heat from a heat dissipating surface to a heat radiating surface where said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

Heat dissipation from the processing unit to the cooling liquid must be very efficient to ensure proper cooling of the processing unit, Especially in the case, where the processing unit is a CPU, the surface for heat dissipation is limited by the surface area of the CPU. This may be remedied by utilizing a heat exchanging surface being made of a material having a high thermal conductivity such as copper or aluminum and ensuring a proper thermal bondage between the heat exchanging interface and the CPU.

However, in a possible embodiment according to the features in the above paragraph, the heat dissipation takes place directly between the processing unit and the cooling liquid by providing an aperture in the reservoir housing, said aperture being adapted for taking up a free surface of the processing unit. Thereby, the free surface of the processing unit extends into the reservoir or constitutes a part of the boundaries of the reservoir, and the cooling liquid has direct access to the free surface of the processing unit.

A possible heat exchanging interface may be the direct contact between the heat generating unit such as a CPU and the cooling liquid, where at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit comprising at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid, said cooling system being adapted such as to provide transfer of said heat from a heat dissipating interface to a heat radiating surface where said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

The aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a the processing unit, said boundaries being liquid-proof when attached to the free surface of the processing unit so that the liquid may flow freely across the free surface without the risk of the liquid dissipating through the boundaries. Alternatively, but posing the same technical effect, the aperture of the reservoir is intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of the processing unit.

If a heat sink is provided as an aid in dissipating heat from the heat generating unit such as a CPU, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a heat sink. Alternatively, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of a heat sink. Alternatively, possibly, the heat exchanging interface may be provided as a first reservoir intended for being closed by attaching boundaries of an aperture in the first reservoir to, alternatively along, a free surface of a said processing unit, and a second reservoir intended for being closed by attaching boundaries of an aperture in the second reservoir to, alternatively along, a free surface of a to a free surface of a heat sink, and liquid conducting means provided between the first reservoir and the second reservoir.

The first reservoir may be closed by attaching said first reservoir to a heat exchanging surface element being in close thermal contact with the processing unit, said heat exchanging surface intended for dissipating heat from the processing unit to cooling liquid in the first reservoir, and wherein a second reservoir is closed by attaching said second reservoir to a surface of a heat sink, said heat sink intended for radiating heat from cooling liquid in the second reservoir to the exterior surroundings.

Also, the first reservoir and said second reservoir may be provided as a monolithic structure comprising both the first reservoir and the second reservoir and where both a heat dissipation from the processing unit to the cooling liquid in the first reservoir and heat radiation from the cooling liquid in the second reservoir to exterior surrounding is provided by the monolithic structure. The said monolithic structure may preferably be manufactured at least partly from plastic, preferably being manufactured fully in plastic, and said monolithic structure thus being manufactured by injection molding.

Transfer of said cooling liquid from an outlet of the first reservoir to an inlet of the second reservoir, and from an outlet of the second reservoir to an inlet of the first reservoir, and circulating the cooling liquid within said liquid conducting means is provided by a pumping means being intended for pumping the cooling liquid. One of said reservoirs of said monolithic structure may comprise said pumping means.

An inlet and/or an outlet and/or a pumping member of said pumping means, may be provided in the vicinity of said substantially plane side in order to provide a turbulence of flow and hereby improve the exchange of heat between said cooling liquid and substantially plane side, and the inlet of the pumping means may be provided within the first reservoir and the outlet may be provided within the second reservoir.

According to one aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilizing a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface and a pumping means, said method of cooling comprising the steps of establishing, or defining, or selecting an operative status of the pumping means; controlling the operation of the motor of the pumping means in response to the following parameters; the necessary direction of movement for obtaining a pumping action of a pumping member of the pumping means, the possible direction of movement of a driving part of the motor of the pumping means; and in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve the necessary direction of movement of the driving part of the motor for establishing the necessary direction of movement for obtaining he pumping action of the pumping member.

There may be pumping means, where the pumping member is only operable in one direction but where the motor driving the pumping member is operable in two directions. The solution to this problem is to either choose a pumping member operable in both directions or to chose a motor being operable in only one direction. According to the invention, a solution is provided where a one-way directional pumping member may be operated any a two-way directional motor. Despite the contradictory nature of this solution, advantages may however be present.

As example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and where said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor before applying a full-wave AC power signal.

As an alternative example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor after having applied the full-wave AC power signal.

In both the above examples, the advantages of the one-way impeller from a traditional DC pump together with the advantages of a motor from a traditional AC pump is obtained in the solution mentioned. The performance of an impeller of a DC pump is much better than the performance of an impeller from an AC pump. The motor from an AC pump is more reliable than a motor from a DC pump. The advantageous obtained is thus of synergetic nature, seeing that different advantages of the impeller of the DC pump and of the motor of the AC pump are different in nature.

According to another aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilizing a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface, an air blowing fan, a pumping means, said method of cooling comprising the steps of applying one of the following possibilities of how to operate the computer system: establishing, or defining, or selecting an operative status of the computer system; controlling the operation of at least one of the following means of the computer system; the pumping means and the air blowing fan in response to at least one of the following parameters; a surface temperature of the heat generating processing unit, an internal temperature of the heat generating processing unit, or a processing load of the CPU; and in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve at least one of the following conditions; a certain cooling performance of the cooling system, a certain electrical consumption of the cooling system, a certain noise level of the cooling system.

Applying the above method ensures an operation of the computer system being in accordance with selected properties during the use of the computer system. For some applications, the cooling performance is vital such as may be the case when working with image files or when downloading large files from a network during which the processing units is highly loaded and thus generating much heat. For other applications, the electrical power consumption is more vital such as may be the case when utilizing domestic computer systems or in large office building in environments where the electrical grid may be weak such as in third countries. In still other applications, the noise generated by the cooling system is to be reduced to a certain level, which may be the case in office buildings with white collar people working alone, or at home, if the domestic computer perhaps is situated in the living room, or at any other location where other exterior considerations have to be dealt with.

According to another aspect of the invention, a method is envisaged, said method being employed with cooling system further comprising a pumping means with an impeller for pumping the cooling liquid through a pumping housing, said pumping means being driven by an AC electrical motor with a stator and a rotor, and said pumping means being provided with a means for sensing a position of the rotor, and wherein the method comprises the following steps: initially establishing a preferred rotational direction of the rotor of the electrical motor; before start of the electrical motor, sensing the angular position of the rotor; during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor; said selection being made according to the preferred rotational direction; and said application of the AC signal, such as an AC voltage, being performed by the computer system for applying the AC signal, such as an AC voltage, from the electrical power supply of the computer system during conversions of the electrical DC signal, such as a DC voltage, of the power supply to the AC signal, such as an AC voltage, for the electrical motor.

Adopting the above method according to the invention ensures the most efficient circulation of cooling liquid in the cooling system and at the same time ensures the lowest possible energy consumption of the electrical motor driving the impeller. The efficient circulation of the cooling liquid is obtained by means of an impeller being designed for rotation in one rotational direction only, thus optimizing the impeller design with regard to the only one rotational direction as opposed to both rotational directions. The low energy consumption is achieved because of the impeller design being optimized, thus limiting the necessary rotational speed of the impeller for obtaining e certain amount of flow of the cooling liquid through the cooling system. A bonus effect of the lowest possible energy consumption being obtained is the lowest possible noise level of the pump also being obtained. The noise level of the pump is amongst other parameters also dependent on the design and the rotational speed of the impeller. Thus, an optimized impeller design and impeller speed will reduce the noise level to the lowest possible in consideration of ensuring a certain cooling capacity.

BRIEF DESCRIPTION OF THE FIGURES

The invention will hereafter be described with reference to the drawings, where

FIG. 1 shows an embodiment of the prior art. The figure shows the typical components in an air-cooling type CPU cooling arrangement.

FIG. 2 shows an embodiment of the prior art. The figure shows the parts of the typical air-cooling type CPU cooling arrangement of FIG. 1 when assembled.

FIG. 3 shows an embodiment of the prior art. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement.

FIG. 4 is an exploded view of the invention and the surrounding elements.

FIG. 5 shows the parts shown in the previous figure when assembled and attached to the motherboard of a computer system.

FIG. 6 is an exploded view of the reservoir from the previous FIGS. 4 and 5 seen from the opposite site and also showing the pump.

FIG. 7 is a cut-out view into the reservoir housing the pump and an inlet and an outlet extending out of the reservoir.

FIG. 8 is a view of the cooling system showing the reservoir connected to the heat radiator.

FIG. 9-10 are perspective views of a possible embodiment of reservoir housing providing direct contact between a CPU and a cooling liquid in a reservoir.

FIG. 11-13 are perspective views of a possible embodiment of heat sink and a reservoir housing constituting an integrated unit.

FIG. 14 is a perspective view of the embodiment shown in FIG. 9-10 and the embodiment shown in FIG. 11-13 all together constituting an integrated unit.

FIG. 15-16 are perspective view of a possible embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit

FIG. 17 is a perspective view of a preferred embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit,

FIG. 18 is a plane view of a possible, however preferred embodiment of an AC electrical motor for a pumping means of the cooling system according to the invention, and

FIG. 19 is a graph showing a method for starting a rotor of the electrical AC motor, said AC motor driving an impeller selected from a pump driven by a DC motor.

FIG. 20 is a is a simplified schematic showing a cross-sectional view of the reservoir along plane 20-20 of FIG. 17.

DETAILED DESCRIPTION

FIG. 1 is an exploded view of an embodiment of prior art cooling apparatus for a computer system. The figure shows the typical components in an air-cooling type CPU cooling arrangement. The figure shows a prior art heat sink 4 intended for air cooling and provided with segments intersected by interstices, a prior art air fan 5 which is to be mounted on top of the heat sink by use of fastening means 3 and 6.

The fastening means comprises a frame 3 provided with holes intended for bolts, screws, rivets or other suitable fastening means (not shown) for thereby attaching the frame to a motherboard 2 of a CPU 1 or onto another processing unit of the computer system. The frame 3 is also provided with mortises provided in perpendicular extending studs in each corner of the frame, said mortises intended for taking up tenons of a couple of braces. The braces 6 are intended for enclosing the heat sink 4 and the air fan 5 so that the air fan and the heat sink thereby is secured to the frame. Using proper retention mechanisms, when the frame is attached to the motherboard of the CPU of other processing unit, and when the tenons of the braces are inserted into the mortises of the frame, the air fan and heat exchanger is pressed towards the CPU by using a force perpendicular to the CPU surface, said force being provided by lever arms.

FIG. 2 shows the parts of the typical air-cooling type CPU cooling arrangement of FIG. 1, when assembled. The parts are attached to each other and will be mounted on top of a CPU on a motherboard (not shown) of a computer system.

FIG. 3 shows another embodiment of a prior art cooling system. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement. The figure shows a prior art heat exchanger 7, which is in connection with a prior art liquid reservoir 8, a prior art liquid pump 9 and a heat radiator 11 and an air fan 10 provided together with the heat radiator. The prior art heat exchanger 7, which can be mounted on a CPU (not shown) is connected to a radiator and reservoir, respectively. The reservoir serves as a storage unit for excess liquid not capable of being contained in the remaining components. The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid. The heat radiator 11 serves as a means for removing the heat from the liquid by means of the air fan 10 blowing air through the heat radiator. All the components are in connection with each other via tubes for conducting the liquid serving as the cooling medium.

FIG. 4 is an exploded view of a cooling system according to an embodiment of the invention. Also elements not being part of the cooling system as such are shown. The figure shows a central processing unit CPU 1 mounted on a motherboard of a computer system 2. The figure also shows a part of the existing fastening means, i.e. amongst others the frame 3 with mortises provided in the perpendicular extending studs in each corner of the frame. The existing fastening means, i.e. the frame 3 and the braces 6, will during use be attached to the motherboard 2 by means of bolts, screws, rivets or other suitable fastening means extending through the four holes provided in each corner of the frame and extending through corresponding holes in the motherboard of the CPU. The frame 3 will still provide an opening for the CPU to enable the CPU to extend through the frame.

The heat exchanging interface 4 is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminum, and which will be in thermal contact with the CPU 1, when the cooling system is fastened to the motherboard 2 of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing 14, thus the heat exchanger 4 constitutes the part of the liquid reservoir housing facing the CPU. The reservoir may as example be made of plastic or of metal. The reservoir or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

If the reservoir is made of metal or any other material having a relative high heat conductivity compared to as example plastic, the heat exchanging interface as a separate element may be excluded because the reservoir itself may constitute a heat exchanger over an area, wherein the reservoir is in thermal contact with the processing unit. Alternatively to having the heat exchanging interface constitute part of the liquid reservoir housing, the liquid reservoir housing may be tightly attached to the heat exchanging interface by means of screws, glue, soldering, brazing or the like means for securing the heat exchanging interface to the housing and vice versa, perhaps with a sealant 5 provided between the housing and the heat exchanging interface.

Alternatively to providing a heat exchanging interface integrate with the reservoir containing the cooling liquid, it will be possible to exclude the heat exchanger and providing another means for dissipating heat from the processing unit to the cooling liquid in the reservoir. The other means will be a hole provided in the reservoir, said hole intended for being directed towards the processing unit. Boundaries of the hole will be sealed towards boundaries of the processing unit or will be sealed on top of the processing unit for thereby preventing cooling liquid from the reservoir from leaking. The only prerequisite to the sealing is that a liquid-tight connection is provided between boundaries of the hole and the processing unit or surrounding of the processing unit, such as a carrier card of the processing unit.

By excluding the heat exchanger, a more effective heat dissipation will be provided from the processing unit and to the cooling liquid of the reservoir, because the intermediate element of a heat exchanger is eliminated. The only obstacle in this sense is the provision of a sealing being fluid-tight in so that the cooling liquid in the reservoir is prevented from leaking.

The heat exchanging surface 4 is normally a copper plate. When excluding the heat exchanging surface 4, which may be a possibility not only for the embodiments shown in FIG. 4, but for all the embodiments of the invention, it may be necessary to provide the CPU with a resistant surface that will prevent evaporation of the cooling liquid and/or any damaging effect that the cooling liquid may pose to the CPU. A resistant surface may be provided the CPU from the CPU producer or it may be applied afterwards. A resistant surface to be applied afterwards may e.g. be a layer, such as an adhesive tape provided on the CPU. The adhesive tape may be made with a thin metal layer e.g. in order to prevent evaporation of the cooling liquid and/or any degeneration of the CPU itself.

Within the liquid reservoir, a liquid pump (not shown) is placed for pumping a cooling liquid from an inlet tube 15 connection being attached to the housing of the reservoir through the reservoir and past the heat exchanger in thermal contact with the CPU to an outlet tube connection 16 also being attached to the reservoir housing. The existing fastening means comprising braces 6 with four tenons and the frame 3 with four corresponding mortises will fasten the reservoir and the heat exchanger to the motherboard of the CPU. When fastening the two parts of the existing fastening means to each other the fastening will by means of the lever arms 18 create a force to assure thermal contact between the CPU 1 mounted on the motherboard and the heat exchanger 4 being provided facing the CPU.

The cooling liquid of the cooling system may be any type of cooling liquid such as water, water with additives such as anti-fungicide, water with additives for improving heat conducting or other special compositions of cooling liquids such as electrically non-conductive liquids or liquids with lubricant additives or anti-corrosive additives.

FIG. 5 shows the parts shown in FIG. 4 when assembled and attached to the motherboard of a CPU of a computer system 2. The heat exchanger and the CPU is in close thermal contact with each other. The heat exchanger and the remainder of the reservoir housing 14 is fastened to the motherboard 2 by means of the existing fastening means being secured to the motherboard of the CPU and by means of the force established by the lever arms 18 of the existing fastening means. The tube inlet connection 15 and the tube outlet connection 16 are situated so as to enable connection of tubes to the connections.

FIG. 6 is an exploded view of the reservoir shown in previous FIG. 4 and FIG. 5 and seen from the opposite site and also showing the pump 21 being situated inside the reservoir. Eight screws 22 are provided for attaching the heat exchanging surface 4 to the remainder of the reservoir. The heat exchanging surface is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see FIG. 4). However, also the inner surface (not shown, see FIG. 7) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the octagonal shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

A sealant in form of a gasket 13 is used for the connection between the reservoir housing 14 and the heat exchanging surface forming a liquid tight connection. The pump is intended for being placed within the reservoir. The pump has a pump inlet 20 through which the cooling liquid flows from the reservoir and into the pump, and the pump has a pump outlet 19 through which the cooling liquid is pumped from the pump and to the outlet connection. The figure also shows a lid 17 for the reservoir. The non-smooth inner walls of the reservoir and the fact that the pump is situated inside the reservoir will provide a swirling of the cooling liquid inside the reservoir.

However, apart from the non-smooth walls of the reservoir and the pump being situated inside the reservoir, the reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir (see FIG. 9-10 and FIG. 15). Channel or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. By providing channels or segments inside the reservoir, a flow will be provided forcing the cooling liquid to pass the heat exchanging surface, and the amount of time increased of the cooling liquid being resident inside the reservoir, thus enhancing heat dissipation. If channels or segments are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting.

The cooling liquid enters the reservoir through the tube inlet connection 15 and enters the pump inlet 20, and is pumped out of the pump outlet 19 connected to the outlet connection 16. The connection between the reservoir and the inlet tube connection and the outlet tube connection, respectively, are made liquid tight. The pump may not only be a self-contained pumping device, but may be made integrated into the reservoir, thus making the reservoir and a pumping device one single integrated component. This single integrated element of the reservoir and the pumping device may also be integrated, thus making the reservoir, the pumping device and the heat exchanging surface one single integrated unit. This may as example be possible if the reservoir is made of a metal such as aluminum. Thus, the choice of material provides the possibility of constituting both the reservoir and a heat exchanging surface having a relatively high heat conductivity, and possibly also renders the possibility of providing bearings and the like constructional elements for a motor and a pumping wheel being part of the pumping device.

In an alternative embodiment, the pump is placed in immediate vicinity of the reservoir, however outside the reservoir. By placing the pump outside, but in immediate vicinity of the reservoir, still an integrate element may be obtained. The pump or the inlet or the outlet is preferably positioned so as to obtain a turbulence of flow in the immediate vicinity of the heat exchanging interface, thereby promoting increased heat dissipation between the heat exchanging interface and the cooling liquid. even in the alternative, a pumping member such as an impeller (see FIG. 15-16) may be provided in the immediate vicinity of the heat exchanging surface. The pumping member itself normally introduces a turbulence of flow, and thereby the increased heat dissipation is promoted irrespective of the position of the pump itself, or the position of the inlet or of the outlet to the reservoir or to the pump.

The pump may be driven by an AC or a DC electrical motor. When driven by an AC electrical motor, although being technically and electrically unnecessary in a computer system, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the pump. The pump may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. However, in the embodiment shown, the pump is driven by a 12V AC electrical motor.

Control of the pump in case the pump is driven by an AC electrical motor, preferably takes place by means of the operative system or an alike means of the computer system itself, and where the computer system comprises means for measuring the CPU load and/or the CPU temperature. Using the measurement performed by the operative system or alike system of the computer system eliminates the need for special means for operating the pump. Communication between the operative system or alike system and a processor for operating the pump may take place along already established communication links in the computer system such as a USB-link. Thereby, a real-time communication between the cooling system and the operative system is provided without any special means for establishing the communication.

In the case of the motor driving the pump is an AC electrical motor, the above method of controlling the pump may be combined with a method, where said pumping means is provided with a means for sensing a position of the rotor of the electrical motor, and wherein the following steps are employed: Initially establishing a preferred rotational direction of the rotor of the electrical motor, before start of the electrical motor, sensing the angular position of the rotor, during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor, said selection being made according to the preferred rotational direction, and said application of the AC voltage being performed by the computer system for applying the AC voltage from the electrical power supply of the computer system during conversion of the electrical DC voltage of the power supply to AC voltage for the electrical motor. By the operative system of the computer system itself generating the AC voltage for the electrical motor, the rotational direction of the pump is exclusively selected by the computer system, non-depending on the applied voltage of the public grid powering the computer system.

Further control strategies utilizing the operative system or alike system of the computer system may involve balancing the rotational speed of the pump as a function of the cooling capacity needed. If a lower cooling capacity is needed, the rotational speed of the pump, may be limited, thereby limiting the noise generating by the motor driving the pump.

In the case an air fan is provided in combination with a heat sink as shown in FIG. 1, of the air fan is provided in combination with the heat radiator, the operative system or alike system of the computer system may be designed for regulating the rotational speed of the pump, and thus of the motor driving the pump, and the rotational speed of the air fan, and thus the motor driving the air fan. The regulation will take into account the cooling capacity needed, but the regulation will at the same time take into account which of the two cooling means, i.e. the pump and the air fan, is generating the most noise. Thus, it the air fan generally is generating more noise than the pump, then the regulation will reduce the rotational speed of the air fan before reducing the rotational speed of the pump, whenever a lower cooling capacity is needed. Thereby, the noise level of the entire cooling system is lowered as much as possible. If the opposite is the case, i.e. the pump generally generating more noise than the air fan, then the rotational speed of the pump will be reduced before reducing the rotational speed of the air fan.

Even further control strategies involve controlling the cooling capacity in dependence on the type of computer processing taking place. Some kind of computer processing, such as word-processing, applies a smaller load on the processing units such as the CPU than other kinds of computer processing, such as image processing. Therefore, the kind of processing taking place on the computer system may be used as an indicator of the cooling capacity. It may even be possible as part of the operative system or similar system to establish certain cooling scenarios, depending on the kind of processing intended by the user. If the user selects as example word-processing, a certain cooling strategy is applied based on a limited need for cooling. If the user selects as example image-processing, a certain cooling strategy is applied based on an increased need for cooling. Two or more different cooling scenarios may be established depending on the capacity and the control possibilities and capabilities of the cooling system and depending on the intended use of the computer system, either as selected by a user during use of the computer system or as selected when choosing hardware during build-up of the computer system, i.e. before actual use of the computer system.

The pump is not being restricted to a mechanical device, but can be in any form capable of pumping the cooling liquid through the system. However, the pump is preferably one of the following types of mechanical pumps: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. Similarly, the motor driving the pumping member need not be electrical but may also be a piezo-electrically operated motor, a permanent magnet operated motor, a fluid-operated motor or a capacitor-operated motor. The choice of pump and the choice of motor driving the pump id dependent on many different parameters, and it is up to the person skilled in the art to choose the type of pump and the type of motor depending on the specific application. As example, some pumps and some motors are better suited for small computer systems such as lab-tops, some pumps and some motors are better suited for establishing high flow of the cooling liquid and thus a high cooling effect, and even some pumps and motors are better suited for ensuring a low-noise operation of the cooling system.

FIG. 7 is a cut-out view into the reservoir, when the reservoir and the heat exchanging surface 4 is assembled and the pump 21 is situated inside the reservoir. The reservoir is provided with the tube inlet connection (not seen from the figure) through which the cooling liquid enters the reservoir. Subsequently, the cooling liquid flows through the reservoir passing the heat exchanging surface and enters the inlet of the pump. After having been passed through the pump, the cooling liquid is passed out of the outlet of the pump and further out through the tube outlet connection 16. The figure also shows a lid 17 for the reservoir. The flow of the cooling liquid inside the reservoir and trough the pump may be further optimized in order to use as little energy as possible for pumping the cooling liquid, but still having a sufficient amount of heat from the heat exchanging surface being dissipated in the cooling liquid. This further optimization can be established by changing the length and shape of the tube connection inlet within the reservoir, and/or by changing the position of the pump inlet, and/or for instance by having the pumping device placed in the vicinity and in immediate thermal contact with the heat exchanging surface and/or by providing channels or segments inside the reservoir.

In this case, an increased turbulence created by the pumping device is used to improve the exchange of heat between the heat exchanging surface and the cooling liquid. Another or an additional way of improving the heat exchange is to force the cooling liquid to pass through specially adapted channels or segments being provided inside the reservoir or by making the surface of the heat exchanging surface plate inside the reservoir uneven or by adopting a certain shape of a heat sink with segments. In the figure shown, the inner surface of the heat exchanging surface facing the reservoir is plane.

FIG. 8 is a perspective view of the cooling system showing the reservoir housing 14 with the heat exchanging surface (not shown) and the pump (not shown) inside the reservoir. The tube inlet connection and the tube outlet connection are connected to a heat radiator by means of connecting tubes 24 and 25 through which the cooling liquid flows into and out of the reservoir and the heat radiator, respectively. Within the heat radiator 11, the cooling liquid passes a number of channels for radiating the heat, which has been dissipated into the cooling liquid inside the reservoir, and to the surroundings of the heat exchanger. The air fan 10 blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir.

According to the invention, the heat radiator 11 may be provided alternatively. The alternative heat radiator is constituted by a heat sink, such as a standard heat sink made of extruded aluminum with fins on a first side and a substantially plane second side. An air-fan may be provided in connection with the fins along the first side. Along the second side of the heat sink a reservoir is provided with at least one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the substantial plane side of the heat sink. When closing the reservoir in such a way a surface of the heat sink is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the at least one aperture. This alternative way of providing the heat radiator may be used in the embodiment shown in FIG. 8 or may be used as a heat radiator for another use and/or for another embodiment of the invention.

A pumping means for pumping the cooling liquid trough the reservoir may or may not be provided inside the reservoir at the heat sink. The reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir. Channels or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. If channels or segments in the reservoir are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting.

By means of the alternative heat radiator, the heat radiator 11 is not provided as is shown in the figure with the rather expensive structure of channels leading the cooling liquid along ribs connecting the channels for improved surface of the structure. Instead, the heat radiator is provided as described as a unit constituted by a heat sink with or without a fan and a reservoir, and thereby providing a simpler and thereby cheaper heat radiator than the heat radiator 11 shown in the figure.

The alternative heat radiator provided as an unit constituted by a heat sink and a reservoir, may be used solely, with or without a pump inside the reservoir and with or without the segments or channels, for being placed in direct or indirect thermal contact with a heat generating processing unit such as CPU or with the heat exchanging surface, respectively. These embodiments of the invention may e.g. be used for a reservoir, where the cooling liquid along a first side within the reservoir is in direct heat exchanging contact with the heat generating processing unit such as a CPU and the cooling liquid along a second side within the reservoir is in direct heat exchanging contact with a heat sink. Such a reservoir may be formed such as to provide a larger area of heat exchanging surface towards the heat generating processing unit such as a CPU than the area of the heat exchanging surface facing the heat sink. This may e.g. have the purpose of enlarging the area of the heat exchanging surface so as to achieve an improved heat dissipation form e.g. the CPU to the heat sink than that of a conventional heat sink without a reservoir attached. Conventional heat sinks normally only exchanges heat with the CPU through the area as given by the area of the top side of the CPU. A system comprising a liquid reservoir and a heat sink with a fan provided has been found to be a simple, cost optimized system with an improved heat dissipation than that of a standard heat sink with a fan, but without the reservoir. In another embodiment of the invention, which may be derived from FIG. 8, the air fan and the heat radiator is placed directly in alignment of the reservoir. Thereby, the reservoir housing 14, the air fan 10 and the radiator 11 constitute an integrate unit. Such an embodiment may provide the possibility of omitting the connection tubes, and passing the cooling liquid directly from the heat radiator to the reservoir via an inlet connection of the reservoir, and directly from the reservoir to the heat radiator via an outlet connection of the reservoir. Such an embodiment may even render the possibility of both the pumping device of the liquid pump inside the reservoir and the electrical motor for the propeller of the air fan 23 of the heat radiator 11 being driven by the same electrical motor, thus making this electrical motor the only motor of the cooling system.

When placing the heat radiator on top of the air fan now placed directly in alignment with the reservoir and connecting the heat radiator directly to the inlet connection and outlet connection of the reservoir, a need for tubes will not be present. However, if the heat radiator and the reservoir is not in direct alignment with each other, but tubes may still be needed, but rather than tubes, pipes made of metal such as copper or aluminum may be employed, such pipes being impervious to any possible evaporation of cooling liquid. Also, the connections between such pipes and the heat radiator and the reservoir, respectively, may be soldered so that even the connections are made impervious to evaporation of cooling liquid.

In the derived embodiment just described, an integrated unit of the reservoir, the heat exchanging surface and the pumping device will be given a structure establishing improved heat radiating characteristics because the flow of air of the air fan may also be directed along outer surfaces of the reservoir. If the reservoir is made of a metal, the metal will be cooled by the air passing the reservoir after having passed or before passing the heat radiator. If the reservoir is made of metal, and if the reservoir is provided with segments on the outside surface of the reservoir, such cooling of the reservoir by the air will be further improved. Thereby, the integrated unit just described will be applied improved heat radiating characteristics, the heat radiation function normally carried out by the heat radiator thus being supplemented by one or more of the further elements of the cooling system, i.e. the reservoir, the heat exchanging surface, the liquid pump and the air fan.

FIG. 9-10 show an embodiment of a reservoir housing 14, where channels 25 are provided inside the reservoir for establishing a forced flow of the cooling liquid inside the reservoir. The channels 25 in the reservoir housing 14 lead from an inlet 15 to an outlet 16 like a maze between the inlet and the outlet. The reservoir housing 14 is provided with an aperture 27 having outer dimensions corresponding to the dimensions of a free surface of the processing unit 1 to be cooled. In the embodiment shown, the processing unit to be cooled is a CPU 1.

When channels 26 are provided inside the reservoir, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps manufactured by injection molding, or is to be made of metal such as aluminum, perhaps manufactured by extrusion or by die casting.

The reservoir housing 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The CPU 1 is intended for being positioned in the aperture 27, as shown in FIG. 10, so that outer boundaries of the CPU are engaging boundaries of the aperture. Possibly, a sealant (not shown) may be provided along the boundaries of the CPU and the aperture for ensuring a fluid tight engagement between the boundaries of the CPU and the boundaries of the aperture. When the CPU 1 is positioned in the aperture 27, the free surface (not shown) of the CPU is facing the reservoir, i.e. the part of the reservoir having the channels provided. Thus, when positioned in the aperture 27 (see FIG. 10), the free surface of the CPU 1 is having direct contact with cooling liquid flowing through the channels 26 in the reservoir.

When cooling liquid is forced from the inlet 15 along the channels 26 to the outlet 16, the whole of the free surface of the CPU 1 will be passed over by the cooling liquid, thus ensuring a proper and maximized cooling of the CPU. The configuration of the channels may be designed and selected according to any one or more provisions, i.e. high heat dissipation, certain flow characteristics, ease of manufacturing etc. Accordingly, the channels may have another design depending on any desire or requirement and depending on the type of CPU and the size and shape of the free surface of the CPU. Also, other processing units than a CPU may exhibit different needs for heat dissipation, and may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the channels. If the processing unit is very elongate, such as a row of microprocessors, one or a plurality of parallel channels may be provided, perhaps just having a common inlet and a common outlet.

FIG. 11-13 show an embodiment of a heat sink 4, where segments 28 are provided at a first side 4A of the heat sink, and fins 29 for dissipating heat to the surroundings are provided at the other, second side 4B of the heat sink. An intermediate reservoir housing 30 is provided having a recessed reservoir at the one side facing the first side 4A of the heat sink. The recessed reservoir 30 has an inlet 31 and an outlet 32 at the other side opposite the side facing the heat sink 4.

When segments 28 are provided on the first side 4A of the heat sink, the shape of the segments may be decisive of whether the reservoir, which is made from metal such as aluminum or copper, is to be made by extrusion or is to be made by other manufacturing processes such as die casting. Especially when the segments 28 are linear and are parallel with the fins 29, as shown in the embodiment, extrusion is a possible and cost-effective means of manufacturing the heat sink 4.

The intermediate reservoir 30 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The recessed reservoir is provided with a kind of serration 33 along opposite sides of the reservoir, and the inlet 31 and the outlet 32, respectively, are provided at opposite corners of the intermediate reservoir 30. The segments 28 provided at the first side 4A of the heat sink, i.e. the side facing the intermediate reservoir 30, are placed so that when the heat

sink is assembled with the intermediate reservoir housing (see FIG. 13) the segments 29 run from one serrated side of the reservoir to the other serrated side of the reservoir.

When cooling liquid is forced from the inlet 31 through the reservoir, along channels (not shown) formed by the segments 29 of the heat sink 4 and to the outlet 32, the whole of the first side 4A of the heat sink will be passed over by the cooling liquid, thus ensuring a proper and maximized heat dissipation between the cooling liquid and the heat sink. The configuration of the segments on the first side 4A of the heat sink and the configuration of the serrated sides of the intermediate reservoir housing may be designed and selected according to any provisions. Accordingly, the segments may have another design, perhaps being wave-shaped or also a serrated shape, depending on any desired flow characteristics of the cooling liquid and depending on the type of heat sink and the size and shape of the reservoir.

Also other types of heat sinks, perhaps circular shaped heat sinks may exhibit different needs for heat dissipation, may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the segments and the intermediate reservoir. If the heat sink and the reservoir are circular or oval, a spiral-shaped segmentation or radially extending segments may be provided, perhaps having the inlet or the outlet in the centre of the reservoir. If an impeller of the pump is provided, as shown in FIG. 15-16, the impeller of the pump may be positioned in the centre of a spiral-shaped segmentation or in the centre of radially extending segments.

FIG. 14 shows the reservoir housing 14 shown in FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 shown in FIG. 11-13 being assembled for thereby constituting an integrated monolithic unit. It is not absolutely necessary to assemble the reservoir housing 14 of FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 of FIG. 11-13 in order to obtain a properly functioning cooling system. The inlet 15 and the outlet 16 of the reservoir housing 14 of FIG. 9-10 may be connected to the outlet 32 and the inlet 31, respectively, of the intermediate reservoir of FIG. 11-13 by means of tubes or pipes.

The reservoir housing 14 of FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 of FIG. 11-13 may then be positioned in the computer system at different locations. However, by assembling the reservoir housing 14 of FIG. 9-10 and the heat sink 4 and the intermediate reservoir 30 of FIG. 11-13 a very compact monolithic unit is obtained, also obviating the need for tubes or pipes. Tubes or pipes may involve an increased risk of leakage of cooling liquid or may require soldering or other special working in order to eliminate the risk of leakage of cooling liquid. By eliminating the need for tubes or pipes, any leakage and any additional working is obviated when assembling the cooling system.

FIG. 15-16 show a possible embodiment of a reservoir according to the invention. The reservoir is basically similar to the reservoir shown in FIG. 9-10. However, an impeller 33 of the pump of the cooling system is provided in direct communication with the channels 26. Also, in the embodiment shown, a heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed between the channels 26 inside the reservoir and the CPU 1 as the processing unit.

The heat exchanging surface 4 is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU 1 (see FIG. 4). However, also the inner surface (not shown, see FIG. 7) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

The provision of the heat exchanging surface 4 need not be a preferred embodiment, seeing that the solution incorporating the aperture (see FIG. 9-10) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging surface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging surface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

In the embodiment shown, the heat exchanging surface 4 is secured to the reservoir by means of bolts 22. Other convenient fastening means may be used. The heat exchanging surface 4 and thus the reservoir housing 14 may be fastened to the CPU 1 or other processing unit by any suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging surface. One such means may be the fastening means shown in FIG. 4 and FIG. 5 or similar fastening means already provided as part of the computer system.

When channels 26 are provided inside the reservoir housing 14, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting.

The reservoir housing 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The impeller 33 (see FIG. 14) of the pump is positioned in a separate recess of the channels 26, said separate recess having a size corresponding to the diameter of the impeller of the pump. The recess is provided with an inlet 34 and an outlet 35 being positioned opposite an inlet 31 and an outlet 32 of cooling liquid to and from, respectively, the channels 26. The impeller 33 of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. in a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer system supplying DC electrical power, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump. However, in the embodiment shown, the impeller of the pump is driven by a 12V electrical motor.

FIG. 17 shows a preferred possible embodiment of a reservoir according to the invention. The reservoir housing 14, as shown in FIGS. 17 and 20, is in the form of a double-sided chassis configured to mount an electrical motor. The reservoir housing 14 has basically the same features as the reservoir housing shown in FIG. 15-16. In the embodiment shown, the reservoir substantially has a conical, circular configuration and is provided with stiffening ribs 36 extending axially along the exterior of the reservoir housing 14.

Other shapes such as cylindrical, circular, or conical rectangular or cylindrical, rectangular or even oval or triangular shapes may be adopted, when designing and possibly injection molding or casting the reservoir. The dimension of the embodiment shown is approximately 55 mm in diameter and also 55 mm in axial extension.

The reservoir housing 14 has a recess 40 in the centre on the upper side_of the reservoir. The recess 40 is intended for accommodating a stator 37 of an electrical motor driving an impeller 33 of the pump, said impeller being attached to a shaft 38 of a rotor 39 of the electrical motor. The recess 40 has an orifice 41, four sidewalls 42, a bottom 43 and a circular jacket 44 extending from the bottom 43 of the recess 40 and outwards towards the orifice 41 of the recess 40. The interior (see FIG. 20) of the jacket 44 is intended for encompassing the rotor 39 of the pump. As shown in FIG. 20, the impeller 33 is housed in a recess on the underside of the reservoir housing 14, the recess being an extension of the interior of the jacket 44.

Thereby, a liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system.

Along an outer circumferential extension, the reservoir housing 14 is provided with protrusions 45 extending outwardly from the circumferential extension. The protrusions are intended for cooperating with a clip (see description below) for fastening the reservoir housing 14 to the CPU or other processing unit of the computer system. The protrusions 45 are shown as a plurality of singular protrusions. Alternatively, the protrusions may be only one continuous protrusion extending outwardly and around the circumferential extension.

The reservoir housing 14 may also be provided with an inlet (not shown) and an outlet (not shown) for the cooling liquid. The inlet and the outlet are provided along a surface of the reservoir facing downward and inwards when seen in the perspective view of the drawing. The inlet and the outlet lead to a radiator (not shown) intended for cooling the cooling liquid after having been heated by the processing unit via a heat exchanging surface (see description below).

The radiator may be placed nearby or distant from the reservoir housing 14, depending on the set-up of the computer system. In one possible embodiment, the radiator is placed in the immediate vicinity of the reservoir, thereby possible excluding any tubing extending between the radiator and the inlet and the outlet, respectively. Such embodiment provides a very compact configuration of the entire cooling system, namely a monolithic configuration where all elements needed for the cooling system are incorporated in one unit.

In an alternative embodiment, the reservoir housing 14 itself also constitutes the radiator of the cooling system. In such embodiment, an inlet and an outlet are not needed. If the reservoir is made of a metal such as copper or aluminum or other material having a high thermal conductance, the cooling liquid, after having been heated by the processing unit via a heat exchanging surface 8 see description below) may radiate the heat via the exterior surface of the reservoir housing 14 itself. In such embodiment, the ribs 36 along the exterior surface of the reservoir housing 14 may also, or may instead, function as cooling fins. In such embodiment, the fins will have a smaller dimension than the transverse dimension of the ribs 14 shown in FIG. 17, and the number of fins will be greater than the number of fins shown in FIG. 17.

An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 formed by impeller cover 46A having an outlet 34 provided tangentially to the circumference of the impeller 33. Thus, the pump functions as a centrifugal pump. The inlet of the pump chamber 46 is the entire opening into the cavity that the pump chamber configures, said cavity being in direct communication with the interior of the reservoir housing 14 as such. An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber 47A provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber 47A provided at the opposite of the intermediate member 47 to the interior of the reservoir housing 14. Thus, the area enclosed between the underside of the reservoir housing 14 and the heat exchange surface 4 constitutes an enclosed space for circulating the cooling liquid therethrough. The enclosed spaced is divided into two separate chambers by the impeller cover 46A and the intermediate member 47, as shown in FIG. 20. The impeller cover 46A interfaces with the recess on the underside of the reservoir 14 to define the pump chamber 46 which houses the impeller 33, while the intermediate member 47 and the heat exchange surface 4 together define the thermal exchange chamber 47A.

In the embodiment shown, a heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47.

The heat exchanging interface 4 is preferably made from a copper plate having a plane outer surface (not shown) at the opposite side as the side shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see FIG. 4). The inner surface facing the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47 is provided with pins 4A extending from the base of the copper plate and into the thermal exchange chamber (not shown) at the opposite side of intermediate member 47. The pins 4A constitutes an uneven surface and may either be provided during casting of the copper plate or may be provided by means of milling or other machining process of a copper plate. The pins provide a network of channels across the inner surface of the heat exchanging interface, along which network the cooling liquid is intended to flow.

Alternatively, also the inner surface of the copper plate facing the reservoir is plane. In this alternative embodiment, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown. No milling or other machining process of the inner and/or the outer surface need be provided, when both the outer surface and the inner surface is plane.

The provision of the heat exchanging interface 4 need not be a preferred embodiment, seeing that the solution incorporating the aperture (see FIG. 9-10) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging interface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging interface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

In the embodiment shown, the heat exchanging interface 4 is secured to the intermediate member 47 by means of gluing or other means ensuring a proper and liquid-tight fastening of the heat exchanging interface with the intermediate member. Any other suitable and convenient means (not shown) for securing the heat exchanging interface to the intermediate member may be envisaged.

The heat exchanging interface and thus the reservoir is fastened to the top of the CPU by means of a clip 50. The clip 50 has a circular configuration and has four legs 51 extending axially from the circular configuration. The four legs 51 are provided with footing 52 and the footings 52 are provided with holes 53. The clip 50 is intended for being displaced around the exterior of the reservoir housing 14 and further axially to the protrusions 45 of the reservoir housing 14.

The clip 50, after having been placed around the reservoir housing 14, is fastened to the motherboard of the computer system by means of bolts (not shown) or the like fastening means extending through the holes 53 in the footings 52 and further though corresponding holes in the motherboard. The corresponding holes in the motherboard are preferably holes already available in the motherboard in the vicinity of the CPU and the socket of the CPU, respectively. Accordingly, the legs 51 and the footings 52 of the clip 50 are specially designed in accordance with the already provided holes in the motherboard.

Alternatively, the heat exchanging interface 4 and thus the reservoir housing 14 may be fastened to the CPU or other processing unit by any other suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging interface. One such means may be the fastening means shown in FIG. 4 and FIG. 5 or similar fastening means already provided as part of the computer system.

When stiffening and/or cooling fins 36 are provided at the exterior of the reservoir housing 14, the shape of and the number of fins may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting. Also, the purpose of the fins i.e. just for stiffening the reservoir, or also or instead for cooling purposes, may be decisive of whether the reservoir is to be made of plastic, perhaps by injection molding, or is to be made of metal such as aluminum, perhaps by die casting.

The reservoir housing 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metalized" in order to minimize liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The impeller 33 of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. In a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V AC power or 220V AC power. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by either an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer system supplying DC electrical power, this may be nevertheless be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump.

In every aspect of the invention, where an AC motor is used for driving an impeller from a DC motor, although this way of configuring a pump is contradictory, the following preferred mode of operation is established for alleviating the disadvantages:

In order to be able to control direction of rotation of the impeller attached to the rotor and to optimize the conditions of maximum average torque value during starting, i.e. from zero speed up to the synchronous speed, an electronic control circuit is used. The electronic control circuit comprises a processing unit, which drives a static power switch, constituted for example by a triac arranged in series between the alternating-voltage power, which is obtained from the DC power supply of the computer system, and the AC motor. The same series network also includes a detector for the current I which flows through the triac and then through the AC motor. The output of the current detector is an input signal for the electronic processing unit.

The electronic control circuit may also comprise a number or sensors suitable for detecting the position and polarity of the permanent magnets comprised in the rotor of the AC motor, both when the rotor is moving and when it is in particular operating conditions, or when it is motionless or stalled at zero speed. The number of position sensors may be

Hall sensors, encoders or optical or electromechanical sensors capable of establishing and/or measuring the position of the rotor. The output signal from the number of position sensors is an input signal for the electronic processing unit.

Alternatively, the output signal from the position sensor may be phase shifted by means of an electronic phase shifting circuit before the output signal is sent to the input of the electronic processing unit.

A third signal may be input to the processing unit, said third signal enabling the processing unit to detect the polarity of the AC voltage applied to the AC motor. However, the third signal is not compulsory.

The signals input to the electronic processing unit are converted into digital form and after being processed by the processing unit, an output signal is provided by the processing unit. The output signal is used for closing or opening the static switch constituted by a triac arranged in series with the AC motor.

In the electronic processing unit, the current signal provided by the current sensor enters a zero-crossing detector which provides in output a logical "1" signal indicating that said current approaches zero with a positive or negative deviation from the zero value of said current. This deviation depends on the type of motor used and on its application, as well as on the type of static power switch being used. The signal arriving from the position sensor enters a phase-shift and processing circuit the output whereof is 1 or 0 according to the position and polarity of the rotor.

In the electronic processing unit, the phase shifted position signal as well as the signal processed from the AC voltage, enter an electronic logic XOR gate which outputs a "1" signal if the digital value of the AC voltage is equal to "0" and the digital value of the phase shifted position signal is equal to "1" or the digital value of the AC voltage is equal to "1" and the digital value of the phase shifted position signal is equal to "0".

The output of the zero-crossing detector and the output of the XOR gate, thus in digital form, enter an electronic logic AND gate which provides in output the control signal for closing or opening the static power switch.

The AND gate with two inputs and the signal processing system allow determining two conditions: 1) the AC voltage signal is positive, the current is proximate to zero, and the rotor rotation angle is between 0 degrees and 180 degrees; 2) the AC voltage signal is negative, the current is proximate to zero, and the rotor rotation angle is between 180 degrees and 360 degrees. These two conditions provide the same rotation direction of the rotor of the AC motor.

FIG. **18** shows an embodiment of an AC motor in which one stator pole **54** is longer than the other stator pole **55** by an amount indicated by I. With this configuration the permanent-magnet rotor **39** with an ideal line **56** separating the north N and the south S of the rotor, is positioned so that the ideal line **56** do not coincide with the median axis **57** of the stator **37**, but so that the ideal line **56** is tilted by a certain angle .alpha. in respect to the median **57** of the stator **37**.

Two energizing windings **58**, **59** are provided on the two poles **54**,**55** of the stator **37**, respectively, and the energizing windings are connected in series and are powered, through terminals (not shown), by an AC power source. With this configuration of the AC motor, the motor is able to start more easily in an intended rotational direction of the rotor.

In a preferred embodiment of the invention, the control electronics supplies the AC motor with only a half-wave voltage signal during start up, thereby providing torque pulses to the rotor. Since only a half-wave voltage signal is supplied to the motor, the torque pulses are always unidirectional and will therefore force the rotor to start rotating in a required direction. The required direction of rotation is determined by the design of the impeller attached to the rotor and by polarity of the half-wave voltage signal.

After some amount of time, in which a number of half-wave voltage signals has been supplied to the motor, the rotor will stop rotating at a certain position e.g. as shown in the figure. Thus, the rotor is brought into a determined steady state position that is independent of its start position. Subsequent to this process, the AC motor is supplied with a full-wave voltage signal that will accelerate the rotor until the motor enters synchronous operation, that is, when the rotor rotates with the same cyclic frequency as the frequency of the AC voltage source.

The initial polarity of the AC voltage signal is determinative for the resulting direction of rotation of the rotor, thus if the initial voltage is positive with an increasing amplitude, the rotor will start rotating in one direction, whereas if the voltage is negative with a decreasing amplitude, the rotor will start rotating in an opposite direction.

The number of half-waves required for bringing the rotor into a determined steady state position, where the rotor stops rotating, depends on the characteristics of the motor such as moment of inertia and the external load applied to the rotor. Thus, the number of half-waves required is based on empirical analysis of a particular motor in particular load conditions.

The half-wave voltage signal and the corresponding half-wave current signal supplied to the motor will have an appearance as shown in FIG. **19**.

In an alternative embodiment the control electrics used to drive the AC motor shown if FIG. **18** is configured so that that the control electronics dictates the AC motor to stop at a predetermined position by supplying the motor with a number of half-wave voltage signals subsequent to the synchronous operation in which the motor was supplied with a full-wave voltage signal. Thus, at the time the motor needs to be started again, the rotor is already in a position so that only the polarity of the full-wave AC voltage signal supplied to the motor must be chosen so that the resulting direction of rotation of the rotor is in conformity with the terminal position of the rotor at the last operation.

According to this method, the initial step of bringing the rotor into a determined steady state position by supplying the motor with a number of half-wave voltage signals is not required. Even in the alternative, it will be possible to both terminate the full-wave power supply with a number of half-wave voltage signals as well as commencing the full-wave power supply by initially supplying the motor with a number of half-wave signals. However, this is more cumbersome, but nevertheless more safe.

FIG. **19** shows a voltage signal V and a current signal I applied to the AC motor as well as the position signal of the rotor. Initially the rotor stands still, which is represented by the straight line L. The electronic control circuit controls the static power switch so that the voltage signal V and the current signal I are present as half-waves. Thus, the rotor receives torque pulses due to the current-voltage combination; these pulses are always one-way directional and tend to start the rotor moving in the required direction. Subsequent to the start-up phase, the rotor enters into its synchronous operation.

Thus, an AC signal is generated, preferably a 12 VAC signal, possibly by means of digital electric pulses from the 12 V DC power supply of the computer's power supply. Based on a possible sensor output relating to the impeller position, a decision is made of how to initiate the AC power signal, i.e. with a negative or positive half-wave, and by doing making sure the impeller starts in the same rotational direction each time and thus the performance benefits of the AC pump is similar to those of a DC pump.

Alternatively, the magnetic field sensor is omitted, and instead of reading the impeller position, the impeller is forced to be in the same position every time the impeller starts. To be sure the impeller is in a defined position before start, a signal is supplied to the stator of the AC motor for a defined period of time. The signal is supplied perhaps three times in a row according to the curvature of the electrical power source. The pulses must be within the same half-wave part of a signal period. The frequency of the pulsed signal is arbitrary, but may be 50/60 Hz, although, despite the fact that under normal circumstances an AC pump being driven by the AC signal from the power outlet of the public electrical power network and transformed from 230/115 V to 12V would not function, as there is no chance of changing the sine signal from the public network.

By this way the impeller will be forced to the right polarity before start, and the pump will start turning the impeller in a defined way of rotation when the power signal full-wave is supplied. The full-wave power signal, which is supplied, must start in the opposite signal half-wave amplitude than that of the initial half-wave pulses, that was supplied before start of the full-wave power signal.

The invention has been described with reference to specific embodiments and with reference to specific utilization, it is to be noted that the different embodiments of the invention may be manufactured, marketed, sold and used separately or jointly in any combination of the plurality of embodiments. In the above detailed description of the invention, the description of one embodiment, perhaps with reference to one or more figures, may be incorporated into the description of another embodiment, perhaps with reference to another or more other figures, and vice versa. Accordingly, any separate embodiment described in the text and/or in the drawings, or any combination of two or more embodiments is envisaged by the present application.

What is claimed is:

1. A cooling system for a heat-generating component, comprising:
- a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator and an impeller, the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;
- a reservoir adapted to pass the cooling liquid therethrough, the reservoir including:
  - a pump chamber including the impeller and formed below the chassis, the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through;
  - a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and
  - a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component; and
- a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.

2. The cooling system of claim 1, wherein the chassis shields the stator from the cooling liquid in the reservoir.

3. The cooling system of claim 1, wherein the heat-exchanging interface includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.

4. The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.

5. The cooling system of claim 4, wherein the features include at least one of pins or fins.

6. The cooling system of claim 1, wherein a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller.

7. The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.

8. The cooling system of claim 1, wherein the heat-exchanging interface includes one of copper and aluminum.

9. The cooling system of claim 1, wherein the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir.

10. A cooling system for a computer system, comprising:
- a centrifugal pump adapted to circulate a cooling liquid, the pump including:
  - an impeller exposed to the cooling liquid; and
  - a stator isolated from the cooling liquid;
- a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:
  - a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;
  - a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber, and wherein at least one of the one or more passages is offset from a center of the impeller.

11. The cooling system of claim 10, wherein a top wall of the reservoir physically separates the impeller from the stator.

12. The cooling system of claim 10, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component.

13. The cooling system of claim 10, further including a heat radiator fluidly coupled to the reservoir using flexible conduits, wherein the heat radiator is configured to be positioned remote from the reservoir.

14. The cooling system of claim 10, wherein the fluid passage that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller.

15. A cooling system for a heat-generating component, comprising:
- a pump adapted to circulate a cooling liquid, the pump including:
  - an impeller exposed to the cooling liquid; and
  - a stator isolated from the cooling liquid;
- a reservoir including an impeller cover, an intermediate member and a heat exchange interface, wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define

a thermal exchange chamber, the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together; and

wherein a first side of the heat-exchanging interface is in contact with a cooling liquid in the thermal exchange chamber and a second side of the heat-exchanging interface opposite the first side is configured to be placed in thermal contact with a surface of the heat-generating component; and

a liquid-to-air heat exchanger fluidly coupled to the reservoir using flexible conduits, the heat exchanger being configured to be positioned remote from the reservoir.

16. The cooling system of claim 15, wherein the impeller cover includes a first opening radially offset from a center of the impeller and the intermediate member includes a second passage that is aligned with the first opening, the first and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber.

17. The cooling system of claim 15, wherein the first side of the heat-exchanging interface includes at least one of pins or fins.

18. The cooling system of claim 15, wherein the top wall of the reservoir extends between the stator and the impeller and shields the stator from the cooling liquid in the reservoir.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO.	: 8,245,764 B2
APPLICATION NO.	: 13/269234
DATED	: August 21, 2012
INVENTOR(S)	: André Sloth Eriksen

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Claim 10, col. 28, line 37, "vertically spaced part" should read --vertically spaced apart--.

Signed and Sealed this
Twenty-fifth Day of September, 2012

David J. Kappos
Director of the United States Patent and Trademark Office

EXHIBIT 2

US007544049B2

(12) **United States Patent**
Koga et al.

(10) **Patent No.: US 7,544,049 B2**
(45) **Date of Patent: Jun. 9, 2009**

(54) **COOLING DEVICE AND CENTRIFUGAL PUMP TO BE USED IN THE SAME DEVICE**

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(73) Assignee: **Panasonic Corporation**, Osaka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 647 days.

(21) Appl. No.: **10/852,179**

(22) Filed: **May 25, 2004**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**
F04B 35/04 (2006.01)
H05K 7/20 (2006.01)

(52) **U.S. Cl.** **417/423.8**; 417/423.1; 417/423.14; 361/699

(58) **Field of Classification Search** 361/689, 361/699, 687, 701, 697, 698, 199; 417/423.14, 417/423.1, 423.8
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,764,483	A	6/1998	Ohashi et al.	
6,019,165	A	2/2000	Batchelder	
6,208,512	B1	3/2001	Goldowsky et al.	
6,327,145	B1	12/2001	Lian et al.	
6,351,384	B1	2/2002	Daikoku et al.	
6,408,937	B1 *	6/2002	Roy	165/104.33
6,829,142	B2 *	12/2004	Belady et al.	361/687
6,867,973	B2 *	3/2005	Chang	361/699
7,255,154	B2	8/2007	Koga et al.	
2003/0151130	A1 *	8/2003	Cheon	257/712
2004/0052048	A1 *	3/2004	Wu et al.	361/699
2004/0052663	A1	3/2004	Laing et al.	

(Continued)

FOREIGN PATENT DOCUMENTS

JP 05264139 A 10/1993

(Continued)

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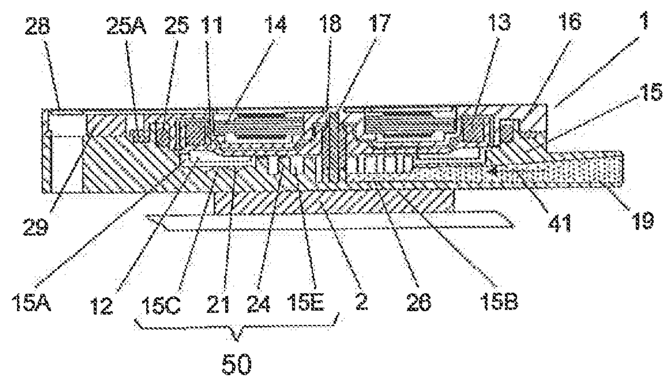
Assistant Examiner—Leonard J Weinstein
(74) *Attorney, Agent, or Firm*—Wenderoth, Lind & Ponack, L.L.P.

(57) **ABSTRACT**

A cooling device has a closed circulating channel for circulating coolant, and in the channel, a radiator and a contact-heat-exchanger type centrifugal pump are provided. A heat-producing electronic component contacts with the centrifugal pump, and the coolant in the pump collects the heat off the component due to the heat exchanging function. Then the heat is dissipated from the radiator. The pump includes a pump-casing made of highly heat conductive material and an impeller. The pump casing has a base wall and a cover wall opposite the base wall. The base wall has an outer wall face constituting a heat-receiving face, and an inner wall face facing the impeller. The impeller is disposed in a pump room defined between the base wall and cover wall of the casing. A sucking channel is provided between the heat-receiving face and an inner wall face of the pump room. This inner wall has a recess where protrusions extending toward the impeller or dimples are provided.

50 Claims, 5 Drawing Sheets



U.S. PATENT DOCUMENTS

2004/0123614 A1 * 7/2004 Stewart 62/259.2
2004/0190254 A1 * 9/2004 Hu et al. 361/699

FOREIGN PATENT DOCUMENTS

JP	7-143615		6/1995
JP	07142886	A	6/1995
JP	1 085 217		3/2001
WO	03/098415		11/2003
WO	WO03098415	A1 *	11/2003

* cited by examiner

FIG.1

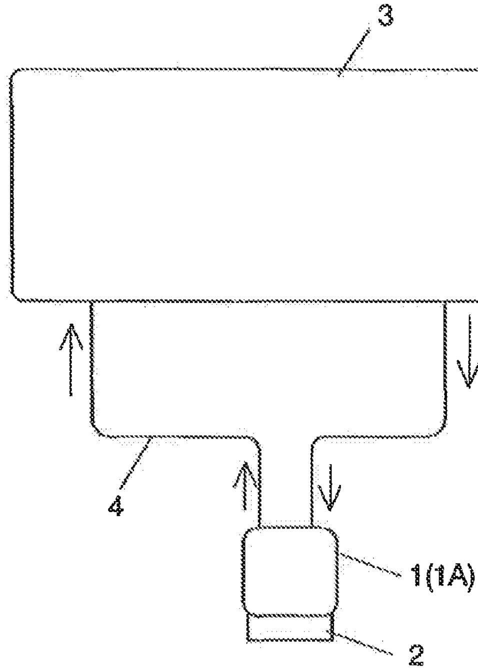


FIG.2

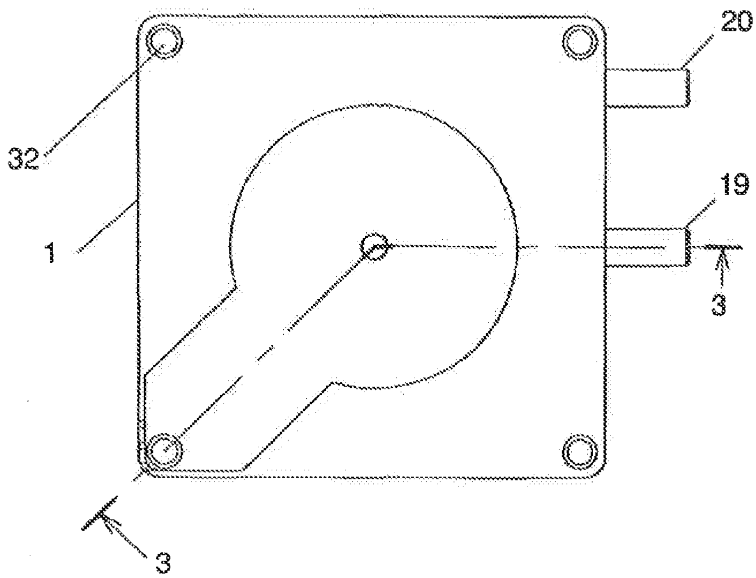
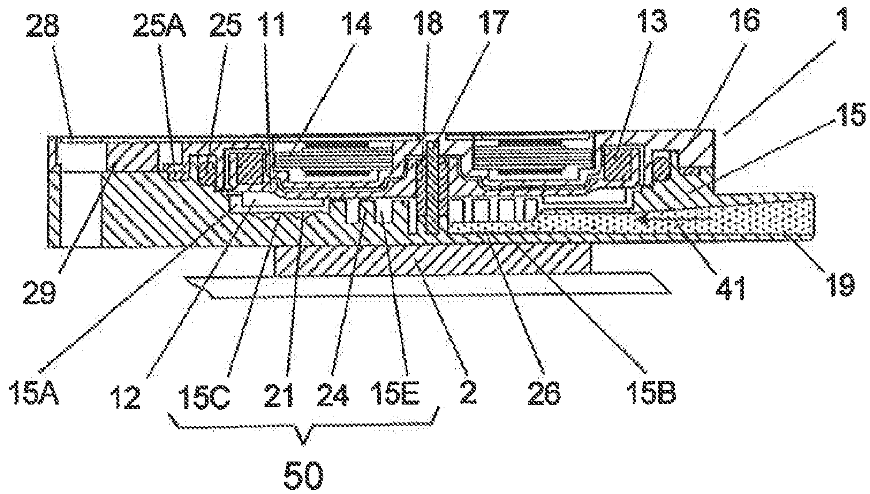


FIG.3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25A
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17
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15A
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15C
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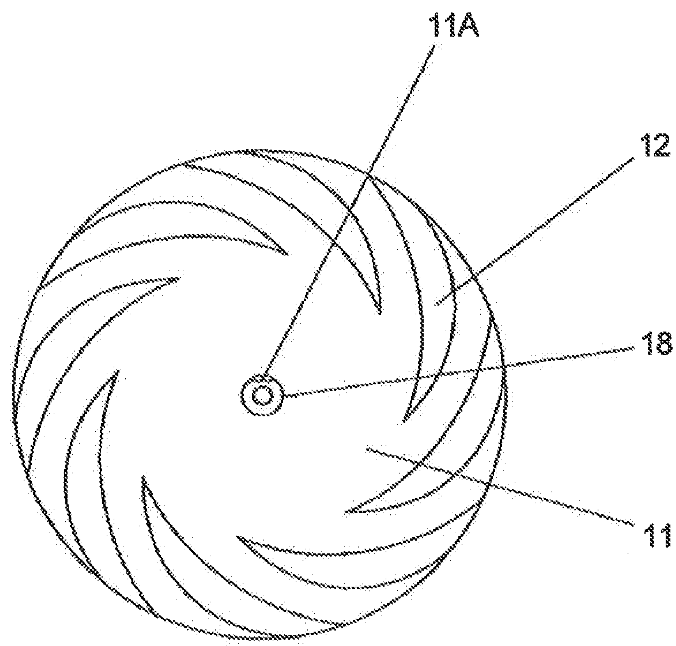
15E
2
26
15B
50

FIG.4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18
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FIG.5

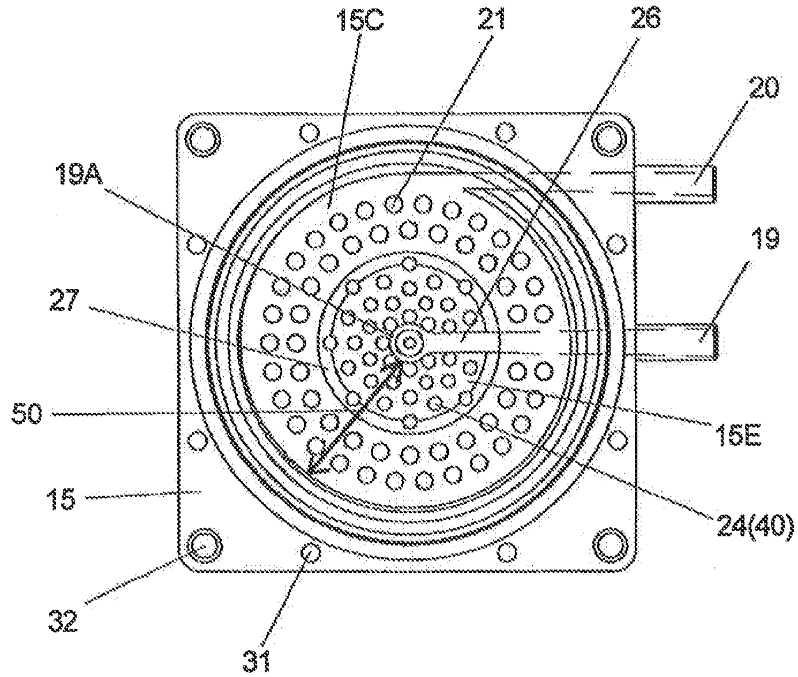


FIG.6

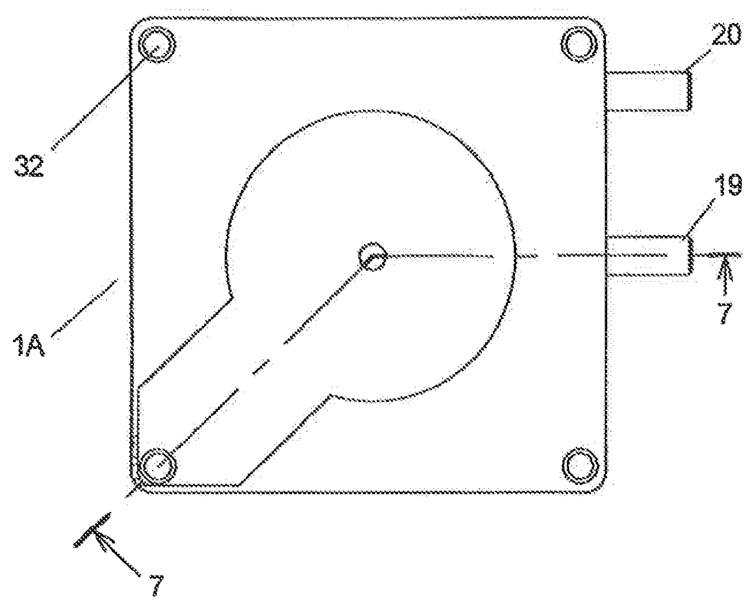
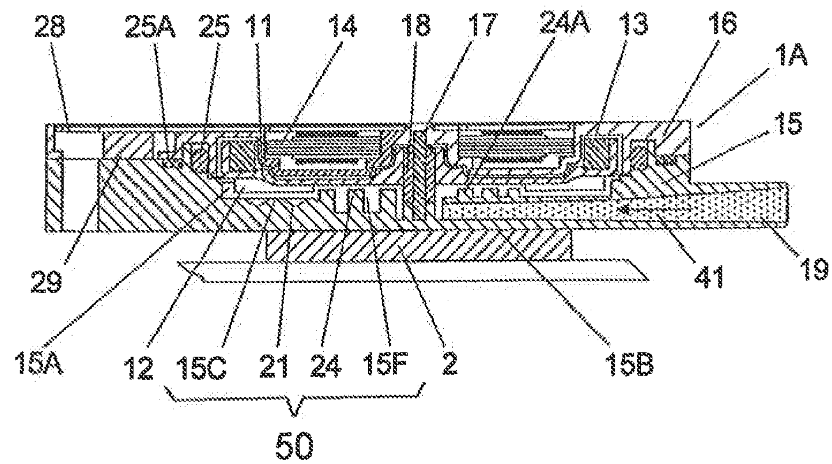


FIG.7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25A
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11
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18
17
24A
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16
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15
29
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15A
12
15C
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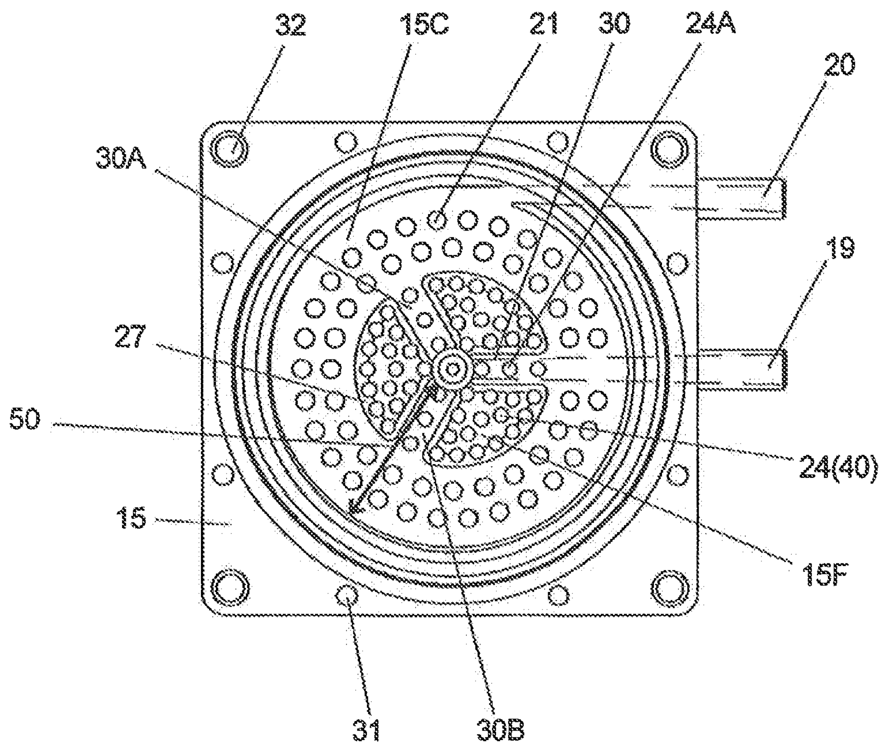
15F
2
15B
50

FIG.8


32
15C
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30A
19
27
50
24(40)
15
15F
31
30B

FIG.9 PRIOR ART

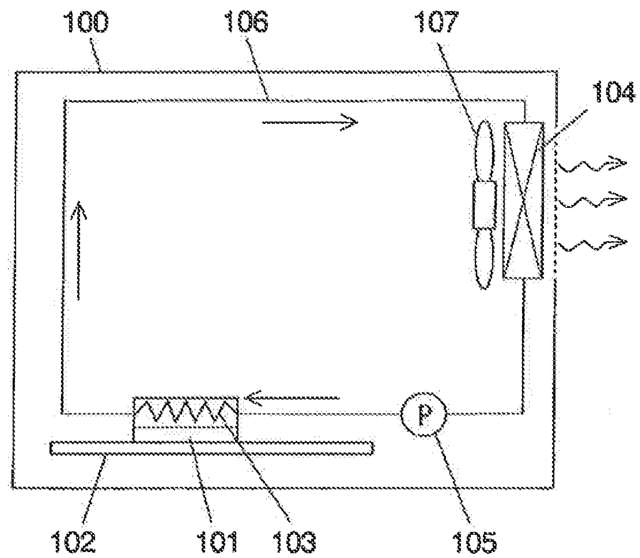
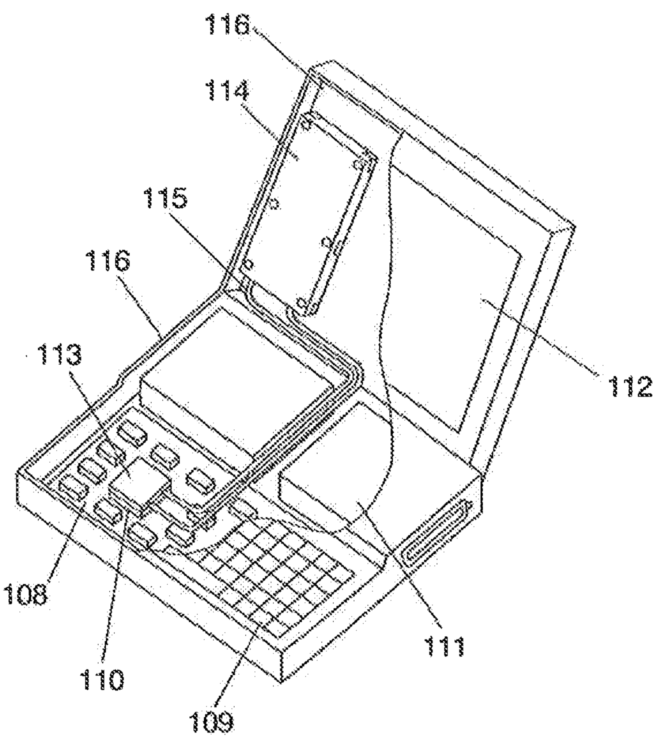


FIG.10 PRIOR ART



COOLING DEVICE AND CENTRIFUGAL PUMP TO BE USED IN THE SAME DEVICE

TECHNICAL FIELD

The present invention relates to a cooling device which cools heat-producing electronic components, such as a central processing unit (CPU), disposed in a housing by circulating coolant. It also relates to a centrifugal pump to be used in the cooling device.

BACKGROUND ART

A speed enhancement technology has been developed rapidly in the computer industry, so that a clock frequency of a CPU becomes substantially higher than a previous one. As a result, the CPU produces too much heat for a conventional heat sink to air-cool the CPU. Thus a cooling device of high power and high efficiency is vitally required. One of such cooling devices is disclosed in Japanese Patent Application Non-Examined Publication No. H07-142886. This cooling device circulates coolant through a substrate on which heat-producing electronic components are mounted, thereby cooling the substrate.

This conventional cooling device that circulates the coolant for cooling an electronic apparatus is described hereinafter. The electronic apparatus in this description refers to such an apparatus that carries out a process by loading a program to a CPU, in particular, a small size and portable apparatus such as a notebook-size computer. Besides the foregoing apparatus, the conventional cooling device can also cool an apparatus in which electronic components producing heat due to energizing are mounted.

A first conventional cooling device has a structure as shown in FIG. 9. Housing 100 accommodates circuit board 102, cooler 103 and radiator 104. Heat-producing electronic component (hereinafter referred to simply as component) 101 is mounted on board 102. Cooler 103 exchanges the heat between component 101 and coolant, thereby cooling component 101. Radiator 104 liberates the heat from the coolant. Pump 105 circulates the coolant through pipe 106, and fan 107 air-cools radiator 104.

An operation of the first conventional cooling device is described hereinafter. Pump 105 discharges the coolant, which then travels through pipe 106 and arrives at cooler 103, where the coolant collects heat off component 101 and its temperature thus rises. The coolant then travels to radiator 104, where fan 107 air-cools forcibly the coolant, so that its temperature lowers. The coolant returned to pump 15, and repeats the foregoing cycle. As discussed above, the coolant circulates through pipe 106, thereby cooling component 101.

The foregoing Non-Examined Publication also discloses a second conventional cooling device of which structure is shown in FIG. 10. When a heat-producing member is mounted in a confined housing, this second cooling device efficiently transfers the heat generated from the heat-producing member to a wall of the metal housing which works as a radiator, thereby cooling the heat-producing member.

An electronic apparatus includes circuit board 108, keyboard 109, heat-producing semiconductor element (hereinafter referred to simply as element) 110, disc device 111 and display device 112 accommodated in metal housing 116. The second cooling device thermally couples heat-producing element 110 to housing 116 with a heat-transport device having a flexible structure. The heat transport device includes a liquid flow channel mounted to element 110, and is formed of heat-receiving header 113, heat-radiating header 114 and flexible tube 115. Flat heat-receiving header 113 exchanges heat with element 110. Heat-radiating header 114 includes the liquid flow channel and contact with a wall of housing 116. Flexible tube 115 couples header 113 to header 114. A liquid driving mechanism integrated in heat-radiating header 114 drives or circulates the liquid that is sealed in the mechanism between heat-receiving header 113 and heat-radiating header 114. This liquid driving mechanism thus couples element 110 to housing 116 with ease regardless of the components arrangement, and transports the heat efficiently using the liquid movement. Since heat-radiating header 114 is thermally coupled to housing 116, which has a high heat conduction rate, the heat diffuses extensively to housing 116.

The first conventional cooling device, however, needs cooler 103, radiator 104, pump 105 and a refilling tank (not shown) for refilling pump 105 with the coolant. Those elements are assembled into the cooling device, so that the device becomes bulky and complicated. As a result, it is difficult to reduce the size of the device and the device becomes expensive. In other words, the first cooling device is basically fit for cooling a large size electronic apparatus, but is not suitable for a recent notebook-size computer which is compact, light-weight, slim, and carried in a variety of postures.

The second cooling device can be used in a notebook-size computer; however, both of heat-receiving header 113 and heat-radiating header 114 are box-shaped and substantially thick, which prevents the notebook-size computer from being slimmed. To be more specific, in the second cooling device, a reciprocating pump (not shown) is prepared in header 114. This pump has a rather narrower width than other pumps and works as the liquid driving mechanism; however, the thickness of header 114 is specified by this pump, so that the overall thickness cannot be reduced. As a result, the notebook-size computer cannot be further slimmed.

In the notebook size computer, it is difficult for heat-receiving header 113 to accommodate the reciprocating pump of the second cooling device. To be more specific, the thickness of the pump on top of the thickness of element 110 increases the height of the computer, and this configuration goes against the trend toward the slimmed-down design. Further, the reciprocating pump produces vibrations and noises, which influence element 110 on which the pump is placed. The vibrations and noises sometimes cause harsh grating noises. This configuration is thus difficult to be realized.

In the second cooling device, heat-radiating header 114 brought into contact with a wall of housing 116 has a limited heat-radiating area, so that it has a low heat conduction efficiency and a limited cooling power. Increasing a heat-radiating area is one of the ideas for boosting the cooling power; however, the larger area lengthens the liquid flow channel, and an amount of circulating coolant increases, which requires a greater power of the built-in reciprocating pump. The greater power of the pump needs, inconsistently, a greater thickness of header 114. Thus, the reciprocating pump can be independently accommodated in housing 116; however, in this case, another space must be prepared for the pump although the notebook-size computer has been ultimately downsized, and the assembly work becomes cumbersome. As discussed above, the second cooling device limits further downsizing of the notebook-size computer. To be more specific, the performance of the CPU will continue to increase, thereby requiring greater cooling power, so that the second conventional cooling device having the foregoing problems will no longer be used.

A conventional pump having a heat exchanger function needs a cooling water channel in the pump for cooling the coolant with the cooling water supplied separately, so that the pump becomes bulky and complicated. The pump also needs a second pump for circulating the cooling water and a second heat exchanger for collecting the heat off the cooling water, so that the cooling system becomes complicated and is difficult to downsize. The pump thus needs a number of components and its assembly work becomes inefficient. The conventional cooling devices thus cannot be expected to have better thermal efficiency or to be less expensive.

SUMMARY OF THE INVENTION

A cooling device of the present invention includes a radiator and a centrifugal pump of contact heat exchanger model, both disposed in a closed circulating channel in which coolant circulates. Heat-producing electronic components are brought into contact with the centrifugal pump, so that the coolant in the pump collects the heat off the electronic components due to its heat exchanger function, and the radiator of the cooling device dissipates the heat. The centrifugal pump includes a pump-casing made of highly heat conductive material and an impeller. The pump casing has a heat-receiving plane formed on a side face along an interior pump room, and a sucking channel prepared between the heat-receiving plane and an inner wall of the pump room. On the inner wall of the pump room, a recess is provided. In this recess, protrusions extending toward the impeller or dimples are provided. According to the present invention, the cooling device of a simple structure, which allows downsizing and slimming-down, is obtainable while its cooling efficiency is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a structure of a cooling device in accordance with an exemplary embodiment of the present invention.

FIG. 2 shows a front view illustrating an appearance of a centrifugal pump of heat-exchanger model, i.e. an element of the cooling device shown in FIG. 1.

FIG. 3 shows a sectional view of the centrifugal pump of heat-exchanger model shown in FIG. 2.

FIG. 4 shows a front view of an impeller of the centrifugal pump shown in FIG. 2.

FIG. 5 shows an appearance of a wall of a pump room disposed in the centrifugal pump shown in FIG. 2.

FIG. 6 shows a front view illustrating an appearance of another centrifugal pump of heat exchanger model, an element of the cooling device in accordance with the exemplary embodiment of the present invention.

FIG. 7 shows a sectional view of the centrifugal pump shown in FIG. 6.

FIG. 8 shows an appearance of an inner wall of an interior pump room in the centrifugal pump shown in FIG. 6.

FIG. 9 shows a structure of a first conventional cooling device that cools an electronic apparatus.

FIG. 10 shows a structure of a second conventional cooling device that cools an electronic apparatus.

DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 shows a structure of a cooling device in accordance with an exemplary embodiment of the present invention, FIG. 2 shows a front view illustrating an appearance of a centrifugal pump of heat-exchanger model, i.e. an element of the cooling device. FIG. 3 shows a sectional view of the centrifugal pump of heat-exchanger model taken out along line 3-3 in FIG. 2. FIG. 4 shows a front view of an impeller of the centrifugal pump shown in FIG. 2, and FIG. 5 shows an appearance of an inner wall of a pump room.

Centrifugal pump 1 of heat exchanger model (hereinafter referred to simply as pump 1) is an element of the cooling device. Heat-producing component 2 (hereinafter referred to simply as component) such as a CPU is, in general, a chip component having a flat surface. Pump 1 and component 2 are extremely small and mounted in a compact portable electronic apparatus such as a notebook-size computer. Radiator 3 radiates the heat collected from component 2 by coolant 41 to the outside. Closed circulating channel 4 couples pump 1 to radiator 3, thereby circulating coolant 41, which is liquid and preferably a water solution of propylene glycol which is harmless and used as a food additive. In the case of using aluminum or copper as a material of the casing, an anti-corrosion additive is preferably added in order to increase resistance to corrosion caused by those materials.

Radiator 3 is formed of material having a high heat conductivity and an excellent heat dissipating property, such as a thin plate of copper or aluminum. A coolant path and a reserve tank are formed in radiator 3. A fan can be prepared for forcibly air-cooling radiator 3 so that a better cooling effect can be expected. Circulating channel 4 is formed of flexible rubber having a low gas-permeability, such as butyl rubber tubing because this material allows a flexible piping layout as well as preventing bubbles from entering into the tube.

Next, an interior structure of pump 1 is described. Open impeller 11 has through hole 11A and open blades 12. Ring magnet 13 is inserted into impeller 11. Stator 14 is disposed inside ring-magnet 13. Pump casing 15 forms pump room 15A which accommodates impeller 11 while casing 15 restores kinetic energy, which impeller 11 has given to coolant 41, by a pressure recovery method and guides the energy to a discharge port. Pump room 15A restores kinetic energy, which blades 12 have given to supplied coolant 41, by the pressure recovery method and guides the energy to the discharge port.

Heat-receiving plane 15B is formed on an outer wall face of a base wall of casing 15 along pump room 15A, and brought into contact with component 2, thereby collecting heat off component 2. Heat-receiving plane 15B is formed on the outer wall face of casing 15 substantially parallel with a revolution surface of impeller 11. On radially outer wall surface 15C of the pump room 15A, a large number of dimples 21 are formed. A recess (recessed area) 15E defines a radially inner wall surface on a bottom of the pump room 15A that faces toward impeller 11, and has a large number of protrusions 24 projected from the radially outer wall surface and toward impeller 11. Recess 15E, slope 27, and radially outer wall surface 15C together define an inner wall face 50 of casing 15. Casing cover (cover wall) 16 accommodates impeller 11, and forms pump room 15A together with casing 15. As shown in FIG. 3, fixed shaft (rotary shaft) 17 is disposed to extend between the cover wall 16 and the base wall of casing 15 rotatively supports impeller 11. Fixed shaft 17 is equipped with bearing 18 provided at the center of impeller 11. Sucking channel 19 sucks coolant 41, and discharging channel 20 discharges coolant 41. Sucking channel 19 is disposed between heat-receiving plane 15B and inner wall face 50.

Sucking groove 26 is provided together with sucking channel 19 unitarily along a direction common to channel 19 and groove 26, and extends toward the rotational center of impeller 11. Sucking groove 26 is formed as a step down from recess 15E and communicates with recess 15E. Sucking groove 26 guides coolant 41 sucked through sucking channel 19 to near the rotational center of impeller 11. Slope 27 gradually goes uphill to radially outer wall surface 15C, which is a sloped step up from recess 15E. O-ring 25 seals the engagement between cover 16 and casing 15, and packing 25A functions similar to O-ring 25.

IC 29 regulates an output voltage applied to the windings of stator 14 and is mounted to control board 28. Screw holes 31 are provided for screwing cover 16 to casing 15. Springs or screws are inserted into fixing holes 32 for bringing pump 1 into contact with component 2, urging pump 1 toward component 2, or fixing pump 1 to component 2.

Cover 16 and casing 15 are assembled into the outer shell of pump 11. Of the cover 16 and the casing 15, at least the casing 15, is formed of material having a high thermal conductivity and an excellent heat dissipating property, e.g. copper or aluminum, of which thermal conductivity is 380-400 W/m·k and ca. 230 W/m·K respectively. It is preferable to use the material having at least the foregoing specific thermal conductivity.

Pump 1 has the following specifications: thickness is 5-50 mm; representative dimension of radial direction is 10-100 mm; flow rate is 0.2-5.0 L/minute; head is 0.2-4 m. More typical values are listed below: thickness along the axial direction of rotation is 7-40 mm; representative dimension of radial direction is 20-50 mm; flow rate is 0.3-3.0 L/minute; head is 0.35-2 m; and rpm is 2500-4000. If the specification of this pump is expressed in terms of specific speed, it can be 30-250 $m\cdot m^3$/minute rpm. This value proves that pump 1 is extraordinarily smaller and slimmer than the conventional pumps.

In pump 1, blades 12 of impeller 11 are disposed facing component 2, and heat-receiving plane 15B is formed to have a surface complementary to the upper surface of component 2, so that pump room 15A receives the heat via heat-receiving plane 15B. FIG. 3 shows that pump 1 is disposed above component 2; however pump 1 can be placed below component 2, or those elements can be laterally placed depending on the placement of component 2.

Stator 14 is press-fitted into cover 16 so that the outer rim of stator 14 faces the inner rim of ring-magnet 13. Cover 16 is placed between stator 14 and ring-magnet 13 as a partition for isolating those two elements, so that stator 14 is completely isolated from coolant 41 flowing through pump room 15A. Ring-magnet 13 is a magnet of which at least one face of its circumference is covered with soft magnetic material shaped like a ring. Impeller 11 can be unitarily formed with ring-magnet 13; however, it is separately formed from magnet 13 in this embodiment. In the case of a unitary design, impeller 11 is made of magnet material and a section thereof facing stator 14 is magnetized. Ring magnet 13 is rotated by the rotary magnetic field of stator 14, thereby rotating impeller 11. Then negative pressure occurs around the center of impeller 11, so that coolant 41 is sucked through sucking channel 19 communicating with impeller 11. Coolant 14 is discharged outside by kinetic momentum due to impeller 11. A discharge port (not shown) is provided to casing 15 at a section facing the outer rim of impeller 11, so that coolant 41 is discharged to circulating channel 4 via discharging channel 20.

Bearing 18 made of resin having abrasion resistance and low friction is press-fitted at the center of impeller 11, and fixed shaft 17 made of stainless steel is prepared inside bearing 18 with its two ends fixed at casing 15 and cover 16. Bearing 18 can be insert-molded with impeller 11 instead of being press-fitted. Fixed shaft 17 can also be insert-molded with cover 15 or press-fitted. As shown in FIG. 4, bearing 18 is provided with a D-cut on its outer wall-face, so that a space is prepared between a press-fit hole (not shown) of impeller 11 and bearing 18 per se. As a result, pump room 15A communicates with the backside of impeller 11. This space is used as through hole 11A deviated from the rotation center. Through hole 11A guides parts of coolant 41 pushed out due to the centrifugal force of impeller 11 to the backside of impeller 11, then the parts of coolant 41 pass through hole 11A and flow out to sucking inlet 19A of impeller 11 with negative pressure. In other words, the parts of coolant 41 flow back. Coolant 41 flowing back is mixed at sucking inlet 19A, so that flow-back coolant 41 is always replaced with another flow-back and never stays at one place.

Impeller 11 receives negative pressure around its center due to the centrifugal force of itself, so that cavitation tends to occur there. However, since pump 1 has specific speed of 30-250 $m\cdot m^3$/minute·rpm, the cavitation hardly occurs, and even if it occurs, it is mixed by the foregoing flow-back and discharged. The cavitation possibly generated will not stay around the center of impeller 11 because coolant 41 circulates so as to replace itself with incoming coolant at the backside of impeller 11 and sucking inlet 19A. If air is mixed somewhere in the cooling device, and if the air is sucked into pump 1, the bubbles will not stay around the center of impeller 11 due to the circulation, and the bubbles are discharged gradually. Therefore, there is little noise caused by the cavitation, and no gas space is formed, so that the flow becomes turbulent, which increases an amount of heat transferred.

In pump 1, recess 15E is provided around the center of inner wall face 50 of the pump room of casing 15, and cylindrical protrusions (surface-area-increasing parts) 24 extend from the bottom face of recess 15E toward impeller 11. This structure reduces the overall thickness of pump 1 by the depth of recess 15E, so that the heat transferred from the electronic component to casing 15 can be collected by coolant 41 with ease. As discussed above, the thickness of pump 1 is reduced as much as possible while the performance of pump 1 is maintained, so that a high heat-collecting efficiency is achieved.

In this embodiment, blades 12 are disposed radially outside the area having protrusions 24 instead of being disposed within the area, so that impeller 11 is placed nearer to casing 15. This structure reduces the overall thickness of the pump, and yet, the height of protrusions 24 becomes greater. If the thickness of the pump can increase in some degree, blades 12 can be provided within the area of protrusions 24, i.e. above protrusions 24.

Sucking channel 19 does not have a hole-shape all the way to the center of impeller 11, but its upper thickness is removed to form sucking groove 26, so that recess 15E and protrusions 24 can be formed. This structure allows pump 1 to reduce its overall size while its performance is maintained.

Further, as shown in FIG. 3, a number of dimples 21 are formed on at least a part of a section, where impeller 11 slides, of radially outer wall surface 15C (backside of heat-receiving plane 15B). In this structure, coolant 41 flowing due to the rotation of impeller 11 peels a laminar boundary layer formed on radially outer wall surface 15C, so that coolant 41 flows turbulently. As a result, an amount of heat transferred from heat-receiving plane 15B to coolant 41 becomes greater. The presence of dimples 21 at the sliding section of impeller 12 facilitates peeling of the laminar boundary layer of coolant 41 off radially outer wall surface 15C, so that the amount of the heat transferred from heat-receiving plane 15B to coolant 41 becomes even greater. In this case, the torque necessary for spinning impeller 11 increases a little, so that the placement and the number of dimples should be designed appropriately to the torque tolerance. Radially outer wall surface 15C can undergo a shot peening process or a sand blasting process to form peaks and valleys thereon or roughening itself. Such a process can also increase the heat collecting efficiency based on the same principle though the effect is rather low. Although it is not shown in the accompanying drawings, a spiral groove can be formed on radially outer wall surface 15C for coolant 41 to flow turbulently, so that the amount of heat transferred can be increased.

Slope 27 disposed around recess 15E reduces flow resistance as much as possible when coolant 41 passes from recess 15E to radially outer wall surface 15C stepped-up, in other words, step 27 helps maintain the pump performance.

O-ring 25 is sandwiched in a radial direction between cover 16 and casing 15 when those two elements are engaged with each other, and seals the two elements off from each other. Packing 25A is compressed by cover 16 and casing 15 when those two elements are tightened up together with screws (not shown), thereby sealing the two elements off from each other. Thus pump room 15A is doubly sealed. This structure allows coolant 41 to vaporize in substantially less quantity than in the case of a single seal, and increases the safety against liquid-leakage from the cooling device. O-ring 25 and packing 25A can be unitarily formed of rubber for double sealing.

A temperature of IC 29 rises as high as nearly 100° C. or more during the pump operation; however if IC 29 is mounted such that it is brought into contact with casing 15, the heat of IC 29 is collected by casing 15. In other words, pump 1 also collects the heat off IC 29, thereby lowering the temperature of IC 29 during the operation. As a result, IC 29 works always steadily. Further, this structure allows IC 29 to extend its life because IC 29 prolongs its service life at a lower temperature. FIG. 3 shows that board 28 is placed such that IC 29 is directly contact with casing 15. However, a free-face of board 28 (the face where electronic components such as IC 29 are not mounted, i.e. the face behind the face having IC 29) can be brought into contact with casing 15 for dissipating the heat of IC 29.

Next, an operation of pump 1 is demonstrated hereinafter. IC 29 and board 28 apply a control voltage to the windings of stator 14, thereby generating rotary magnetic field in stator 14. The rotary magnetic field spins ring-magnet 13, namely, impeller 11.

Magnetic flux flows from ring-magnet 13 toward stator 14; however some flux leaks in other directions, so that the rotation of impeller 11 extends the shifting magnetic field leaked from ring-magnet 13 to metal casing 15 (conductive material), and an eddy current occurs in casing 15. This eddy current makes resistance against the rotation of ring-magnet 13. Thus if the minimum distance between ring-magnet 13 and casing 15 can be kept at not less than 2 mm in every direction, the resistance can be substantially reduced. In the case of disposing stator 14 within ring-magnet 13 in a radius direction, ring-magnet 13 is magnetized to produce magnetic force inward in the radius direction. This preparation allows the leakage magnetic field to occur mainly at the outside as far as within the height in an axial direction of ring-magnet 13. Thus if metal casing 15 (conductive material) is placed at a distance not less than 2 mm from ring-magnet 13 and in the same level as the height of ring-magnet 13 in the axial direction, the resistance against the rotation of ring-magnet 13 can be substantially reduced. In other words, the outer rim of ring-magnet 13 is preferably off casing 15 by not less than 2 mm along the radius direction of the rotating axis of impeller 11. If a yoke is further provided at the outer rim of ring-magnet 13, the leakage magnetic field can be almost prevented. If ring-magnet 13 tapers inward and is magnetized at its inner rim, and both of ring-magnet 13 and stator 14 are placed in the radial direction, the resistance against the rotation caused by the eddy current due to the shifting magnetic field can be reduced.

Coolant 41 is sucked through sucking channel 19 by spinning blades 12, and discharged from discharging channel 20. During this operation, in pump room 15A, coolant 41 sucked from channel 19 is transported to recess 15E of casing 15 and further flows along sucking groove 26 to near the rotation center of impeller 11. Then coolant 41 hits against bearing 18 to diffuse in every direction, and hits a number of protrusions 24 before entering between blades 12. On the other hand, the heat generated from component 2 travels to casing 15 and is transferred to protrusions 24 projected from recess 15E, so that coolant 41 collects the heat when it hits against protrusions 24. The flow of coolant 41 through spaces between protrusions 24 produces eddies, which peel thermal boundary layers off protrusions 24. In other words, coolant 41 peels liquid film clung to protrusions 24 off, thereby collecting the heat off protrusions 24. Instead of protrusions 24, dimples 40 can be provided on the bottom face of recess 15E. This preparation also peels the thermal boundary layer and can collect the heat off casing 15 with ease.

The heat transferred from component 2 to casing 15 travels everywhere on radially outer wall surface 15C. On the other hand, the laminar boundary layer, which is formed when coolant 41 passes through pump room 15A in such a manner as the layer clings to radially outer wall surface 15C, is peeled off by dimples 21 and impeller 11 or blades 12 sliding there. In other words, the layer which stores the heat transferred to casing 15, namely, the thermal boundary layer, is peeled off. As a result, much more heat transferred to casing 15 can be collected by coolant 41. As discussed above, the heat generated from component 2, i.e. the heat stored in protrusions 24 and casing 15, is collected by coolant 41, and discharged through discharging channel 20 together with coolant 41 by spinning blades 12. Coolant 41 then flows through circulating channel 4 to radiator 3, which cools coolant 41, and is sucked into pump 1 again with a lower temperature. This circulation is repeated, thereby cooling component 2.

As described above, pump 1 includes casing 15 made from material having a high thermal conductivity, and open impeller 11 having blades 12. Inner wall face 15C has recess 15E, and protrusions 24 extend from the bottom face of recess 15E toward impeller 11. This structure allows reducing the thickness of pump 1 and increasing the surface area of interior wall of the pump room, so that a heat collecting efficiency increases. The shape of heat-receiving plane 15B and the shape of an upper surface of component 2 complement each other three-dimensionally, so that sucking channel 19 does not extend over component 2. This structure allows heat-receiving plane 15B and the upper surface of component 2 to solidly contact with each other, so that the heat can be transferred efficiently.

Next, another structure of the centrifugal pump in accordance with the embodiment is described hereinafter. FIG. 6 shows a front view illustrating an appearance of this another centrifugal pump of heat exchanger model, i.e. an element of the cooling device in accordance with this exemplary embodiment of the present invention. FIG. 7 shows a sectional view of the centrifugal pump taken along line 7-7 in FIG. 6. FIG. 8 shows an appearance of an interior wall of a pump room disposed in the centrifugal pump shown in FIG. 6. Centrifugal pump 1A differs from pump 1 in the following point: A sucking channel delivered from the outside of pump 1A crosses a part of recessed section in the pump room and extends to near the center of the impeller with itself being kept in a tubular form. Similar elements to those of pump 1 shown in FIG. 2-FIG. 5 have the same reference marks, and the descriptions thereof are omitted here.

Recess 15F of the pump room is disposed one step down from radially outer wall surface 15C of casing 15. Cylindrical protrusions 24 extend from a bottom face of recess 15F toward impeller 11. Recess transversal sections 30, 30A, 30B cross recess 15F and extend from sucking channel 19 toward the center of casing 15. Protrusions 24A extend from the upper faces of transverse sections 30, 30A, 30B.

Transverse section 30 has sucking channel 19 therein, and guides channel 19 to near the center of casing 15. The upper face of transverse section 30 has approximately the same height as radially outer wall surface 15C. In other words, sucking channel 19 crosses parts of recess 15F. During the operation of pump 1A, coolant 41 sucked is drawn by impeller 11 and flows on recess 15F to the outside of impeller 11. In this case, transverse section 30 works as resistance against the flow of coolant 41 and floats impeller 11. In order to keep the flotation balance of impeller 11, transverse sections 30A, 30B having a similar shape viewed from pump room 15A to transverse section 30 are provided at the same intervals. This structure allows impeller 11 to rotate free from slanting because impeller 11 receives floating force well balanced. If there is only transverse section 30, impeller 11 tends to rotate slantingly with respect to radially outer wall surface 15C. In this case, fixed shaft 17 and bearing 18 shorten their service lives, or impeller 11 rotates contacting with wall face 15C, so that the performance of the pump lowers, and in the worst case, the pump stops. In this embodiment, three transverse sections 30, 30A, 30B are provided at the same intervals (120 degrees). If they are provided radially from shaft 17 at the same intervals, it is preferable to provide a number of transverse sections.

Transverse sections 30, 30A, 30B have protrusions 24A on their faces toward pump room 15A, and blades 12 are not provided in the area of protrusions 24A. This structure allows increasing the surface area of radially outer wall surface 15C, so that the overall thickness of the pump can be reduced while the heat collecting efficiency increases. In the case of increasing the pump performance instead of the heat collecting performance, protrusions 24A are omitted, and blades 12 can be provided at the places toward the protrusion-omitted places. If a user does not stick to a slim pump, protrusions 24A are provided, and blades 12 are also provided above the protruded area such that blades 12 do not touch protrusions 24A. In this case, both of the heat-collecting performance and the pump performance can increase.

Next, an operation of pump 1A is demonstrated. IC 29 and board 28 apply a control voltage to the windings of stator 14, thereby generating rotary magnetic field in stator 14. The rotary magnetic field spins ring-magnet 13, namely, impeller 11. Coolant 41 is sucked through sucking channel 19 by spinning impeller 11, namely blades 12, and discharged from discharging channel 20. During this operation, in pump room 15A, coolant 41 sucked from channel 19 crosses recess 15F of casing 15 passing through transverse section 30 and further flows to near the center of pump room 15A. Then coolant 41 hits against bearing 18 to diffuse in every direction, and hits a number of protrusions 24 before entering between blades 12. On the other hand, the heat generated from component 2 travels to casing 15 and is transferred to protrusions 24, 24A projected from recess 15F, so that coolant 41 collects the heat when it hits against protrusions 24. The flow of coolant 41 through spaces between protrusions 24 produces eddies, which peel thermal boundary layers off protrusions 24. In other words, coolant 41 peels liquid film clung to protrusions 24 off, thereby collecting the heat off protrusions 24. Instead of protrusions 24, dimples 40 can be provided on the bottom face of recess 15F. This preparation also peels the thermal boundary layer and can collect the heat off casing 15 with ease.

The heat transferred from component 2 to casing 15 travels everywhere on radially outer wall surface 15C. On the other hand, the laminar boundary layer, which is formed when coolant 41 passes through pump room 15A in such a manner as the layer clings to radially outer wall surface 15C, is peeled off by dimples 21 and impeller 11 or blades 12 sliding there. In other words, the layer which stores the heat transferred to casing 15, namely, the thermal boundary layer, is peeled off. As a result, much more heat transferred to casing 15 can be collected by coolant 41. As discussed above, the heat generated from component 2, i.e. the heat stored in protrusions 24 and casing 15, is collected by coolant 41, and discharged through discharging channel 20 together with coolant 41 by spinning blades 12. Coolant 41 then flows through circulating channel 4 to radiator 3, which cools coolant 41, and is sucked into pump 1 again with a lower temperature. This circulation is repeated, thereby cooling component 2.

As described above, pump 1A includes casing 15 made of material having a high thermal conductivity, and open impeller 11 having blades 12. Radially outer wall surface 15C surrounds recess 15F, and protrusions 24 extend from the bottom face of recess 15F toward impeller 11. This structure allows reducing the thickness of the pump and increasing the surface area of interior wall of the pump room, so that a heat collecting efficiency increases. Further, transverse sections 30, 30A and 30B positively guide coolant 41 sucked to near the center of recess 15F. Protrusions 24 thus positively transferred the heat to coolant 41, so that the heat collecting efficiency further increases. The shape of heat-receiving plane 15B and the shape of an upper surface of component 2 complement each other three-dimensionally, so that sucking channel 19 does not extend over component 2. This structure allows heat-receiving plane 15B and the upper surface of component 2 to solidly contact with each other, so that the heat can be transferred efficiently.

In a closed circulating channel which circulates coolant, a radiator and a centrifugal pump of contact heat-exchanger model are provided. A heat-producing electronic component is brought into contact with the centrifugal pump, and the coolant in the pump collects the heat off the electronic component due to the heat exchanging function. Then the heat is dissipated from the radiator. A cooling device is thus obtainable. The centrifugal pump includes a pump-casing and an impeller both made of highly heat conductive material. In the pump casing, a heat-receiving plane is formed on a side face along a pump room disposed in the casing, and a sucking channel is prepared between the heat-receiving plane and an inner wall of the pump room. On the inner wall of the pump room, a recess is provided. In this recess, protrusions extending toward the impeller, or dimples are provided. The cooling device as structured above has a simple structure and can be downsized and slimmed while its cooling efficiency is improved.

What is claim is:

1. A centrifugal pump comprising:

a pump casing made of thermally conductive material and having a pump room defined therein, said pump casing including a casing base wall;

an impeller rotatably mounted in said pump room for rotation about a rotary axis extending in a thickness direction of said pump casing;

wherein said casing base wall has an inner wall face facing said impeller in the thickness direction;

wherein said casing base wall has an outer wall face opposite said inner wall face, said outer wall face being provided in a heat receiving plane and configured to receive heat from a component;

wherein said inner wall face includes a radially inner surface and a radially outer surface, said radially outer surface being disposed outwardly of said radially inner surface with respect to said rotary axis;

wherein said radially inner surface and said radially outer surface are disposed at different levels in the thickness direction so as to be at different distances from said impeller;

wherein said inner and outer surfaces both face an interior of said pump room, and said radially inner surface constitutes a recessed area that is recessed, relative to said radially outer surface away from said impeller;

wherein said inner wall face further includes a step portion formed between said radially inner surface and said radially outer surface;

wherein a surface-area-increasing part is formed in said recessed area so as to project in the thickness direction toward said impeller from said radially inner surface;

wherein said pump casing further includes a peripheral side wall having an inwardly facing surface that defines an outer boundary of said pump room;

wherein said radially outer surface has an outer periphery defined by said inwardly facing surface of said peripheral side wall of said pump casing, and said radially outer surface extends continuously from said outer periphery thereof to said step portion; and

said radially outer surface of said inner wall face of said base wall of said pump casing constitutes a surrounding area that surrounds said recessed area and is disposed closer to said impeller than said recessed area, and said step portion of said inner wall face constitutes a sloped portion as a transition between said recessed area and said surrounding area, said sloped portion gradually sloping from said recessed area toward said impeller.

2. The centrifugal pump of claim 1, wherein

said recessed area includes a recessed surface having a portion thereof that is open toward said impeller.

3. The centrifugal pump of claim 1, wherein

said surface-area-increasing part comprises a protrusion protruding toward said impeller from said recessed area of said inner wall face.

4. The centrifugal pump of claim 3, wherein

said protrusion is one of a plurality of protrusions protruding toward said impeller from said recessed area of said inner wall face.

5. The centrifugal pump of claim 1, wherein

at least one dimple is provided on said inner wall face outside said recessed area, said at least one dimple facing toward said impeller.

6. The centrifugal pump of claim 1, wherein

a sucking channel is disposed, in said thickness direction of said pump casing, between said heat receiving plane and an inner wall face plane in which said inner wall face extends, for sucking coolant into said pump room.

7. The centrifugal pump of claim 6, wherein

said sucking channel extends into said pump room toward said recessed area to communicate with said recessed area and allow coolant to be sucked into said recessed area via said sucking channel.

8. The centrifugal pump of claim 7, wherein

said sucking channel crosses part of said recessed area.

9. The centrifugal pump of claim 6, wherein

said sucking channel extends into said pump room toward the rotary axis of said impeller to communicate with said recessed area and allow coolant to be sucked into said recessed area via said sucking channel.

10. The centrifugal pump of claim 9, wherein

said sucking channel crosses part of said recessed area.

11. The centrifugal pump of claim 9, wherein

a groove is formed in said recessed area in a direction extending along said sucking channel.

12. The centrifugal pump of claim 1, wherein

said impeller includes a ring-shaped magnet, and at least one face of a circumference of said magnet is covered with ring-shaped soft magnetic material.

13. The centrifugal pump of claim 12, wherein

said centrifugal pump further includes a stator facing said magnet and being wound with a winding, and a circuit board having an IC for controlling power to said winding, wherein said circuit board is mounted to said pump casing such that said circuit board is in contact with said pump casing.

14. The centrifugal pump of claim 12, wherein

said centrifugal pump further includes a stator facing the magnet and being wound with a winding, and an IC for controlling power to said winding, wherein said IC is mounted such that said IC is in contact with said pump casing.

15. The centrifugal pump of claim 1, wherein

said impeller includes a ring-shaped magnet spaced from said pump casing by at least 2 mm in every direction.

16. The centrifugal pump of claim 15, wherein

said centrifugal pump further includes a stator facing said magnet and being wound with a winding, and a circuit board having an IC for controlling power to said winding, wherein said circuit board is mounted to said pump casing such that said circuit board is in contact with said pump casing.

17. The centrifugal pump of claim 15, wherein

said centrifugal pump further includes a stator facing the magnet and being wound with a winding, and an IC for controlling power to said winding, wherein said IC is mounted such that said IC is in contact with said pump casing.

18. The centrifugal pump of claim 1, wherein

said impeller includes a ring-shaped magnet having an outer rim spaced from said pump casing by at least 2 mm in a radial direction.

19. The centrifugal pump of claim 18, wherein

said centrifugal pump further includes a stator facing said magnet and being wound with a winding, and a circuit board having an IC for controlling power to said winding, wherein said circuit board is mounted to said pump casing such that said circuit board is in contact with said pump casing.

20. The centrifugal pump of claim 18, wherein

said centrifugal pump further includes a stator facing the magnet and being wound with a winding, and an IC for controlling power to said winding, wherein said IC is mounted such that said IC is in contact with said pump casing.

21. The centrifugal pump of claim 1, wherein

said outer wall face of said base wall of said pump casing has a shape configured to be complementary with a three-dimensional shape of a surface of the component so that said outer wall face and the component can contact each other complementarily to facilitate heat transfer from the component to said base wall of said pump casing.

22. The centrifugal pump of claim 1, wherein
said pump casing further includes a casing cover wall disposed opposite said casing base wall, said pump room being defined between said casing base wall and said casing cover wall.

23. The centrifugal pump of claim 1, wherein
said impeller has an impeller blade; and
said impeller blade of said impeller is not disposed in the immediate space opposite said inner surface of said inner wall face in said thickness direction.

24. The centrifugal pump of claim 23, wherein
said outer surface is annular and is disposed radially outwardly of said radially inner surface; and
each of said radially inner surface and said outer surface extends circumferentially and radially.

25. The centrifugal pump of claim 1, wherein
said outer surface is annular and is disposed radially outwardly of said radially inner surface; and
each of said radially inner surface and said outer surface extends circumferentially and radially.

26. A cooling device including:
a centrifugal pump comprising
a pump casing made of thermally conductive material and having a pump room defined therein, said casing including a casing base wall,
an impeller rotatably mounted in said pump room for rotation about a rotary axis extending in a thickness direction of said pump casing,
wherein said casing base wall has an inner wall face facing said impeller in the thickness direction,
wherein said casing base wall has an outer wall face opposite said inner wall face, said outer wall face being provided in a heat receiving plane and configured to receive heat from a heat-producing electronic component,
wherein said inner wall face includes a radially inner surface and a radially outer surface, said radially outer surface being disposed outwardly of said radially inner surface with respect to said rotary axis,
wherein said radially inner surface and said radially outer surface are disposed at different levels in the thickness direction so as to be at different distances from said impeller,
wherein said inner and radially outer surfaces both face an interior of said pump room, and said radially inner surface constitutes a recessed area that is recessed, relative to said outer surface away from said impeller,
wherein said inner wall face further includes a step portion formed between said radially inner surface and said radially outer surface,
wherein a surface-area-increasing part is formed in said recessed area so as to project in the thickness direction toward said impeller from said radially inner surface,
wherein said pump casing further includes a peripheral side wall having an inwardly facing surface that defines an outer boundary of said pump room,
wherein said radially outer surface has an outer periphery defined by said inwardly facing surface of said peripheral side wall of said pump casing, and said radially outer surface extends continuously from said outer periphery thereof to said step portion, and
wherein said radially outer surface of said inner wall face of said base wall of said pump casing constitutes a surrounding area that surrounds said recessed area and is disposed closer to said impeller than said recessed area, and said step portion of said inner wall face constitutes a sloped portion as a transition between said recessed area and said surrounding area, said sloped portion gradually sloping from said recessed area toward said impeller;
a radiator; and
a closed circulating channel fluidically coupling said pump room with said radiator to circulate coolant through said pump room and said radiator so that heat produced by the electronic component, when the electronic component is contacted with said outer wall face of said base wall of said pump casing, is transferred to said coolant and then from said coolant to said radiator so that the heat can be dissipated by said radiator.

27. The cooling device of claim 26, wherein
said recessed area includes a recessed surface having a portion thereof that is open toward said impeller.

28. The cooling device of claim 26, wherein
said surface-area-increasing part comprises a protrusion protruding toward said impeller from said recessed area of said inner wall face.

29. The cooling device of claim 28, wherein
said protrusion is one of a plurality of protrusions protruding toward said impeller from said recessed area of said inner wall face.

30. The cooling device of claim 26, wherein
at least one dimple is provided on said inner wall face outside said recessed area, said at least one dimple facing toward said impeller.

31. The cooling device of claim 26, wherein
a sucking channel is disposed, in said thickness direction of said pump casing, between said heat receiving plane and an inner wall face plane in which said inner wall face extends, for sucking coolant into said pump room.

32. The cooling device of claim 31, wherein
said sucking channel extends into said pump room toward said recessed area to communicate with said recessed area and allow coolant to be sucked into said recessed area via said sucking channel.

33. The cooling device of claim 32, wherein
said sucking channel crosses part of said recessed area.

34. The cooling device of claim 31, wherein
said sucking channel extends into said pump room toward the rotary axis of said impeller to communicate with said recessed area and allow coolant to be sucked into said recessed area via said sucking channel.

35. The cooling device of claim 34, wherein
said sucking channel crosses part of said recessed area.

36. The cooling device of claim 34, wherein
a groove is formed in said recessed area in a direction extending along said sucking channel.

37. The cooling device of claim 26, wherein
said impeller includes a ring-shaped magnet, and at least one face of a circumference of said magnet is covered with ring-shaped soft magnetic material.

38. The cooling device of claim 37, wherein
said centrifugal pump further includes a stator facing said magnet and being wound with a winding, and a circuit board having an IC for controlling power to said winding, wherein said circuit board is mounted to said pump casing such that said circuit board is in contact with said pump casing.

39. The cooling device of claim 37, wherein
said centrifugal pump further includes a stator facing the magnet and being wound with a winding, and an IC for

controlling power to said winding, wherein said IC is mounted such that said IC is in contact with said pump casing.

40. The cooling device of claim 26, wherein said impeller includes a ring-shaped magnet spaced from said pump casing by at least 2 mm in every direction.

41. The cooling device of claim 40, wherein said centrifugal pump further includes a stator facing said magnet and being wound with a winding, and a circuit board having an IC for controlling power to said winding, wherein said circuit board is mounted to said pump casing such that said circuit board is in contact with said pump casing.

42. The cooling device of claim 40, wherein said centrifugal pump further includes a stator facing the magnet and being wound with a winding, and an IC for controlling power to said winding, wherein said IC is mounted such that said IC is in contact with said pump casing.

43. The cooling device of claim 26, wherein said impeller includes a ring-shaped magnet having an outer rim spaced from said pump casing by at least 2 mm in a radial direction.

44. The cooling device of claim 43, wherein said centrifugal pump further includes a stator facing said magnet and being wound with a winding, and a circuit board having an IC for controlling power to said winding, wherein said circuit board is mounted to said pump casing such that said circuit board is in contact with said pump casing.

45. The cooling device of claim 43, wherein said centrifugal pump further includes a stator facing the magnet and being wound with a winding, and an IC for controlling power to said winding, wherein said IC is mounted such that said IC is in contact with said pump casing.

46. The cooling device of claim 26, wherein said outer wall face of said base wall of said pump casing has a shape configured to be complementary with a three-dimensional shape of a surface of the component so that said outer wall face and the component can contact each other complementarily to facilitate heat transfer from the component to said base wall of said pump casing.

47. The cooling device of claim 26, wherein said pump casing further includes a casing cover wall disposed opposite said casing base wall, said pump room being defined between said casing base wall and said casing cover wall.

48. The cooling device of claim 26, wherein said impeller has an impeller blade; and said impeller blade of said impeller is not disposed in the immediate space opposite said inner surface of said inner wall face in said thickness direction.

49. The cooling device of claim 48, wherein said outer surface is annular and is disposed radially outwardly of said radially inner surface; and each of said radially inner surface and said outer surface extends circumferentially and radially.

50. The cooling device of claim 26, wherein said outer surface is annular and is disposed radially outwardly of said radially inner surface; and each of said radially inner surface and said outer surface extends circumferentially and radially.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,544,049 B2
APPLICATION NO. : 10/852179
DATED : June 9, 2009
INVENTOR(S) : Shinya Koga et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In the Claims:

(column 11, line 13), after "wherein said" insert --radially--;

(column 11, lines 26-30), please indent the paragraph (in the same manner as the other paragraphs of claim 1);

(column 11, line 51), after "is provided on" insert --said radially outer surface of--;

(column 13, line 12), after "opposite said" insert --radially--;

(column 13, line 15), after "said" insert --radially--;

(column 13, line 17), after "and said" insert --radially--;

(column 13, line 20), after "said" insert --radially--;

(column 13, line 22), after "and said" insert --radially--;

(column 13, line 47), after "wherein said" insert --radially--; before "outer surfaces" delete "radially";

(column 13, line 50), after "to said" insert --radially--;

(column 14, line 28), after "is provided on" insert --said radially outer surface of--;

(column 16, line 20), after "opposite said" insert --radially--;

(column 16, line 23), after "said" insert --radially--;

(column 16, line 25), after "and said" insert --radially--;

(column 16, line 28), after "said" insert --radially--; and

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 7,544,049 B2 Page 2 of 2
APPLICATION NO. : 10/852179
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INVENTOR(S) : Shinya Koga et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

(column 16, line 30), after "and said" insert --radially--.

Signed and Sealed this

Fifteenth Day of September, 2009

David J. Kappos
Director of the United States Patent and Trademark Office

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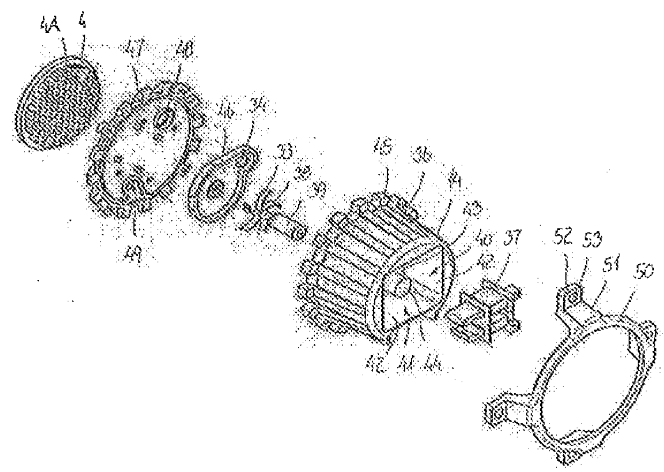
(54) Title: COOLING SYSTEM FOR A COMPUTER SYSTEM



(57) Abstract: The invention relates to a cooling system for a compute system, said computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid. The cooling system has a heat exchanging interface for providing thermal contact between he processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, Different embodiments of the heat exchanging system as well as means for establishing and controlling a flow of cooling liquid and a cooling strategy constitutes the invention of the cooling system.

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COOLING SYSTEM FOR A COMPUTER SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to a cooling system for a central processing unit (CPU) or other processing unit of a computer system. More specifically, the invention relates to a liquid-cooling system for a mainstream computer system such as a PC.

During operation of a computer, the heat created inside the CPU or other processing unit must be carried away fast and efficiently, keeping the temperature within the design range specified by the manufacturer. As an example of cooling systems, various CPU cooling methods exist and the most used CPU cooling method to date has been an air-cooling arrangement, wherein a heat sink in thermal contact with the CPU transports the heat away from the CPU and as an option a fan mounted on top of the heat sink functions as an air fan for removing the heat from the heat sink by blowing air through segments of the heat sink. This air-cooling arrangement is sufficient as long as the heat produced by the CPU is kept at today's level, however it becomes less useful in future cooling arrangements when considering the development of CPUs since the speed of a CPU is said to double perhaps every 18 months, thus increasing the heat production accordingly.

Another design used today is a CPU cooling arrangement where cooling liquid is used to cool the CPU by circulating a cooling liquid inside a closed system by means of a pumping unit, and where the closed system also comprises a heat exchanger past which the cooling liquid is circulated.

A liquid-cooling arrangement is more efficient than an air-cooling arrangement and tends to lower the noise level of the cooling arrangement in general. However, the liquid-cooling design consists of many components, which increases the total installation time, thus making it less desirable as a mainstream solution. With a trend of producing smaller and more compact PCs for the end-users, the greater amount of components in a typical liquid-cooling arrangement is also undesirable. Furthermore, the many components having to be coupled together incurs a risk of leakage of cooling liquid from the system.

SUMMARY OF INVENTION

It may be one object of the invention to provide a small and compact liquid-cooling solution, which is more efficient than existing air-cooling arrangements and which can be produced at a low cost enabling high production volumes. It may be another object to create a liquid-cooling arrangement, which is easy-to-use and implement, and which

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requires a low level of maintenance or no maintenance at all. It may be still another object of the present invention to create a liquid-cooling arrangement, which can be used with existing CPU types, and which can be used in existing computer systems.

This object may be obtained by a cooling system for a computer system, said computer system comprising:

- at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit,
- a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid,
- a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid,
- a pump being provided as part of an integrate element, said integrate element comprising the heat exchanging interface, the reservoir and the pump,
- said pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means,
- said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means.

By providing an integrate element, it is possible to limit the number of separate elements of the system. However, there is actually no need for limiting the number of elements, because often there is enough space within a cabinet of a computer system to encompass the different individual elements of the cooling system. Thus, it is surprisingly that, at all, any attempt is conducted of integrating some of the elements.

In possible embodiments according to this aspect of the invention, the entire pump is placed inside the reservoir with at least an inlet or an outlet leading to the liquid in the reservoir. In an alternative embodiment the pump is placed outside the reservoir in the immediate vicinity of the reservoir and wherein at least an inlet or an outlet is leading directly to the liquid in the reservoir. By placing the pump inside the reservoir or in the immediate vicinity outside the reservoir, the integrity of the combined reservoir, heat exchanger and pump is obtained, so that the element is easy to employ in new and existing computer systems, especially mainstream computer systems.

In a preferred embodiment, the pumping member of the pump and a driven part of the motor of the pump, such as a rotor of en electrical motor, is placed inside the reservoir embedded in the cooling liquid, and wherein a stationary part of the motor of the pump, such as a stator of an electrical motor, is placed outside the reservoir. By having the driven part of the motor placed inside the reservoir submerged in the cooling liquid and the stationary part of the motor outside the reservoir, there is no need for encapsulating the stationary part in a liquid-proof insulation. However, problems may occur having then stationary part driving the driven part. However, the present invention provide means for obtaining such action, although not at all evident how to solve this problem.

The object may also be obtained by a cooling system for a computer system, said computer system comprising:
- at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit,
- a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid,
- a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid,
- a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means,
- said cooling system being intended for thermal contact with the processing unit by means of existing fastening means associated with the processing unit, and
- said heat radiating means intended for radiating from the cooling liquid thermal energy, dissipated to the cooling liquid, to surroundings of the heat radiating means.

The use of existing fastening means has the advantage that fitting of the cooling system is fast and easy. However, once again there is no problem for the person skilled in the art to adopt specially adapted mounting means for any element of the cooling system, because there are numerous possibilities in existing cabinets of computer systems for mounting any kind of any number of elements, also elements of a cooling system.

In preferred embodiments according to this aspect of the invention, the existing fastening means are means intended for attaching a heat sink to the processing unit, or the existing fastening means are means intended for attaching a cooling fan to the processing unit, or the existing fastening means are means intended for attaching a heat sink together with a cooling fan to the processing unit. Existing fastening means of the kind mentioned is commonly used for air cooling of CPUs of computer systems, however, air cooling arrangements being much less complex than liquid cooling systems. Nevertheless, it has ingeniously been possible to develop a complex and effective liquid cooling system capable of utilising such existing fastening means for simple and less effective air cooling arrangements.

According to an aspect of the invention, the pump is selected from the following types: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. By adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

According to another aspect of the invention, driving means for driving the pump is selected among the following driving means: electrically operated rotary motor, piezo-electrically operated motor, permanent magnet operated motor, fluid-operated motor, capacitor-operated motor. As is the case when selecting the pump to pump the liquid, by adopting one or more of the solution of the present invention, a wide variety of pumps may be used without departing from the scope of the invention.

The object may also be obtained by a cooling system for a computer system, said computer system comprising:

- at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit,
- a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid,
- a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid,
- a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, and
- said cooling system further comprising a pump wherein the pump is driven by an AC electrical motor by a DC electrical power supply of the computer system,
- where at least part of the electrical power from said power supply is intended for being converted to AC being supplied to the electrical motor.

It may be advantageous to use an AC motor, such as a 12V AC motor, for driving the pump in order to obtain a stabile unit perhaps having to operate 24 hours a day, 365 days a year. However, the person skilled in the art will find it unnecessary to adopt as example a 12V motor because high voltage such as 220V or 110V is readily accessible as this is the electrical voltage used to power the voltage supply of the computer system itself. Although choosing to use a 12V motor for the pump, it has never been and will never be the choice of the person skilled in the art to use an AC motor. The voltage supplied by the voltage supply of the computer system itself is DC, thus this will be the type of voltage chosen by the skilled person.

In preferred embodiments according to any aspect of the invention, an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, or an electrical motor is intended both for driving the pump for pumping the liquid and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means, or an electrical motor is intended both for driving the pump for pumping the liquid, and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, and for driving the a fan for establishing a flow of air in the vicinity of the heat radiating means.

By utilising a single electrical motor for driving more than one element of the cooling system according to any of the aspects of the invention, the lesser complexity and the reliability of the cooling system will be further enhanced.

The heat exchanging interface may be an element being separate from the reservoir, and where the heat exchanging interface is secured to the reservoir in a manner so that the heat exchanging interface constitutes part of the reservoir when being secured to the reservoir. Alternatively, the heat exchanging interface constitutes an integrate surface of the reservoir, and where the heat exchanging surface extends along an area of the surface of the reservoir, said area of surface being intended for facing the processing unit and said area of surface being intended for the close thermal contact with the processing unit. Even alternatively, the heat exchanging interface is constitutes by a free surface of the processing unit, and where the free surface is capable of establishing heat dissipation between the processing unit and the cooling liquid through an aperture provided in the reservoir, and where the aperture extends along an area of the surface of the reservoir, said surface being intended for facing the processing unit.

Possibly, an uneven surface such as pins or fins extending from the copper plate provide a network of channels across the inner surface of the heat exchanging interface. A network of channels ensure the cooling liquid being passed along the inner surface of the interface such as a copper plate in a way that maximises the retention time of the cooling liquid along the heat exchanging interface and in a way that optimises the thermal exchange between the heat exchanging interface and the cooling liquid as long as the cooling liquid is in thermal contact with heat exchanging interface.

Possibly, the cooling system may be provided with a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid,

- a pumping means being intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means,
- said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means,
- said heat exchanging interface constituting a heat exchanging surface being manufactured from a material suitable for heat conducting, and
- with a first side of the heat exchanging surface facing the central processing unit being substantially plane and
- with a second side of the heat exchanging surface facing the cooling liquid being substantially plane and
- said reservoir being manufactured from plastic, and channels or segments being provided in the reservoir for establishing a certain flow-path for the cooling liquid through the reservoir.

Providing a plane heat exchanging surface, both the first, inner side being in thermal contact with the cooling liquid and the second, outer side being in thermal contact with the heat generating processing unit, results in the costs for manufacturing the heat exchanging surface is reduced to an absolute minimum.

According to the above possible solution, an inlet of the pumping means is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

Alternatively, or additionally, an outlet of said pumping means being positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchange interface. The turbulence of flow is advantageous for obtaining a heat dissipation. If the heat exchanging interface is plane, the inlet of the pump being positioned as mentioned above, may result in a turbulence of flow occurring along the heat exchanging interface, at least in the vicinity of the inlet of the pump, but possibly also distant form the inlet.

However, a plane first, inner surface may also result in the cooling liquid passing the heat exchanging surface too fast. This may be remedied by providing grooves along the inner surface, thereby providing a flow path in the heat exchanging surface. This however results in the costs for manufacturing the heat exchanging surface increasing.

The solution to this problem has been dealt with by providing channels or segments in the reservoir housing in stead. The reservoir housing may be manufactured by injection moulding or by casting, depending on the material which the reservoir housing is made from. Proving channels or segments during moulding or casting of the reservoir housing is much more cost-effective than milling grooves along the inner surface of the heat exchanging surface.

Possibly, the cooling system may be provided with at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid,

- said cooling system being adapted such as to provide transfer of said heat from a heat dissipating surface to a heat radiating surface where
- said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

Heat dissipation from the processing unit to the cooling liquid must be very efficient to ensure proper cooling of the processing unit, Especially in the case, where the processing unit is a CPU, the surface for heat dissipation is limited by the surface area of the CPU. This may be remedied by utilising a heat exchanging surface being made of a material having a high thermal conductivity such as copper or aluminium and ensuring a proper thermal bondage between the heat exchanging interface and the CPU.

However, in a possible embodiment according to the features in the above paragraph, the heat dissipation takes place directly between the processing unit and the cooling liquid by providing an aperture in the reservoir housing, said aperture being adapted for taking up a free surface of the processing unit. Thereby, the free surface of the processing unit extends into the reservoir or constitutes a part of the boundaries of the reservoir, and the cooling liquid has direct access to the free surface of the processing unit.

A possible heat exchanging interface may be the direct contact between the heat generating unit such as a CPU and the cooling liquid, where

- at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit comprising
- at least one liquid reservoir mainly for dissipating or radiating heat, said heat being accumulated and transferred by said cooling liquid,

- said cooling system being adapted such as to provide transfer of said heat from a heat dissipating interface to a heat radiating surface where
- said at least one liquid reservoir being provided with one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the at least one processing unit in such a way that a free surface of the processing unit is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the aperture.

The aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a the processing unit, said boundaries being liquid-proof when attached to the free surface of the processing unit so that the liquid may flow freely across the free surface without the risk of the liquid dissipating through the boundaries. Alternatively, but posing the same technical effect, the aperture of the reservoir is intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of the processing unit.

If a heat sink is provided as an aid in dissipating heat from the heat generating unit such as a CPU, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture to a free surface of a heat sink. Alternatively, the aperture of the reservoir may be intended for being closed by attaching boundaries of said aperture along boundaries of a free surface of a heat sink. Alternatively,

Possibly, the heat exchanging interface may be provided as
- a first reservoir intended for being closed by attaching boundaries of an aperture in the first reservoir to, alternatively along, a free surface of a said processing unit, and
- a second reservoir intended for being closed by attaching boundaries of an aperture in the second reservoir to, alternatively along, a free surface of a to a free surface of a heat sink, and
- liquid conducting means provided between the first reservoir and the second reservoir.

The first reservoir may be closed by attaching said first reservoir to a heat exchanging surface element being in close thermal contact with the processing unit, said heat exchanging surface intended for dissipating heat from the processing unit to cooling liquid in the first reservoir, and wherein a second reservoir is closed by attaching said second reservoir to a surface of a heat sink, said heat sink intended for radiating heat from cooling liquid in the second reservoir to the exterior surroundings.

Also, the first reservoir and said second reservoir may be provided as a monolithic structure comprising both the first reservoir and the second reservoir and where both a heat dissipation from the processing unit to the cooling liquid in the first reservoir and heat radiation from the cooling liquid in the second reservoir to exterior surrounding is provided by the monolithic structure. The said monolithic structure may preferably be manufactured at least partly from plastic, preferably being manufactured fully in plastic, and said monolithic structure thus being manufactured by injection moulding.

Transfer of said cooling liquid from an outlet of the first reservoir to an inlet of the second reservoir, and from an outlet of the second reservoir to an inlet of the first reservoir, and circulating the cooling liquid within said liquid conducting means is provided by a pumping means being intended for pumping the cooling liquid.

One of said reservoirs of said monolithic structure may comprise said pumping means.

An inlet and/or an outlet and/or a pumping member of said pumping means, may be provided in the vicinity of said substantially plane side in order to provide a turbulence of flow and hereby improve the exchange of heat between said cooling liquid and substantially plane side, and the inlet of the pumping means may be provided within the first reservoir and the outlet may be provided within the second reservoir.

According to one aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilising a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface and a pumping means, said method of cooling comprising the steps of

- establishing, or defining, or selecting an operative status of the pumping means
- controlling the operation of the motor of the pumping means in response to the following parameters; the necessary direction of movement for obtaining a pumping action of a pumping member of the pumping means, the possible direction of movement of a driving part of the motor of the pumping means, and
- in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve the necessary direction of movement of the driving part of the motor for establishing the necessary direction of movement for obtaining he pumping action of the pumping member.

There may be pumping means, where the pumping member is only operationable in one direction but where the motor driving the pumping member is operationable in two directions. The solution to this problem is to either choose a pumping member operationale in both directions or to chose a motor being operationable in only one direction. According to the invention, a solution is provided where a one-way directional pumping member may be operated ny a two-way directional motor. Despite the contradictory nature of this solution, advantages may however be present.

As example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and where said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor before applying a full-wave AC power signal.

As an alternative example, the method is being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and said method comprises the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor after having applied the full-wave AC power signal.

In both the above examples, the advantages of the one-way impeller from a traditional DC pump together with the advantages of a motor from a traditional AC pump is obtained in the solution mentioned. The performance of an impeller of a DC pump is much better than the performance of an impeller from an AC pump. The motor from an AC pump is more reliable than a motor from a DC pump. The advantageous obtained is thus of synergetic nature, seeing that different advantages of the impeller of the DC pump and of the motor of the AC pump are different in nature.

According to another aspect of the invention, a method is envisaged, said method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilising a cooling system for cooling the at least one processing unit and, said cooling system comprising a reservoir, at least one heat exchanging interface, an air blowing fan, a pumping means, said method of cooling comprising the steps of

- applying one of the following possibilities of how to operate the computer system: establishing, or defining, or selecting an operative status of the computer system
- controlling the operation of at least one of the following means of the computer system; the pumping means and the air blowing fan in response to at least one of the following

parameters; a surface temperature of the heat generating processing unit, an internal temperature of the heat generating processing unit, or a processing load of the CPU and
- in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve at least one of the following conditions; a certain cooling performance of the cooling system, a certain electrical consumption of the cooling system, a certain noise level of the cooling system.

Applying the above method ensures an operation of the computer system being in accordance with selected properties during the use of the computer system. For some applications, the cooling performance is vital such as may be the case when working with image files or when downloading large files from a network during which the processing units is highly loaded and thus generating much heat. For other applications, the electrical power consumption is more vital such as may be the case when utilising domestic computer systems or in large office building in environments where the electrical grid may be weak such as in third countries. In still other applications, the noise generated by the cooling system is to be reduced to a certain level, which may be the case in office buildings with white collar people working alone, or at home, if the domestic computer perhaps is situated in the living room, or at any other location where other exterior considerations have to be dealt with.

According to another aspect of the invention, a method is envisaged, said method being employed with cooling system further comprising a pumping means with an impeller for pumping the cooling liquid through a pumping housing, said pumping means being driven by an AC electrical motor with a stator and a rotor, and said pumping means being provided with a means for sensing a position of the rotor, and wherein the method comprises the following steps:
- initially establishing a preferred rotational direction of the rotor of the electrical motor
- before start of the electrical motor, sensing the angular position of the rotor
- during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor
- said selection being made according to the preferred rotational direction, and
- said application of the AC signal, such as an AC voltage, being performed by the computer system for applying the AC signal, such as an AC voltage, from the electrical power supply of the computer system during conversions of the electrical DC signal, such as a DC voltage, of the power supply to the AC signal, such as an AC voltage, for the electrical motor.

Adopting the above method according to the invention ensures the most efficient circulation of cooling liquid in the cooling system and at the same time ensures the lowest possible energy consumption of the electrical motor driving the impeller. The efficient circulation of the cooling liquid is obtained by means of an impeller being designed for rotation in one rotational direction only, thus optimising the impeller design with regard to the only one rotational direction as opposed to both rotational directions. The low energy consumption is achieved because of the impeller design being optimised, thus limiting the necessary rotational speed of the impeller for obtaining e certain amount of flow of the cooling liquid through the cooling system. A bonus effect of the lowest possible energy consumption being obtained is the lowest possible noise level of the pump also being obtained. The noise level of the pump is amongst other parameters also dependent on the design and the rotational speed of the impeller. Thus, an optimised impeller design and impeller speed will reduce the noise level to the lowest possible in consideration of ensuring a certain cooling capacity.

BRIEF DESCRIPTION OF THE FIGURES

The invention will hereafter be described with reference to the drawings, where

Fig. 1 shows an embodiment of the prior art. The figure shows the typical components in an air-cooling type CPU cooling arrangement.
Fig. 2 shows an embodiment of the prior art. The figure shows the parts of the typical air-cooling type CPU cooling arrangement of figure 1 when assembled.
Fig. 3 shows an embodiment of the prior art. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement.
Fig. 4 is an exploded view of the invention and the surrounding elements.
Fig. 5 shows the parts shown in the previous figure when assembled and attached to the motherboard of a computer system.
Fig. 6 is an exploded view of the reservoir from the previous figures 4 and 5 seen from the opposite site and also showing the pump.
Fig. 7 is a cut-out view into the reservoir housing the pump and an inlet and an outlet extending out of the reservoir.
Fig. 8 is a view of the cooling system showing the reservoir connected to the heat radiator.
Fig. 9-10 are perspective views of a possible embodiment of reservoir housing providing direct contact between a CPU and a cooling liquid in a reservoir.
Fig. 11-13 are perspective views of a possible embodiment of heat sink and a reservoir housing constituting an integrated unit.
Fig. 14 is a perspective view of the embodiment shown in fig. 9-10 and the embodiment shown in fig. 11-13 all together constituting an integrated unit.
Fig. 15-16 are perspective view of a possible embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit

Fig. 17 is a perspective view of a preferred embodiment of a reservoir and a pump and a heat exchanging surface constituting an integrated unit,

Fig. 18 is a plane view of a possible, however preferred embodiment of an AC electrical motor for a pumping means of the cooling system according to the invention, and

Fig. 19 is a graph showing a method for starting a rotor of the electrical AC motor, said AC motor driving an impeller selected from a pump driven by a DC motor.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 is an exploded view of an embodiment of prior art cooling apparatus for a computer system. The figure shows the typical components in an air-cooling type CPU cooling arrangement. The figure shows a prior art heat sink 4 intended for air cooling and provided with segments intersected by interstices, a prior art air fan 5 which is to be mounted on top of the heat sink by use of fastening means 3 and 6.

The fastening means comprises a frame 3 provided with holes intended for bolts, screws, rivets or other suitable fastening means (not shown) for thereby attaching the frame to a motherboard 2 of a CPU 1 or onto another processing unit of the computer system. The frame 3 is also provided with mortises provided in perpendicular extending studs in each corner of the frame, said mortises intended for taking up tenons of a couple of braces. The braces 6 are intended for enclosing the heat sink 4 and the air fan 5 so that the air fan and the heat sink thereby is secured to the frame. Using proper retention mechanisms, when the frame is attached to the motherboard of the CPU of other processing unit, and when the tenons of the braces are inserted into the mortises of the frame, the air fan and heat exchanger is pressed towards the CPU by using a force perpendicular to the CPU surface, said force being provided by lever arms.

Fig. 2 shows the parts of the typical air-cooling type CPU cooling arrangement of figure 1, when assembled. The parts are attached to each other and will be mounted on top of a CPU on a motherboard (not shown) of a computer system.

Fig. 3 shows another embodiment of a prior art cooling system. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement. The figure shows a prior art heat exchanger 7, which is in connection with a prior art liquid reservoir 8, a prior art liquid pump 9 and a heat radiator 11 and an air fan 10 provided together with the heat radiator. The prior art heat exchanger 7, which can be mounted on a CPU (not shown) is connected to a radiator and reservoir, respectively. The reservoir serves as a storage unit for excess liquid not capable of being contained in the remaining components. The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid. The heat radiator 11 serves as a means for removing the heat from the liquid by means of the air fan 10 blowing air through the heat radiator. All the components are in connection with each other via tubes for conducting the liquid serving as the cooling medium.

Fig. 4 is an exploded view of a cooling system according to an embodiment of the invention. Also elements not being part of the cooling system as such are shown. The figure shows a central processing unit CPU 1 mounted on a motherboard of a computer system 2. The figure also shows a part of the existing fastening means, i.e. amongst others the frame 3 with mortises provided in the perpendicular extending studs in each corner of the frame. The existing fastening means, i.e. the frame 3 and the braces 6, will during use be attached to the motherboard 2 by means of bolts, screws, rivets or other suitable fastening means extending through the four holes provided in each corner of the frame and extending through corresponding holes in the motherboard of the CPU. The frame 3 will still provide an opening for the CPU to enable the CPU to extend through the frame.

The heat exchanging interface 4 is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminium, and which will be in thermal contact with the CPU 1, when the cooling system is fastened to the motherboard 2 of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing 14, thus the heat exchanger 4 constitutes the part of the liquid reservoir housing facing the CPU. The reservoir may as example be made of plastic or of metal. The reservoir or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

If the reservoir is made of metal or any other material having a relative high heat conductivity compared to as example plastic, the heat exchanging interface as a separate element may be excluded because the reservoir itself may constitute a heat exchanger over an area, wherein the reservoir is in thermal contact with the processing unit. Alternatively to having the heat exchanging interface constitute part of the liquid reservoir housing, the liquid reservoir housing may be tightly attached to the heat exchanging interface by means of screws, glue, soldering, brazing or the like means for securing the heat exchanging interface to the housing and vice versa, perhaps with a sealant 5 provided between the housing and the heat exchanging interface.

Alternatively to providing a heat exchanging interface integrate with the reservoir containing the cooling liquid, it will be possible to exclude the heat exchanger and providing another means for dissipating heat from the processing unit to the cooling liquid in the reservoir, The other means will be a hole provided in the reservoir, said hole intended for being directed towards the processing unit. Boundaries of the hole will be sealed towards boundaries of the processing unit or will be sealed on top of the processing unit for thereby preventing cooling liquid from the reservoir from leaking. The only prerequisite to the sealing is that a liquid-tight connection is provided between boundaries of the hole and the processing unit or surrounding of the processing unit, such as a carrier card of the processing unit.

By excluding the heat exchanger, a more effective heat dissipation will be provided from the processing unit and to the cooling liquid of the reservoir, because the intermediate element of a heat exchanger is eliminated. The only obstacle in this sense is the provision of a sealing being fluid-tight in so that the cooling liquid in the reservoir is prevented from leaking.

The heat exchanging surface 4 is normally a copper plate. When excluding the heat exchanging surface 4, which may be a possibility not only for the embodiments shown in fig. 4, but for all the embodiments of the invention, it may be necessary to provide the CPU with a resistant surface that will prevent evaporation of the cooling liquid and/or any damaging effect that the cooling liquid may pose to the CPU. A resistant surface may be provided the CPU from the CPU producer or it may be applied afterwards. A resistant surface to be applied afterwards may e.g. be a layer, such as an adhesive tape provided on the CPU. The adhesive tape may be made with a thin metal layer e.g. in order to prevent evaporation of the cooling liquid and/or any degeneration of the CPU itself.

Within the liquid reservoir, a liquid pump (not shown) is placed for pumping a cooling liquid from an inlet tube 15 connection being attached to the housing of the reservoir through the reservoir and past the heat exchanger in thermal contact with the CPU to an outlet tube connection 16 also being attached to the reservoir housing. The existing fastening means comprising braces 6 with four tenons and the frame 3 with four corresponding mortises will fasten the reservoir and the heat exchanger to the motherboard of the CPU. When fastening the two parts of the existing fastening means to each other the fastening will by means of the lever arms 18 create a force to assure thermal contact between the CPU 1 mounted on the motherboard and the heat exchanger 4 being provided facing the CPU.

The cooling liquid of the cooling system may be any type of cooling liquid such as water, water with additives such as anti-fungicide, water with additives for improving heat conducting or other special compositions of cooling liquids such as electrically non-conductive liquids or liquids with lubricant additives or anti-corrosive additives.

Fig. 5 shows the parts shown in fig. 4 when assembled and attached to the motherboard of a CPU of a computer system 2. The heat exchanger and the CPU is in close thermal contact with each other. The heat exchanger and the remainder of the reservoir 14 is fastened to the motherboard 2 by means of the existing fastening means being secured to the motherboard of the CPU and by means of the force established by the lever arms 18 of the existing fastening means. The tube inlet connection 15 and the tube outlet connection 16 are situated so as to enable connection of tubes to the connections.

Fig. 6 is an exploded view of the reservoir shown in previous fig. 4 and fig. 5 and seen from the opposite site and also showing the pump 21 being situated inside the reservoir. Eight screws 22 are provided for attaching the heat exchanging surface 4 to the remainder of the reservoir. The heat exchanging surface is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see fig. 4). However, also the inner surface (not shown, see fig. 7) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the octagonal shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

A sealant in form of a gasket 13 is used for the connection between the reservoir 14 and the heat exchanging surface forming a liquid tight connection. The pump is intended for being placed within the reservoir. The pump has a pump inlet 20 through which the cooling liquid flows from the reservoir and into the pump, and the pump has a pump outlet 19 through which the cooling liquid is pumped from the pump and to the outlet connection. The figure also shows a lid 17 for the reservoir. The non-smooth inner walls of the reservoir and the fact that the pump is situated inside the reservoir will provide a swirling of the cooling liquid inside the reservoir.

However, apart from the non-smooth walls of the reservoir and the pump being situated inside the reservoir, the reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir (see fig 9-10 and fig 15). Channel or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. By providing channels or segments inside the reservoir, a flow will be provided forcing the cooling liquid to pass the heat exchanging surface , and the amount of time increased of the cooling liquid being resident inside the reservoir, thus enhancing heat dissipation. If channels or segments are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

The cooling liquid enters the reservoir through the tube inlet connection 15 and enters the pump inlet 20, and is pumped out of the pump outlet 19 connected to the outlet connection 16. The connection between the reservoir and the inlet tube connection and the outlet tube connection, respectively, are made liquid tight. The pump may not only be a self-contained pumping device, but may be made integrated into the reservoir, thus making the reservoir and a pumping device one single integrated component. This single integrated element of the reservoir and the pumping device may also be integrated, thus making the reservoir, the pumping device and the heat exchanging surface one single integrated unit. This may as example be possible if the reservoir is made of a metal such as aluminium. Thus, the choice of material provides the possibility of constituting both the reservoir and a heat exchanging surface having a relatively high heat conductivity, and possibly also renders the possibility of providing bearings and the like constructional elements for a motor and a pumping wheel being part of the pumping device.

In an alternative embodiment, the pump is placed in immediate vicinity of the reservoir, however outside the reservoir. By placing the pump outside, but in immediate vicinity of the reservoir, still an integrate element may be obtained, The pump or the inlet or the outlet is preferably positioned so as to obtain a turbulence of flow in the immediate vicinity of the heat exchanging interface, thereby promoting increased heat dissipation between the heat exchanging interface end the cooling liquid. even in the alternative, a pumping member such as an impeller (see fig. 15-16) may be provided in the immediate vicinity of the heat exchanging surface. The pumping member itself normally introduces a turbulence of flow, and thereby the increased heat dissipation is promoted irrespective of the position of the pump itself, or the position of the inlet or of the outlet to the reservoir or to the pump.

The pump may be driven by an AC or a DC electrical motor. When driven by an AC electrical motor, although being technically and electrically unnecessary in a computer system, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the pump. The pump may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. However, in the embodiment shown, the pump is driven by a 12V AC electrical motor.

Control of the pump in case the pump is driven by an AC electrical motor, preferably takes place by means of the operative system or an alike means of the computer system itself, and where the computer system comprises means for measuring the CPU load and/or the CPU temperature. Using the measurement performed by the operative system or alike system of the computer system eliminates the need for special means for operating the pump. Communication between the operative system or alike system and a processor for operating the pump may take place along already established communication links in the computer system such as a USB-link. Thereby, a real-time communication between the cooling system and the operative system is provided without any special means for establishing the communication.

In the case of the motor driving the pump is an AC electrical motor, the above method of controlling the pump may be combined with a method, where said pumping means is provided with a means for sensing a position of the rotor of the electrical motor, and wherein the following steps are employed: Initially establishing a preferred rotational direction of the rotor of the electrical motor, before start of the electrical motor, sensing the angular position of the rotor, during start, applying an electrical AC voltage to the electrical motor and selecting the signal value, positive or negative, of the AC voltage at start of the electrical motor, said selection being made according to the preferred rotational direction, and said application of the AC voltage being performed by the computer system for applying the AC voltage from the electrical power supply of the computer system during conversion of the electrical DC voltage of the power supply to AC voltage for the electrical motor. By the operative system of the computer system itself generating the AC voltage for the electrical motor, the rotational direction of the pump is exclusively selected by the computer system, non-depending on the applied voltage of the public grid powering the computer system.

Further control strategies utilising the operative system or alike system of the computer system may involve balancing the rotational speed of the pump as a function of the cooling capacity needed. If a lower cooling capacity is needed, the rotational speed of the pump, may be limited, thereby limiting the noise generating by the motor driving the pump.

In the case an air fan is provided in combination with a heat sink as shown in fig. 1, of the air fan is provided in combination with the heat radiator, the operative system or alike system of the computer system may be designed for regulating the rotational speed of the pump, and thus of the motor driving the pump, and the rotational speed of the air fan, and thus the motor driving the air fan. The regulation will take into account the cooling capacity needed, but the regulation will at the same time take into account which of the two cooling means, i.e. the pump and the air fan, is generating the most noise. Thus, it the air fan generally is generating more noise than the pump, then the regulation will reduce the rotational speed of the air fan before reducing the rotational speed of the pump, whenever a lower cooling capacity is needed. Thereby, the noise level of the entire cooling system is lowered as much as possible. If the opposite is the case, i.e. the pump generally generating more noise than the air fan, then the rotational speed of the pump will be reduced before reducing the rotational speed of the air fan.

Even further control strategies involve controlling the cooling capacity in dependence on the type of computer processing taking place. Some kind of computer processing, such as word-processing, applies a smaller load on the processing units such as the CPU than other kinds of computer processing, such as image processing. Therefore, the kind of processing taking place on the computer system may be used as an indicator of the cooling capacity. It may even be possible as part of the operative system or similar system to establish certain cooling scenarios, depending on the kind of processing intended by the user. If the user selects as example word-processing, a certain cooling strategy is applied based on a limited need for cooling. If the user selects as example image-processing, a certain cooling strategy is applied based on an increased need for cooling. Two or more different cooling scenarios may be established depending on the capacity and the control possibilities and capabilities of the cooling system and depending on the intended use of the computer system, either as selected by a user during use of the computer system or as selected when choosing hardware during build-up of the computer system, i.e. before actual use of the computer system.

The pump is not being restricted to a mechanical device, but can be in any form capable of pumping the cooling liquid through the system. However, the pump is preferably one of the following types of mechanical pumps: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump. Similarly, the motor driving the pumping member need not be electrical but may also be a piezo-electrically operated motor, a permanent magnet operated motor, a fluid-operated motor or a capacitor-operated motor. The choice of pump and the choice of motor driving the pump id dependent on many different parameters, and it is up to the person skilled in the art to choose the type of pump and the type of motor depending on the specific application. As example, some pumps and some motors are better suited for small computer systems such as lab-tops, some pumps and some motors are better suited for establishing I high flow of the cooling liquid and thus a high cooling effect, and even some pumps and motors are better suited for ensuring a low-noise operation of the cooling system.

Fig. 7 is a cut-out view into the reservoir, when the reservoir and the heat exchanging surface 4 is assembled and the pump 21 is situated inside the reservoir. The reservoir is provided with the tube inlet connection (not seen from the figure) through which the cooling liquid enters the reservoir. Subsequently, the cooling liquid flows through the reservoir passing the heat exchanging surface and enters the inlet of the pump. After having been passed through the pump, the cooling liquid is passed out of the outlet of the pump and further out through the tube outlet connection 16. The figure also shows a lid 17 for the reservoir. The flow of the cooling liquid inside the reservoir and trough the pump may be further optimised in order to use as little energy as possible for pumping the cooling liquid, but still having a sufficient amount of heat from the heat exchanging surface being dissipated in the cooling liquid. This further optimisation can be established by changing the length and shape of the tube connection inlet within the reservoir, and/or by changing the position of the pump inlet, and/or for instance by having the pumping device placed in the vicinity and in immediate thermal contact with the heat exchanging surface and/or by providing channels or segments inside the reservoir.

In this case, an increased turbulence created by the pumping device is used to improve the exchange of heat between the heat exchanging surface and the cooling liquid. Another or an additional way of improving the heat exchange is to force the cooling liquid to pass through specially adapted channels or segments being provided inside the reservoir or by making the surface of the heat exchanging surface plate inside the reservoir uneven or by adopting a certain shape of a heat sink with segments. In the figure shown, the inner surface of the heat exchanging surface facing the reservoir is plane.

Fig. 8 is a perspective view of the cooling system showing the reservoir 14 with the heat exchanging surface (not shown) and the pump (not shown) inside the reservoir. The tube inlet connection and the tube outlet connection are connected to a heat radiator by means of connecting tubes 24 and 25 through which the cooling liquid flows into and out of the reservoir and the heat radiator, respectively. Within the heat radiator 11, the cooling liquid passes a number of channels for radiating the heat, which has been dissipated into the cooling liquid inside the reservoir, and to the surroundings of the heat exchanger. The air fan 10 blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir.

According to the invention, the heat radiator 11 may be provided alternatively. The alternative heat radiator is constituted by a heat sink, such as a standard heat sink made of extruded aluminium with fins on a first side and a substantially plane second side. An air-fan may be provided in connection with the fins along the first side. Along the second side of the heat sink a reservoir is provided with at least one aperture intended for being closed by placing said aperture covering part of, alternatively covering the whole of, the substantial plane side of the heat sink. When closing the reservoir in such a way a surface of the heat sink is in direct heat exchanging contact with an interior of the reservoir, and thus in direct heat exchanging contact with the cooling liquid in the reservoir, through the at least one aperture. This alternative way of providing the heat radiator may be used in the embodiment shown in fig. 8 or may be used as a heat radiator for another use and/or for another embodiment of the invention.

A pumping means for pumping the cooling liquid trough the reservoir may or may not be provided inside the reservoir at the heat sink. The reservoir may be provided with channels or segments for establishing a certain flow-path for the cooling liquid through the reservoir. Channels or segments are especially needed when the inner surface of the heat exchanging surface is plane and/or when the inner walls of the reservoir are smooth and/or if the pump is not situated inside the reservoir. In either of the circumstances mentioned, the flow of the cooling liquid inside the reservoir may result in the cooling liquid passing the reservoir too quickly and not being resident in the reservoir for a sufficient amount of time to take up a sufficient amount of heat from the heat exchanging surface. If channels or segments in the reservoir are to be provided inside the reservoir, the shape and of the channels and segments may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

By means of the alternative heat radiator, the heat radiator 11 is not provided as is shown in the figure with the rather expensive structure of channels leading the cooling liquid along ribs connecting the channels for improved surface of the structure. Instead, the heat radiator is provided as described as a unit constituted by a heat sink with or without a fan and a reservoir, and thereby providing a simpler and thereby cheaper heat radiator than the heat radiator 11 shown in the figure.

The alternative heat radiator provided as an unit constituted by a heat sink and a reservoir, may be used solely, with or without a pump inside the reservoir and with or without the segments or channels, for being placed in direct or indirect thermal contact with a heat generating processing unit such as CPU or with the heat exchanging surface, respectively. These embodiments of the invention may e.g. be used for a reservoir, where the cooling liquid along a first side within the reservoir is in direct heat exchanging contact with the heat generating processing unit such as a CPU and the cooling liquid along a second side within the reservoir is in direct heat exchanging contact with a heat sink. Such a reservoir may be formed such as to provide a larger area of heat exchanging surface towards the heat generating processing unit such as a CPU than the area of the heat exchanging surface facing the heat sink. This may e.g. have the purpose of enlarging the area of the heat exchanging surface so as to achieve an improved heat dissipation form e.g. the CPU to the heat sink than that of a conventional heat sink without a reservoir attached. Conventional heat sinks normally only exchanges heat with the CPU through the area as given by the area of the top side of the CPU. A system comprising a liquid reservoir and a heat sink with a fan provided has been found to be a simple, cost optimised system with an improved heat dissipation than that of a standard heat sink with a fan, but without the reservoir. In another embodiment of the invention, which may be derived from fig. 8, the air fan and the heat radiator is placed directly in alignment of the reservoir. Thereby, the reservoir 14, the air fan 10 and the radiator 11 constitute an integrate unit. Such an embodiment may provide the possibility of omitting the connection tubes, and passing the cooling liquid directly from the heat radiator to the reservoir via an inlet connection of the reservoir, and directly from the reservoir to the heat radiator via an outlet connection of the reservoir. Such an embodiment may even render the possibility of both the pumping device of the liquid pump inside the reservoir and the electrical motor for the propeller of the air fan 23 of the heat radiator 11 being driven by the same electrical motor, thus making this electrical motor the only motor of the cooling system.

When placing the heat radiator on top of the air fan now placed directly in alignment with the reservoir and connecting the heat radiator directly to the inlet connection and outlet connection of the reservoir, a need for tubes will not be present. However, if the heat radiator and the reservoir is not in direct alignment with each other, but tubes may still be needed, but rather than tubes, pipes made of metal such as copper or aluminium may be employed, such pipes being impervious to any possible evaporation of cooling liquid. Also, the connections between such pipes and the heat radiator and the reservoir, respectively, may be soldered so that even the connections are made impervious to evaporation of cooling liquid.

In the derived embodiment just described, an integrated unit of the reservoir, the heat exchanging surface and the pumping device will be given a structure establishing improved heat radiating characteristics because the flow of air of the air fan may also be directed along outer surfaces of the reservoir. If the reservoir is made of a metal, the metal will be cooled by the air passing the reservoir after having passed or before passing the heat radiator. If the reservoir is made of metal, and if the reservoir is provided with segments on the outside surface of the reservoir, such cooling of the reservoir by the air will be further improved. Thereby, the integrated unit just described will be applied improved heat radiating characteristics, the heat radiation function normally carried out by the heat radiator thus being supplemented by one or more of the further elements of the cooling system, i.e. the reservoir, the heat exchanging surface, the liquid pump and the air fan.

Fig. 9-10 show an embodiment of a reservoir housing 14, where channels 25 are provided inside the reservoir for establishing a forced flow of the cooling liquid inside the reservoir. The channels 25 in the reservoir 14 lead from an inlet 15 to an outlet 16 like a maze between the inlet and the outlet. The reservoir 14 is provided with an aperture 27 having outer dimensions corresponding to the dimensions of a free surface of the processing unit 1 to be cooled. In the embodiment shown, the processing unit to be cooled is a CPU 1.

When channels 26 are provided inside the reservoir, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps manufactured by injection moulding, or is to be made of metal such as aluminium, perhaps manufactured by extrusion or by die casting.

The reservoir 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The CPU 1 is intended for being positioned in the aperture 27, as shown in fig. 10, so that outer boundaries of the CPU are engaging boundaries of the aperture. Possibly, a sealant (not shown) may be provided along the boundaries of the CPU and the aperture for ensuring a fluid tight engagement between the boundaries of the CPU and the boundaries of the aperture. When the CPU 1 is positioned in the aperture 27, the free surface (not shown) of the CPU is facing the reservoir, i.e. the part of the reservoir having the channels provided. Thus, when positioned in the aperture 27 (see fig. 10), the free surface of the CPU 1 is having direct contact with cooling liquid flowing through the channels 26 in the reservoir.

When cooling liquid is forced from the inlet 15 along the channels 26 to the outlet 16, the whole of the free surface of the CPU 1 will be passed over by the cooling liquid, thus ensuring a proper and maximised cooling of the CPU. The configuration of the channels may be designed and selected according to any one or more provisions, i.e. high heat dissipation, certain flow characteristics, ease of manufacturing etc. Accordingly, the channels may have another design depending on any desire or requirement and depending on the type of CPU and the size and shape of the free surface of the CPU. Also, other processing units than a CPU may exhibit different needs for heat dissipation, and may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the channels. If the processing unit is very elongate, such as a row of microprocessors, one or a plurality of parallel channels may be provided, perhaps just having a common inlet and a common outlet.

Fig. 11-13 show an embodiment of a heat sink 4, where segments 28 are provided at a first side 4A of the heat sink, and fins 29 for dissipating heat to the surroundings are provided at the other, second side 4B of the heat sink. An intermediate reservoir housing 30 is provided having a recessed reservoir at the one side facing the first side 4A of the heat sink. The recessed reservoir 30 has an inlet 31 and an outlet 32 at the other side opposite the side facing the heat sink 4.

When segments 28 are provided on the first side 4A of the heat sink, the shape of the segments may be decisive of whether the reservoir, which is made from metal such as aluminium or copper, is to be made by extrusion or is to be made by other manufacturing processes such as die casting. Especially when the segments 28 are linear and are parallel with the fins 29, as shown in the embodiment, extrusion is a possible and cost-effective means of manufacturing the heat sink 4.

The intermediate reservoir 30 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The recessed reservoir is provided with a kind of serration 33 along opposite sides of the reservoir, and the inlet 31 and the outlet 32, respectively, are provided at opposite corners of the intermediate reservoir 30. The segments 28 provided at the first side 4A of the heat sink, i.e. the side facing the intermediate reservoir 30, are placed so that when the heat

sink is assembled with the intermediate reservoir housing (see fig 13) the segments 29 run from one serrated side of the reservoir to the other serrated side of the reservoir.

When cooling liquid is forced from the inlet 31 through the reservoir, along channels (not shown) formed by the segments 29 of the heat sink 4 and to the outlet 32, the whole of the first side 4A of the heat sink will be passed over by the cooling liquid, thus ensuring a proper and maximised heat dissipation between the cooling liquid and the heat sink. The configuration of the segments on the first side 4A of the heat sink and the configuration of the serrated sides of the intermediate reservoir housing may be designed and selected according to any provisions. Accordingly, the segments may have another design, perhaps being wave-shaped or also a serrated shape, depending on any desired flow characteristics of the cooling liquid and depending on the type of heat sink and the size and shape of the reservoir.

Also other types of heat sinks, perhaps circular shaped heat sinks may exhibit different needs for heat dissipation, may exhibit other sizes and shapes of the free surface, leading to a need for other configurations of the segments and the intermediate reservoir. If the heat sink and the reservoir are circular or oval, a spiral-shaped segmentation or radially extending segments may be provided, perhaps having the inlet or the outlet in the centre of the reservoir. If an impeller of the pump is provided, as shown in fig. 15-16, the impeller of the pump may be positioned in the centre of a spiral-shaped segmentation or in the centre of radially extending segments.

Fig. 14 shows the reservoir 14 shown in fig. 9-10 and the heat sink 4 and the intermediate reservoir 30 shown in fig. 11-13 being assembled for thereby constituting an integrated monolithic unit. It is not absolutely necessary to assemble the reservoir 14 of fig. 9-10 and the heat sink 4 and the intermediate reservoir 30 of fig. 11-13 in order to obtain a properly functioning cooling system. The inlet 15 and the outlet 16 of the reservoir 14 of fig. 9-10 may be connected to the outlet 32 and the inlet 31, respectively, of the intermediate reservoir of fig. 11-13 by means of tubes or pipes.

The reservoir 14 of fig. 9-10 and the heat sink 4 and the intermediate reservoir 30 of fig. 11-13 may then be positioned in the computer system at different locations. However, by assembling the reservoir 14 of fig- 9-10 and the heat sink 4 and the intermediate reservoir 30 of fig. 11-13 a very compact monolithic unit is obtained, also obviating the need for tubes or pipes. Tubes or pipes may involve an increased risk of leakage of cooling liquid or may require soldering or other special working in order to eliminate the risk of leakage of cooling liquid. By eliminating the need for tubes or pipes, any leakage and any additional working is obviated when assembling the cooling system.

Fig. 15-16 show a possible embodiment of a reservoir according to the invention. The reservoir is basically similar to the reservoir shown in fig. 9-10. However, an impeller 33 of the pump of the cooling system is provided in direct communication with the channels 26. Also, in the embodiment shown, a heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed between the channels 26 inside the reservoir and the CPU 1 as the processing unit.

The heat exchanging surface 4 is preferably made from a copper plate having a plane outer surface as shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU 1 (see fig. 4). However, also the inner surface (not shown, see fig. 7) facing the reservoir is plane. Accordingly, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown and drilling of holes for insertion of the bolts. No milling of the inner and/or the outer surface need be provided.

The provision of the heat exchanging surface 4 need not be a preferred embodiment, seeing that the solution incorporating the aperture (see fig. 9-10) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging surface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging surface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

In the embodiment shown, the heat exchanging surface 4 is secured to the reservoir by means of bolts 22. Other convenient fastening means may be used. The heat exchanging surface 4 and thus the reservoir 14 may be fastened to the CPU 1 or other processing unit by any suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging surface. One such means may be the fastening means shown in fig. 4 and fig. 5 or similar fastening means already provided as part of the computer system.

When channels 26 are provided inside the reservoir 14, the shape of the channels may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

The reservoir 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The impeller 33 (see fig. 14) of the pump is positioned in a separate recess of the channels 26, said separate recess having a size corresponding to the diameter of the impeller of the pump. The recess is provided with an inlet 34 and an outlet 35 being positioned opposite an inlet 31 and an outlet 32 of cooling liquid to and from, respectively, the channels 26. The impeller 33 of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. In a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V or 220V. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer systemsupplying DC electrical power, this may be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump. However, in the embodiment shown, the impeller of the pump is driven by a 12V electrical motor.

Fig. 17 shows a preferred possible embodiment of a reservoir according to the invention. The reservoir 14 has basically the same features as the reservoir shown in fig. 15-16. In the embodiment shown, the reservoir substantially has a conical, circular configuration and is provided with stiffening ribs 36 extending axially along the exterior of the reservoir 14.

Other shapes such as cylindrical, circular, or conical rectangular or cylindrical, rectangular or even oval or triangular shapes may be adopted, when designing and possibly injection moulding or casting the reservoir. The dimension of the embodiment shown is approximately 55 mm in diameter and also 55 mm in axial extension.

The reservoir 14 has a recess 40 in the centre of the reservoir. The recess 37 is intended for accommodating a stator 37 of an electrical motor driving an impeller 33 of the pump, said impeller being attached to a shaft 38 of a rotor 39 of the electrical motor. The recess 40 has an orifice 41, four sidewalls 42, a bottom 43 and a circular jacket 44 extending from the bottom 43 of the recess 40 and outwards towards the orifice 41 of the recess 40. The interior (not shown) of the jacket 44 is intended for encompassing the rotor 39 of the pump.

Thereby, a liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system.

Along an outer circumferential extension, the reservoir 14 is provided with protrusions 45 extending outwardly from the circumferential extension. The protrusions are intended for cooperating with a clip (see description below) for fastening the reservoir 14 to the CPU or other processing unit of the computer system. The protrusions 45 are shown as a plurality of singular protrusions. Alternatively, the protrusions may be only one continuous protrusion extending outwardly and around the circumferential extension.

The reservoir 14 may also be provided with an inlet (not shown) and an outlet (not shown) for the cooling liquid. The inlet and the outlet are provided along a surface of the reservoir facing downward and inwards when seen in the perspective view of the drawing. The inlet and the outlet lead to a radiator (not shown) intended for cooling the cooling liquid after having been heated by the processing unit via a heat exchanging surface (see description below).

The radiator may be placed nearby or distant from the reservoir 14, depending on the set-up of the computer system. In one possible embodiment, the radiator is placed in the immediate vicinity of the reservoir, thereby possible excluding any tubing extending between the radiator and the inlet and the outlet, respectively. Such embodiment provides a very compact configuration of the entire cooling system, namely a monolithic configuration where all elements needed for the cooling system are incorporated in one unit.

In an alternative embodiment, the reservoir 14 itself also constitutes the radiator of the cooling system. In such embodiment, an inlet and an outlet are not needed. If the reservoir is made of a metal such as copper or aluminium or other material having a high thermal conductance, the cooling liquid, after having been heated by the processing unit via a heat exchanging surface 8see description below) may radiate the heat via the exterior surface of the reservoir 14 itself. In such embodiment, the ribs 36 along the exterior surface of the reservoir 14 may also, or may in stead, function as cooling fins. In such embodiment, the fins will have a smaller dimension than the transverse dimension of the ribs 14 shown in figure 17, and the number of fins will be greater than the number of fins shown in figure 17.

An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33. Thus, the pump functions as a centrifugal pump. The inlet if the pump chamber 46 is the entire opening into the cavity that the pump chamber configures, said cavity being in direct communication with the interior of the reservoir 14 as such. An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir 14.

In the embodiment shown, a heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47.

The heat exchanging interface 4 is preferably made from a copper plate having a plane outer surface (not shown) at the opposite side as the side shown in the figure, said outer surface being intended for abutting the free surface of the heat generating component such as the CPU (see fig. 4). The inner surface facing the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47 is provided with pins 4A extending from the base of the copper plate and into the thermal exchange chamber (not shown) at the opposite side of intermediate member 47. The pins 4A constitutes an uneven surface and may either be provided during casting of the copper plate or may be provided by means of milling or other machining process of a copper plate. The pins provide a network of channels across the inner surface of the heat exchanging interface, along which network the cooling liquid is intended to flow.

Alternatively, also the inner surface of the copper plate facing the reservoir is plane. In this alternative embodiment, the copper plate need no machining other than the shaping of the outer boundaries into the specially adapted shape used in the embodiment shown. No milling or other machining process of the inner and/or the outer surface need be provided, when both the outer surface and the inner surface is plane.

The provision of the heat exchanging interface 4 need not be a preferred embodiment, seeing that the solution incorporating the aperture (see figure 9-10) result in a direct heat exchange between the free surface of the CPU or other processing unit and the cooling liquid flowing along the channels in the reservoir. However, the heat exchanging interface enables usage of the cooling system independently on the type and size of the free surface of CPU or other processing unit. Also, the heat exchanging interface enables replacement, repair or other intervention of the cooling system without the risk of cooling liquid entering the computer system as such and possibly without the need for draining the cooling system fully or partly of cooling liquid.

In the embodiment shown, the heat exchanging interface 4 is secured to the intermediate member 47 by means of gluing or other means ensuring a proper and liquid-tight fastening of the heat exchanging interface with the intermediate member. Any other suitable and convenient means (not shown) for securing the heat exchanging interface to the intermediate member may be envisaged.

The heat exchanging interface and thus the reservoir is fastened to the top of the CPU by means of a clip 50. The clip 50 has a circular configuration and has four legs 51 extending axially from the circular configuration. The four legs 51 are provided with footing 52 and the footings 52 are provided with holes 53. The clip 50 is intended for being displaced around the exterior of the reservoir 14 and further axially to the protrusions 45 of the reservoir 14.

The clip 50, after having been placed around the reservoir 14, is fastened to the motherboard of the computer system by means of bolts (not shown) or the like fastening means extending through the holes 53 in the footings 52 and further though corresponding holes in the motherboard. The corresponding holes in the motherboard are preferably holes already available in the motherboard in the vicinity of the CPU and the socket of the CPU, respectively. Accordingly, the legs 51 and the footings 52 of the clip 50 are specially designed in accordance with the already provided holes in the motherboard.

Alternatively, the heat exchanging interface 4 and thus the reservoir 14 may be fastened to the CPU or other processing unit by any other suitable means such as soldering, brazing or by means of thermal paste combined with glue. Alternatively, special means (not shown) may be provided for ensuring a thermal contact between the free surface of the CPU or other processing unit and the heat exchanging interface. One such means may be the fastening means shown in fig. 4 and fig. 5 or similar fastening means already provided as part of the computer system.

When stiffening and/or cooling fins 36 are provided at the exterior of the reservoir 14, the shape of and the number of fins may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting. Also, the purpose of the fins i.e. just for stiffening the reservoir, or also or in stead for cooling purposes, may be decisive of whether the reservoir is to be made of plastic, perhaps by injection moulding, or is to be made of metal such as aluminium, perhaps by die casting.

The reservoir 14 or any other parts of the cooling system, which are possibly manufactured from a plastic material may be "metallised" in order to minimise liquid diffusion or evaporation of the liquid. The metal may be provided as a thin layer of metal coating provided on either or on both of the internal side or the external side of the plastic part.

The impeller 33 of the pump has a shape and a design intended only for one way rotation, in the embodiment shown a clock-wise rotation only. Thereby, the efficiency of the impeller of the pump is highly increased compared to impellers capable of and intended for both clock-wise and counter clock-wise rotation.

The increased efficiency of the impeller design results in the electric motor (not shown) driving the impeller of the pump possibly being smaller than otherwise needed for establishing a proper and sufficient flow of cooling liquid through the channels. In a preferred embodiment, the electric motor is an AC motor, preferably a 12V AC motor, although the impeller is intended for a DC motor. The contradictory use of an AC motor driving a DC impeller leads to the possibility of an even smaller motor needed for establishing the proper and sufficient flow of cooling liquid through the channels.

The impeller may be driven by an electrical motor at any voltage common in public electrical networks such as 110V AC power or 220V AC power. The power supply of the computer system converts the high voltage AC power to low voltage DC power. Thus, the impeller of the pump may be driven by either an AC or a DC electrical motor. As mentioned, preferably the impeller of the pump is driven by an AC electrical motor. Although being technically unnecessary to use an AC electrical motor and being electrically disadvantageous to use an AC electrical motor in a computer system supplying DC electrical power, this may be nevertheless be accomplished by converting part of the DC electrical power of the power supply of the computer system to AC electrical power for the AC motor of the pump.

In every aspect of the invention, where an AC motor is used for driving an impeller from a DC motor, although this way of configuring a pump is contradictory, the following preferred mode of operation is established for alleviating the disadvantages:

In order to be able to control direction of rotation of the impeller attached to the rotor and to optimise the conditions of maximum average torque value during starting, i.e. from zero speed up to the synchronous speed, an electronic control circuit is used. The electronic control circuit comprises a processing unit, which drives a static power switch, constituted for example by a triac arranged in series between the alternating-voltage power, which is obtained form the DC power supply of the computer system, and the AC motor. The same series network also includes a detector for the current I which flows through the triac and then through the AC motor. The output of the current detector is an input signal for the electronic processing unit.

The electronic control circuit may also comprise a number or sensors suitable for detecting the position and polarity of the permanent magnets comprised in the rotor of the AC motor, both when the rotor is moving and when it is in particular operating conditions, or when it is motionless or stalled at zero speed. The number of position sensors may be Hall sensors, encoders or optical or electro-mechanical sensors capable of establishing and/or measuring the position of the rotor. The output signal from the number of position sensors is an input signal for the electronic processing unit.

Alternatively, the output signal from the position sensor may be phase shifted by means of an electronic phase shifting circuit before the output signal is sent to the input of the electronic processing unit.

A third signal may be input to the processing unit, said third signal enabling the processing unit to detect the polarity of the AC voltage applied to the AC motor. However, the third signal is not compulsory.

The signals input to the electronic processing unit are converted into digital form and after being processed by the processing unit, an output signal is provided by the processing unit. The output signal is used for closing or opening the static switch constituted by a triac arranged in series with the AC motor.

In the electronic processing unit, the current signal provided by the current sensor enters a zero-crossing detector which provides in output a logical "1" signal indicating that said current approaches zero with a positive or negative deviation from the zero value of said current. This deviation depends on the type of motor used and on its application, as well as on the type of static power switch being used. The signal arriving from the position sensor enters a phase-shift and processing circuit the output whereof is 1 or 0 according to the position and polarity of the rotor.

In the electronic processing unit, the phase shifted position signal as well as the signal processed from the AC voltage, enter an electronic logic XOR gate which outputs a "1" signal if the digital value of the AC voltage is equal to "0" and the digital value of the phase shifted position signal is equal to "1" or the digital value of the AC voltage is equal to "1" and the digital value of the phase shifted position signal is equal to "0".

The output of the zero-crossing detector and the output of the XOR gate, thus in digital form, enter an electronic logic AND gate which provides in output the control signal for closing or opening the static power switch.

The AND gate with two inputs and the signal processing system allow determining two conditions: 1) the AC voltage signal is positive, the current is proximate to zero, and the rotor rotation angle is between 0 degrees and 180 degrees; 2) the AC voltage signal is negative, the current is proximate to zero, and the rotor rotation angle is between 180 degrees and 360 degrees. These two conditions provide the same rotation direction of the rotor of the AC motor.

Fig. 18 shows an embodiment of an AC motor in which one stator pole 54 is longer than the other stator pole 55 by an amount indicated by l. With this configuration the permanent-magnet rotor 39 with an ideal line 56 separating the north N and the south S of the rotor, is positioned so that the ideal line 56 do not coincide with the median axis 57 of the stator 37, but so that the ideal line 56 is tilted by a certain angle α in respect to the median 57 of the stator 37.

Two energising windings 58, 59 are provided on the two poles 54,55 of the stator 37, respectively, and the energising windings are connected in series and are powered, through terminals (not shown), by an AC power source. With this configuration of the AC motor, the motor is able to start more easily in an intended rotational direction of the rotor.

In a preferred embodiment of the invention, the control electronics supplies the AC motor with only a half-wave voltage signal during start up, thereby providing torque pulses to the rotor. Since only a half-wave voltage signal is supplied to the motor, the torque pulses are always unidirectional and will therefore force the rotor to start rotating in a required direction. The required direction of rotation is determined by the design of the impeller attached to the rotor and by polarity of the half-wave voltage signal.

After some amount of time, in which a number of half-wave voltage signals has been supplied to the motor, the rotor will stop rotating at a certain position e.g. as shown in the figure. Thus, the rotor is brought into a determined steady state position that is independent of its start position. Subsequent to this process, the AC motor is supplied with a full-wave voltage signal that will accelerate the rotor until the motor enters synchronous operation, that is, when the rotor rotates with the same cyclic frequency as the frequency of the AC voltage source.

The initial polarity of the AC voltage signal is determinative for the resulting direction of rotation of the rotor, thus if the initial voltage is positive with an increasing amplitude, the rotor will start rotating in one direction, whereas if the voltage is negative with a decreasing amplitude, the rotor will start rotating in an opposite direction.

The number of half-waves required for bringing the rotor into a determined steady state position, where the rotor stops rotating, depends on the characteristics of the motor such as moment of inertia and the external load applied to the rotor. Thus, the number of half-waves required is based on empirical analysis of a particular motor in particular load conditions.

The half-wave voltage signal and the corresponding half-wave current signal supplied to the motor will have an appearance as shown in Fig. 19.

In an alternative embodiment the control electrics used to drive the AC motor shown if Figure 18 is configured so that that the control electronics dictates the AC motor to stop at a predetermined position by supplying the motor with a number of half-wave voltage signals subsequent to the synchronous operation in which the motor was supplied with a full-wave voltage signal. Thus, at the time the motor needs to be started again, the rotor is already in a position so that only the polarity of the full-wave AC voltage signal supplied to the motor must be chosen so that the resulting direction of rotation of the rotor is in conformity with the terminal position of the rotor at the last operation.

According to this method, the initial step of bringing the rotor into a determined steady state position by supplying the motor with a number of half-wave voltage signals is not required. Even in the alternative, it will be possible to both terminate the full-wave power supply with a number of half-wave voltage signals as well as commencing the full-wave power supply by initially supplying the motor with a number of half-wave signals. However, this is more cumbersome, but nevertheless more safe.

Fig. 19 shows a voltage signal V and a current signal I applied to the AC motor as well as the position signal of the rotor. Initially the rotor stands still, which is represented by the straight line L. The electronic control circuit controls the static power switch so that the voltage signal V and the current signal I are present as half-waves. Thus, the rotor receives torque pulses due to the current-voltage combination; these pulses are always one-way directional and tend to start the rotor moving in the required direction. Subsequent to the start-up phase, the rotor enters into its synchronous operation.

Thus, an AC signal is generated, preferably a 12 V AC signal, possibly by means of digital electric pulses from the 12 V DC power supply of the computer's power supply. Based on a possible sensor output relating to the impeller position, a decision is made of how to initiate the AC power signal, i.e. with a negative or positive half-wave, and by doing making sure the impeller starts in the same rotational direction each time andthus the performance benefits of the AC pump is similar to those of a DC pump.

Alternatively, the magnetic field sensor is omitted, and instead of reading the impeller position, the impeller is forced to be in the same position every time the impeller starts. To be sure the impeller is in a defined position before start, a signal is supplied to the stator of tha AC motor for a defined period of time. The signal is supplied perhaps three times in a row according to the curvature of the electrical power source. The pulses must be within the same half-wave part of a signal period. The frequency of the pulsed signal is arbitrary, but may be 50/60 Hz, although, despite the fact that under normal circumstances an AC pump being driven by the AC signal from the power outlet of the public electrical power network and transformed from 230/115 V to 12V would not function, as there is no chance of changing the sine signal from the public network.

By this way the impeller will be forced to the right polarity before start, and the pump will start turning the impeller in a defined way of rotation when the power signal full-wave is supplied. The full-wave power signal, which is supplied, must start in the opposite signal half-wave amplitude than that of the initial half-wave pulses, that was supplied before start of the full-wave power signal.

The invention has been described with reference to specific embodiments and with reference to specific utilisation, it is to be noted that the different embodiments of the invention may be manufactured, marketed, sold and used separately or jointly in any combination of the plurality of embodiments. In the above detailed description of the invention, the description of one embodiment, perhaps with reference to one or more figures, may be incorporated into the description of another embodiment, perhaps with reference to another or more other figures, and vice versa. Accordingly, any separate embodiment described in the text and/or in the drawings, or any combination of two or more embodiments is envisaged by the present application.

CLAIMS

1. A cooling system for a computer system, said computer system comprising
- at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising
- a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid,
- a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid,
- a pumping means being provided as part of an integrate element, said integrate element comprising the heat exchanging interface, the reservoir and the pump,
- said pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means,
- said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means.

2. A cooling system according to claim 1, wherein the entire pump is placed inside the reservoir with at least an inlet or an outlet leading to the cooling liquid in the reservoir.

3. A cooling system according to claim 1, wherein the pumping member of the pump and a movable driven part of the motor of the pump, such as a rotor of en electrical motor, is placed inside a liquid-containing interior of the reservoir, embedded in the cooling liquid, and wherein a stationary driving part of the motor of the pump, such as a stator of an electrical motor, is placed outside the liquid-containing interior of the reservoir.

4. A cooling system according to claim 1, wherein the entire pump is placed outside the reservoir in the immediate vicinity of the reservoir, and wherein at least an inlet or an outlet of the pump is leading directly to the cooling liquid in the reservoir.

5. A cooling system according to any of the preceding claims, wherein an inlet of the pump is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface.

6. A cooling system according to any of the preceding claims, wherein an outlet of the pump is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface.

7. A cooling system according to any of the preceding claims, wherein a pumping member such as an impeller of the pump is positioned in immediate vicinity of the heat exchanging interface for thereby obtaining a turbulence of flow of the cooling liquid in the immediate vicinity of the heat exchanging interface.

8. A cooling system according to any of the preceding claims, wherein the pumping member of the pump is intended for only one-way of displacement for pumping, such as one-way rotation for pumping, and where the pumping member is driven by a motor capable of two-way displacement when operating, such as both clockwise and counter-clockwise rotation when operating.

9. A cooling system according to any of the preceding claims, wherein the pump is selected from the following types: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump.

10. A cooling system according to any of the preceding claims, wherein driving means for driving the pump is selected among the following driving means: electrically operated rotary DC motor, electrically operated rotary AC motor, piezo-electrically operated motor, permanent magnet operated motor, fluid-operated motor, capacitor-operated motor.

11. A cooling system according to any of claims 8-10, wherein the pumping member of the pump is a one-way rotational impeller of a centrifugal pump, and wherein the motor of the pump is an electrical rotary AC motor driven by AC electrical power.

12. A cooling system according to any of the preceding claims, wherein one or more of the following means are provided inside the reservoir for increasing the heat absorption by the cooling liquid: channels or segments inside the reservoir, an uneven surface being provided on a physical surface of the heat exchanging interface, a heat sink with segments provided inside the reservoir and being in thermal contact with the cooling liquid.

13. A cooling system according to any of the preceding claims, wherein the heat exchanging interface is a heat exchanging surface being in close thermal contact with the processing unit for dissipating heat from the processing unit to the cooling liquid via the heat exchanging surface.

14. A cooling system according to any of the preceding claims, where the heat exchanging interface is a free surface of the processing unit, said free surface of the processing unit having direct access to the cooling liquid for dissipating heat from the processing unit directly to the cooling liquid.

15. A cooling system for a computer system, said computer system comprising
- at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising
- a reservoir having an amount of cooling liquid for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid,
- a heat exchanging interface for providing thermal contact with the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid,
- a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, and
- said cooling system further comprising a pump wherein the pump is driven by an AC electrical motor powered by a DC electrical power supply of the computer system,
- where at least part of the DC electrical power from said power supply is intended for being converted to AC electrical power being supplied to the electrical motor.

16. A cooling system according to claim 15, wherein the pump is selected from the following types: Bellows pump, centrifugal pump, diaphragm pump, drum pump, flexible liner pump, flexible impeller pump, gear pump, peristaltic tubing pump, piston pump, processing cavity pump, pressure washer pump, rotary lobe pump, rotary vane pump and electro-kinetic pump.

17. A cooling system according to claim 15 or 16, wherein one or more of the following means are provided inside the reservoir for increasing the heat absorption by the cooling liquid: channels or segments inside the reservoir, an uneven surface being provided on a physical surface of the heat exchanging interface, a heat sink with segments provided inside the reservoir and being in thermal contact with the heat exchanging surface.

18. A cooling system according to any of claims 15-17, where the heat exchanging interface is a heat exchanging surface being in close thermal contact with the processing unit for dissipating heat from the processing unit to the cooling liquid via the heat exchanging surface.

19. A cooling system according to any of the claims 15-17, where the heat exchanging interface is a free surface of the processing unit, said free surface of the processing unit having direct access to the cooling liquid for dissipating heat from the processing unit directly to the cooling liquid,

20. A cooling system according to any of the claims 1-19, wherein a motor is intended both for driving the pump for pumping the cooling liquid and for driving a fan for establishing a flow of air in the vicinity of the reservoir.

21. A cooling system according to any of the claims 1-19, wherein a motor is intended both for driving the pump for pumping the cooling liquid and for driving a fan for establishing a flow of air in the vicinity of the heat radiating means.

22. A cooling system according to any of the claims 1-19, wherein a motor is intended both for driving the pump for pumping the cooling liquid, and for driving the a fan for establishing a flow of air in the vicinity of the reservoir, and for driving a fan for establishing a flow of air in the vicinity of the heat radiating means.

23. A cooling system according to any of the preceding claims, wherein the heat exchanging interface is an element being separate from the reservoir, and where the heat exchanging interface is secured to the reservoir in a manner so that the heat exchanging interface constitutes part of the reservoir when being secured to the reservoir.

24. A cooling system according to any of claims 1-22, wherein the heat exchanging interface constitutes an integrate part of the reservoir, and where the heat exchanging interface extends along an area of a surface of the reservoir, said area of surface being intended for facing the processing unit and said area of surface being intended for close thermal contact with the processing unit.

25. A cooling system according to any of claims 1-22, wherein the heat exchanging interface is constituted between a free surface of the processing unit and the cooling liquid in the reservoir, and where the heat exchanging interface is capable of establishing the close thermal contact with the processing unit through an aperture provided in the reservoir, and where the aperture extends along an area of the surface of the reservoir, said area of surface being intended for facing the processing unit.

26. A method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilising a cooling system for cooling the at least one processing unit and, said cooling system comprising - a reservoir, at least one heat exchanging interface and a pumping means, said method of cooling comprising the steps of

establishing, or defining, or selecting an operative status of the pumping means

- controlling the operation of the motor of the pumping means in response to the following parameters; the necessary direction of movement for obtaining a pumping action of a pumping member of the pumping means, the possible direction of movement of a driving part of the motor of the pumping means, and

- in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve the necessary direction of movement of the driving part of the motor for establishing the necessary direction of movement for obtaining he pumping action of the pumping member.

27. A method according to claim 26, said method being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and said method comprising the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor before applying a full-wave AC power signal.

28. A method according to claim 26, said method being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and said method comprising the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and applying at least one half-wave of an AC power signal to the stator of the AC motor after having applied the full-wave AC power signal.

29. A method according to claim 26, said method being applied to a cooling system where the pumping member is a rotary impeller having a one-way direction for obtaining a pumping action, and where the motor of the pumping means is an electrical AC motor having a rotor constituting the driving part of the motor, and said method comprising the step of establishing, or defining, or selecting a rotary position of the rotor of the electrical AC motor, and terminating a full-wave AC power signal having been applied with a selected known orientation of the last half-wave of the AC power signal.

30. A method of cooling a computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said method utilising a cooling system for cooling the at least one processing unit and, said cooling system comprising - a reservoir, at least one heat exchanging interface, a pumping means and an air blowing fan, said method of cooling comprising the steps of
- applying one of the following possibilities of how to operate the computer system: establishing, or defining, or selecting an operative status of the computer system
- controlling the operation of at least one of the following means of the computer system; the pumping means and the air blowing fan in response to at least one of the following parameters; a surface temperature of the heat generating processing unit, an internal temperature of the heat generating processing unit, or a processing load of the CPU and
- in accordance with the operative status being established, defined or selected, controlling the operation of the computer system in order to achieve at least one of the following conditions; a certain cooling performance of the cooling system, a certain electrical consumption of the cooling system, a certain noise level of the cooling system.

31. A method according to claim 32 for cooling a computer system, wherein the operation of the air blowing fan is controlled before any control of the operation of the pumping means in order to achieve the at least one selected condition of the cooling system.

32. A method according to claim 32 or 33 for cooling a computer system, wherein said computer system further comprises an operative system or an alike means comprising a means for measuring the CPU load and/or the CPU temperature, and wherein said method of cooling said CPU further comprises the step of
- using a measurement, performed by said BIOS or alike means, of the CPU load and/or the CPU temperature for controlling said cooling system.

33. A method according to claim 32 for cooling a computer system, wherein said cooling system further comprises a temperature measuring means for measuring a temperature of the CPU, and wherein said method of cooling said CPU further comprises the step of
- using a measurement, performed by said temperature measurement means, of the CPU temperature for controlling said cooling system.

34. A method for cooling a computer system, wherein said cooling system further comprises a pumping means with an impeller for pumping the cooling liquid through a pump chamber, said pumping means being driven by an AC electrical motor with a stator and a rotor, and said pumping means being provided with a means for sensing a position of the rotor, and wherein the method comprises the following steps

- initially establishing a preferred rotational direction of the rotor of the electrical motor
- before start of the electrical motor, sensing the angular position of the rotor
- during start, applying an electrical AC signal to the electrical motor and selecting the signal value, positive or negative, of the AC signal at start of the electrical motor
- said selection being made according to the preferred rotational direction, and
- said application of the AC signal being performed by the computer system for applying the AC voltage from the electrical power supply of the computer system during conversions of the electrical DC voltage of the power supply to AC voltage for the electrical motor.

35. A method according to claim 34, where sensing the angular position of the rotor is accomplished by a number Hall-sensors placed at angular intervals for detection of the rotor's magnetic poles, the number of sensors corresponding to the number of magnetic poles establishing the mechanical angle, and corresponding to the electrical angle.

36. A method according to claim 34 or claim 35, where application of the electrical AC voltage to the electrical motor and selection of the signal value, positive or negative, of the AC voltage at start of the electrical motor is accomplished by the operating system of the computer system and is communicated to an DC/AC converter of the computer system.

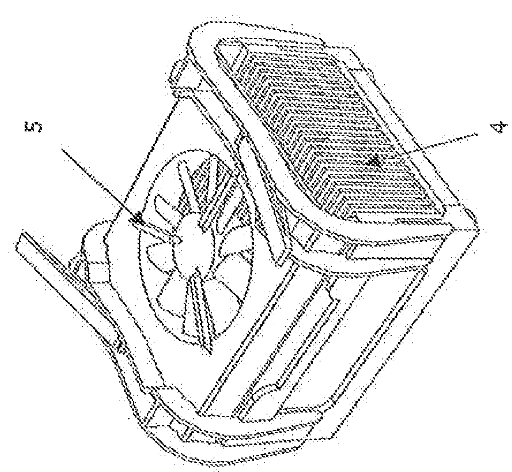


FIG. 2

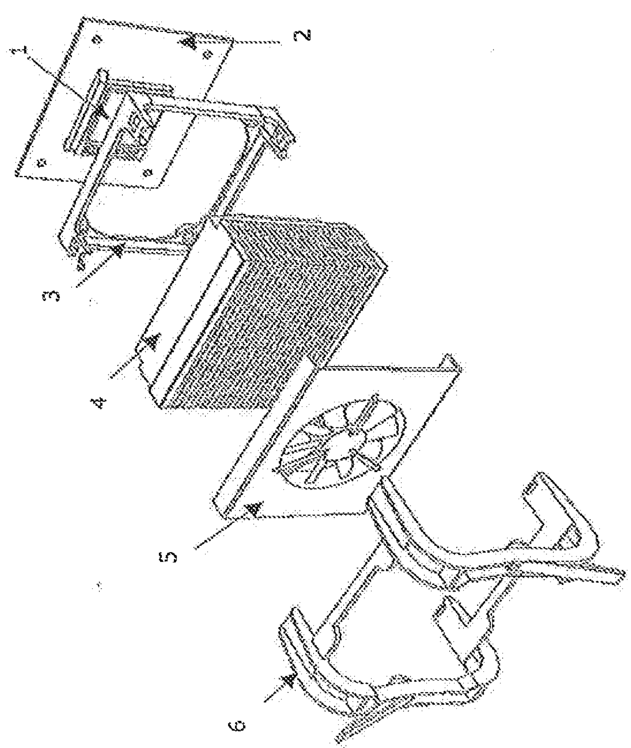


FIG. 1

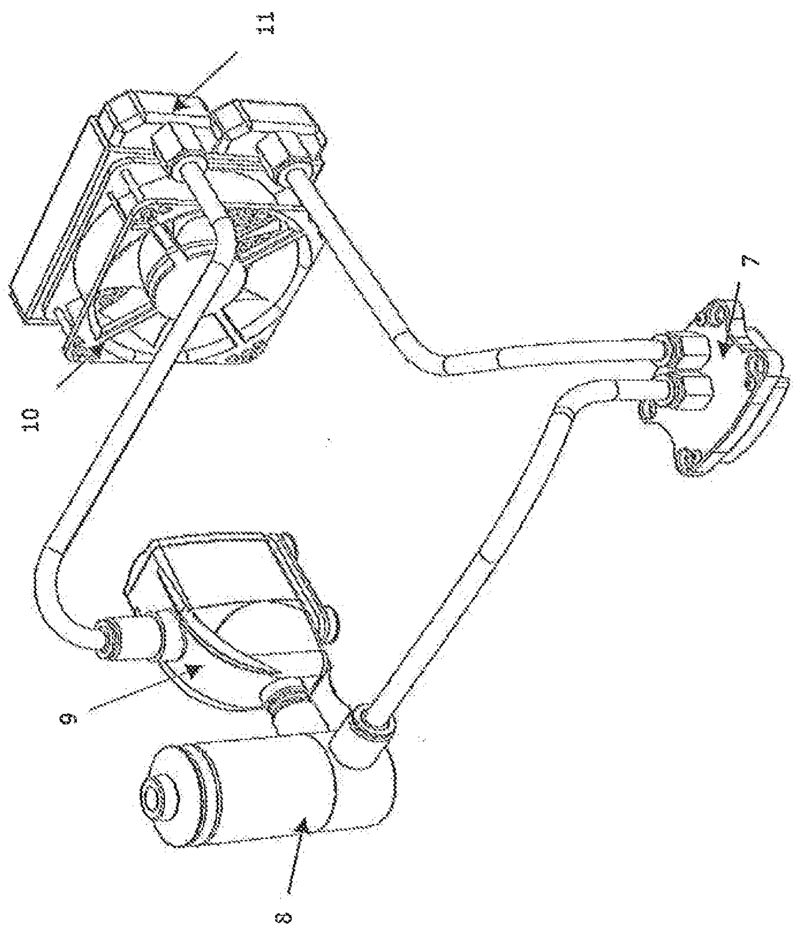


FIG. 3

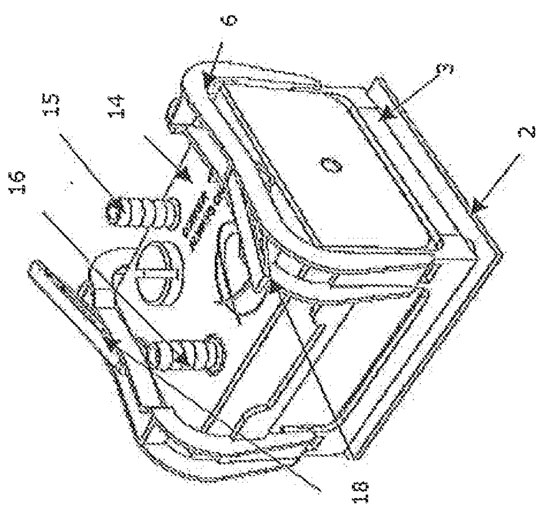


FIG. 5

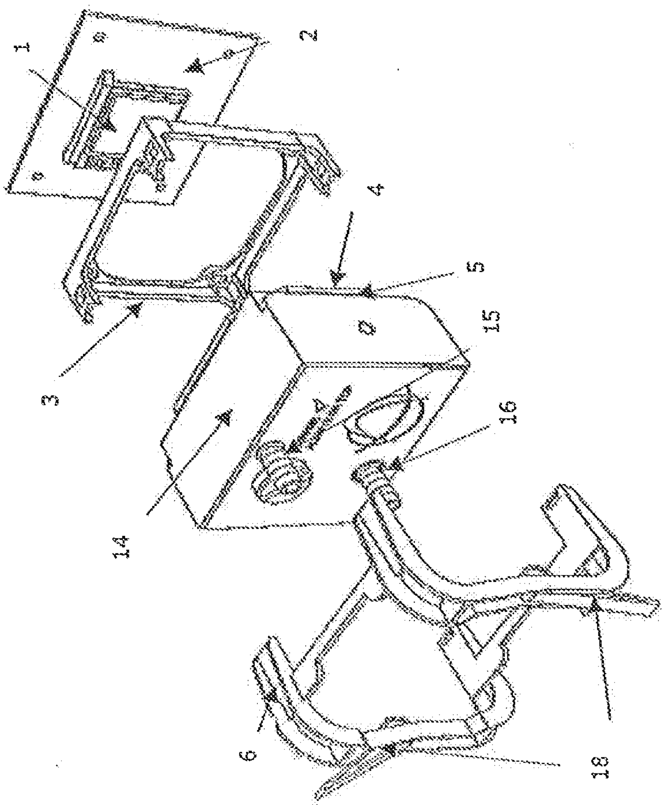


FIG. 4

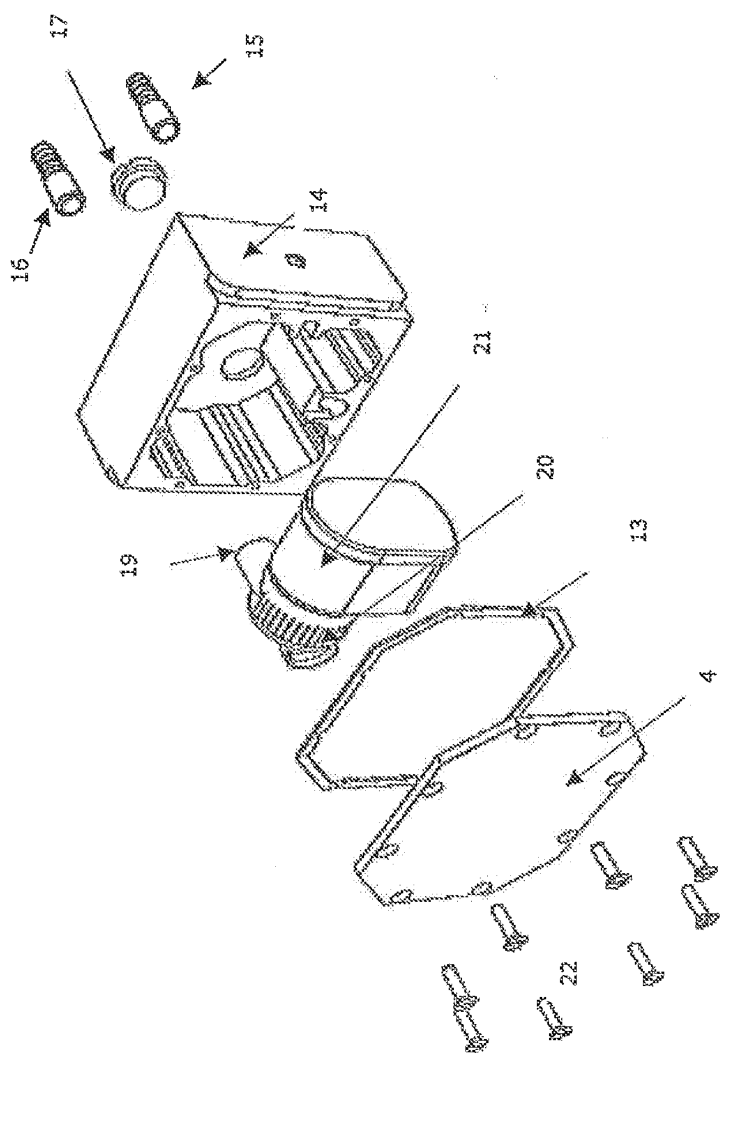


FIG. 6

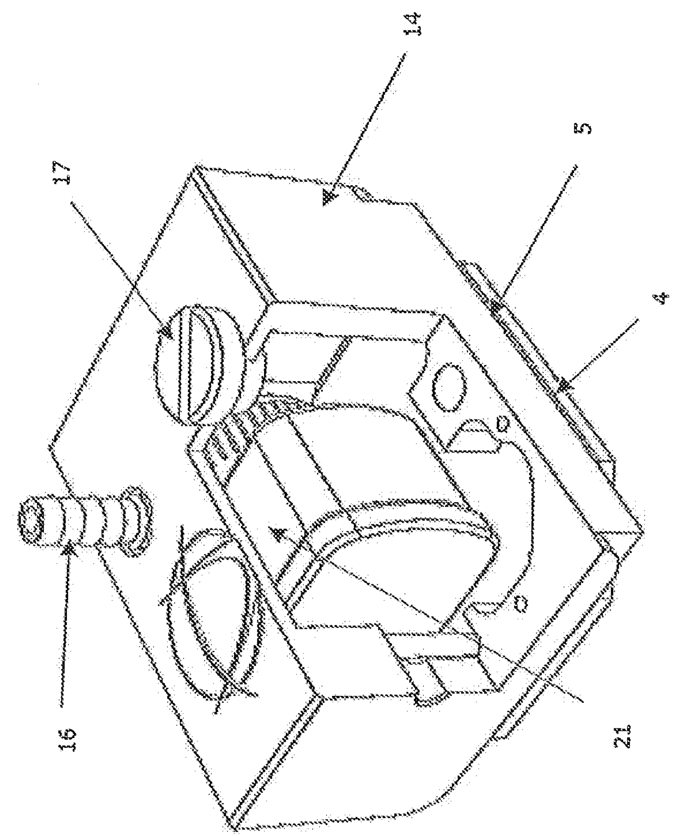


FIG. 7

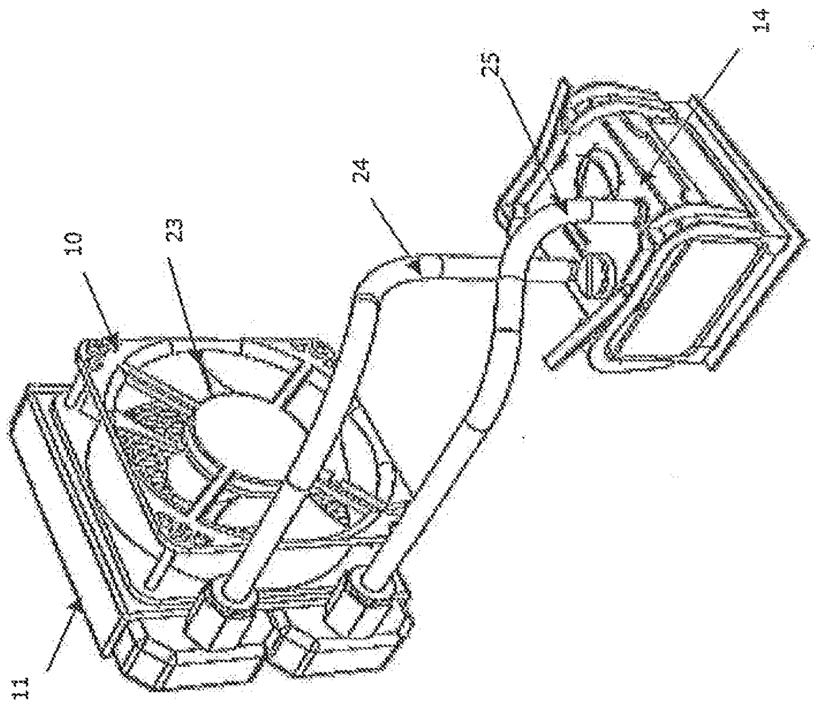


FIG. 8

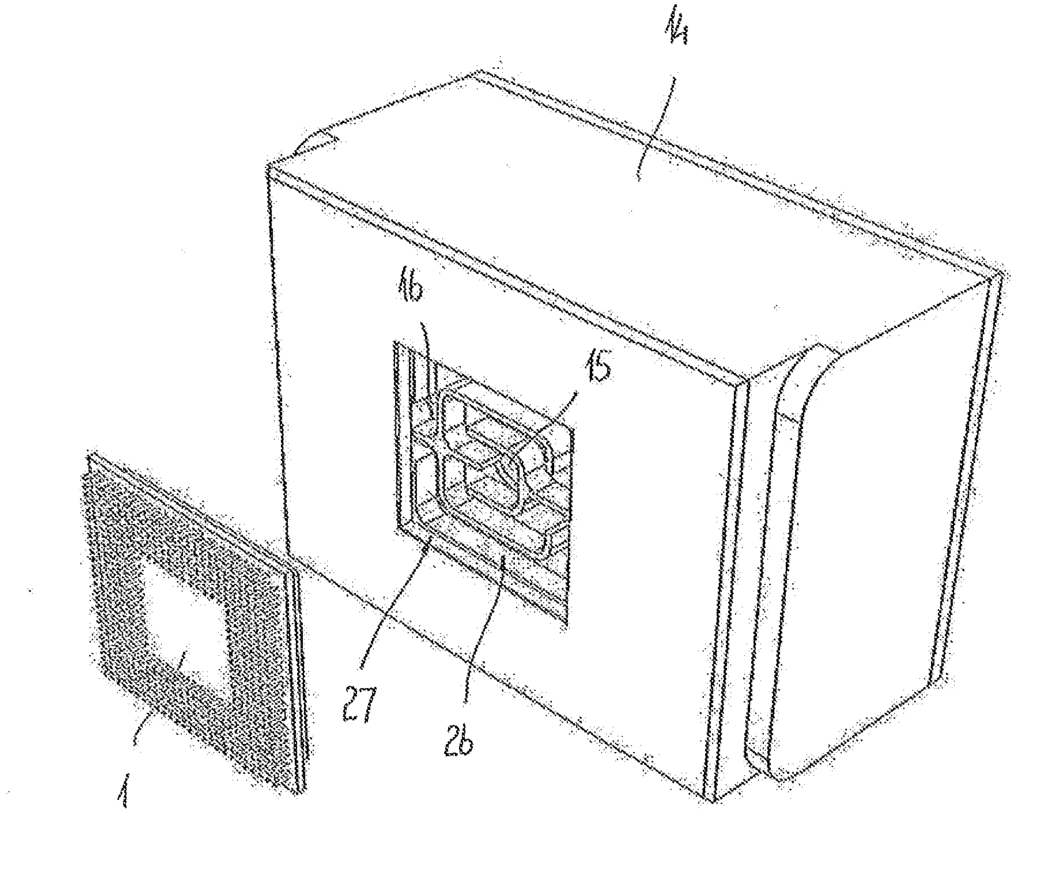


FIG. 9

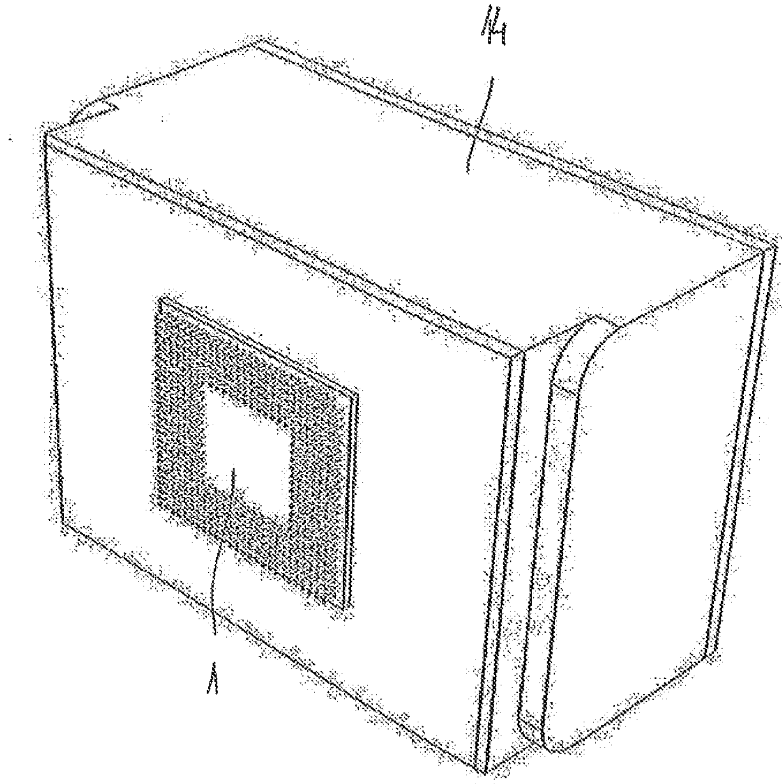


FIG. 10

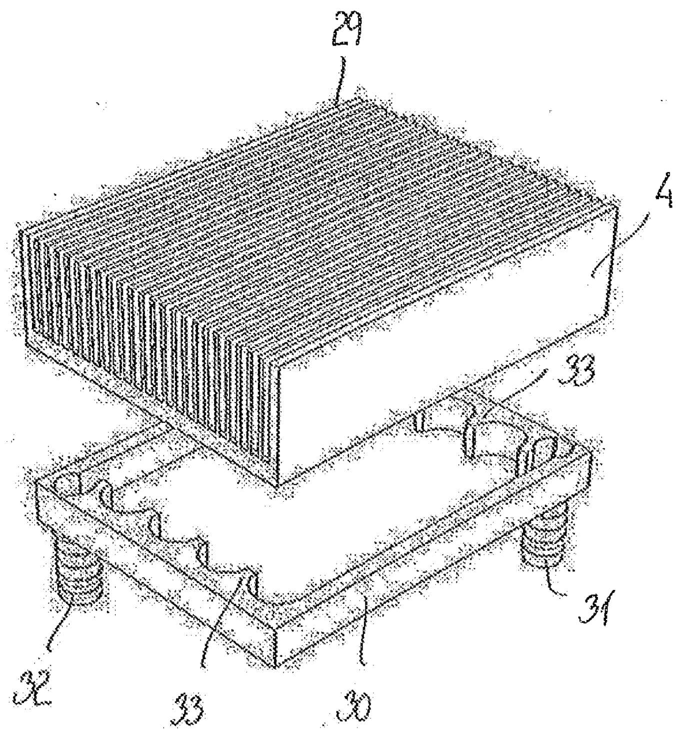


FIG. 11

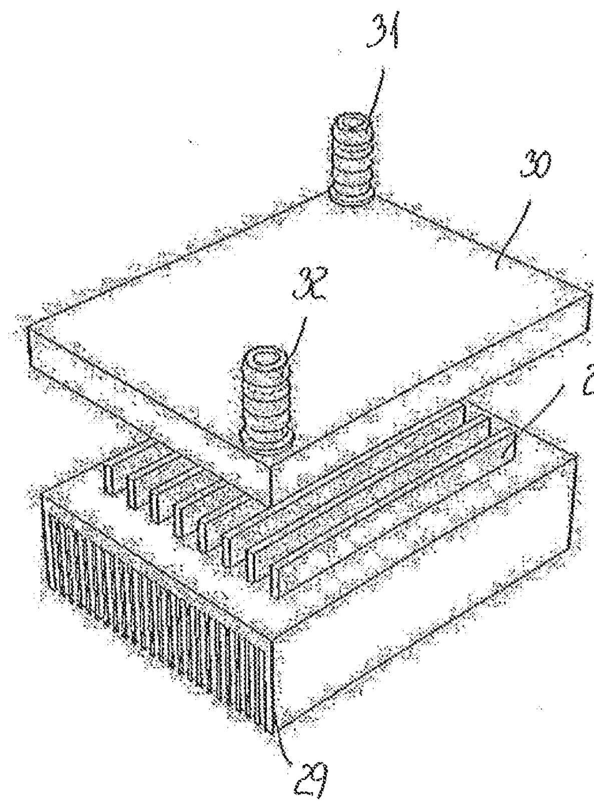


FIG. 12

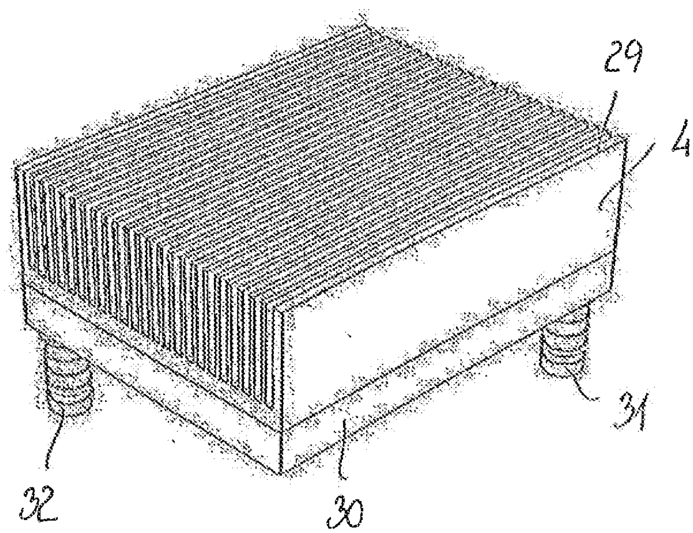


FIG. 13

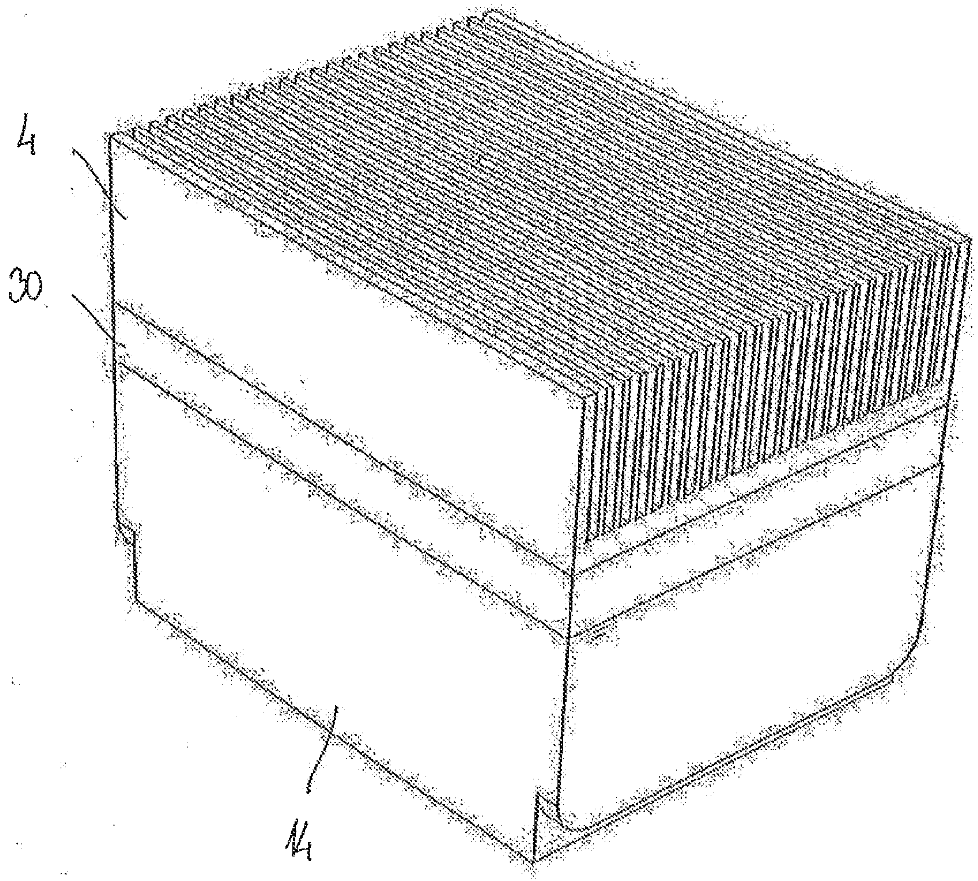


FIG. 14

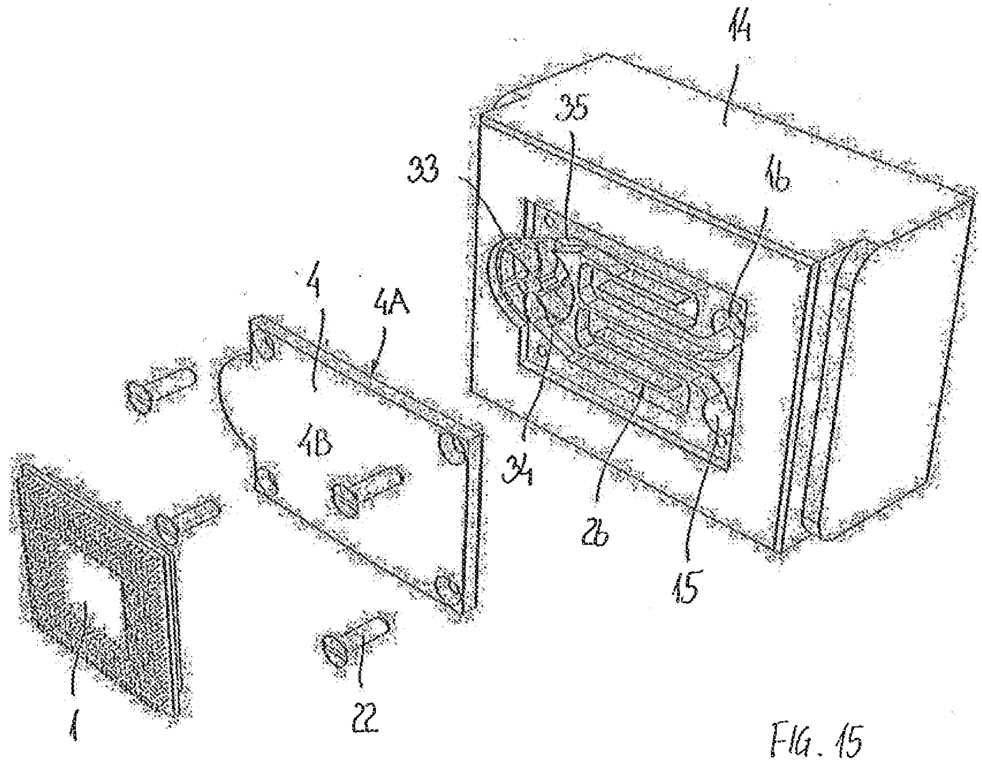


FIG. 15

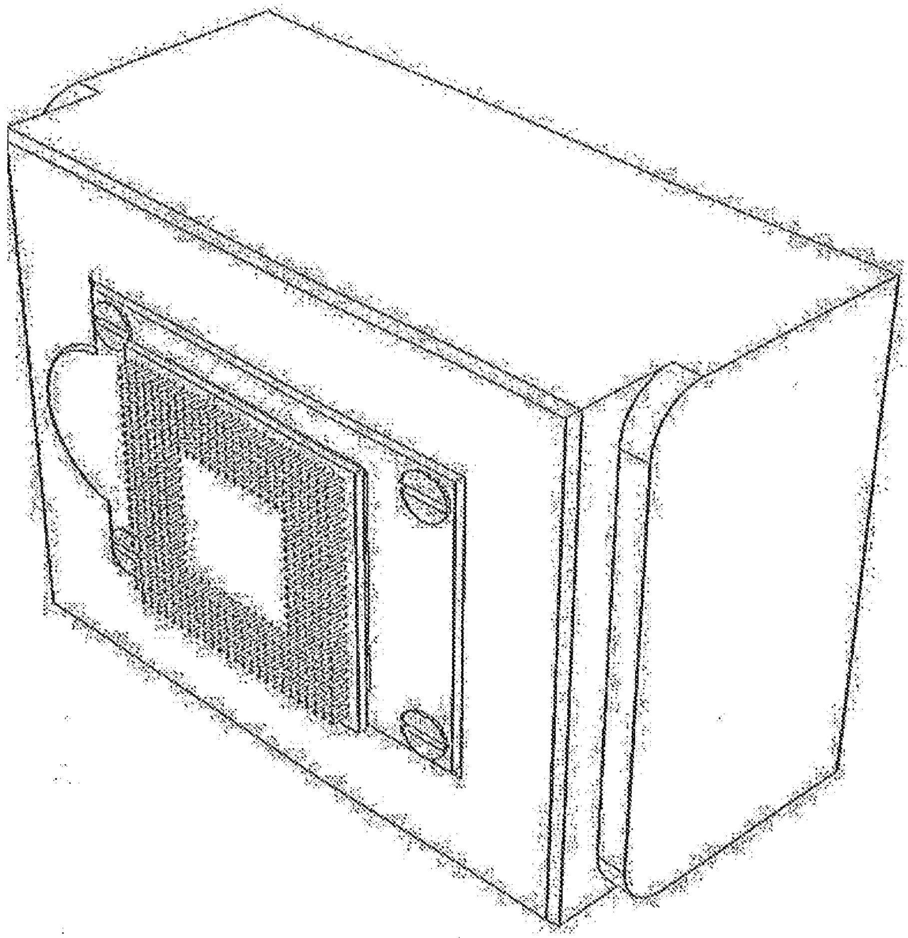


FIG. 1b

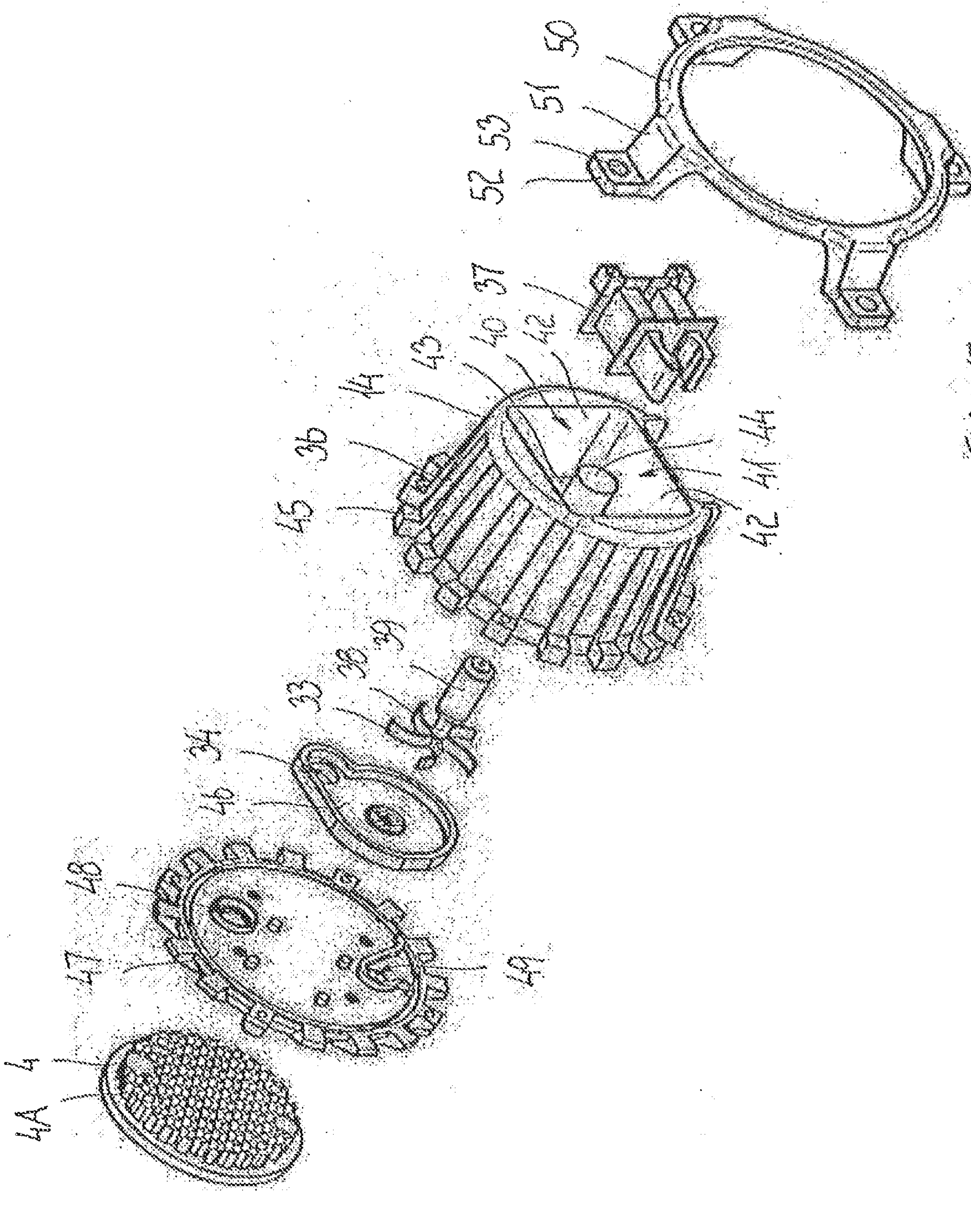


FIG. 17

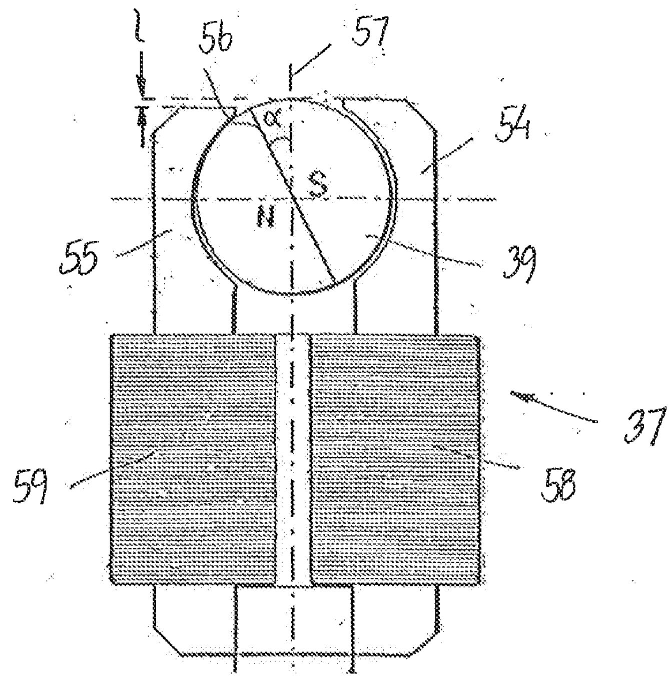


FIG. 18

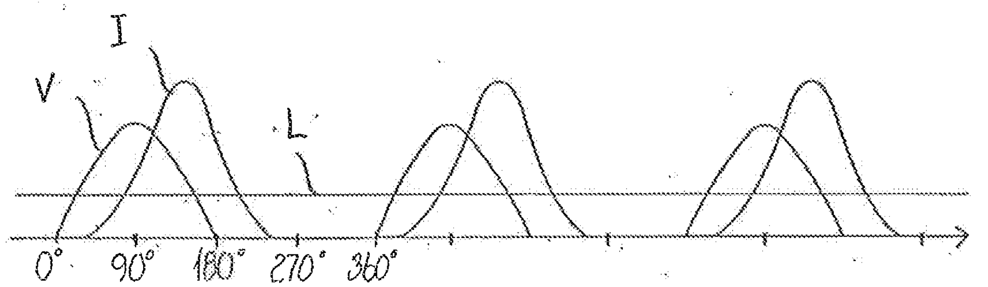


FIG. 19

INTERNATIONAL SEARCH REPORT

International application No
PCT/DK2005/000310

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F1/20 H02P6/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F H02P F04D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/052049 A1 (WU BO JIU ET AL) 18 March 2004 (2004-03-18) paragraph [0011] paragraph [0021] - paragraph [0025]; figure 1	1-14, 20-25
X	US 6 019 165 A (BATCHELDER ET AL) 1 February 2000 (2000-02-01) column 4, line 64 - column 11, line 56; figures 2-12	1-14, 20-25
X	US 2005/061482 A1 (LEE HSIEH KUN ET AL) 24 March 2005 (2005-03-24) paragraph [0004] - paragraph [0029]; figures 1-3	1-14, 20-25

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 April 2006	08/05/2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Legrand, J-C

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/DK2005/000310

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 263 957 B1 (CHEN SHIAW-JONG S ET AL) 24 July 2001 (2001-07-24) column 3, line 17 - column 5, line 7; figures 1-3	1-14, 20-25
X	US 2003/010050 A1 (SCOTT ALEXANDER ROBIN WALTER) 16 January 2003 (2003-01-16)	15-19
Y	paragraph [0054] - paragraph [0105]; figures 1-19	26-29, 34-36
Y	EP 0 574 823 A (ASKOLL S.P.A) 22 December 1993 (1993-12-22) column 1, line 1 - line 45 column 2, line 43 - column 6, line 52; figures 1-6	26-29, 34-36
A	EP 0 610 826 A (ASKOLL S.P.A) 17 August 1994 (1994-08-17) the whole document	26-29, 34-36
A	US 4 563 620 A (KOMATSU ET AL) 7 January 1986 (1986-01-07) column 2, line 14 - line 40 column 3; figures 1-4 claim 3	28,29
E	WO 2005/045654 A (ASETEK A/S; ERIKSEN, ANDRE, SLOTH) 19 May 2005 (2005-05-19) the whole document	1-29, 34-36

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK2005/000310

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. [ ] Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. [ ] Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. [ ] Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. [ ] As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. [ ] As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. [X] As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

1-29,34-36

4. [ ] No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

[ ] The additional search fees were accompanied by the applicant's protest.

[X] No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-14,20-25

   A cooling system for a computer system comprising:
   - a reservoir having an amount of cooling liquid;
   - a heat exchanging interface;
   - a pumping means;
   - a heat radiating means;
   - where the pump, the heat exchanging interface and the reservoir are provided as an integrate element.

   ---

2. claims: 15-19, 26-29, 34-36

   A cooling system for a computer system comprising:
   - a reservoir having an amount of cooling liquid;
   - a heat exchanging interface;
   - a pumping means;
   - a heat radiating means;
   - where the pump is driven by an AC electrical motor powered by a DC electrical power supply of the computer system, where at least part of the DC electrical power from said power supply is intended for being converted to AC electrical power being supplied to the electrical motor.

   ---

3. claims: 30-33

   A method of cooling a computer system, said cooling system comprising:
   - a reservoir having an amount of cooling liquid;
   - a heat exchanging interface;
   - a pumping means;
   - a heat radiating means;
   - a fan;

   and said method of cooling comprising the steps of:
   - controlling the operation of the pump or the fan depending on the temperature or the processing load of the CPU;
   - controlling the operation of the computer system according to an operating status of the computer in order to achieve a certain cooling performance, electrical consumption or noise level.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/DK2005/000310

Patent document cited in search report		Publication date	Patent family member(s)			Publication date
US 2004052049	A1	18-03-2004	US	2004052048	A1	18-03-2004
US 6019165	A	01-02-2000	NONE			
US 2005061482	A1	24-03-2005	TW	244513	Y	21-09-2004
US 6263957	B1	24-07-2001	NONE			
US 2003010050	A1	16-01-2003	CA	2352997	A1	13-01-2003
EP 0574823	A	22-12-1993	AT	163813	T	15-03-1998
			CA	2097672	A1	18-12-1993
			DE	69317156	D1	09-04-1998
			DE	69317156	T2	25-06-1998
			ES	2116368	T3	16-07-1998
			IT	1259115	B	11-03-1996
			JP	6078583	A	18-03-1994
			US	5434491	A	18-07-1995
EP 0610826	A	17-08-1994	IT	1263644	B	27-08-1996
US 4563620	A	07-01-1986	JP	59188383	A	25-10-1984
WO 2005045654	A	19-05-2005	NONE			

EXHIBIT 4

PATENT
Customer No. 22,852
Attorney Docket No. 10494.8000-00000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Inter Partes* Reexamination of:	)	
André Sloth ERIKSEN	)	Group Art Unit: 3993
U.S. Patent No.: 8,245,764 B2 Filed: October 7, 2011 Issued: August 21, 2012	)	Examiner: Joseph A. KAUFMAN
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	Confirmation No.: 7254
Reexamination Proceeding Control No. 95/002,386 Filed: September 15, 2012	)	

Mail Stop *Inter Partes* Reexam
Attention: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

RESPONSE UNDER 37 C.F.R. § 1.111

In response to the Office Action mailed on October 26, 2012, Patent Owner respectfully requests reconsideration in light of the Remarks that follow.

Claim Amendments begin on page 2 of this paper.

The **Status of Claims** is listed on page 10 of this paper.

Remarks/Arguments begin on page 11 of this paper.

Attachments: (1) Exhibit A - American Heritage® College Dictionary, Third Edition, 2000, pp. 232, 234. (4 pages); (2) Exhibit B - Office Action in U.S. Application No. 13/269,234 dated 12/20/2011 (9 pages).

CLAIM AMENDMENTS:

As permitted by 35 U.S.C. § 314(a) prior to recent amendments[1], Patent Owner proposes to add new claims 19-30 as provided below. Changes to the claims relative to the patent being reexamined are shown by markings as specified by 37 C.F.R. § 1.530(f). Since the newly added claims are dependent from, and further limit, an originally issued claim, these claims do not enlarge the scope of the issued claims. The originally issued claims remain pending without any amendments. These original claims are included in the listing below for the sake of completeness[2]. Patent Owner recognizes that 37 C.F.R. § 1.530(d)(2) does not require the use of parentheticals with newly added claims. However, following the advice of the Patent Office in other reexamination proceedings[3], these newly added claims are identified with the parenthetical "(New)."

1. (Original) A cooling system for a heat-generating component, comprising::

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator and an impeller, the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including

[1] With regard to *inter partes* reexamination requests filed between September 16, 2011 and September 16, 2012, "the 'reasonable likelihood' standard will apply throughout the reexamination proceeding ...[and] 35 U.S.C. chapter 31, as amended by section 6(c)(3) of the Leahy-Smith America Invents Act, §§ 1.902-1.997 and 41.60-41.81 of title 37 CFR, effective on September 16, 2011, will apply throughout the reexamination, even after September 16, 2012. Federal Register Volume 76, Number 185, September 23, 2011.

[2] Although 37 C.F.R. § 1.530(d)(2) does not require unamended claims to be included in the claim listing, it also does not require that such unamended claims be left out of the listing.

[3] See, e.g., *inter partes* reexamination 95/000031 (2007-09-18 Notice, p. 3); *inter partes* reexamination 95/000084 (2007-09-26 Notice, p. 2).

a pump chamber including the impeller and formed below the chassis, the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through

a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and

a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component; and

a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.

2 (Original) The cooling system of claim 1, wherein the chassis shields the stator from the cooling liquid in the reservoir.

3 (Original) The cooling system of claim 1, wherein the heat-exchanging interface includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.

4 (Original) The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.

5 (Original) The cooling system of claim 4, wherein the features include at least one of pins or fins.

6 (Original) The cooling system of claim 1, wherein a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller.

7 (Original) The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.

8. (Original) The cooling system of claim 1, wherein the heat-exchanging interface includes one of copper and aluminum.

9 (Original) The cooling system of claim 1, wherein the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir.

10 (Original) A cooling system for a computer system, comprising:

a centrifugal pump adapted to circulate a cooling liquid, the pump including:

an impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:

a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;

a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber, and wherein at least one of the one or more passages is offset from a center of the impeller.

11. (Original) The cooling system of claim 10, wherein a top wall of the reservoir physically separates the impeller from the stator.

12. (Original) The cooling system of claim 10, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component.

13. (Original) The cooling system of claim 10, further including a heat radiator fluidly coupled to the reservoir using flexible conduits, wherein the heat radiator is configured to be positioned remote from the reservoir.

14. (Original) The cooling system of claim 10, wherein the fluid passage that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller.

15. (Original) A cooling system for a heat-generating component, comprising:

a pump adapted to circulate a cooling liquid, the pump including:

an impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir including an impeller cover, an intermediate member and a heat exchange interface, wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber, the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together; and

wherein a first side of the heat-exchanging interface is in contact with a cooling liquid in the thermal exchange chamber and a second side of the heat-exchanging interface opposite the first side is configured to be placed in thermal contact with a surface of the heat-generating component; and

a liquid-to-air heat exchanger fluidly coupled to the reservoir using flexible conduits, the heat exchanger being configured to be positioned remote from the reservoir.

16. (Original) The cooling system of claim 15, wherein the impeller cover includes a first opening radially offset from a center of the impeller and the intermediate member includes a second passage that is aligned with the first opening, the first and the second opening being

configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber.

17. (Original) The cooling system of claim 15, wherein the first side of the heat-exchanging interface includes at least one of pins or fins.

18. (Original) The cooling system of claim 15, wherein the top wall of the reservoir extends between the stator and the impeller and shields the stator from the cooling liquid in the reservoir.

19. (New) The cooling system of claim 1, wherein the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

20. (New) The cooling system of claim 1, wherein the one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber.

21. (New) The cooling system of claim 1, wherein an entire surface of the heat-exchanging interface in contact with the cooling liquid in the reservoir forms the boundary wall of the thermal exchange chamber.

22. (New) The cooling system of claim 1, wherein the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

23. (New) The cooling system of claim 10, wherein the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

24. (New) The cooling system of claim 10, wherein the one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber.

25. (New) The cooling system of claim 12, wherein an entire surface of the heat-exchange interface in contact with the cooling liquid in the reservoir forms a boundary wall of the thermal exchange chamber.

26. (New) The cooling system of claim 10, wherein the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

27. (New) The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by one or more passages, the one or more

passages including a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

28. (New) The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by a plurality of passages positioned within the reservoir that open into the thermal exchange chamber.

29. (New) The cooling system of claim 15, wherein an entire surface of the heat-exchanging interface in contact with the cooling liquid in the reservoir forms a boundary wall of the thermal exchange chamber.

30. (New) The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by one or more passages, and the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

STATUS OF CLAIMS:

In accordance with 37 C.F.R. § 1.530(e), Patent Owner provides the status of the pending claims. Claims 1-18 are original patented claims. Of these claims, claims 1-18 are subject to reexamination. *See*, Office Action at page 1. The original patented claims have not been amended by this response. Claims 19-30 are proposed to be added by this response. Accordingly, claims 1-30 are pending.

REMARKS

I. Introduction

This Response is filed in reply to the Office Action mailed on October 26, 2012 (the Office Action). The deadline for filing a response to the Office Action is December 26, 2012. *See*, 37 C.F.R. § 1.945. Thus, this Response is timely filed.

A. Compliance with 37 C.F.R. § 1.943

The number of pages in this response is less than fifty pages. Therefore, this response is in compliance with 37 C.F.R. § 1.943.

B. Notice of Concurrent Litigation

Patent Owner notes that the present patent is involved in the following litigation: Civil Action No. 3:12-CV-04498-EMC, now pending in the U.S. District Court for the Northern District of California San Francisco Division, Asetek Holdings, Inc., v. CoolIT Systems, Inc., filed August 27, 2012.

A copy of this Response is being served on the third-party Requester, pursuant to 37 C.F.R. §§ 1.248 and 1.550(f).

C. Related Applications

U.S. Application No. 13/269,234 which issued on August 21, 2012 as U.S. Patent No. 8,245,764 B2 ("the '764 patent") is a continuation of currently-pending U.S. Application No. 11/919,974. The '764 patent further claims priority to International Application No. PCT/DK2005/000310 filed May 6, 2005 (the "International Application").

D. Related Reexamination Proceedings

On September 15, 2012, Requester, CoolIT Systems, Inc. also requested reexamination of U.S. Application No. 12/826,768 which issued as U.S. Patent No. 8,240,362 B2. In an Order dated 12/3/2012, the Patent Office denied this reexamination request. See, *inter partes* reexamination control no. 95/002,385.

E. **Disclaimer Regarding Claim Construction**

In accordance with 37 C.F.R. § 1.555(b) and M.P.E.P. § 2111, Patent Owner agrees that, for the purposes of proceedings before the U.S. Patent & Trademark Office, each term of the claims is to be given its broadest reasonable construction consistent with the specification.

Patent Owner, however, submits that the claim constructions discussed in the Request, the Office Action, and this Response do not necessarily comport with the construction of claims under the legal standards that are mandated to be used by the courts in litigation. *See* M.P.E.P. § 2686.04(IV). Thus, Patent Owner expressly reserves the right to present its own interpretations and construction of the claims of this patent at a later time, where such interpretation and/or construction may be the same, or may differ in whole or in part, from the interpretation and/or construction presented herein.

II. Support for Amendments

By this Proposed Amendment, new claims 19-30 are proposed to be added. These newly added claims find support throughout the specification and drawings of the '764 patent, and its earliest-filed parent application, the International Application. In accordance with 37 C.F.R. § 1.530(e), Patent Owner provides in the table below, specific examples of support in the originally filed specification of the '764 patent and the International Application. Patent Owner notes that the totality of support for each added claim is not necessarily limited to the specific examples provided herein.

New claim	*Support in U.S. Application No. 13/269,234*	*Support in International Application No. WO 2006/119761*
19, 23, 27	FIG. 17, "34", "48"; Col. 22: 26-43.	FIG. 17, "34", "48"; p. 26: 17-28
20, 24, 28	FIG. 17, "34", "48"; Col. 22: 26-43.	FIG. 17, "34", "48", p. 26: 17-28
21, 25, 29	FIG. 17, "34", "48"; Col. 22: 26-43.	FIG. 17, "34", "48"; p. 26: 17-28
22, 26, 30	FIG. 4, "15", "16"; Col. 11: 64 - col. 12: 4.	FIG. 4, "15", "16"; p. 15: 28-31; p. 28: 30-35.

III. Summary of the Office Action

The above-identified *inter partes* reexamination of the '764 patent was ordered, and an Office Action was issued on October 26, 2012 ("the Office Action"), in response to the Request for *Inter Partes* Reexamination filed on September 15, 2012 ("Request").

A. Rejection

The '764 patent has eighteen (18) claims. In the Request, the Requester proposed twelve (12) separate grounds of rejection for each of these claims based on combinations of one or more of the references listed on page 11 of the Request. *See*, Request, pp. 9-10. In the Office Action, the Examiner declined to adopt eleven (11) of the twelve (12) proposed grounds of rejection stating that none of the references upon which these rejections are based teach a pump chamber vertically spaced apart from a thermal exchange chamber, as required by all of claims 1-18. *See*, Order Granting/Denying Request for Inter Partes Reexamination, pp. 4-8.

However, the Examiner adopted the proposed rejection of claims 1-18 as being anticipated by U.S. Patent No. 7,544,049 B2 to Koga et al. ("*Koga*"). To describe the application of *Koga* to the elements of claims 1-18, the Examiner relied on claim chart K on pages 149-164 of the Request. Office Action, p. 3.

While disagreeing that claims 1-18 are anticipated by *Koga*, Patent Owner gratefully acknowledges the Examiner's confirmation that claims 1-18 are patentable over the other cited references in the Request. Since the Office Action relies on discussion in the Request for the application of *Koga* to the claims, the discussions below will also make reference to the Request.

B. Priority claim

In the Office Action, the Examiner notes that the Requester alleges that claims 1-18 are not eligible to the filing date of the International Application, since FIG. 20 and some text were added to the specification later. Therefore, the Examiner asserts, "the Examiner will use the effective filing date of 14 July 2011." Patent Owner disagrees that claims 1-18 are not eligible to the filing date of the International Application. As explained fully below, each of claims 1-18 is fully supported by the International Application (the earliest-filed parent application of the '764 patent), and is therefore entitled to its filing date.

IV. Discussion of Rejection

In the Office Action, the Examiner rejected claims 1-18 under 35 U.S.C § 102(b) as allegedly being anticipated by *Koga*. Office Action, p. 3. The Patent Owner respectfully traverses this rejection. Among claims 1-18, claims 1, 10, and 15 are independent.

A. Independent claims 1, 10, and 15 are not anticipated by Koga

Although different in scope, independent claims 1, 10, and 15 recite some common features of a reservoir of a cooling system. For instance, independent claim 1[4] recites a cooling system for a heat-generating component having a reservoir including "a pump chamber including the impeller and … a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages."

Independent claim 10 recites a cooling system for a computer system, comprising, a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including "a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component; [and] a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber, and wherein at least one of the one or more passages is offset from a center of the impeller."

Independent claims 15 recites a cooling system for a heat-generating component, comprising, a reservoir including "a pump chamber for housing the impeller, and … a thermal exchange chamber, the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together."

[4] Independent claim 1 also recites a double-sided chassis with an "impeller being positioned on the underside of the chassis" and "a pump chamber including the impeller and formed below the chassis." Claim chart K of the Request incorrectly recites these limitations of claim 1 as "the impeller being positioned *in a recess* on the underside of the chassis," and "a pump chamber *formed by the recess and* including the impeller and formed below the chassis." (emphasis added). See, Request, p. 150. However, claim 1 does not include the limitations "in a recess," and "formed by the recess."

The Request alleges that *Koga* "exactly discloses [these] limitations." See, Request, pp. 150-154. For the reasons described in more detail below, Patent Owner disagrees.

1. *Koga* does not disclose a reservoir with "a thermal exchange chamber" vertically spaced apart from a "pump chamber" as required by independent claims 1, 10, and 15.

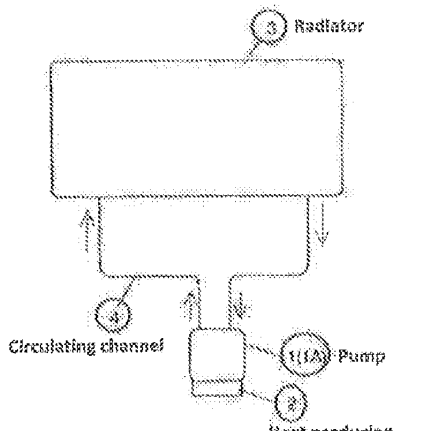


FIG.1

With reference to FIG. 1 of *Koga* reproduced above, *Koga* discloses a cooling device for a heat producing electronic component 2. Abstract. The cooling device of *Koga* includes a pump 1A, circulating a liquid coolant, and positioned atop a heat-producing component 2 to absorb heat. Col. 4, ll. 3-15. A circulating channel 4 directs the heated liquid coolant from the pump 1A to a radiator 3 to cool the coolant and direct the cooled coolant back to pump 1A. Col. 4, ll. 18-26.

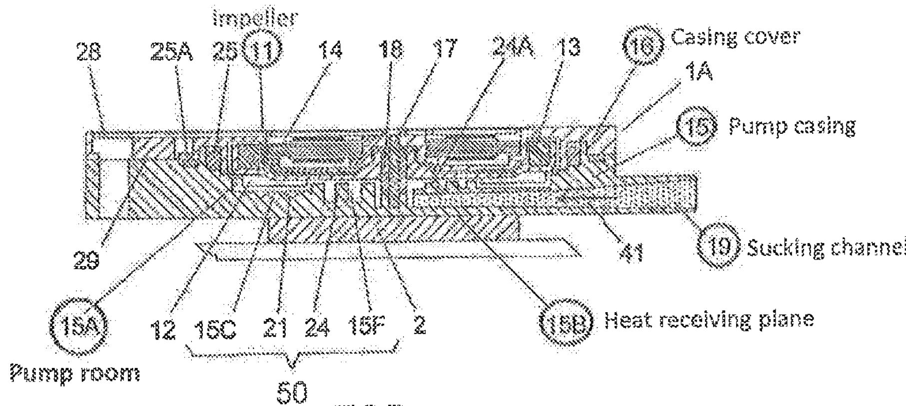


FIG.7

With reference to FIG. 7 of *Koga* annotated and reproduced above, pump 1A includes a pump casing 15 and a casing cover 16 that encloses a pump room 15A containing the coolant 41. Col. 4:51-53. An impeller 11 is positioned in the pump room 15A. Col. 4:30-32. The impeller 11 has blades 12 on a bottom surface. Col. 4:27-29. And, a ring magnet 13 and a stator 14 is inserted through an open top surface of the impeller 11. *Id.* In *Koga*, a bottom face of the casing 15 forms a heat-receiving plane 15B that is placed in contact with a surface of the heat producing component 2. Col. 4:38-41. A sucking channel 19 directs coolant into the pump room 15A, and a discharging channel 20 discharges the coolant 41 out of the pump room 15A. Col. 4:57-60; col. 5:50-57.

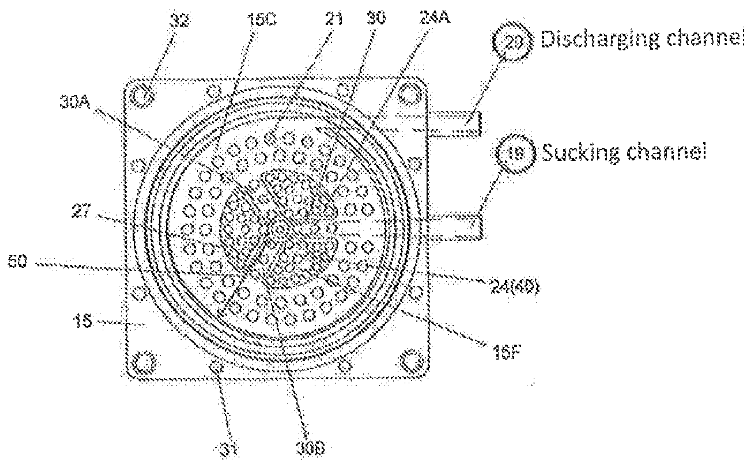


FIG.8

In the Office Action, pump room 15A of *Koga* is interpreted as the recited "pump chamber" of independent claims 1, 10, and 15. Request, pp. 151, 157, 160. And, sucking channel 19, that supplies coolant 41 to the pump room 15A (the alleged "pump chamber"), is interpreted as the recited vertically spaced apart "thermal exchange chamber" of independent claims 1, 10, and 15. See, Request, pp. 152, 157, 161. However, sucking channel 19 is not a "chamber" of *Koga*'s pump room 15A. As can be seen in FIG. 8 reproduced above, it is only a conduit that supplies coolant to the pump room 15A. As the Examiner correctly pointed out "[t]he definition of a chamber according to *Webster's New World Dictionary, Third Edition*, is 'any enclosed space; compartment…'." Order Granting/Denyinig Request for *Inter Partes* Reexamination, pp. 4, 7[5]. Sucking channel 19 is neither an "enclosed space" nor a "compartment" of pump room 15A. It is merely a tube that supplies coolant to the pump room 15A. Col. 8:65-67; *See* FIG. 8.

[5] Consistently, The American Heritage® College Dictionary also defines a chamber as an "enclosed space or compartment American Heritage® College Dictionary, Third Edition, 2000, p. 232 (attached as Exhibit A). In contrast, a channel is defined as a "tubular passage for liquids: a conduit." See, Exhibit A, p. 234.

"During reexamination, claims are given the broadest reasonable interpretation consistent with the specification." M.P.E.P. § 2258.I.G (citing *In re Yamamoto*, 740 F.2d 1569 (Fed. Cir. 1984)). The broadest reasonable construction requires "the words of the claim [to] be given their plain meaning unless the plain meaning is inconsistent with the specification." M.P.E.P. § 2111.01.I (citing *In re Zletz*, 893 F.2d 319, 321 (Fed. Cir. 1989)). "Ordinary, simple English words whose meaning is clear and unquestionable, absent any indication that their use in a particular context changes their meaning, are construed to mean exactly what they say." M.P.E.P 2111.01 I (internal citations deleted). The M.P.E.P. further explains that "plain meaning" refers to the ordinary and customary meaning given to the term by those of ordinary skill in the art at the time of the invention. M.P.E.P. 2111.01 III.

In the Request, the Requester's interpretation of a conduit that supplies coolant to pump room 15A as a separate "chamber" of the pump room 15A is erroneous in light of the plain meaning of term "chamber," and in light of the specification of this application. In the context of a reservoir, consistent with the Examiner's interpretation (Order Granting/Denying Request for *Inter Partes* Reexamination, pp. 4, 7), a person of ordinary skill in the art would have interpreted, a "chamber" to be an enclosed space or a compartment within the reservoir. The specification also consistently describes the pump chamber and the thermal exchange chambers to be vertically spaced apart enclosed spaces within the reservoir. *See*, '764 patent, FIG. 17, col. 22:26-43; see also, WO 2006/119761 A1, FIG. 17, p. 26:17-28. Therefore, contrary to the interpretation advanced by the Requester, a person of ordinary skill in the art would not have interpreted a conduit or a pipe (sucking channel 19) that supplies coolant to pump room 15A of Koga to be a chamber. Accordingly, Koga does not disclose a reservoir with "a thermal exchange chamber" in addition to a "pump chamber" as required by independent claims 1, 10, and 15.

FIG.8

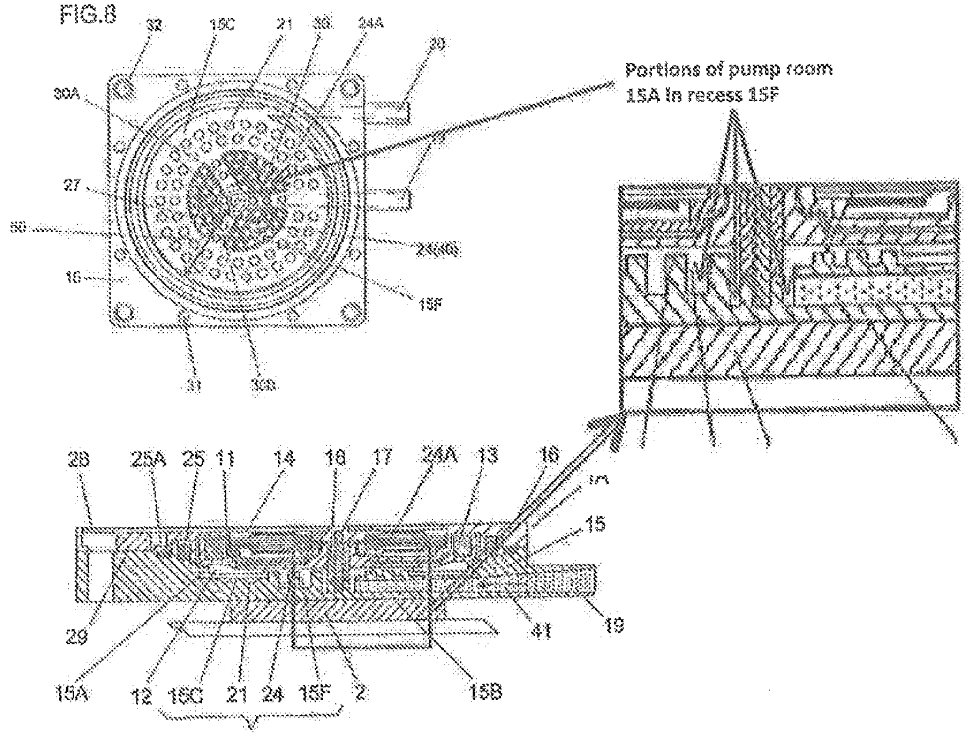
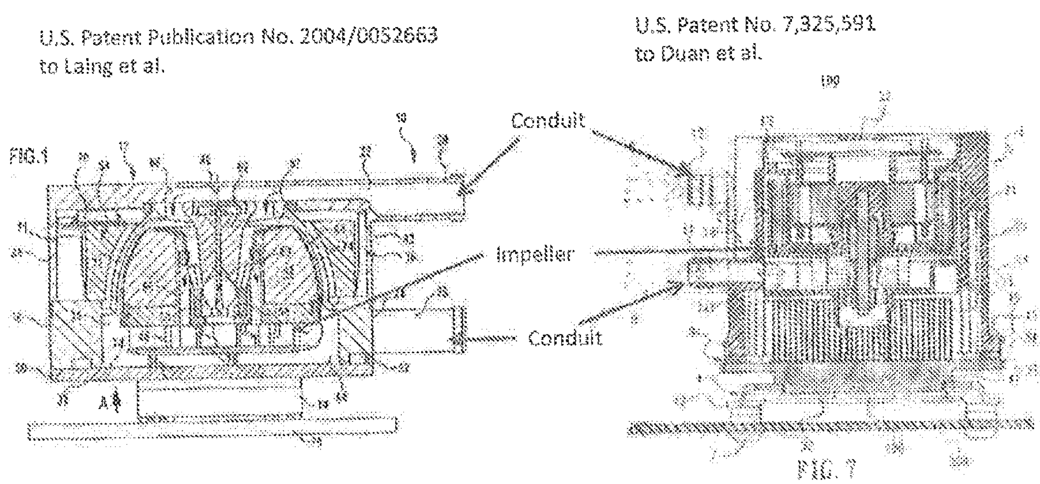


FIG.7

Furthermore, the alleged "thermal exchange chamber" of Koga is not "vertically spaced apart" from the "pump chamber" as required by claims 1, 10, and 15. Although, sucking channel 19 extends through the lower portion of the pump room 15A, sucking channel 19 is at the same level as the lower portion of the pump room 15A. Specifically, as illustrated in the FIGS 7 and 8 annotated and reproduced above, the portion of the pump room 15A in recess 15F is at the same level as the sucking channel 19. See, col. 10: 3-21. Therefore, the alleged thermal exchange chamber of *Koga* is not vertically spaced apart from the pump room 15A.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." M.P.E.P. 2131 quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F. 2d 628, 631, 2 USPQ 2d 1051, 1053 (Fed. Cir. 1987). Furthermore, "[t]he identical invention must be shown in as complete detail as is contained in the … claim." M.P.E.P. § 2131, quoting *Richardson v. Suzuki Motor Co.*, 868 F. 2d 1126, 1236, 9 U.S.P.Q. 2d 1913, 1920 (Fed. Cir. 1989). Koga does not expressly or inherently disclose the above-recited aspects of independent claims 1, 10, and 15. Accordingly, amended independent claim 27 is not anticipated by Koga.

In fact, several of the references relied by the Requester in the eleven proposed grounds of rejection denied by the Examiner also have similar conduits that supply a coolant to a reservoir. For example, as shown in figures reproduced below, U.S. Patent Publication No. 2004/0052663 to Laing et al. ("*Liang*") and U.S. Patent No. 7,325,591 to Duan et al. ("*Duan*") also have conduits that supply coolant to, and discharge coolant from, a reservoir.



However, neither the Requester nor the Examiner interpreted these conduits of *Liang* and *Duan* as separate chambers of the reservoir. With respect to these references, the Examiner correctly stated that their reservoirs do "not show a separate pump chamber and thermal exchange chamber." Order Granting/Denying Request for *Inter Partes* Reexamination, p. 4; see also, p. 6. As the Examiner implicitly recognized with respect to these references, conduits or tubes that supply, and discharge coolant from, a reservoir are not separate "chambers" of the reservoir. Consistent with the Examiner's interpretation with respect to the reservoirs of *Laing* and *Duan*, Patent Owner respectfully requests the Examiner to reconsider the interpretation of sucking channel 19 of *Koga* as a "chamber."

2. Claims 2-9, 11-14, and 16-18 are allowable over *Koga* at least due to their dependency from their respective independent claims.

Claims 2-9 depend from independent claim 1, claims 11-14 depend from independent claim 10, and claims 16-18 depend from independent claim 15. These dependent claims include all the limitations of their respective independent claims. Therefore, these dependent claims are allowable over *Koga* at least for the same reason independent claims 1, 10, and 15 are allowable over *Koga*. Additionally, these dependent claims are not anticipated by *Koga* due to their added limitations and combinations.

For instance, claim 4 recites that "the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber." In the Request, as discussed previously, sucking channel 19 of *Koga* was interpreted as the recited "thermal exchange chamber" and protrusions 24 and 24A of the heat-receiving plane 15B were interpreted as the recited "features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid **in the thermal exchange chamber**." (emphasis added). *See*, Request, p. 154.

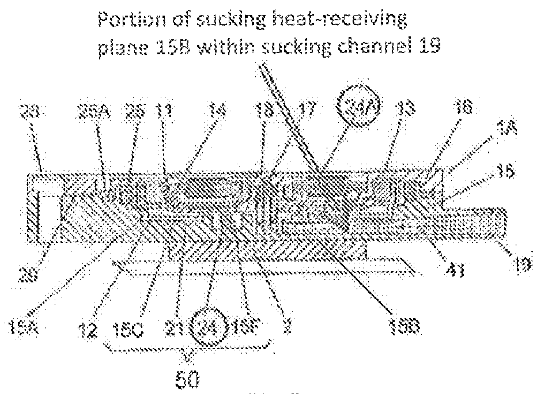


FIG.7

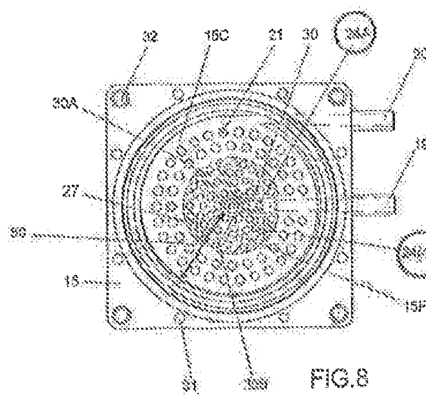


FIG.8

However, as evident from FIGS. 7 and 8 of Koga annotated and reproduced above, projections 24 and 24A are not located in the sucking channel 19 (the alleged "thermal exchanger chamber"). These projections are positioned in a region of the heat-receiving plane 15B located outside the sucking channel 19. Therefore, projections 24 and 24A are not features that are adapted to increase heat transfer from the heat-exchanging interface "to the cooling liquid in the thermal exchange chamber" as required by claim 4. Rather, these projections 24 and 24A increase heat transfer from the heat-receiving plane 15B to the coolant 41 in the pump room 15A (the alleged "pump chamber"). See, col. 8:9-22. Therefore, claims 4 and 5 (claim 5 depends from claim 4) are not anticipated by *Koga* for this additional reason.

3. New claims 19-30 are allowable over *Koga*.

New claims 19-30 are proposed to be added by this response. Each of these new claims are of a more narrow scope than at least one of the issued claims of the '764 patent. Support for these new claims in the disclosure of the original patent has been indicated above. Among these claims, claims 19-22 depend from independent claim 1, claims 23-26 depend from independent claim 10, and claims 27-30 depend from independent claim 15. These claims are allowable over

Koga at least for the same reason independent claims 1, 10, and 15 are allowable over *Koga*. As explained below, these claims are also allowable over *Koga* for additional reasons.

Claims 19, 23, and 27 recite that the "one or more passages includ[e] a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber." In the Request, sucking channel 19 and discharge channel 20 are interpreted as the recited "one or more passages." *See*, Request, pp. 152, 158, 161. Sucking channel 19 supplies coolant 41 to the pump room 15A, and discharge channel 20 discharges the coolant 41 from pump room 15A to the circulating channel 4 outside the reservoir. Koga, FIG. 1; col. 4: 65-67; col. 5: 54-57. Therefore, neither sucking channel 19 nor discharge channel 20 "direct cooling liquid from the pump chamber directly into the thermal exchange chamber," as required by claims 19, 23, and 27.

Claims 20 and 24 recite that the "one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber." Similarly, claim 28 recites that the pump chamber and the thermal exchange chamber are fluidly coupled together by "a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber." As discussed above, the Request interprets sucking channel 19 and discharge channel 20 as the recited one or more passages. *See*, Request, pp. 152, 158, 161. However, as evident from FIG. 7 of *Koga*, sucking channel 19 and discharge channel 20 do not comprise "a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber," as required by claims 20, 24, and 28.

Claims 21, 25, and 29 recite that "an entire surface of the heat-exchang[e] interface in contact with the cooling liquid in the reservoir forms [a] boundary wall of the thermal exchange chamber." In the Request, sucking channel 19 is interpreted as the recited thermal exchange chamber, and the lower portion of casing 15 is interpreted as the recited heat-exchange interface. *See*, Request, pp. 152-153 157-159, 161. Sucking channel 19 of *Koga* is a tubular conduit that extends to the center of the impeller 11. *Koga*, FIGS. 5, 8; col. 4: 61-67; col. 8: 5-9. As evident from FIGS. 7 and 8 of Koga reproduced above, the entire surface of the lower portion of casing 15 in contact with the cooling liquid in pump room 15A does not form a boundary wall of the sucking channel 19. Therefore, Koga does not disclose that "an entire surface of the heat-exchang[e] interface in contact with the cooling liquid in the reservoir forms [a] boundary wall of the thermal exchange chamber," as required by claims 21, 25, and 29.

Claims 22, 26, and 30 recite that "the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir." In *Koga*, sucking channel 19 supplies coolant 41 to pump room 15A, and discharge channel 20 discharges the coolant 41 from the pump room 15A. *Koga*, FIG. 1; col. 4: 65-67; col. 5: 54-57. However, in the Request, the sucking and discharge channels are interpreted as the one or more passages that fluidly couple the pump chamber and thermal exchange chamber. Therefore, *Koga* does not disclose the recited "inlet" and "outlet" in addition to the one or more passages that fluidly couple the pump and thermal exchange chambers.

IV. Discussion of Priority

U.S. Application No. 13/269,234 (the '234 application) which issued as the '764 patent is a continuation of U.S. Patent Application No. 11/919,974 (the '974 application). The '974 application is a national stage entry of International Application No. PCT/DK2005/000310 (the International Application) filed on May 6, 2005.

The Requester alleges that since FIG. 20 and its description were added to the specification of the '974 application after the filing of the International Application, and this added subject matter "was relied on to confer patentability to each and every claim of the '764 Patent ... no claim in the '764 Patent is entitled to priority from the [ ] filing date" of the International Application. *Request*, p. 18. Referring to these allegations, the Office Action states that "the Examiner will use the effective filing date of 14 July 2011." Office Action, p. 3.

The Patent Owner disagrees that the International Application does not provide support for the issued claims of the '764 patent. As clearly explained in the Supplemental Preliminary Amendment filed on January 9, 2009 during prosecution of the '974 application, FIG. 20 was only added to "help clearly identify ***previously presented*** subject matter." (emphasis added) Supplemental Preliminary Amendment in U.S. Patent Application No. 11/919,974 filed on January 9, 2009, p. 12. FIG. 20 did not add any new subject matter to the application. To the contrary, as will be explained below, the earliest parent of the '764 patent, the International Application, provides support for each and every claim of the '764 patent.

1. **The priority date of the '764 patent is not relevant to this reexamination.**

As a preliminary matter however, Asetek notes that the priority date of the '764 claims is not an issue relevant to this reexamination proceeding. Although Requester challenges the claimed priority date, all the prior art references relied upon in the Request predate the filing date of the International Application. That is, none of the prior art relied upon in the Request is an intervening reference. Patent Owner recognizes that the MPEP permits a third party requester to point out that the claims of a patent are not entitled to its claimed priority, and propose rejections using an intervening reference. M.P.E.P. § 2617. In such cases, the Patent Office addresses the priority issue to determine if the intervening reference qualifies as prior art for the reexamination. In this case, however, the availability of the references relied upon in the proposed rejections is not dependent on the priority date of the '764 patent. Therefore, the priority date of the '764 patent is not relevant to this reexamination proceeding.

The rules governing *inter partes* reexamination state that an issue not relevant to the reexamination, will not be resolved in the reexamination proceedings, and "[i]f such issues are raised … during a reexamination proceeding, the existence of such issues will be noted by the examiner in the next Office action." 37 C.F.R. § 1.906(c). Patent Owner believes that the remarks in the Office Action relating to the priority date are merely statements pointing out the existence of such issues, rather than an expression of the Examiner's opinion. However, since this statement may be misconstrued (and since a statement unconnected to an applied rejection cannot be corrected by appeal), Patent Owner respectfully requests the Examiner to retract this statement or further clarify this issue in the next Office Action.

2. **The International Application provides § 112 support for claims 1-18 of the '764 patent.**

During prosecution of the '234 application (that issued as the '764 patent), the Examiner considered whether the International Application provides support for the pending claims, and decided that it does. In fact, during this prosecution, all the pending claims were rejected as being anticipated by the International Application. Office Action dated 12/20/2011 (attached as Exhibit B). In this Office Action, the Examiner clearly identified portions of the International Application that he believed to disclose each and every aspect of the pending claims. *See*, Exhibit B, pp. 2-7. The '764 patent issued with claims similar to those that were rejected as being anticipated by the International Application. *See*, Reply to Office Action filed on April 6, 2012, pp. 2-7. That is, during prosecution of the '764 patent, the Examiner reviewed the International Application and decided that it provides adequate § 112 support for the '764 claims. Nevertheless, in the table below, Patent Owner identifies specific examples of support in the International Application for each issued claim of the '764 patent. Patent Owner notes that the totality of support for each issued claim is not necessarily limited to the specific examples provided below. In the table below, numbers in parenthesis refer to reference numbers in FIG. 17 of the International Application annotated and reproduced below.

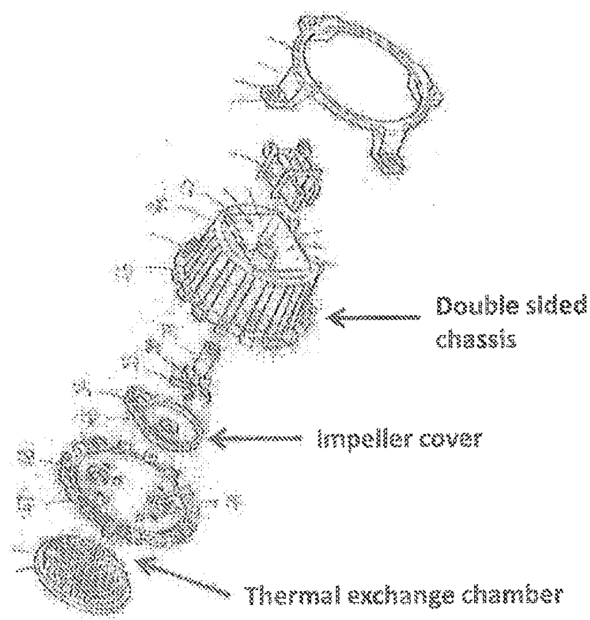


FIG. 17

Claim number	*Text of the claim showing exemplary support in International Application.*
1	A cooling system for a heat-generating component (p. 1: 5-7), comprising: a double-sided chassis (annotated in FIG. 17 reproduced above) adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator (37) and an impeller (33), the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid (FIG. 17; p. 28: 6-20; p. 29: 17-28); a reservoir (14) adapted to pass the cooling liquid therethrough (FIG. 17; p. 28: 6-20; p. 29: 17-28), the reservoir including a pump chamber (46) including the impeller and formed below the chassis,

	the pump chamber being defined by at least an impeller cover (annotated in FIG. 17 reproduced above) having one or more passages for the cooling liquid to pass through a thermal exchange chamber (p. 29: 24-28, annotated in FIG. 17 reproduced above) formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages (34, 48, 49); and a heat-exchanging interface (4), the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component (p. 29: 35-38); and a heat radiator (11, FIG. 3) fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid (p. 28: 30-35).
2	The cooling system of claim 1, wherein the chassis shields the stator from the cooling liquid in the reservoir. P. 28: 14-19.
3	The cooling system of claim 1, wherein the heat-exchanging interface includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side. P. 29:35 - p. 30: 6.
4	The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber. FIG. 17, 4A; p. 29: 38 - p. 30: 6.
5	The cooling system of claim 4, wherein the features include at least one of pins or fins. FIG. 17, "4A"; p. 29: 38 - p. 30: 6.
6	The cooling system of claim 1, wherein a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller. FIG. 17, "34"; p. 29: 17-19.
7	The cooling system of claim 1, wherein the impeller includes a plurality of curved blades. *See*, FIG. 17, "33"; p. 31: 28-31.
8	The cooling system of claim 1, wherein the heat-exchanging interface includes one of copper and aluminum. P. 29: 35.
9	The cooling system of claim 1, wherein the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir. FIG. 4; p. 28: 37-39.
10	A cooling system for a computer system (p. 1: 5-7), comprising: a centrifugal pump adapted to circulate a cooling liquid (p. 1: 21-24; p. 29: 19), the pump including: an impeller (33) exposed to the cooling liquid (p. 28: 14-15; p. 29: 17-18);

	and a stator (37) isolated from the cooling liquid (p. 28: 14-21); a reservoir configured to be thermally coupled to a heat-generating component of the computer system (p. 28: 23-28), the reservoir including: a thermal exchange chamber (p. 29: 24-28; annotated in FIG. 17 reproduced above) adapted to be positioned in thermal contact with the heat-generating component (p. 29: 35-38); a separate pump chamber (46) vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages (34, 48, 49) configured for fluid communication between the pump chamber and the thermal exchange chamber, and wherein at least one (34) of the one or more passages is offset from a center of the impeller (p. 29: 17-18).
11	The cooling system of claim 10, wherein a top wall of the reservoir physically separates the impeller from the stator (p. 28: 6-21).
12	The cooling system of claim 10, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component (p. 29: 35 - p. 30: 2).
13	The cooling system of claim 10, further including a heat radiator fluidly coupled to the reservoir using flexible conduits, wherein the heat radiator is configured to be positioned remote from the reservoir (p. 28: 30-38).
14	The cooling system of claim 10, wherein the fluid passage (34) that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller. (p. 29: 17-18).
15	A cooling system for a heat-generating component (p. 1: 5-7), comprising: a pump adapted to circulate a cooling liquid (p. 28: 6-35), the pump including: an impeller (33) exposed to the cooling liquid (p. 14-15); and a stator (37) isolated from the cooling liquid (p. 28: 14-20); a reservoir including an impeller cover (annotated in FIG. 17 reproduced above), an intermediate member (47) and a heat exchange interface (4), wherein a top wall of the reservoir and the impeller cover define a pump chamber (46) for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber (p. 29: 24-28; annotated in FIG. 17 reproduced above), the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together (p. 29: 17-38); and wherein a first side of the heat-exchanging interface is in contact with a cooling liquid in the thermal exchange chamber and a second side of the heat-exchanging interface opposite the first side is configured to be placed in thermal contact with a surface of the heat-generating component (p. 29: 35 - p. 30: 6); and

	a liquid-to-air heat exchanger fluidly coupled to the reservoir using flexible conduits (FIG. 8; p. 22: 18-21), the heat exchanger being configured to be positioned remote from the reservoir (p. 28: 37-38).
16	The cooling system of claim 15, wherein the impeller cover includes a first opening (34) radially offset from a center of the impeller (33) and the intermediate member (47) includes a second passage (48) that is aligned with the first opening, the first and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber (p. 17-25).
17	The cooling system of claim 15, wherein the first side of the heat-exchanging interface includes at least one of pins or fins (p. 29: 38 - p. 30: 6).
18	The cooling system of claim 15, wherein the top wall of the reservoir extends between the stator and the impeller and shields the stator from the cooling liquid in the reservoir (p. 28: 14-20).

As evident from the table above, the specification of the International Application contains a written description of the claimed inventions, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to make and use the claimed inventions. Accordingly, contrary to the Requester's allegations, the effective filing date of claims 1-18 of the '764 patent is the filing date of the International Application.

VI. Conclusion

For at least the above reasons, it is respectfully submitted that reexamined claims 1-18, as well as new claims 19-30, patentably distinguish over the cited art. Thus, reconsideration and confirmation of the patentability of reexamined claims 1-18, as well as new claims 19-30, and an early Action Closing Prosecution (ACP), are solicited.

It is believed that all pending issues have been addressed. However, the absence of a reply to a specific rejection, issue, or comment does not signify agreement with or concession of that rejection, issue, or comment. In addition, because arguments made above may not be exhaustive, there may be other reasons for patentability of any or all pending claims and any other claims that have not been expressed. Finally, nothing in this Response should be construed as an intention to concede any issue with regard to any claim, except as stated in the Response.

The Office Action and Request contain characterizations of the claims and the related art with which Patent Owner does not necessarily agree. Unless expressly noted otherwise, Patent Owner declines to subscribe to any statement or characterization in the Office Action or Request.

In discussing the specification, claims, and/or drawings in this Response, it is to be understood that Patent Owner is in no way intending to limit the scope of the claims to an exemplary embodiment described in the specification or abstract and/or shown in the drawings. Rather, Patent Owner is entitled to have the claims interpreted broadly, to the maximum extent permitted by statute, regulation, and applicable case law.

Patent Owner has submitted herewith the fees for the newly added claims. It is believed that no other fees are required. However, if any additional fee or fees are necessary for consideration of this Response, please charge any such fee or fees and refund any excess payments to Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: December 26, 2012

By: ____________________
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EXHIBIT 5

PATENT
Customer No. 22,852
Attorney Docket No. 10494.8000-00000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Inter Partes* Reexamination of:	)	
	)	
André Sloth ERIKSEN	)	Group Art Unit: 3993
	)	
U.S. Patent No.: 8,245,764 B2	)	Examiner: Joseph A. KAUFMAN
Filed: October 7, 2011	)	
Issued: August 21, 2012	)	
	)	
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	)	Confirmation No.: 7254
	)	
	)	
Reexamination Proceeding	)	
Control No. 95/002,386	)	
Filed: September 15, 2012	)	

Mail Stop *Inter Partes* Reexam
Attn: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

PATENT OWNER'S RESPONSE TO ACTION CLOSING PROSECUTION

In reply to the Action Closing Prosecution mailed on September 3, 2013, and in compliance with 37 C.F.R. §§ 1.951 and 1.943, Patent Owner requests the Examiner's consideration of the comments presented herein.

Remarks begin on page 1 of this paper.

Appendix A provides a listing of the claims.

Attachments to this paper are as follows:

(1) **Expert Declaration** under 37 C.F.R. § 1.132.

(2) **Certificate of Service**, pursuant to 37 C.F.R. § 1.903 and M.P.E.P. § 2666.06.

REMARKS

I. INTRODUCTION

This Response is filed in reply to the Action Closing Prosecution mailed on September 3, 2013 ("ACP") in the *Inter Partes* Reexamination of U.S. Patent No. 8,245,764 ("the '764 patent") to Eriksen. The deadline for filing a response to the ACP is October 3, 2013. *See* 37 C.F.R. § 1.951(a). Thus, this Response is timely filed. The number of pages in this Response is less than fifty pages. Therefore, this Response is in compliance with 37 C.F.R. § 1.943.

II. STATUS OF CLAIMS

In accordance with 37 C.F.R. § 1.530(e), Patent Owner provides the status of the pending claims. Claims 1-18 are original patented claims. Claims 19-30 were in the Response filed on December 26, 2012. No claims have been amended by the present Response. Claims 1-30 remain pending. Appendix A provides a listing of the pending claims.

III. ACTION CLOSING PROSECUTION

In the ACP, the Examiner took the following actions:

(a) Rejected claims 1-30 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 7,544,049 to Koga et al. ("*Koga*");

(b) Rejected claims 20, 24, and 28 under 35 U.S.C. § 103(a) as being unpatentable over *Koga;* and

(c) Rejected priority claim to PCT Application No. PCT/DK2005/000310 filed on May 6, 2005 (International Publication No. WO 2006/119761).

Patent Owner respectfully submits that claims 1-30 are patentable at least for the reasons that follow and the reasons stated in Patent Owner's Response filed on

December 26, 2013 ("the First Response"). This Response is supported by a Declaration of Donald Tilton, Ph.D. ("Tilton Decl."). The Declaration is submitted to address arguments presented by the Examiner for the first time in the ACP. For example, the Examiner's interpretation of the term "chamber" was presented for the first time in the ACP, and the Declaration addresses the Examiner's interpretation by highlighting the requirements for an enclosed region to function as a "thermal exchange chamber". Patent Owner respectfully requests the Examiner to consider the Declaration and the following remarks and to confirm the pending claims 1-30.

IV. THE REJECTION UNDER 35 U.S.C. § 102(b) OVER *KOGA*

The Examiner rejected claims 1-30 under 35 U.S.C. § 102(b) as allegedly anticipated by *Koga*. For at least the reasons provided below, Patent Owner respectfully submits that *Koga* does not disclose each and every limitation of claims 1-30.

A. Independent claim 1 and dependent claims 2-9 and 19-22

1. Independent claim 1 is not anticipated by *Koga*

Independent claim 1 recites a cooling system for a heat-generating component, comprising, *inter alia*, a reservoir having "a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages," and "a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component." (Emphasis added.) As discussed below, *Koga* does not disclose at least these features of independent claim 1.

a) <u>*Koga* fails to disclose a thermal exchange chamber separate from the pump chamber</u>

In the Third Party Request ("Request"), and the Office Action dated October 26, 2012 ("Office Action"), which refers to the Request, the "pump chamber" and the "thermal exchange chamber," recited in claim 1, are equated to the pump room 15A and sucking channel 19 of *Koga,* respectively. *Request,* pp. 149-164. In response to the Office Action, Patent Owner argued that sucking channel 19 does not satisfy the claim element "thermal exchange chamber" as recited in claim 1. *First Response*, p. 18. In the ACP, the Examiner maintains that sucking channel 19 of *Koga* does satisfy the claim requirement for a "chamber," because "chambers can clearly have inlets and outlets." *ACP*, p. 5. Patent Owner respectfully disagrees for the following reasons.

First, *Koga* represents the sucking channel as simply a conduit to deliver coolant to the rotational center of the impeller. *See Koga*, col. 4, ll. 57--67; *see also Tilton Decl.* ¶¶9, 10. For a prior art reference to anticipate a claim, "[t]he identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1126, 1236 (Fed. Cir. 1989). In this case, nowhere does *Koga* disclose or suggest that sucking channel 19 performs as a heat exchanging chamber. Pump room 15A is the only chamber provided in the cooling device of *Koga*, and it performs the <u>dual function</u> of housing the impeller and providing a reservoir for the coolant to collect and absorb thermal energy dissipated from heat-generating component 2. The fact that pump room 15A serves as the "thermal exchange chamber" of the *Koga* device is evident from the fact that inner wall face 50 of pump room 15A comprises dimples or protrusions to facilitate heat transfer from the heat-generating component to the coolant in the pump room. *Koga*, col. 3, ll. 25-27 ("On the inner wall of the pump room, a recess is provided. In this recess, protrusions extending toward the impeller or dimples are provided.") Sucking channel 19 of *Koga*, on the other hand, is simply a passageway for coolant to flow through to pump room 15A. *See Tilton Decl.*, ¶11.

Second, even assuming *arguendo* that sucking channel 19 could properly be reasonably construed to constitute a "chamber," which Patent Owner in no case concedes, sucking channel 19 still cannot constitute a "thermal exchange chamber," as required by claim 1, because sucking channel 19 is simply a flow-through region that would not allow the coolant to accumulate and absorb heat from the cooling device. *Id.* Additionally, the surface area of sucking channel 19 in any thermal contact with heat-generating component 2 would be negligible compared to the total surface area of the heat-receiving face 15B of the base wall of pump casing 15. FIGS. 5 and 8 of *Koga* (FIG. 8 annotated and reproduced below) clearly shows that the sucking channel is a narrow conduit inserted between heat-receiving face 15B and inner wall face 50 of the base wall. *See also Koga,* col. 4, ll. 50-60. Because of the narrow width of the channel, the outer surface area of the channel in any contact with component 2 would be very small. *Tilton Decl.*, ¶12. Therefore, one of ordinary skill in the art would not interpret sucking channel 19 as able to transfer any heat from component 2. *Id.*

(Cont'd)

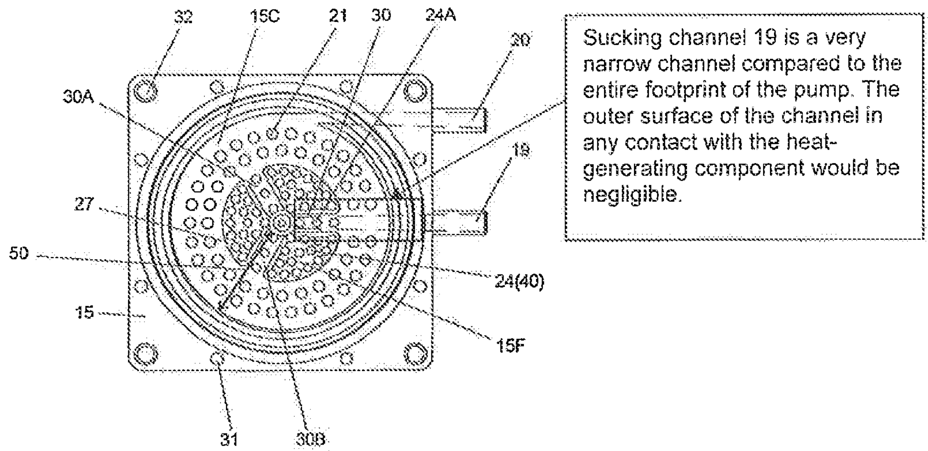

FIG. 8 of *Koga*

Accordingly, even if the Requester's strained construction of "chamber" to read on sucking channel 19 is accepted, the sucking channel still cannot be considered a "thermal exchange chamber," as recited in claim 1, because it would not be able to transfer any heat from the component to be cooled. Even under the most aggressive application of the "broadest reasonable interpretation" standard, a claim element cannot be construed so as to ignore claim limitations. *In re Suitco Surface, Inc.*, 603 F. 3d 1255, 1260 (Fed. Cir. 2010) (explaining that although the USPTO is to give claims their broadest reasonable construction, "[t]he broadest-construction rubric coupled with the term 'comprising' does not give the PTO an unfettered license to interpret claims to embrace anything remotely related to the claimed invention. Rather, claims should always be read in light of the specification and teachings in the underlying patent."). Here, the Examiner's construction of the term "chamber" is contrary to the express language of the claim requiring not just a "chamber," but a "thermal exchange chamber."

The specification also clearly requires a "thermal exchange chamber" as a feature of the cooling system, not simply any compartment or enclosed region as has been construed by the Examiner. Therefore, the Examiner's construction is unreasonably broad in light of the claim and the specification.

At least due to the above reasons, *Koga* fails to disclose a "thermal exchange chamber" that is separate and distinct from the pump chamber under any reasonable interpretation. Accordingly, at least the limitation "a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages," recited in independent claim 1, is not disclosed by *Koga*.

b) Sucking channel 19 of *Koga* is not in thermal contact with the electronic component to be cooled

Independent claim 1 recites that the cooling system comprises a "heat-exchanging interface," which forms "a boundary wall of the thermal exchange chamber" and is "configured to be placed in thermal contact with a surface of the heat-generating component." (Emphasis added.) As discussed earlier, the Examiner equates the "thermal exchange chamber" to sucking channel 19 of *Koga*. By extension, under the Examiner's reasoning, at least a portion of the outer surface area of sucking channel 19 forms the "heat-exchanging interface," as recited in claim 1. Claim 1 further recites that the "heat-exchanging interface" is "configured to be placed in thermal contact with a surface of the heat-generating component." *Koga*, however, teaches away from placing sucking channel 19 in thermal contact with the electronic component to be cooled. In particular, *Koga* teaches that:

> The shape of heat-receiving plane 15B and the shape of an upper surface of component 2 complement each other three-dimensionally, so that sucking-channel 19 does not extend over component 2. This structure allows heat-receiving plane 15B and the upper surface of component 2 to solidly contact with each other, so that heat can be transferred efficiently.

Koga, col. 8, ll. 47-53, and col. 10, ll. 33-40 (emphasis added). In other words, *Koga* teaches that the cooling device be designed in such a way that the sucking channel does not extend over the heat-generating component, because this would allow heat-receiving face 15B of the base wall and the upper surface of the heat-generating component to be in better contact with each other to allow efficient transfer of heat. Thus, contrary to the Examiner's position, sucking channel 19 does not contact the heat-generating component, and for at least that reason, sucking channel 19 cannot constitute a "thermal exchange chamber" because no heat exchange can take place between the component and sucking channel 19 if they are not in thermal contact with each other.

Accordingly, at least the limitation "a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component," as recited in claim 1, is not disclosed by *Koga*.

For at least the above reasons, *Koga* fails to disclose each and every limitation of independent claim 1. Therefore, claim 1 is not anticipated by *Koga*.

2. *Koga* does not anticipate dependent claims 2-9 and 19-22

Dependent claims 2-9 and 19-22 depend from independent claim 1, and are not anticipated by *Koga* at least due their dependence from claim 1.

Additionally, Patent Owner respectfully submits that at least claim 4 recites an added limitation, not recited in independent claim 1, that further illustrates that the Requester's interpretation of sucking channel 19 as the "thermal exchange chamber" must fail as unreasonable. Claim 4 recites that "the first side [the side that contacts the cooling liquid] of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber." The Examiner equates sucking channel 19 to the "thermal exchanging chamber" recited in claim 1, and thus under the Examiner's argument, a boundary wall of sucking channel 19 must constitute the heat-exchanging interface. But nowhere does *Koga* disclose that an inner wall surface of sucking channel 19, i.e., the side that contacts the coolant, comprises features to increase heat transfer to the coolant. In fact, inclusion of such features would impede the flow of coolant to pump room 15A. *Tilton Decl.*, ¶13. FIG. 7, annotated and reproduced below, further shows that sucking channel 19 is not a thermal exchange chamber as interpreted by the Requester and the Examiner.

(Cont'd)

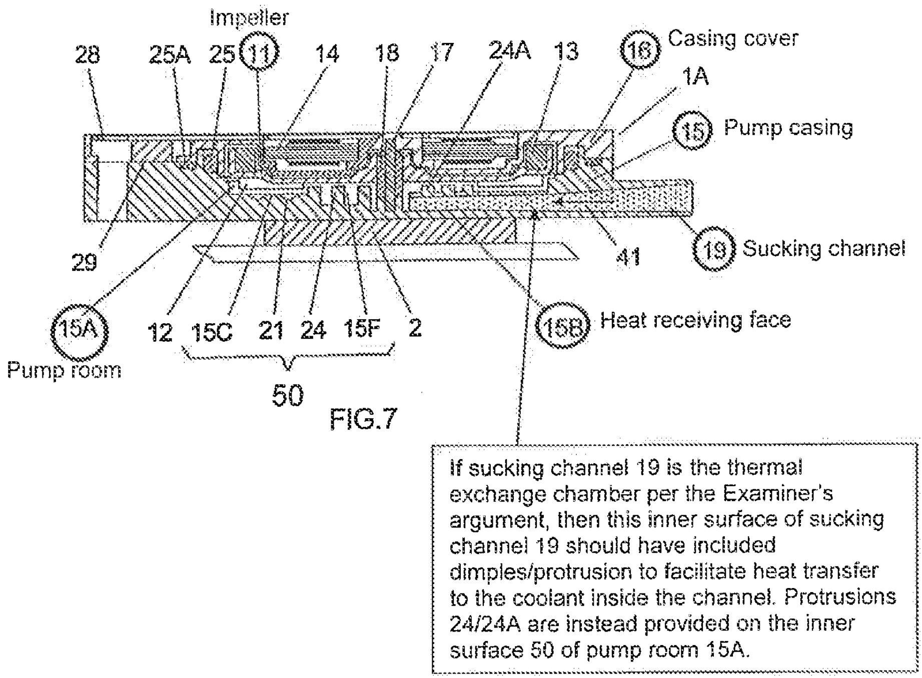

FIG.7

Koga teaches that dimples, or protrusions extending towards the impeller, may be provided to help in transfer of heat from the pump casing 15 to the coolant. *See Koga*, col. 8, ll. 11-22. However, the <u>protrusions and/or dimples are provided on the inner surface of the pump room 15A</u>, as shown in FIG. 3 (showing that protrusions 24 and dimples 40 are located on recessed area 15E of inner surface wall 50 of the pump room). *See also Koga*, col. 3, ll. 25-27 ("On the inner wall of the pump room, a recess is provided. In this recess, protrusions extending toward the impeller or dimples are provided.") Since sucking channel 19 is sandwiched between inner wall surface 50 and heat-receiving face 15B of the base wall, the sucking channel itself does not comprise any features to help in the transfer of heat. Thus the Examiner has improperly conflated the pump room 15A and the sucking channel 19. It is respectfully submitted that the need to do so is evidence that sucking channel 19 is not a thermal exchange chamber under any reasonable interpretation of the term. Thus, contrary to the Examiner's position, nowhere does *Koga* discloses that "the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber."

Accordingly, claim 4 (and claim 5 which depends from claim 4) are not anticipated by *Koga* for this additional limitation.

B. Independent claim 10 and dependent claims 11-14 and 23-26

Independent claim 10 recites a cooling system comprising, *inter alia*, a reservoir having "a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component," and "a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber." (Emphasis added.) At least these limitations of claim 10 are not disclosed by *Koga*. As discussed in Section A above, *Koga* fails to disclose a "pump chamber" separate from the "thermal exchange chamber;" the pump room 15A of *Koga* is both the "pump chamber" and the "thermal exchange chamber." Further, as discussed in Section A, sucking channel 19 of *Koga*, which the Examiner alleges satisfies the recitation of a "thermal exchange chamber," is not placed in thermal contact with the component to be cooled. Therefore, at least the above-identified limitations of claim 10 are not disclosed by *Koga* under any reasonable interpretation. Accordingly, claim 10, and claims 11-14 and 23-26, which depend from claim 10, are not anticipated by *Koga*.

C. Independent claim 15 and dependent claims 16-18 and 27-30

Independent claim 15 recites a cooling system, comprising, *inter alia*, "a reservoir including an impeller cover, an intermediate member and a heat exchange interface, wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber, the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together." (Emphasis added.) Patent Owner respectfully submits that at least this limitation of claim 15 is not disclosed by *Koga*.

Although not identical, independent claim 15 recites features similar to independent claims 1 and 10. As in claims 1 and 10, claim 15 recites a "pump chamber" that is vertically spaced apart from the "thermal exchange chamber." That is, the "pump chamber" and the "thermal exchange chamber" are separate chambers within the "reservoir." As discussed in Sections A and B above, *Koga* fails to teach a "pump chamber" that is separate from the "thermal exchange chamber;" pump room 15A of *Koga* serves as both the "pump chamber" and the "thermal exchange chamber."

Additionally, claim 15 recites that "a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber." Neither the Request nor the Office Action identifies an "impeller cover" and an "intermediate member" in the cooling device of *Koga*. The Request simply asserts that casing 15 forms the impeller cover and "the upper wall of the channel 19 defines the intermediate member." *Request*, pp. 160-161. Patent Owner respectfully disagrees with this assertion in the Request. *Koga* clearly describes that sucking channel 19 is inserted between heat-receiving plane 15B and inner wall surface 50 of the base wall of pump casing 15. *See Koga,* Abstract; *see also Koga*, col. 4, ll. 58-60 ("Sucking channel 19 is disposed between heat-receiving plane 15B and inner wall face 50."). Therefore, sucking channel 19 does not have an upper wall that is separate and distinct from the inner wall face 50 of the pump casing 15. Although inner wall face 50 and cover wall 16 are asserted to be equivalent to the "impeller cover" and the "top wall of the reservoir," respectively, which Patent Owner in no case concedes, nowhere does *Koga* disclose a <u>separate</u> "intermediate member." The use of different terms in a claim indicates that different elements are required. *See CAE Screen Plates, Inc. v. Heinrich Fiedler GMBH & Co.* KG, 224 F.3d 1308, 1317 (Fed. Cir. 2000) ("In the absence of any evidence to the contrary, we must presume that the use of these different terms in the claims connotes different meanings.") (citation omitted). Here, the Request and the Office Action have failed to identify an "intermediate member" in the *Koga* device, and have applied the inner wall face 50 as both the "impeller cover" and the "intermediate member" in their analysis. Accordingly, *Koga* fails to disclose the limitation "intermediate member and the heat exchange interface define a thermal exchange chamber."

For at least the above reasons, *Koga* fails to anticipate independent claim 15. Claims 16-18 and 27-30, which depend from claim 30, are also not anticipated by *Koga* at least due to their dependence from claim 15.

D. Conclusion regarding the anticipation rejection over *Koga*

As stated in the M.P.E.P., for a prior art reference to anticipate a claim under 35 U.S.C. § 102, the reference must teach each and every element of the claim. *See* M.P.E.P. § 2131. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the . . . claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989).

The USPTO, in applying the broadest reasonable interpretation of claim elements, is bounded by what would be reasonable from the perspective of one of ordinary skill in the art. *See In re Buszard*, 504 F.3d 1364, 65-66 (Fed. Cir. 2007) (The Federal Circuit found that the Board's interpretation that equated a "flexible" polyurethane foam with a crushed "rigid" foam was not reasonable because persons experienced in the field of polyurethane foams knew that a flexible mixture is different from a rigid foam mixture). In the rejection appearing in the ACP, the strained interpretations of the Requester are simply not reasonable because, from the perspective of one of ordinary skill in the art, a small diameter sucking channel cannot be reasonably said to serve a heat exchange function in a device whose primary purpose is heat exchange. Therefore, it is respectfully submitted that *Koga* cannot be shoehorned into the role of an anticipating reference.

For at least the reasons identified in Sections A–D, Patent Owner respectfully submits that *Koga* fails to teach each and every limitation of claims 1-30. Therefore, Patent Owner requests withdrawal of the rejection of claims 1-30 under 35 U.S.C. § 102(b).

IV. THE REJECTION UNDER 35 U.S.C. § 103(a) OVER *KOGA*

The Examiner rejected claims 20, 24, and 28 under 35 U.S.C. § 103(a) as being unpatentable over *Koga.* The Examiner admits that *Koga* fails to teach a plurality of passages between the pump chamber and the thermal exchange chamber, but contends that "[i]t would have been obvious to one of ordinary skill in the art to provide a plurality of passages between the pump and thermal exchange chambers to order to further enhance communication between the two which would increase flow and thus be better able to cool the device." *ACP,* p. 5.

The Examiner offers no explanation as to how the single-outlet sucking channel 19 (allegedly the "thermal exchange chamber") might be modified to "increase flow" by providing more passages. The Examiner's argument is especially confounding when *Koga* requires the sucking channel to deliver fluid to the center of the pump room 15A. *Koga*, col. 4, ll. 57–67; *Tilton Decl.,* ¶9. Adding more outlets to the channel would disrupt the very purpose of the sucking channel. Again, therefore, Patent Owner respectfully points out the unreasonableness of the Requester's interpretation.

Nevertheless, Patent Owner respectfully submits that claims 20, 24, and 28 depend from independent claims 1, 10, and 15, respectively. As discussed in Section IV above, *Koga* fails to disclose, teach, or suggest at least one limitation of independent claims 1, 10, and 15. Therefore, claims 20, 24, and 28 are patentable over *Koga* at least due to their dependence from one of the independent claims 1, 10, and 15.

For at least the above-stated reason, Patent Owner respectfully requests withdrawal of the rejection of claims 20, 24, and 28 under 35 U.S.C. § 103(a).

V. PRIORITY CLAIM

U.S. Application No. 13/269,234 (the '234 application) which issued as the '764 patent is a continuation of U.S. Patent Application No. 11/919,974 (the '974 application). The '974 application is a national stage entry of PCT Application No. PCT/DK2005/000310 ("the International Application") filed on May 6, 2005.

The Requester alleges that since FIG. 20 and its description were added to the specification of the '974 application after the filing of the International Application, the '764 patent in not entitled to the effective filing date of the International Application. Referring to these allegations, the Office Action states that "the Examiner will use the effective filing date of 14 July 2011." *ACP*, p. 3.

The Patent Owner disagrees that the International Application does not provide support for the issued claims of the '764 patent. In the Response filed on December 26, 2013, Patent Owner had explained that FIG. 20 was added during prosecution of the '974 application only to "help clearly identify previously presented subject matter." *See* Supplemental Preliminary Amendment in U.S. Patent Application No. 11/919,974 filed on January 9, 2009, p. 12. FIG. 20 did not add any new subject matter to the application. To the contrary, the International Application provides support for each and every claim of the '764 patent, as was shown in the claim chart provided in the First Response. Indeed, support was explicitly found by the Examiner during prosecution. *See, e.g.,* Exhibit B submitted with the First Response.

The ACP does not address the priority arguments presented by Patent Owner in the First Response. The Examiner ignores Patent Owner's detailed argument and simply reiterates that he has used the effective filing date of July 14, 2011 without comment. *ACP*, p. 3. That is, the Examiner has not made any finding regarding the §112 support for claims 1-30 in the International Application. For at least this reason, the Office Action mailed on September 3, 2013, should not have been made an ACP. *See* M.P.E.P. § 2671.02 ("Before an ACP is in order, a clear issue should be developed."). Therefore, Patent Owner requests the Examiner to withdraw the ACP as premature and to consider the claim chart presented below to make a proper determination of the support for pending claims 1-30 in the International Application.

Pending claims 1-30	**§ 112 support in the International Application**
1. A cooling system for a heat-generating component, comprising:	"The invention relates to a cooling system for a computer system, said computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid." *See* Abstract.
a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator and an impeller, the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;	FIG. 17 shows that the housing of the reservoir 14 is in the form of a double-sided chassis, with the stator 37 mounted on the upper side and the impeller 33 mounted on the underside of the chassis. "[T]he pumping member of the pump and a driven part of the motor of the pump, such as a rotor of the an electrical motor, is placed inside the reservoir embedded in the cooling liquid, and wherein a stationary part of the motor of the pump, such as a stator of an electrical motor, is placed outside the reservoir." *See* p. 2, ll. 36-39. (Cont'd)

Pending claims 1-30	§ 112 support in the International Application
	"The reservoir 14 has a recess 40 in the of the reservoir. The recess [40] is intended for accommodating a stator 37 of an electrical motor driving an impeller 33 of the pump, said impeller being attached to a shaft 38 of a rotor 39 of the electrical motor. The recess 40 has an orifice 41, four sidewalls 42, a bottom 43 and a circular jacket 44 extending from the bottom 43 of the recess 40 and outwards towards the orifice 41 of the recess 40. The interior (not shown) of the jacket 44 is intended for encompassing the rotor 39 of the pump." *See* p. 26, ll. 6-12. "[A] liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system." *See* p. 26, ll. 14-21.
a reservoir adapted to pass the cooling liquid therethrough, the reservoir including:	"The object may also be obtained by a cooling system for a computer system, said computer system comprising: ... a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means." *See* p. 3, ll. 7-21.
a pump chamber including the impeller and formed below the chassis, the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through;	"An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 formed by impeller cover 46A having an outlet 34 provided tangentially to the circumference of the impeller 33." *See* p. 29, ll. 17-19. *See also* FIG. 17.

Pending claims 1-30	§ 112 support in the International Application
a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and	"An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33…An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir 14." *See* p. 29, ll. 21-28. *See also* FIG. 17.
a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component; and	"[A] heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47." *See* p. 29, ll. 30-33. "The heat exchanging interface 4 is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminium *[sic]*, and which will be in thermal contact with the CPU 1, when the cooling system is fastened to the motherboard 2 of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing 14, thus the heat exchanger 4 constitutes the part of the liquid reservoir housing facing the CPU." *See* p. 4, ll. 18-23.
a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.	"The tube inlet connection and the tube outlet connection are connected to a heat radiator by means of connecting tubes 24 and 25 through which the cooling liquid flows into and out of the reservoir and the heat radiator, respectively. Within the heat radiator 11, the cooling liquid passes a number of channels for radiating the heat, which has been dissipated into the cooling liquid inside the reservoir, and to the surroundings of the heat exchanger.

Pending claims 1-30	§ 112 support in the International Application
	The air fan 10 blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir." *See* p. 20, l. 34-p. 21, l. 3. *See also* FIG. 8.
2. The cooling system of claim 1, wherein the chassis shields the stator from the cooling liquid in the reservoir.	"[A] a liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system." *See* p. 28, ll. 14-21.
3. The cooling system of claim 1, wherein the heat-exchanging interface includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.	At least paragraphs [0113] and [0173], and FIG. 20 "[A] heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47." *See* p. 29, ll. 30-33. "The heat exchanging interface 4 is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminium *[sic]*, and which will be in thermal contact with the CPU 1, when the cooling system is fastened to the motherboard 2 of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing 14, thus the heat exchanger 4 constitutes the part of the liquid reservoir housing facing the CPU." *See* p. 4, ll. 18-23.

Pending claims 1-30	§ 112 support in the International Application
4. The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.	"The inner surface facing the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47 is provided with pins 4A extending from the base of the copper plate and into the thermal exchange chamber (not shown) at the opposite side of intermediate member 47. The pins 4A constitutes an uneven surface and may either be provided during casting of the copper plate or may be provided by means of milling or other machining process of a copper plate. The pins provide a network of channels across the inner surface of the heat exchanging interface, along which network the cooling liquid is intended to flow." *See* p. 29, l. 38-p. 30, l. 6. *See also* FIG. 17.
5. The cooling system of claim 4, wherein the features include at least one of pins or fins.	Same as claim 4.
6. The cooling system of claim 1, wherein a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller.	"An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir 14." *See* p. 29, ll. 21-28.
7. The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.	FIG. 17 shows that the impeller 33 includes a plurality of curved blades.
8. The cooling system of claim 1, wherein the heat-exchanging interface includes one of copper and aluminum.	"[A] heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47." *See* p. 29, ll. 30-33. (Cont'd)

Pending claims 1-30	§ 112 support in the International Application
	"The heat exchanging interface 4 is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminium *[sic]*, and which will be in thermal contact with the CPU 1, when the cooling system is fastened to the motherboard 2 of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing 14, thus the heat exchanger 4 constitutes the part of the liquid reservoir housing facing the CPU." *See* p. 4, ll. 18-23.
9. The cooling system of claim 1, wherein the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir.	"The tube inlet connection and the tube outlet connection are connected to a heat radiator by means of connecting tubes 24 and 25 through which the cooling liquid flows into and out of the reservoir and the heat radiator, respectively. Within the heat radiator 11, the cooling liquid passes a number of channels for radiating the heat, which has been dissipated into the cooling liquid inside the reservoir, and to the surroundings of the heat exchanger. The air fan 10 blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir." *See* p. 20, l. 34-p. 21, l. 3. *See also* FIG. 8.
10. A cooling system for a computer system, comprising:	At least the abstract of the present application "The invention relates to a cooling system for a computer system, said computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid." *See* Abstract.
a centrifugal pump adapted to circulate a cooling liquid, the pump including:	"The object may also be obtained by a cooling system for a computer system, said computer system comprising:... a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means." *See* p. 3, ll. 7-17. (Cont'd)

Pending claims 1-30	§ 112 support in the International Application
	"An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33. Thus, the pump functions as a centrifugal pump." *See* p. 29, ll. 17-19.
an impeller exposed to the cooling liquid; and	"[A] liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system." *See* p. 26, ll. 14-21.
a stator isolated from the cooling liquid;	"[A] liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system." *See* p. 26, ll. 14-21.
a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:	"[T]he heat exchanging interface constitutes an integrate surface of the reservoir, and where the heat exchanging surface extends along an area of the surface of the reservoir, said area of surface being intended for facing the processing unit and said area of surface being intended for the close thermal contact with the processing unit." *See* p. 5, ll. 18-21.

Pending claims 1-30	§ 112 support in the International Application
a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;	"[A] heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47." *See* p. 29, ll. 30-33. "The heat exchanging interface 4 is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminium *[sic]*, and which will be in thermal contact with the CPU 1, when the cooling system is fastened to the motherboard 2 of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing 14, thus the heat exchanger 4 constitutes the part of the liquid reservoir housing facing the CPU." *See* p. 4, ll. 18-23.
a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber, and wherein at least one of the one or more passages is offset from a center of the impeller.	An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33…An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47." *See* p. 29, ll. 17-26. *See also* FIG. 17.
11. The cooling system of claim 10, wherein a top wall of the reservoir physically separates the impeller from the stator.	"[A] liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry

Pending claims 1-30	§ 112 support in the International Application
	from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system." *See* p. 26, ll. 14-21.
12. The cooling system of claim 10, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component.	"[A] heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47." *See* p. 29, ll. 30-33. "The heat exchanging interface 4 is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminium *[sic]*, and which will be in thermal contact with the CPU 1, when the cooling system is fastened to the motherboard 2 of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing 14, thus the heat exchanger 4 constitutes the part of the liquid reservoir housing facing the CPU." *See* p. 4, ll. 18-23.
13. The cooling system of claim 10, further including a heat radiator fluidly coupled to the reservoir using flexible conduits, wherein the heat radiator is configured to be positioned remote from the reservoir.	"The tube inlet connection and the tube outlet connection are connected to a heat radiator by means of connecting tubes 24 and 25 through which the cooling liquid flows into and out of the reservoir and the heat radiator, respectively. Within the heat radiator 11, the cooling liquid passes a number of channels for radiating the heat, which has been dissipated into the cooling liquid inside the reservoir, and to the surroundings of the heat exchanger. The air fan 10 blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir." *See* p. 20, l. 34-p. 21, l. 3. *See also* FIG. 8.
14. The cooling system of claim 10, wherein the fluid passage that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller.	"An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33." *See* p. 29, ll. 17-19.

Pending claims 1-30	§ 112 support in the International Application
15. A cooling system for a heat-generating component, comprising:	At least the abstract of the present application "The invention relates to a cooling system for a computer system, said computer system comprising at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit and comprising a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid." *See* Abstract.
a pump adapted to circulate a cooling liquid, the pump including:	"The object may also be obtained by a cooling system for a computer system, said computer system comprising:... a pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means." *See* p. 3, ll. 7-17.
an impeller exposed to the cooling liquid; and	"[A] liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system." *See* p. 26, ll. 14-21.
a stator isolated from the cooling;	"[A] liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system." *See* p. 26, ll. 14-21.

Pending claims 1-30	§ 112 support in the International Application
a reservoir including an impeller cover, an intermediate member and a heat exchange interface, wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber,	"An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33…An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47." *See* p. 29, ll. 17-26. *See also* FIG. 17.
the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together; and	"An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33…An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir 14." *See* p. 29, ll. 17-28. *See also* FIG. 17.
wherein a first side of the heat-exchanging interface is in contact with a cooling liquid in the thermal exchange chamber and a second side of the heat-exchanging interface opposite the first side is configured to be placed in thermal contact with a	"[A] heat exchanging interface 4 such as a surface made from a copper plate, alternatively a plate of another material having a high thermal conductivity, is placed in thermal communication with the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47." *See* p. 29, ll. 30-33. "The heat exchanging interface 4 is a separate element and is made of a heat conducting material having a relative high heat thermal conductivity such as copper or aluminium *[sic]*, and which will be in thermal contact with

Pending claims 1-30	§ 112 support in the International Application
surface of the heat-generating component; and	the CPU 1, when the cooling system is fastened to the motherboard 2 of the CPU. The heat exchanging surface constitutes part of a liquid reservoir housing 14, thus the heat exchanger 4 constitutes the part of the liquid reservoir housing facing the CPU." *See* p. 4, ll. 18-23.
a liquid-to-air heat exchanger fluidly coupled to the reservoir using flexible conduits, the heat exchanger being configured to be positioned remote from the reservoir.	"The tube inlet connection and the tube outlet connection are connected to a heat radiator by means of connecting tubes 24 and 25 through which the cooling liquid flows into and out of the reservoir and the heat radiator, respectively. Within the heat radiator 11, the cooling liquid passes a number of channels for radiating the heat, which has been dissipated into the cooling liquid inside the reservoir, and to the surroundings of the heat exchanger. The air fan 10 blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid flowing inside the channels through the heat radiator and back into the reservoir." *See* p. 20, l. 34-p. 21, l. 3. *See also* FIG. 8.
16. The cooling system of claim 15, wherein the impeller cover includes a first opening radially offset from a center of the impeller and the intermediate member includes a second passage that is aligned with the first opening, the first and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber.	"An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33...An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir 14." *See* p. 29, ll. 17-28. *See also* FIG. 17.
17. The cooling system of claim 15, wherein the first side of the heat-exchanging interface includes at least one of	"The inner surface facing the thermal exchange chamber (not shown) at the opposite side of the intermediate member 47 is provided with pins 4A extending from the base of the copper plate and into the thermal exchange chamber (not shown) at the opposite side of intermediate

Pending claims 1-30	§ 112 support in the International Application
pins or fins.	member 47. The pins 4A constitutes an uneven surface and may either be provided during casting of the copper plate or may be provided by means of milling or other machining process of a copper plate. The pins provide a network of channels across the inner surface of the heat exchanging interface, along which network the cooling liquid is intended to flow." *See* p. 29, l. 38–p. 30, l. 6. *See also* FIG. 17.
18. The cooling system of claim 15, wherein the top wall of the reservoir extends between the stator and the impeller and shields the stator from the cooling liquid in the reservoir.	"[A] liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system." *See* p. 26, ll. 14-21.
19. The cooling system of claim 1, wherein the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.	"An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33…An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir 14." *See* p. 29, ll. 17-28. *See also* FIG. 17

Pending claims 1-30	§ 112 support in the International Application
20. The cooling system of claim 1, wherein the one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber.	Same as claim 19.
21. The cooling system of claim 1, wherein an entire surface of the heat-exchanging interface in contact with the cooling liquid in the reservoir forms the boundary wall of the thermal exchange chamber.	FIG. 17 (showing that an entire surface of heat exchange interface 4 forms a boundary wall of the thermal exchange chamber defined by intermediate member 47 on one side and heat exchange interface 4 on the other).
22. The cooling system of claim 1, wherein the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.	"The reservoir 14 may also be provided with an inlet (not shown) and an outlet (not shown) for the cooling liquid. The inlet and outlet are provided along a surface of the reservoir facing downward and inwards when seen in the perspective view of the drawing [FIG. 17]." *See* p. 28, ll. 30-35.
23. The cooling system of claim 10, wherein the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.	"An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33…An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir 14." *See* p. 29, ll. 17-28.

Pending claims 1-30	§ 112 support in the International Application
24. The cooling system of claim 10, wherein the one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber.	Same as claim 23
25. The cooling system of claim 12, wherein an entire surface of the heat-exchange interface in contact with the cooling liquid in the reservoir forms a boundary wall of the thermal exchange chamber.	FIG. 17 (showing that an entire surface of heat exchange interface 4 forms a boundary wall of the thermal exchange chamber defined by intermediate member 47 on one side and heat exchange interface 4 on the other).
26. The cooling system of claim 10, wherein the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.	"The reservoir 14 may also be provided with an inlet (not shown) and an outlet (not shown) for the cooling liquid. The inlet and outlet are provided along a surface of the reservoir facing downward and inwards when seen in the perspective view of the drawing [FIG. 17]." *See* p. 28, ll. 30-35.
27. The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by one or more passages, the one or more passages including a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.	"An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33…An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir 14." *See* p. 29, ll. 17-28.

Pending claims 1-30	§ 112 support in the International Application
28. The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by a plurality of passages positioned within the reservoir that open into the thermal exchange chamber.	Same as claim 27.
29. The cooling system of claim 15, wherein an entire surface of the heat-exchanging interface in contact with the cooling liquid in the reservoir forms a boundary wall of the thermal exchange chamber.	FIG. 17 (showing that an entire surface of heat exchange interface 4 forms a boundary wall of the thermal exchange chamber defined by intermediate member 47 on one side and heat exchange interface 4 on the other).
30. The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by one or more passages, and the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.	"An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 having an outlet 34 provided tangentially to the circumference of the impeller 33…An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47 to the interior of the reservoir 14." *See* p. 29, ll. 17-28. "The reservoir 14 may also be provided with an inlet (not shown) and an outlet (not shown) for the cooling liquid. The inlet and outlet are provided along a surface of the reservoir facing downward and inwards when seen in the perspective view of the drawing [FIG. 17]." *See* p. 28, ll. 30-35.

Patent Owner respectfully requests the Examiner to consider the claim chart presented above and to accord the '764 patent the priority date of May 6, 2005.

VI. CONCLUSION

For at least the reasons discussed above, Patent Owner respectfully requests withdrawal of the pending rejection of claims 1-30, and the allowance and confirmation of all pending claims 1-30

Patent Owner notes that the Request, Order, Office Action, and ACP contain a number of assertions and allegations concerning the claims and/or the cited art. The Patent Owner declines to subscribe to any assertion or allegation in the Request, Order, Office Action, or ACP, regardless of whether it might be addressed specifically herein.

Pursuant to 37 C.F.R. § 1.903 and M.P.E.P. § 2666.06, Patent Owner served a copy of this Response on the third party requester in the manner provided by 37 C.F.R. § 1.248 on the same date this paper was filed with the Office.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: October 3, 2013

By: ______________________
Eric P. Raciti
Reg. No. 41,475

APPENDIX A — LISTING OF THE CLAIMS

1. (Original) A cooling system for a heat-generating component, comprising::

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator and an impeller, the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including

a pump chamber including the impeller and formed below the chassis, the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through

a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and

a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component; and

a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.

2. (Original) The cooling system of claim 1, wherein the chassis shields the stator from the cooling liquid in the reservoir.

3. (Original) The cooling system of claim 1, wherein the heat-exchanging interface includes a first side and a second side opposite the first side, and wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.

4. (Original) The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.

5. (Original) The cooling system of claim 4, wherein the features include at least one of pins or fins.

6. (Original) The cooling system of claim 1, wherein a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller.

7. (Original) The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.

8. (Original) The cooling system of claim 1, wherein the heat-exchanging interface includes one of copper and aluminum.

9. (Original) The cooling system of claim 1, wherein the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir.

10. (Original) A cooling system for a computer system, comprising:

a centrifugal pump adapted to circulate a cooling liquid, the pump including:

an impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:

a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;

a separate pump chamber vertically spaced part from the thermal exchange chamber and coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber, and wherein at least one of the one or more passages is offset from a center of the impeller.

11. (Original) The cooling system of claim 10, wherein a top wall of the reservoir physically separates the impeller from the stator.

12. (Original) The cooling system of claim 10, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component.

13. (Original) The cooling system of claim 10, further including a heat radiator fluidly coupled to the reservoir using flexible conduits, wherein the heat radiator is configured to be positioned remote from the reservoir.

14. (Original) The cooling system of claim 10, wherein the fluid passage that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller.

15. (Original) A cooling system for a heat-generating component, comprising:

a pump adapted to circulate a cooling liquid, the pump including:

an impeller exposed to the cooling liquid; and

a stator isolated from the cooling liquid;

a reservoir including an impeller cover, an intermediate member and a heat exchange interface, wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the impeller, and the intermediate member and the heat exchange interface define a thermal exchange chamber, the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together; and

wherein a first side of the heat-exchanging interface is in contact with a cooling liquid in the thermal exchange chamber and a second side of the heat-exchanging interface opposite the first side is configured to be placed in thermal contact with a surface of the heat-generating component; and

a liquid-to-air heat exchanger fluidly coupled to the reservoir using flexible conduits, the heat exchanger being configured to be positioned remote from the reservoir.

16. (Original) The cooling system of claim 15, wherein the impeller cover includes a first opening radially offset from a center of the impeller and the intermediate member includes a second passage that is aligned with the first opening, the first and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber.

17. (Original) The cooling system of claim 15, wherein the first side of the heat-exchanging interface includes at least one of pins or fins.

18. (Original) The cooling system of claim 15, wherein the top wall of the reservoir extends between the stator and the impeller and shields the stator from the cooling liquid in the reservoir.

19. (Previously Added) The cooling system of claim 1, wherein the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

20. (Previously Added) The cooling system of claim 1, wherein the one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber.

21. (Previously Added) The cooling system of claim 1, wherein an entire surface of the heat-exchanging interface in contact with the cooling liquid in the reservoir forms the boundary wall of the thermal exchange chamber.

22. (Previously Added) The cooling system of claim 1, wherein the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

23. (Previously Added) The cooling system of claim 10, wherein the one or more passages include a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

24. (Previously Added) The cooling system of claim 10, wherein the one or more passages include a plurality of passages positioned within the reservoir that opens into the thermal exchange chamber.

25. (Previously Added) The cooling system of claim 12, wherein an entire surface of the heat-exchange interface in contact with the cooling liquid in the reservoir forms a boundary wall of the thermal exchange chamber.

26. (Previously Added) The cooling system of claim 10, wherein the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

27. (Previously Added) The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by one or more passages, the one or more passages including a passage configured to direct cooling liquid from the pump chamber directly into the thermal exchange chamber.

28. (Previously Added) The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by a plurality of passages positioned within the reservoir that open into the thermal exchange chamber.

29. (Previously Added) The cooling system of claim 15, wherein an entire surface of the heat-exchanging interface in contact with the cooling liquid in the reservoir forms a boundary wall of the thermal exchange chamber.

30. (Previously Added) The cooling system of claim 15, wherein the pump chamber and the thermal exchange chamber are fluidly coupled together by one or more passages, and the reservoir further includes an inlet configured to direct the cooling liquid into the reservoir and an outlet configured to discharge the cooling liquid from the reservoir.

Control No. 95/002,386
Attorney Docket No. 10494.8000-00000

CERTIFICATE OF SERVICE

The undersigned certifies that on this 3rd day of October 2013, service of a true and complete copy of the "PATENT OWNER'S RESPONSE TO ACTION CLOSING PROSECUTION" was served in its entirety via first class U.S. mail on counsel for the third party requester, at the following address:

Ganz Law P.C.
P.O. Box 2200
Hillsboro, OR 97123

with sufficient postage affixed, and with delivery confirmation requested.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: October 3, 2013

By:
Eric P. Raciti
Reg. No. 41,475

EXHIBIT 6

PATENT
Customer No. 22,852
Attorney Docket No. 10494.8000-00000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Inter Partes* Reexamination of:	)
	)
André Sloth ERIKSEN	) Group Art Unit: 3993
	)
U.S. Patent No.: 8,245,764 B2	) Examiner: Joseph A. KAUFMAN
Filed: October 7, 2011	)
Issued: August 21, 2012	)
	)
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	) Confirmation No.: 7254
	)
	)
Reexamination Proceeding	)
Control No. 95/002,386	)
Filed: September 15, 2012	)

Mail Stop *Inter Partes* Reexam
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Commissioner:

DECLARATION UNDER 37 C.F.R. § 1.132 OF DONALD TILTON

I, Donald TILTON, declare as follows:

I. Qualifications

1. I am a Mechanical Engineer. I have a B.S. in Mechanical Engineering from Washington State University, Pullman, WA. I also have an M.S. and a Ph.D. in Mechanical Engineering from the University of Kentucky, Lexington, KY.

2. I am an experienced innovator and inventor with 23 issued patents, and many pending applications, spanning the fields of energy efficiency, renewable energy, thermal management systems, heat transfer, and fluid flow.

3. I founded Isothermal Systems Research, Inc. (sold to Parker Aerospace) in 1988 while attending graduate school at the University of Kentucky. I worked at Isothermal Systems Research from 1988 to 2008, and during that time I developed and deployed critical liquid cooling technologies for aerospace and defense electronic systems.

4. I am an experienced entrepreneur and executive leader with 22 years of experience founding, growing and leading technology companies. I am currently the Managing Director of Emerging Ventures at Mindshare Resources where I assist in the formation and growth of new technology businesses.

5. I understand this Declaration will be filed in support of the patentability of the claims pending in the reexamination proceeding of U.S. Patent No.: 8,245,764 B2 ("the '764 patent"). I also understand that the '764 patent is currently assigned to Asetek A/S.

6. In preparing this Declaration, I have considered the '764 patent, the references cited against the '764 patent, the Office Action (mailed on October 26, 2012), and the Action Closing Prosecution (mailed on September 3, 2013) issued against the '764 patent.

II. U.S. Patent No. 7,544,049 to Koga et al. ("*Koga*")

In my opinion:

7. The cooling device of *Koga* has a single chamber—the pump room—which houses the impeller <u>and</u> serves as a heat exchanging chamber. The pump room is defined by the base wall and the cover wall of the pump casing. The base wall

serves as a heat exchanging interface between the coolant in the pump room and the electronic component to be cooled.

8. The outer surface of the base wall (which *Koga* refers to as the "heat-receiving face" or "heat-receiving plane") contacts the electronic component, and the inner surface of the base wall faces the impeller. The inner surface has dimples, or protrusions extending towards the impeller, which help in transfer of heat from the base wall to the coolant in the pump room.

9. An inlet conduit (which *Koga* refers to as the "sucking channel") is inserted between the outer surface and the inner surface of the base wall. The sucking channel guides the coolant to the center of the pump room, so that coolant can enter the pump room near the rotational center of the impeller.

10. The Office Actions and the Action Closing Prosecution refer to the sucking channel as a "heat exchanging chamber." I disagree with this characterization of the sucking channel. Throughout the written description of *Koga*, the sucking channel is represented as nothing more than a conduit to deliver coolant to the rotational center of the impeller.

11. The pump room of *Koga* serves as a reservoir for the coolant to spread out and absorb thermal energy dissipated from the electronic component. Thus, the pump room serves as the heat exchanging chamber. The sucking channel, on the other hand, is simply a passageway for coolant to flow through to the pump room; it does not allow the coolant to accumulate and absorb heat from the cooling device.

12. The sucking channel occupies a very small percentage of the heat exchanging interface between the pump and the electronic component. FIGS. 5 and 8 clearly show that the sucking channel is very narrow compared to the overall footprint of the pump. As such any outer surface area of the channel in any contact with the electronic component would be negligible compared to the total surface area of the base wall. The sucking channel would not be able to transfer hardly any heat from the electronic component if it is in thermal contact with only a sliver of the electronic component. Accordingly, the sucking channel cannot be reasonably said to function as a heat exchanging chamber.

13. It is also not feasible to contain the dimples or protrusions necessary to extend the surface area needed to effectively exchange heat within the sucking channel, as these features would impede the flow or delivery of fluid to the center of the pump impeller.

III. Conclusion

14. I reserve the right to amend, supplement, or otherwise modify my opinions, whether in a written declaration or otherwise. I also reserve the right to reply to positions taken by the Requester's experts.

15. I declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and may jeopardize the validity of the patent application to which they are directed or any patent issuing thereon.

16. In signing this declaration, I understand that the declaration will be filed as evidence in the United States Patent and Trademark Office. I acknowledge that I may be subject to cross examination in the case and that cross examination will take place within the United States. If cross examination is required of me, I will appear for cross examination within the United States during the time allotted for cross examination.

Dated: October 1, 2013

Signed: ______________________
Donald Tilton

EXHIBIT 7

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
95/002,386	09/15/2012	8245764	COOL-1.012	7254

22852 7590 06/30/2014
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER	
KAUFMAN, JOSEPH A	

ART UNIT	PAPER NUMBER
3993	

MAIL DATE	DELIVERY MODE
06/30/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

Transmittal of Communication to Third Party Requester *Inter Partes* Reexamination	Control No. 95/002,386	Patent Under Reexamination 8245764	
	Examiner JOSEPH KAUFMAN	Art Unit 3993	

*-- The **MAILING DATE** of this communication appears on the cover sheet with the correspondence address. --*

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

GANZ LAW, P.C.
P.O. BOX 2200
HILLSBORO, OR 97123

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above-identified reexamination prceeding. 37 CFR 1.903.

Prior to the filing of a Notice of Appeal, each time the patent owner responds to this communication, the third party requester of the *inter partes* reexamination may once file written comments within a period of 30 days from the date of service of the patent owner's response. This 30-day time period is statutory (35 U.S.C. 314(b)(2)), and, as such, it cannot be extended. See also 37 CFR 1.947.

If an *ex parte* reexamination has been merged with the *inter partes* reexamination, no responsive submission by any *ex parte* third party requester is permitted.

All correspondence relating to this inter partes reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of the communication enclosed with this transmittal.

U.S. Patent and Trademark Office
PTOL-2070 (Rev. 07-04)

Paper No. 20140604

Right of Appeal Notice (37 CFR 1.953)	Control No. 95/002,386	Patent Under Reexamination 8245764
	Examiner JOSEPH KAUFMAN	Art Unit 3993

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address. --

Responsive to the communication(s) filed by:
Patent Owner on 03 October, 2013
Third Party(ies) on ______

Patent owner and/or third party requester(s) may file a notice of appeal with respect to any adverse decision with payment of the fee set forth in 37 CFR 41.20(b)(1) within **one-month or thirty-days (whichever is longer)**. See MPEP 2671. In addition, a party may file a notice of **cross** appeal and pay the 37 CFR 41.20(b)(1) fee **within fourteen days of service** of an opposing party's timely filed notice of appeal. See MPEP 2672.

All correspondence relating to this inter partes reexamination proceeding should be directed to the **Central Reexamination Unit** at the mail, FAX, or hand-carry addresses given at the end of this Office action.

If no party timely files a notice of appeal, prosecution on the merits of this reexamination proceeding will be concluded, and the Director of the USPTO will proceed to issue and publish a certificate under 37 CFR 1.997 in accordance with this Office action.

The proposed amendment filed ______ ☐ will be entered ☐ will not be entered*

*Reasons for non-entry are given in the body of this notice.

1a. ☒ Claims 1-30 are subject to reexamination.
1b. ☐ Claims ______ are not subject to reexamination.
2. ☐ Claims ______ have been cancelled.
3. ☐ Claims ______ are confirmed. [Unamended patent claims].
4. ☐ Claims ______ are patentable. [Amended or new claims].
5. ☒ Claims 1-30 are rejected.
6. ☐ Claims ______ are objected to.
7. ☐ The drawings filed on ______ ☐ are acceptable. ☐ are not acceptable.
8. ☐ The drawing correction request filed on ______ is ☐ approved. ☐ disapproved.
9. ☐ Acknowledgment is made of the claim for priority under 35 U.S.C. 119 (a)-(d) or (f). The certified copy has:
☐ been received. ☐ not been received. ☐ been filed in Application/Control No. ______.
10. ☐ Other ______

Attachments
1. ☐ Notice of References Cited by Examiner, PTO-892
2. ☒ Information Disclosure Citation, PTO/SB/08
3. ☐ ______

Extensions of Time

Extensions of time under 37 CFR 1.136(a) will **not** be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexamination proceeding. Additionally, 35 U.S.C. 314(c) requires that *inter partes* reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.937). Patent owner extensions of time in *inter partes* reexamination proceedings are provided for in 37 CFR 1.956. Extensions of time are not available for third party requester comments, because a comment period of 30 days from service of patent owner's response is set by statute. 35 USC 314(b)(3).

Notification of Concurrent Proceedings

The patent owner is reminded of the continuing responsibility under 37 CFR 1.985 to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving the Eriksen patent throughout the course of this reexamination proceeding. The third party requester is also reminded of the ability to similarly apprise the Office of any such activity or proceeding throughout the course of this reexamination proceeding. See MPEP § 2686 and 2686.04.

Service of Papers

Any paper filed by either the patent owner or the third party requester ***must be served*** on the other party in the reexamination proceeding in the manner provided by 37 CFR 1.248. See 37 CFR 1.903 and MPEP 2666.06.

Non-Entry of Requester's Response

Requester has been previously notified that when claims have not been amended, no new rejections over those claims are permissible. In the response by Requester dated 4 November 2013, Requester proposes new rejections of all of the claims based on Ryu and Duan. Therefore, Requester's response dated 4 November 2013 is improper, will not be considered in its entirety, and be expunged from the record.

Declaration

The Declaration submitted by Patent Owner on 3 October 2013 has been considered. The following rejections and comments are maintained/made in light of the declaration.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Koga et al.

Requester has stated that Patent Owner is only eligible for the effective filing date of 7 October 2011 as the original application did not have Figure 20 or the passages in the specification to support the claimed subject matter. This material was added on 9 January 2009 and 14 July 2011. Therefore, the Examiner will use the effective filing date of 14 July 2011.

The Examiner incorporates by reference the claim charts on pages 149-164 of the Request.

Claims 19, 21-23, 25-27, 29 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Koga et al.

Koga et al. has been discussed in detail as noted in the above rejection. In addition, as seen in Figure 7, a passage directs cooling liquid from the pump chamber 15 directly to the thermal exchange chamber; an entire surface of the heat exchange interface that contacts the cooling liquid forms a boundary wall of the thermal exchange chamber as seen with either surface of 19 in Figure 7; and the pump and thermal exchange chambers are connected together by one of more passages as noted above and in Figure 7, and the reservoir has and inlet and outlet at 19 and 20 as seen in Figure 8.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been

> obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 20, 24 and 28 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Koga et al.

Koga et al. has been discussed in detail above, but while showing at least one passage between the pump and thermal exchange chamber, is silent as to a plurality of passages between the two. It would have been obvious to one of ordinary skill in the art to provide a plurality of passages between the pump and thermal exchange chambers in order to further enhance communication between the two which would increase flow and thus be better able to cool the device.

Response to Arguments

Summary of Patent Owner's Arguments:

Patent Owner contends that Koga et al. does not anticipate the claims, nor renders the claims obvious. Specifically, Patent Owner states that Koga et al. does not show a thermal exchange chamber separate from the pump chamber nor is the chamber in thermal contact with the electronic component to be cooled. With regard to the dependent claims, Patent Owner contends that Koga et al. does not disclose that an inner wall of the chamber acts as a heat exchanger and further, does not have the required protrusions. With regard to independent claim 15 and its dependent claims, Patent Owner argues that Koga et al. does not teach the required intermediate member. Patent Owner alleges that the Examiner has not explained how the modification of multiple channels would operate. Finally, Patent Owner has contends that the Examiner has not addressed the priority claim and that the invention is due a filing date going back to the filing date of the PCT.

Examiner's Remarks:

The Examiner begins by referencing the above rejections of the claims. Specifically pages 149-164 of the Request that gives the details of the rejections over Koga et al., Figure 3 of the drawings of Koga and Figure 20 of the Eriksen patent. Eriksen shows a pump chamber 46 and passage 34 connecting the pump chamber to thermal exchange chamber 47A. Now looking at Koga et al., Koga shows pump chamber 15A connected to thermal exchange chamber 19, the thermal exchange chamber being separated vertically from the pump chamber and connected by a channel. Various parts of the casing 15 that forms the thermal exchange chamber cool component 2 as clearly seen in Figure 3.

In light of the above, the Examiner will now address the specific arguments set forth by Patent Owner. Regarding the contention that Koga et al. does not show a separate chamber, it is not clear how feature 19 does not meet the conventional definition of a chamber. The chamber of Koga is an enclosed space and a compartment as would have been recognized by one of ordinary skill in the art. Further, when comparing the Figures of Koga et al. and Eriksen, it is clear that both 19 and 47A respectively have a separate volume, and inlet and outlet.

Patent Owner discusses the passage in Koga that states that the chamber 19 does not sit directly over component 2. It is evident that the wall portion of the chamber does contact the component and acts as the heat-exchanging interface as required by the claims. The chamber 19 is not required to be in direct contact with the component, only the interface. The Tilton declaration also addresses the channel and not the interface.

Regarding claim 4 and by extension 5, looking at Figure 7 of Koga et al., pins 24 and 24A increase the surface area of the heat exchange unit 15B. 15B is the wall of the thermal exchange chamber. Therefore, the pins are the features that "are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber".

With regard to the intermediate member of claim 15 and its dependent claims, Patent Owner contends that the intermediate member must be "separate". First, it should be noted that the intermediate member is part of the reservoir as required by the claim. Further, Requester has shown that Koga et al. discloses that the intermediate member is a region of the reservoir, different in location to the cover and heat exchange interface (page 160 of the Request, copied below):

Koga's reservoir 1A has casings 15 and 16, forming an impeller cover as claimed. An upper wall of the channel 19 defines an intermediate member. The lower portion of the casing defines a heat exchange interface of the reservoir 1A.

This can be seen in Figure 3. Therefore, the region disclosed by Koga et al. defining the intermediate member is indeed separate from the other disclosed features of the reservoir while still being a part of the reservoir as required by the claim.

Patent Owner questions how the addition of additional passages would increase the flow as it would disrupt the purpose of the sucking channel. The Examiner notes that the Koga et al. reference has all of the claimed structure as noted above in the rejection. Therefore, it is unclear how adding the feature of additional passages would negatively impact the operation of the device as this would call into question the operability of Patent Owner's invention. Further, the motivation provided is an implicit reason one would add additional passages. It is implicit in the concept of flow that adding additional passages (more area for the fluid to pass through) would increase the flow with respect to having fewer passages (under the conditions present in the Koga et al. system). Therefore, proper motivation has been provided.

Finally, with respect to Patent Owners assertion that the Examiner ignored /did not address Patent Owner's remarks with regard to priority, this is not in evidence. The Examiner reiterated when additional material was added to the disclosure and hence what the effective filing date was. Contrary to Patent Owner's assertions and indeed, in Patent Owner's explanation of support, there are features that were not in the original disclosure that are now claimed. For example, all of the claims require that the thermal exchange chamber be vertically spaced from the pump chamber. There is no mention in the passage cited by Patent Owner of any vertical spacing between the thermal exchange chamber and the pump chamber (see page 18 of Patent Owner's response to

ACP, for example). The Examiner cannot find any evidence in the disclosure as filed that there is explicit support for this relationship. Further, Figure 17 also does not show this relationship. For this one reason alone, Patent Owner is not entitled to the earlier filing date.

Conclusion

This is a RIGHT OF APPEAL NOTICE (RAN); see MPEP § 2673.02 and § 2674. The decision in this Office action as to the patentability or unpatentability of any original patent claim, any proposed amended claim and any new claim in this proceeding is a FINAL DECISION.

No amendment can be made in response to the Right of Appeal Notice in an *inter partes* reexamination. 37 CFR 1.953(c). Further, no affidavit or other evidence can be submitted in an *inter partes* reexamination proceeding after the right of appeal notice, except as provided in 37 CFR 1.981 or as permitted by 37 CFR 41.77(b)(1). 37 CFR 1.116(f).

Each party has a **thirty-day or one-month time period, whichever is longer**, to file a notice of appeal. The patent owner may appeal to the Board of Patent Appeals and Interferences with respect to any decision adverse to the patentability of any original or proposed amended or new claim of the patent by filing a notice of appeal and paying the fee set forth in 37 CFR 41.20(b)(1). The third party requester may appeal to the Board of Patent Appeals and Interferences with respect to any decision favorable to the patentability of any original or proposed amended or new claim of the patent by filing a notice of appeal and paying the fee set forth in 37 CFR 41.20(b)(1).

In addition, a patent owner who has not filed a notice of appeal may file a notice of cross appeal within **fourteen days of service** of a third party requester's timely filed notice of appeal and pay the fee set forth in 37 CFR 41.20(b)(1). A third party requester who has not filed a notice of appeal may file **a notice of cross appeal within fourteen days of service** of a patent owner's timely filed notice of appeal and pay the fee set forth in 37 CFR 41.20(b)(1).

Any appeal in this proceeding must identify the claim(s) appealed, and must be signed by the patent owner (for a patent owner appeal) or the third party requester (for a third party requester appeal), or their duly authorized attorney or agent.

Any party that does not file a timely notice of appeal or a timely notice of cross appeal will lose the right to appeal from any decision adverse to that party, but will not lose the right to file a respondent brief and fee where it is appropriate for that party to do so. If no party files a timely appeal, the reexamination prosecution will be terminated, and the Director will proceed to issue and publish a certificate under 37 CFR 1.997 in accordance with this Office action.

All correspondence relating to this *inter partes* reexamination proceeding should be directed:

By EFS: Registered users may submit via the electronic filing system EFS-Web, at https://efs.uspto.gov/efile/myportal/efs-registered

By Mail to: Mail Stop *Inter Partes* Reexam

Attn: Central Reexamination Unit
Commissioner for Patents
United States Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

By Fax to: (571) 273-9900
Central Reexamination Unit

By hand: Customer Service Window
Randolph Building
401 Dulany Street
Alexandria, VA 22314

For EFS-Web transmissions, 37 CFR 1.8(a)(1)(i)(C) and (ii) states that correspondence (except for a request for reexamination and a corrected or replacement request for reexamination) will be considered timely if (a) it is transmitted via the Office's electronic filing system in accordance with 37 CFR 1.6(a)(4), and (b) includes a certificate of transmission for each piece of correspondence stating the date of transmission, which is prior to the expiration of the set period of time in the Office action.

Any inquiry concerning this communication or earlier communications from the examiner, or as to the status of this proceeding, should be directed to the Central Reexamination Unit at telephone number (571) 272-7705.

Signed:

/Joseph A. Kaufman/
Joseph A. Kaufman
Primary Examiner
Art Unit 3993

Conferees: /RF/

/EDL/

EXHIBIT 8

ATTORNEY DOCKET NO.: COOL-1.012
FILED VIA EFS ON SEPTEMBER 15, 2012

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of	:	Andre Sloth Eriksen
U.S. Patent No.	:	8,245,764
Application No.	:	13/269,234
Issue Date	:	August 21, 2012
Filing Date	:	October 7, 2011
Title	:	COOLING SYSTEM FOR A COMPUTER SYSTEM

REQUEST FOR *INTER PARTES* REEXAMINATION

FILED VIA ELECTRONIC FILING SYSTEM ON SEPTEMBER 15, 2012
COMMISSIONER FOR PATENTS

Mail Stop *Inter Partes* Reexam
ATTN: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to 35 U.S.C. §§ 311 *et seq.*, as amended by the Leahy-Smith America Invents Act, reexamination of all claims (i.e., claims 1 through 18) of United States Patent No. 8,245,764 (hereinafter "the '764 Patent") is requested.[1] The '764 Patent issued on August 21, 2012, to Eriksen and purportedly was assigned to Asetek A/S (hereinafter "Asetek") (collectively hereinafter the "Applicants") from U.S. Patent Application No. 13/269,234 (hereinafter, the "Application") filed on October 7, 2011 (hereinafter the "Application Date").

The '764 Patent is currently the subject of litigation in the case styled Asetek Holdings, Inc v. CoolIT Systems, Inc., Case No. 3:12-cv-4498, now pending in the United States District Court for the Northern District of California (hereinafter "the Concurrent Litigation"). The Concurrent Litigation does not preclude the present Request for Reexamination.

Requester CoolIT Systems Inc. ("Requester") respectfully submits that it shows herein a reasonable likelihood that at least one, and indeed all, of claims 1 through 18 ("the challenged claims") of the '764 Patent should be and will be cancelled or at least narrowed in view of the prior art. This reasonable likelihood that Requester will prevail (hereinafter, "Reasonable Likelihood") is based in part on previously uncited prior art that renders the claims invalid.[2] Accordingly, Requester respectfully asks that this Request for *Inter Partes* Reexamination (hereinafter "Request") be granted and that the claims be cancelled.

Pursuant to 37 C.F.R. § 1.915(b)(8), Requester CoolIT Systems Inc. is the sole real-party-in-interest.

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[1] A complete copy of the '764 Patent, including any certificates of correction, disclaimer or reexamination, is attached as Appendix A.

[2] All of the prior art cited herein against the challenged claims is listed in the Information Disclosure Statement attached as Appendix B.

housing."*See* Appendix D, Amendment dated April 6, 2012 (amending specification to emphasize the distinction between "reservoir" and "reservoir housing"). Thus, claim 18 is nonsensical since a "reservoir" has no physical structure (i.e., the claimed "top wall"). Nonetheless, solely for purposes of construing claim 18 in this Request, the recited "top wall" will be construed to mean a "top wall" of a housing positioned adjacent the claimed reservoir.	

K. CLAIMS 1-18 ARE ANTICIPATED BY KOGA

As the claim chart below illustrates, Koga discloses each and every feature arranged as claimed in claims 1-18 in the '764 Patent. Thus, Koga anticipates claims 1-18.

U.S. Patent No. 8,245,764 Claim Language	Correspondence to Koga
1. A cooling system for a heat-generating component, comprising:	Koga discloses exactly this type of system. *See*, Appendix I, Koga, FIG. 1; Specification, 8:32-39.

a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid,	Koga discloses exactly this limitation. Koga's casing 15 and 16 is a double-sided chassis adapted to mount a pump 1A. *See* Koga, FIG. 7. The pump 1A is configured to circulate a coolant. Id. at 9:52-54; 10:18-21.
the pump comprising a stator and an impeller,	Koga discloses exactly this limitation. Koga's pump 1A has a stator 14 and an impeller 11. Id. at 9:48-52; FIG. 7.
the impeller being positioned in a recess on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;	Koga discloses exactly this limitation. Koga's impeller 1 (FIG. 7) is positioned in a recess formed by the casing 16 (FIG. 7) on the underside of the casing. The corresponding stator 14, is positioned on the upper side of the casing 16 and is isolated from the coolant in the "pump room 15A".

a reservoir adapted to pass the cooling liquid therethrough, the reservoir including: **Construction of "reservoir"**: "The reservoir serves as a **storage unit for excess liquid not capable of being contained in the remaining components.** The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid." ['764 Patent, 10:45-49.] Applicant purports that a "reservoir" is not a "reservoir housing."*See* Appendix D, Amendment dated April 6, 2012 (amending specification to emphasize the distinction between "reservoir" and "reservoir housing").	Koga discloses exactly this limitation. Koga's device 1A is adapted to pass the coolant 41 therethrough. Id. at 9:52-54; FIG. 7.
a pump chamber formed by the recess and including the impeller and formed below the chassis,	Koga discloses exactly this limitation. Koga's impeller 11, 13 (FIG. 7) is positioned in a recess formed by the casing 16 (FIG. 7) on the underside of the casing. The corresponding stator 14, is positioned on the upper side of the casing 16 and is isolated from the coolant in the "pump room 15A".

the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through;	Koga discloses exactly this limitation. Koga's pump chamber 15A is defined by at least the casings 15 and 16, forming an impeller cover as claimed. The casings define "sucking channel" 19 and discharge channel 20 for the cooling liquid to pass through. Id.
a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, **Construction of "vertically"** Based on Patent Owner's remarks in the reply dated April 6, 2012, "vertically spaced apart" purportedly is different than "radially outwards" in a plane of the impeller. Appendix D, Applicant's Reply dated April 6, 2012, pp. 8-10. For purposes of this Request, "vertically" is taken to mean "in a direction parallel to a rotational axis of the impeller."	Koga discloses exactly this limitation. An interior of the channel 19 defines a thermal exchange chamber as claimed. *See* Koga, Specification, 10:5-6; FIG. 7. The interior of the channel 19 is formed below the region occupied by the impeller 11 and is vertically spaced apart from that region. Id.

the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages; and **Construction of "coupled"** The Federal Circuit construed the phrase "coupled to," directing that it "should be construed broadly so as to allow an indirect attachment." Bradford v. ConTeyor North America, Inc. 2010 U.S. App. LEXIS 8869 (Fed. Cir., April 29, 2010).	Koga discloses exactly this limitation. As shown in FIG. 7, the region occupied by Koga's impeller11 is separated from the interior of the channel 19 by the upper wall of the channel 19. Koga's pump chamber 15A and thermal exchange chamber are fluidly coupled by the channels 19 and 20 (e.g., via the radiator 3). For example, the discharge channel 20 also fluidly couples the thermal exchange chamber (channel 19) and the pump chamber 15A insofar as coolant circulates from the pump chamber, through the channel 20, through the radiator 3 (FIG. 1) and returns to the thermal exchange chamber in the channel 19.
a heat-exchanging interface,	Koga discloses exactly this limitation. Koga's the lower portion of the casing 15 defines a heat-exchanging interface as claimed (e.g., the outer wall surface 15C contacts an upper surface of the component 2).
the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and	Koga discloses exactly this limitation. As shown, for example, in FIG. 7, the casing 15 forms a boundary wall of the thermal exchange chamber 19.
configured to be placed in thermal contact with a surface of the heat-generating component; and	Koga discloses exactly this limitation. The outer wall surface 15C of the casing 15 is configured to be placed in thermal contact with an upper surface of the component 2.

a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.	Koga discloses exactly this limitation. As shown in FIG. 1, Koga's system includes a heat radiator 3 fluidly coupled to the reservoir 1A and configured to dissipate heat from the coolant 41. *See*, Appendix I, Koga, Specification, 10:14-21.
2. The cooling system of claim 1, wherein the chassis shields the stator from the cooling liquid in the reservoir.	Koga discloses exactly this limitation. As shown in Koga's FIG. 7, a portion of the casing 16 is positioned between the stator 14 and the impeller 11, 13, shielding the stator 14 from coolant in the reservoir.
3. The cooling system of claim 1,	
wherein the heat-exchanging interface includes a first side and a second side opposite the first side, and	Koga discloses exactly this limitation. Koga's casing 15 has a first side (e.g., interior of channel 19) and a second side 15C opposite the first side.
wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and	Koga discloses exactly this limitation. The first side of the casing 15 contacts coolant in the channel 19.
the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.	Koga discloses exactly this limitation. Koga's outer wall surface 15C is configured to be in thermal contact with the component 2, as shown in FIG. 7. *See*, Appendix I, Koga, Specification 10:5-7.
4. The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-	Koga discloses exactly this limitation. Koga's inner surface of the casing 15 includes features adapted to increase heat transfer from the casing 15 to the coolant. *See*, Appendix I, Koga, FIG. 7 (protrusions 24, 24A), Specification, 9:34-39.

exchanging interface to the cooling liquid in the thermal exchange chamber.	
5. The cooling system of claim 4, wherein the features include at least one of pins or fins.	Koga discloses exactly this limitation. Koga's features 24, 24A are pins or fins. *See*, Id. at FIGS. 7 and 8.
6. The cooling system of claim 1, wherein a passage of the one or more passages that fluidly couple the pump chamber and the thermal exchange chamber is offset from a center of the impeller. **Construction of "coupled"** The Federal Circuit construed the phrase "coupled to," directing that it "should be construed broadly so as to allow an indirect attachment." Bradford v. ConTeyor North America, Inc. 2010 U.S. App. LEXIS 8869 (Fed. Cir., April 29, 2010).	Koga discloses exactly this limitation. As noted above, Koga's pump chamber 15A and thermal exchange chamber 19 are fluidly coupled by the opening adjacent the terminal end of the channel 19, as well as by the discharge channel 20. As shown in FIG. 8, the discharge channel 20 is offset from a center of the impeller 11, 13.
7. The cooling system of claim 1, wherein the impeller includes a plurality of curved blades.	Koga discloses exactly this limitation. Koga's impeller 11 can include a plurality of curved blades 12. Id. at FIG. 4.

8. The cooling system of claim 1, wherein the heat-exchanging interface includes one of copper and aluminum.	Koga discloses exactly this limitation. Koga's casing 15 can be formed of copper or aluminum. Id. at 5:14-18 and 10:24
9. The cooling system of claim 1, wherein the heat radiator is fluidly coupled to the reservoir using flexible conduits, and the heat radiator is configured to be positioned remote from the reservoir.	Koga discloses exactly this limitation. Koga's radiator 3 can be fluidly coupled to the reservoir 1A using flexible conduits. *See*, Appendix I, Koga, Specification, 4:23-26 (stating "[c]irculating channel 4 is formed of flexible rubber having a low gas-permeability, such as butyl rubber tubing because this material allows flexible piping layout as well as preventing bubbles from entering into the tube"). Koga's radiator 3 is also configured to be positioned remote from the reservoir 1A. Id. at 8:32-39; FIGS. 1, 9 and 10.
10. A cooling system for a computer system, comprising:	Koga discloses exactly such a system.
a centrifugal pump adapted to circulate a cooling liquid, the pump including:	Koga discloses exactly this limitation. Koga's Abstract states "… a radiator and a contact-heat-exchanger type centrifugal pump are provided."
an impeller exposed to the cooling liquid; and	Koga discloses exactly this limitation. Koga's impeller 1 (FIG. 7) is exposed to the coolant in the pump chamber 15A.
a stator isolated from the cooling liquid;	Koga discloses exactly this limitation. Koga's stator 14 is isolated from the coolant in the "pump room 15A" by the wall of the casing 16 positioned between the stator 14 and the impeller 11, 13.

a reservoir configured to be thermally coupled to a heat-generating component of the computer system, the reservoir including:	Koga discloses exactly this limitation. Koga's centrifugal pump 1A is configured to be thermally coupled to the heat generating component 2. *See*, Appendix I, Koga, Specification 10:5; FIG. 7.
a thermal exchange chamber adapted to be positioned in thermal contact with the heat-generating component;	Koga discloses exactly this limitation. Koga's channel 19 is adapted to be positioned in thermal contact with the component 2. Id. at FIG. 7.
a separate pump chamber	Koga discloses exactly this limitation. As shown in FIG. 7, the region occupied by Koga's impeller 11 (e.g., the "pump room 15A") is separated from the interior of the channel 19 by the upper wall of the channel 19.
vertically spaced apart from the thermal exchange chamber and **Construction of "vertically"** Based on Patent Owner's remarks in the reply dated April 6, 2012, "vertically spaced apart" purportedly is different than "radially outwards" in a plane of the impeller. Appendix D, Applicant's Reply dated April 6, 2012, pp. 8-10. For purposes of this Request, "vertically" is taken to mean	Koga discloses exactly this limitation. Koga's pump chamber 15A is vertically spaced from the channel 19.

"in a direction parallel to a rotational axis of the impeller."	
coupled with the thermal exchange chamber through one or more passages configured for fluid communication between the pump chamber and the thermal exchange chamber, and **Construction of "coupled"** The Federal Circuit construed the phrase "coupled to," directing that it "should be construed broadly so as to allow an indirect attachment." Bradford v. ConTeyor North America, Inc. 2010 U.S. App. LEXIS 8869 (Fed. Cir., April 29, 2010).	Koga discloses exactly this limitation. Koga's pump chamber 15A and thermal exchange chamber 19 are fluidly coupled by the opening adjacent the terminal end of the channel 19, as well as by the discharge channel 20, allowing fluid communication between the pump chamber and thermal exchange chamber.
wherein at least one of the one or more passages is offset from a center of the impeller.	Koga discloses exactly this limitation. As shown in FIG. 7, the opening adjacent the terminal end of the channel 19, as well as the discharge channel 20, are offset from a center of the impeller.
11. The cooling system of claim 10, wherein a top wall of the reservoir physically separates the impeller from the stator.	Koga discloses exactly this limitation. Koga's stator 14 is isolated from the coolant in the "pump room 15A" by the top wall of the casing 16 positioned between the stator 14 and the impeller 11, 13.

12. The cooling system of claim 10, wherein the thermal exchange chamber includes a heat-exchange interface configured to be placed in thermal contact with the heat-generating component.	Koga discloses exactly this limitation. Koga's casing 15 thermally couples the interior of the channel 19 to the component 2. The outer wall 15C of the casing 15 is configured to be placed in thermal contact with the component 2.
13. The cooling system of claim 10, further including a heat radiator fluidly coupled to the reservoir using flexible conduits, wherein the heat radiator is configured to be positioned remote from the reservoir.	Koga discloses exactly this limitation. Koga's radiator 3 can be fluidly coupled to the reservoir 1A using flexible conduits. *See*, Appendix I, Koga, Specification, 4:23-26 (stating "[c]irculating channel 4 is formed of flexible rubber having a low gas-permeability, such as butyl rubber tubing because this material allows flexible piping layout as well as preventing bubbles from entering into the tube"). Koga's radiator 3 is also configured to be positioned remote from the reservoir 1A. Id. at 8:32-39; FIGS. 1, 9 and 10.
14. The cooling system of claim 10, wherein the fluid passage that is offset from the center of the impeller is positioned tangentially to the circumference of the impeller.	Koga discloses exactly this limitation. As noted above, Koga's pump chamber 15A and thermal exchange chamber 19 are fluidly coupled by the opening adjacent the terminal end of the channel 19, as well as by the discharge channel 20, allowing fluid communication between the pump chamber and thermal exchange chamber. The discharge channel is positioned tangentially to the circumference of the impeller 11. *See*, Appendix I, Koga, FIG. 8.
15. A cooling system for a heat-generating component, comprising:	Koga discloses exactly such a system.
a pump adapted to circulate a cooling liquid, the pump including:	Koga discloses exactly this limitation. Koga's Abstract states "… a radiator and a contact-heat-exchanger type centrifugal pump are provided."

an impeller exposed to the cooling liquid; and	Koga discloses exactly this limitation. Koga's impeller 1 (FIG. 7) is exposed to the coolant in the pump chamber 15A.
a stator isolated from the cooling liquid;	Koga discloses exactly this limitation. Koga's stator 14 is isolated from the coolant in the "pump room 15A" by the wall of the casing 16 positioned between the stator 14 and the impeller 11, 13.
a reservoir including an impeller cover, an intermediate member and a heat exchange interface, **<u>Construction of "reservoir"</u>**: "The reservoir serves as **a storage unit for excess liquid not capable of being contained in the remaining components.** The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid." ['764 Patent, 10:45-49.] Applicant purports that a "reservoir" is not a "reservoir housing."*See* Appendix D, Amendment dated April 6, 2012 (amending specification to emphasize the distinction between "reservoir" and "reservoir housing").	Koga discloses exactly this limitation. Koga's reservoir 1A has casings 15 and 16, forming an impeller cover as claimed. An upper wall of the channel 19 defines an intermediate member. The lower portion of the casing defines a heat exchange interface of the reservoir 1A.
wherein a top wall of the reservoir and the impeller cover define a pump chamber for housing the	Koga discloses exactly this limitation. The casing 16 and the casing 15 define the claimed top wall of the reservoir and the impeller cover defining a pump chamber 15A for housing the impeller 11,

impeller, and	13.
the intermediate member and the heat exchange interface define a thermal exchange chamber,	Koga discloses exactly this limitation. The upper wall of the channel 19 defines the intermediate member, and the lower portion of the casing 15 defines the heat exchange interface. The channel 19 positioned between the upper wall (the claimed intermediate member) and the casing 15 (the claimed heat exchange interface) defines a thermal exchange chamber, as claimed.
the pump chamber and the thermal exchange chamber being spaced apart from each other in a vertical direction and fluidly coupled together; and **Construction of "vertical"** Based on Patent Owner's remarks in the reply dated April 6, 2012, "vertically spaced apart" purportedly is different than "radially outwards" in a plane of the impeller. Appendix D, Applicant's Reply dated April 6, 2012, pp. 8-10. For purposes of this Request, "vertical" is taken to mean "in a direction parallel to a rotational axis of the impeller." **Construction of "coupled"** The Federal Circuit construed the phrase "coupled to," directing that it	Koga discloses exactly this limitation. The pump chamber 15A and the thermal exchange chamber 19 are spaced apart from each other in a vertical direction (e.g., the horizontal upper wall of the channel 19 separates the chambers from each other). The pump chamber 15A and the thermal exchange chamber 19 are fluidly coupled together by virtue of the opening adjacent the terminal end of the channel 19, as well as by the discharge channel 20, as noted above.

"should be construed broadly so as to allow an indirect attachment." Bradford v. ConTeyor North America, Inc. 2010 U.S. App. LEXIS 8869 (Fed. Cir., April 29, 2010).	
wherein a first side of the heat-exchanging interface is in contact with a cooling liquid in the thermal exchange chamber and	Koga discloses exactly this limitation. A first side of the casing 15 (the claimed heat-exchanging interface) is in contact with coolant 41 in the channel 19 (the claimed thermal exchange chamber), as claimed.
a second side of the heat-exchanging interface opposite the first side is configured to be placed in thermal contact with a surface of the heat-generating component; and	Koga discloses exactly this limitation. A second side of the casing 15 opposite the first side in contact with coolant 41 in the channel 19 (e.g., the outer wall surface 15C) is configured to be placed in thermal contact with the upper surface of the component 2.
a liquid-to-air heat exchanger fluidly coupled to the reservoir using flexible conduits, the heat exchanger being configured to be positioned remote from the reservoir.	Koga discloses exactly this limitation. Koga explains: "Radiator 3 radiates the heat collected from component 2 by coolant 41 to the outside." Id. at 4:9-11. Koga explains further: "A fan can be prepared for forcibly air-cooling radiator 3 so that a better cooling effect can be expected." Id. at 4:21-23. Thus, Koga's radiator 3 is a liquid-to-air heat exchanger. Koga's radiator 3 can be fluidly coupled to the reservoir 1A using flexible conduits. *See*, Appendix I, Koga, Specification, 4:23-26 (stating "[c]irculating channel 4 is formed of flexible rubber having a low gas-permeability, such as butyl rubber tubing because this material allows flexible piping layout as well as preventing bubbles from entering into the tube"). Koga's radiator 3 is also configured to be positioned remote from the reservoir 1A. Id. at 8:32-39; FIGS. 1, 9 and 10.
16. The cooling system of claim 15, wherein the impeller cover includes a	Koga discloses exactly this limitation. Koga's impeller cover 15, 16 includes an opening 20 radially offset from a

first opening radially offset from a center of the impeller and	center of the impeller 11, 13. Id. at FIG. 8.
the intermediate member includes a second passage that is aligned with the first opening,	Koga discloses exactly this limitation. Koga's intermediate member (e.g., the upper wall of the channel 19) defines an opening adjacent the terminal end of the channel 19, spaced from the shaft 17. The opening defines the claimed second passage, and is aligned with the radially offset opening 20. As Koga explains: "Coolant 41 is sucked through sucking channel 19 by spinning blades 12, and discharged from discharging channel 20." Id. at 9:4-5.
the first and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber. **Construction of "second opening"** For purposes of this Request, the recited "second opening" is assumed to mean the previously recited "second passage."	To the extent that the term "second opening" can be construed for purposes of this Request, Koga discloses exactly this limitation. In Koga, coolant passes from the pump chamber 15A, through the opening 20 and into the thermal exchange chamber 19. Id. at FIGS. 1 and 7. Coolant passes from the pump chamber 15A in proportion to the amount of coolant entering the thermal exchange chamber 19. Accordingly, Koga discloses that the openings are configured as claimed.
17. The cooling system of claim 15, wherein the first side of the heat-exchanging interface includes at least one of pins or fins.	Koga discloses exactly this limitation. Koga's features 24, 24A are pins or fins. *See*, Id. at FIGS. 7 and 8.
18. The cooling system of claim 15, wherein the top wall of the reservoir extends between the stator and the impeller and shields the stator from the cooling	Koga discloses exactly this limitation. The casing 16 extends between the stator 14 and shields the stator 14 from the coolant in the reservoir 1A.

liquid in the reservoir.	

L. Claims 1-18 are Obvious from the '761 Publication and Laing

As the claim chart below illustrates, the Published International Application (also referred to herein as the '761 Publication) discloses each and every feature arranged as claimed in claims 1-18 in the '764 Patent. Thus, the Published International Application anticipates claims 1-18.

U.S. Patent No. 8,245,764 Claim Language	Correspondence to the '761 Publication and Laing
1. A cooling system for a heat-generating component, comprising:	The Published International Application discloses exactly such a cooling system. *See*, Appendix J, Published International Application, FIG. 17; Specification, 2:5-6, 7. Laing also discloses exactly the type of cooling system claimed in the '234 Application. Laing's title states it clearly: "Device for the Local Cooling or Heating of an Object." Laing, Title. An example of an object cooled by Laing's device is a processor positioned on a circuit board 16. Laing, ¶ [0044]. Under MPEP 2143, various accepted rationale are set forth for making a *prima facie* case of obviousness under *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1395-1397 (2007). In this instance, several of the rational apply, including but not limited to: (I) combining prior art elements according to known methods to yield predictable results; (II) simple substitution of one known element for another to obtain predictable results; or (III) some teaching, suggestion, or motivation to combine. All of these rationale apply here as detailed below. First, combining the '761 Publication's reservoir with Laing's reservoir having a pump chamber and a vertically separated thermal exchange chamber to cool a processor yields predictable results. Second, simply substituting Laing's reservoir for the '761 Publication's reservoir to cool a processor achieves predictable results. Third, Laing suggests providing a reservoir having a pump chamber and a vertically separated thermal exchange chamber to cool a processor.

EXHIBIT 9

PATENT
Attorney Docket No. 10494.0003
CUSTOMER NUMBER 22,852

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re U.S. national phase of PCT/DK2005/000310	Group Art Unit: Unknown
Inventor: André Sloth ERIKSEN	
Application No.: 11/919,974	Examiner: Unknown
Filed: November 6, 2007	Confirmation No.: 9542
For: COOLING SYSTEM FOR A COMPUTER SYSTEM	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

SUPPLEMENTARY PRELIMINARY AMENDMENT

Prior to examination, please amend the above-identified application as follows:

Amendments to the Specification begin on page 2.

Amendments to the Drawings are discussed on page 4.

Amendments to the Claims begin on page 5.

Remarks begin on page 12.

Attachments to this amendment include one (1) drawing REPLACEMENT SHEET depicting FIG.17, and one (1) drawing NEW SHEET depicting FIG. 20.

AMENDMENT TO THE SPECIFICATION:

Please add the following paragraph after line 6 on page 13

Fig. 20 is a simplified schematic showing a cross-sectional view of the reservoir along plane 20-20 of Fig. 16.

Please modify the paragraph between lns. 6-12 on page 28 as follows

The reservoir 14 has a recess 40 in the centre of the reservoir. The recess ~~37~~ 40 is intended for accommodating a stator 37 of an electrical motor driving an impeller 33 of the pump, said impeller being attached to a shaft 38 of a rotor 39 of the electrical motor. The recess 40 has an orifice 41, four sidewalls 42, a bottom 43 and a circular jacket 44 extending from the bottom 43 of the recess 40 and outwards towards the orifice 41 of the recess 40. The interior ~~(not shown)~~ (see Fig. 20) of the jacket 44 is intended for encompassing the rotor 39 of the pump.

Please modify the paragraph between lns. 17-28 on page 29 as follows

An impeller 33 of the pump of the cooling system is provided in direct communication with a pump chamber 46 formed by impeller cover 46A having an outlet 34 provided tangentially to the circumference of the impeller 33. Thus, the pump functions as a centrifugal pump. The inlet if the pump chamber 46 is the entire opening into the cavity that the pump chamber configures, said cavity being in direct communication with the interior of the reservoir 14 as such. An intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4. The intermediate member 47 is provided with a first passage 48 for leading cooling liquid from the pump chamber 46 to a thermal exchange chamber (not shown) provided at the opposite of the intermediate member 47. The intermediate member 47 is provided also with a second passage 49 for leading cooling liquid from the thermal exchange chamber ~~(not shown)~~ 47A provided at the opposite of the intermediate member 47 to the interior of the reservoir 14.

AMENDMENT TO THE DRAWINGS:

Please replace Fig. 17 with the figure in the Replacement Sheet attached to this paper. Fig. 17 in the Replacement Sheet includes a reference number (46A) for the impeller cover described between lines 17 and 28 on page 29 of the specification. Fig. 17 in the Replacement Sheet also includes cross-sectional plane 20-20 as a plane of reference for new figure 20, and a corrected leader line for reference number 34. No other changes have been made to Fig. 17.

A new drawing labeled as Fig. 20 is also provided in the New Sheet attached to this paper. Fig. 20 finds support in Fig. 17 and on pages 28 and 29 of the Specification. No new matter is included in Fig. 20.

AMENDMENT TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

Claims 1-72 (Cancelled).

73. (New) A cooling system for a heat generating electronic component of a computer system, comprising:

a reservoir adapted to pass a cooling liquid therethrough, the reservoir including a heat exchange interface configured to be positioned in thermal contact with the electronic component;

a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid; and

a pump configured to circulate the cooling liquid between the reservoir and the heat radiator, the pump including a rotor, a stator, and an impeller, the rotor being coupled to the impeller and positioned within the reservoir and the stator being positioned outside the reservoir and isolated from the cooling liquid.

74. (New) The cooling system of claim 73, wherein a wall of the reservoir extends between the stator and the rotor and shields the stator from the cooling liquid in the reservoir.

75. (New) The cooling system of claim 73, wherein the reservoir includes a hollow sleeve extending away from a surface opposite the heat exchanging interface, the rotor of the pump being positioned within the sleeve and the stator being positioned outside the sleeve.

76. (New) The cooling system of claim 75, wherein the sleeve is a substantially cylindrical sleeve that extends substantially from a center of the surface opposite the heat exchanging interface.

77. (New) The cooling system of claim 76, wherein the reservoir has a generally cylindrical shape.

78. (New) The cooling system of claim 73, wherein the reservoir includes an impeller cover that defines a pump chamber housing the impeller and an intermediate member that defines a thermal exchange chamber adjacent to the heat exchange interface, the pump chamber and the heat exchange chamber being spaced apart fluid enclosures that are fluidly coupled together.

79. (New) The cooling system of claim 78, wherein the impeller cover includes a first opening radially offset from a center of the impeller and the intermediate member includes a second opening that is aligned with the first opening, the first opening and the second opening being configured to direct the cooling liquid from the pump chamber into the thermal exchange chamber.

80. (New) The cooling system of claim 79, wherein the intermediate member further includes a third opening spaced apart from the second opening, the third opening being configured to direct cooling liquid out of the thermal exchange chamber.

81. (New) The cooling system of claim 78, wherein the heat exchange interface includes a plurality of pins that extend into the thermal exchange chamber.

82. (New) The cooling system of claim 73, wherein the rotor includes permanent magnets and the impeller includes a plurality of curved blades.

83. (New) The cooling system of claim 73, further including a clip configured to mate with features on an external surface of the reservoir and keep the heat exchange interface in thermal contact with the electronic component.

84. (New) The cooling system of claim 83, wherein the clip defines a generally circular opening that is dimensioned to fit around the reservoir, and the clip includes features configured to be attached to a motherboard of the computer system.

85. (New) The cooling system of claim 83, wherein the clip is configured to be attached to the motherboard using pre-existing holes on the motherboard.

86. (New) A cooling system for a computer system, comprising:

a reservoir configured to be thermally coupled to a heat generating electronic component of the computer system, the reservoir including a thermal exchange chamber proximate the heat generating electronic component and a pump chamber longitudinally displaced from the thermal exchange chamber, the reservoir being adapted to direct a cooling liquid from the pump chamber to the thermal exchange chamber to remove heat from the heat generating electronic component; and

a pump including a rotor, a stator, and an impeller, wherein the impeller is positioned in the pump chamber, the rotor is positioned within the reservoir and exposed to the cooling liquid in the reservoir, and the stator is positioned outside the reservoir and isolated from the cooling liquid in the reservoir.

87. (New) The cooling system of claim 86, wherein the stator is positioned radially outward of the rotor and a wall of the reservoir extends between the rotor and the stator, the wall shielding the stator from the cooling liquid in the reservoir.

88. (New) The cooling system of claim 87, wherein reservoir includes a heat exchange interface in thermal contact with the heat generating electronic component and the wall is a hollow sleeve extending from a surface opposite

the heat exchange interface, the rotor of the pump being positioned within the sleeve and the stator being positioned outside the sleeve.

89. (New) The cooling system of claim 86, wherein the reservoir includes an impeller cover that defines the pump chamber and an intermediate member that defines the thermal exchange chamber, the impeller cover and the intermediate member including mutually aligned openings configured to direct cooling liquid from the pump chamber to the thermal exchange chamber.

90. (New) The cooling system of claim 86, further including a heat radiator fluidly coupled to the reservoir, the heat radiator being configured to dissipate heat from the cooling liquid to air.

91. (New) The cooling system of claim 90, wherein the reservoir and the heat radiator form an integrated unit.

92. (New) The cooling system of claim 90, wherein the heat radiator and the reservoir are positioned at different locations within the computer system and the heat radiator and the reservoir are fluidly coupled to each other with tubes.

93. (New) A method of cooling a heat generating electronic component of a computer system, comprising:

directing a cooling liquid to a reservoir, the reservoir including a heat exchange interface thermally coupled to the electronic component and an impeller mechanically coupled to a rotor of a pump, the rotor being exposed to the cooling liquid in the reservoir and being operatively coupled to a stator of the pump, the stator being positioned radially outwards the rotor and located outside the reservoir;

passing the cooling liquid from a pump chamber to a thermal exchange chamber to remove at least a portion of the heat from the electronic component, the pump chamber being an enclosed space within the reservoir that houses the impeller, and the thermal exchange chamber being a separate enclosed space within the reservoir adjacent to the heat exchange interface; and

dissipating the heat from the cooling liquid to ambient by passing the cooling liquid through a heat radiator.

94. (New) The method of claim 93, wherein passing the cooling liquid from the pump chamber to the thermal exchange chamber includes directing the cooling liquid to the pump chamber through a first opening on one side of the impeller, and directing the cooling liquid to the thermal exchange chamber through a second opening on an opposite side of the impeller, the second opening being positioned substantially tangential to a circumference of the impeller.

95. (New) The method of claim 94, wherein passing the cooling liquid from the pump chamber to the thermal exchange chamber further includes rotating the impeller in a fixed direction.

96. (New) A method of operating a liquid cooling system for a heat generating electronic component of a computer system, the cooling system including a reservoir and a pump driven by an AC motor to circulate a cooling liquid through the reservoir, the pump including a stator, a rotor, and an impeller, the impeller being mechanically coupled to the stator and configured to be rotated in a preferred direction, the rotor being positioned within the reservoir and exposed to the cooling liquid in the reservoir, the stator being positioned outside the reservoir and isolated from the cooling liquid in the reservoir, comprising;

converting a DC voltage of a power supply of the computer system to an AC voltage;

detecting an algebraic sign of the AC voltage;

detecting an angular position of the rotor; and

applying a signal to the AC motor to rotate the impeller in the preferred direction, the signal being selected based at least on the detected angular position and the algebraic sign of the AC voltage.

REMARKS

By this Supplementary Preliminary Amendment, the specification is amended to include reference numbers to elements shown in previously presented figures and to include reference to a newly added drawing. A drawing is amended to include a reference number to a previously identified element of the drawing, and a drawing is added to help clearly identify previously presented subject matter. Claims 37-72, presented in a Preliminary Amendment filed on November 6, 2007 have been cancelled, and new claims 73-96 have been added. Therefore, claims 73-96 are currently pending.

The examiner is respectfully requested to consider the above preliminary amendment prior to examination of the application.

If there is any fee due in connection with the filing of this Preliminary Amendment, please charge the fee to our Deposit Account No. 06-0916.

Respectfully submitted,

FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER, L.L.P.

Dated: January 9, 2009

By: */Eric P. Raciti/*
Eric P. Raciti
Reg. No. 41,475

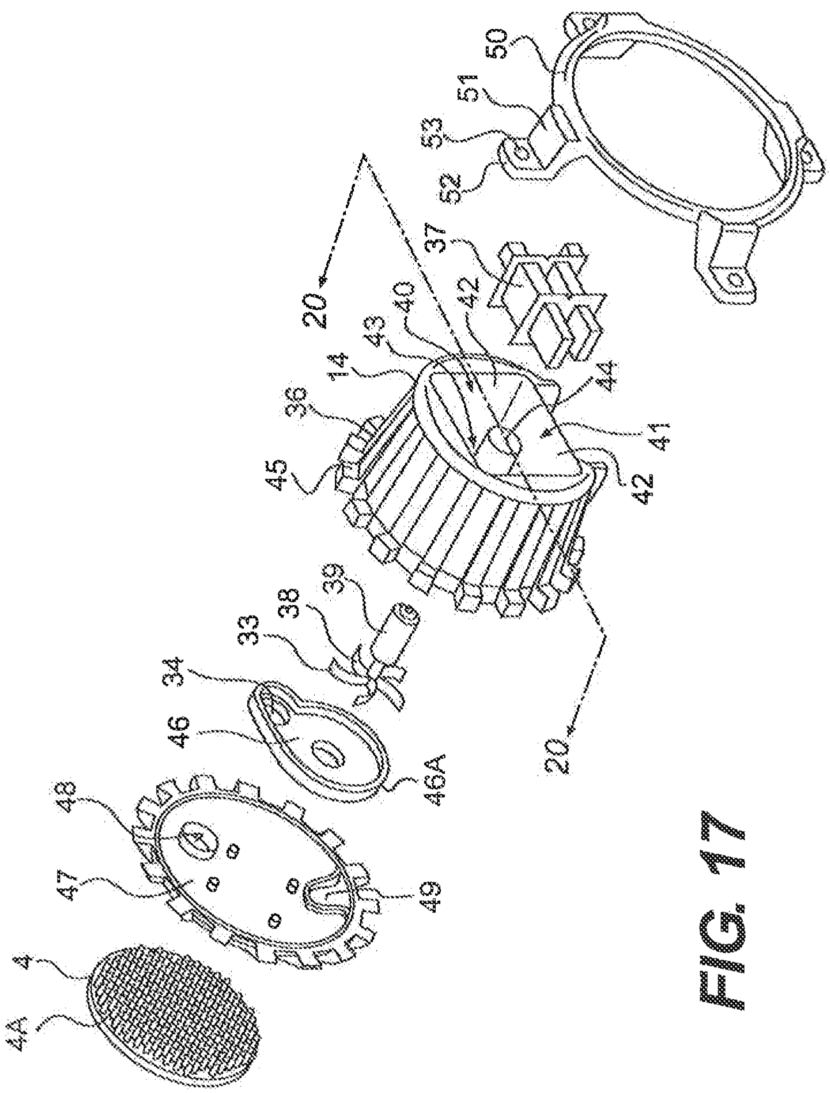
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FIG. 17

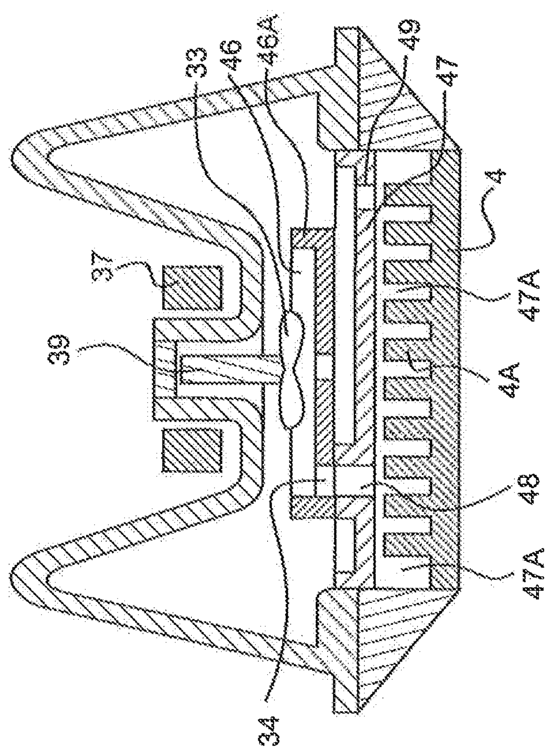

FIG. 20

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

ASETEK HOLDINGS, INC., *et al.*,

Plaintiffs,

v.

COOLIT SYSTEMS INC.,

Defendant.

______________________________/

ASETEK HOLDINGS, INC., *et al.*,

Plaintiff,

v.

COOLER MASTER CO., LTD., *et al.*,

Defendants.

______________________________/

No. C-12-4498 EMC

AND

No. C-13-0457 JST

ORDER RE CLAIM CONSTRUCTION FOR ASETEK'S PATENTS

Asetek is the owner of two patents: the '362 patent and the '764 patent. In this Court's case, Asetek has accused CoolIT of infringing the patents in suit. In Judge Tigar's case (No. C-13-0457 JST), Asetek has accused Cooler Master of infringing the patents in suit. This order addresses claim construction for the '362 and '764 patents in both the instant case as well as Judge Tigar's case.[1] A separate order shall provide claim construction on CoolIT's patent (the '456 patent).

[1] The parties in both cases agreed to have this Court address claim construction for both cases.

I. LEGAL STANDARD

Claim construction is a question of law to be determined by the Court. *See Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) ("hold[ing] that in a case tried to a jury, the court has the power and obligation to construe as a matter of law the meaning of language used in the patent claim"). "The purpose of claim construction is to 'determin[e] the meaning and scope of the patent claims asserted to be infringed.'" *O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1360 (Fed. Cir. 2008).

> Words of a claim are generally given their ordinary and customary meaning, which is the meaning a term would have to a person of ordinary skill in the art after reviewing the intrinsic record at the time of the invention. "In some cases, the ordinary meaning of claim language . . . may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words." However, in many cases, the meaning of a claim term as understood by persons of skill in the art is not readily apparent.

Id.

> Because the meaning of a claim term as understood by persons of skill in the art is often not immediately apparent, and because patentees frequently use terms idiosyncratically, the court looks to "those sources available to the public that show what a person of skill in the art would have understood disputed claim language to mean." Those sources include "the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art."

Phillips v. AWH Corp., 415 F.3d 1303, 1314 (Fed. Cir. 2005). As a general matter, extrinsic evidence such as dictionaries and expert testimony is considered less reliable than intrinsic evidence (*i.e.*, the patent and its prosecution history). *See id.* at 1317-19 (noting that "extrinsic evidence may be useful to the court, but it is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence").

II. REPRESENTATIVE CLAIMS

As noted above, the two Asetek patents in suit are the '362 patent and the '764 patent. Although the two patents are not directly related, the parties have agreed that "certain similar claim terms in the two patents should be construed to have the same meaning." Docket No. 127 (Mot. at 3).

Claims 1 and 14 of the '362 patent and claim 1 of the '764 patent are representative claims. The text of those claims is provided below (with terms to be construed in bold).

A. Claim 1 of the '363 Patent

> **1.** A cooling system for a computer system processing unit, comprising:
>
> an integrated element including a heat exchanging interface, a **reservoir**, and a pump, wherein
>
> the reservoir is configured to receive a cooling liquid from outside the reservoir through an inlet and pass the cooling liquid to the outside through an outlet, the reservoir including an upper chamber and a lower chamber, the upper chamber and the lower chamber being **vertically displaced chambers** that are separated from each other by at least a horizontal wall and **fluidly coupled** together by a plurality of **substantially circular passages**, at least one of the plurality of substantially circular passages being positioned on the horizontal wall, a boundary wall of the lower chamber being formed by the heat exchanging interface;
>
> the heat exchanging interface is adapted to provide separable thermal contact between the processing unit and the cooling liquid such that the heat is dissipated from the processing unit to the cooling liquid as the cooling liquid passes through the lower chamber of the reservoir; and
>
> the pump is adapted to direct the cooling liquid through the upper chamber and the lower chamber of the reservoir, the pump including a motor having a rotor, a stator and an impeller having a plurality of curved blades, the impeller being positioned within the reservoir;
>
> a heat radiator spaced apart from the integrated element, the heat radiator being fluidly coupled to the outlet and inlet of the reservoir, the heat radiator being configured to circulate the cooling liquid therethrough and exhaust heat from the cooling liquid; and
>
> a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump.

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B. Claim 14 of the '362 Patent

> **14.** A cooling system for a processing unit positioned on a motherboard of a computer, comprising:
>
> a **reservoir** configured to be coupled to the processing unit positioned on the motherboard at a first location, the reservoir being adapted to pass a cooling liquid therethrough, wherein the reservoir includes an upper chamber and a lower chamber, the upper chamber and the lower chamber being separate chambers containing cooling liquid that are separated by at least a horizontal wall and **fluidly coupled** together by one or more passageways, at least one of the one or more passageways being a **substantially circular passageway** positioned on the horizontal wall, the reservoir further including a heat exchanging interface configured to be placed in separable thermal contact with the processing unit, the heat exchanging interface being removably attached to the reservoir such that the heat exchanging interface forms a boundary wall of the lower chamber of the reservoir;
>
> a heat radiator configured to be positioned at a second location **horizontally spaced apart** from the first location when the reservoir is coupled to the processing unit;
>
> a fan adapted to direct air to the heat radiator to dissipate heat from the cooling liquid to surrounding atmosphere;
>
> a pump configured to circulate the cooling liquid between the reservoir and the heat radiator, the pump including a motor having a rotor, a stator, and an impeller having curved blades, the impeller being mechanically coupled to the rotor and at least partially submerged in the cooling liquid in the reservoir, wherein a speed of the impeller is configured to be varied independent of the speed of the fan.

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C. Claim 1 of the '764 Patent

> **1.** A cooling system for a heat-generating component, comprising:
>
> a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a stator and an impeller, the impeller being positioned on the underside of the chassis and the stator being positioned on the upper side of the chassis and isolated from the cooling liquid;
>
> a **reservoir** adapted to pass the cooling liquid therethrough, the reservoir including:
>
> a pump chamber including the impeller and formed below the chassis, the pump chamber being defined by at least an impeller cover having one or more passages for the cooling liquid to pass through;
>
> a thermal exchange chamber formed below the pump chamber and **vertically spaced apart** from the pump chamber, the pump chamber and the thermal exchange chamber being separate chambers that are **fluidly coupled** together by the one or more passages; and
>
> a heat-exchanging interface, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, and configured to be placed in thermal contact with a surface of the heat-generating component; and
>
> a heat radiator fluidly coupled to the reservoir and configured to dissipate heat from the cooling liquid.

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III. DISCUSSION

A. "reservoir"

Asetek	CoolIT	Cooler Master	Court
a single receptacle	region of the integrated element not in normal fluid flow and available to accommodate fluid expansion; or, alternatively, fluid containing portion of the device that includes a region not in the normal fluid flow and available to accommodate fluid expansion	the portions of the integrated element through which cooling liquid flows when the cooling system is operating	a receptacle or chamber for holding a liquid or fluid

1. "integrated element"

CoolIT and Cooler Master's constructions are problematic to the extent both incorporate the term "integrated element" (*i.e.*, a reservoir is part of an integrated element). As Asetek points out, the term "integrated element" (1) is not used in any of the claims of the '764 patent and (2) shows up only in claim 1, and claims dependent on claim 1, in the '362 patent. *See* '362 patent, claim 1 (describing "[a] cooling system for a computer system processing unit, comprising: an integrated element including a heat exchanging interface, a reservoir, and a pump"). Thus, while a reservoir can be a part of an integrated element, it need not be. When it is, the claim language so provides.

Furthermore, the term "integrated element" is itself a confusing term and therefore a construction incorporating that term would not be helpful to the jury. In this regard, the Court takes note that "integrated element" does not necessarily mean that the reservoir, pump, and heat exchanging interface must all be part of a single component. For example, the '362 and '764 patents make note that

> [t]he pump may not only be a self-contained pumping device, but *may* be made integrated into the reservoir, thus making the reservoir and pumping device one single integrated component. This single integrated element of the reservoir and the pumping device *may* also

> be integrated, thus making the reservoir, the pumping device and the heating exchanging surface one single integrated unit.

'362 patent, col. 10:52-59 (emphasis added); '764 patent, col. 13:18-25 (stating the same); *see also* '362 patent, col. 2:25-35 (stating that, in the preferred embodiment, "the pump is placed inside the reservoir" and that "[i]n an alternative embodiment the pump is placed outside the reservoir in the immediate vicinity of the reservoir" – with both placements making "the element . . . easy to employ in new and existing computer systems"); 764 patent, col. 2:20-31 (making a similar point).

2. <u>"not in normal fluid flow and available to accommodate fluid expansion"</u>

CoolIT's construction is also problematic to the extent it offers a limitation – *i.e.*, "not in normal fluid flow and available to accommodate fluid expansion" – that is not justified by the intrinsic evidence. CoolIT argues that the limitation is appropriate based on the following excerpt from the specification:

> FIG. 3 shows another embodiment of a prior art cooling system. The figure shows the typical components in a liquid-cooling type CPU cooling arrangement. The figure shows a prior art heat exchanger 7, which is in connection with a prior art liquid reservoir 8, a prior art liquid pump 9 and a heat radiator 11 and an air fan 10 provided together with the heat radiator. . . . *The reservoir serves as a storage unit for excess liquid not capable of being contained in the remaining components. The reservoir is also intended as a means for venting the system of any air entrapped in the system and as a means for filling the system with liquid.*

'362 patent, col. 8:5-17; '764 patent, col. 10:37-49 (emphasis added).

But this position is fundamentally flawed because the statement above concerns the prior art, and not the present invention. *See* Docket No. 148 (Reply at 4). Indeed, the statement above specifically refers to a "*prior art* liquid reservoir" (emphasis added). That there is a difference between (1) a prior art reservoir and (2) a reservoir that is part of the invention claimed is underscored by the fact that a prior art reservoir was used, in part, as a means for venting the system of any air entrapped in the system. But a reservoir that is part of the invention claimed does not serve that purpose as it is part of a closed/sealed system.

Furthermore, CoolIT's position runs counter to the language used in the patent claims. The claims in both the '362 patent and '764 patent indicate that the reservoir is an integral part of fluid flow for cooling. *See, e.g.*, '362 patent, claim 1 (providing that "the reservoir is configured to receive a cooling liquid from outside the reservoir through an inlet and pass the cooling liquid to the outside through an outlet"); '362 patent, claim 14 (providing that the reservoir is "adapted to pass a cooling liquid therethrough"); '764 patent, claim 1 (providing that "a reservoir [is] adapted to pass the cooling liquid therethrough"). Nothing about the patents suggests that there is a portion of the reservoir that is not involved in the fluid flow.

Finally, CoolIT's suggestion that the construction of "reservoir' should include a reference to "excess fluid created by fluid expansion" is completely unwarranted. Nothing in the patents makes mention of fluid expansion at all. Docket No. 136 (CoolIT's Resp. Br. at 7). Rather, that is one of the issues that is the subject of CoolIT's own invention, the '456 patent, not Asetek's patents.

3. "through which cooling liquid flows when the cooling system is operating"

As for the limitation proposed by Cooler Master – *i.e.*, "through which cooling liquid flows when the cooling system is operating" – the Court finds it unnecessary as it is largely redundant of the surrounding claim language. *Cf. Atser Research Techs., Inc. v. Raba-Kistner Consultants, Inc.*, No. SA-07-CA-93-H, 2009 U.S. Dist. LEXIS 25294, at *31-32 (W.D. Tex. Mar. 2, 2009) (rejecting defendant's construction of the term "client computer" because it "includ[ed] the surrounding words of the claim" which was "redundant and unnecessary").

4. "single receptacle"

Finally, Asetek's construction – *i.e.*, "single receptacle" – is lacking in that it does not provide any information as to what the function or purpose of a reservoir is. To the extent Asetek puts a premium on the word "single," that word is unnecessary because the fact that the claim term is "reservoir" (singular) and not "reservoirs" (plural) indicates that a reservoir is only one receptacle and not many. Also, it is clear from the surrounding claim language that a reservoir is a single receptacle made up of an upper and lower chamber (the '362 patent) or a pump chamber and a thermal exchange chamber (the '764 patent).

5. Dictionary Definition

Although a dictionary definition is extrinsic evidence, the Court concludes that it best captures what a "reservoir" is based on the language of the patents, including the specifications and claims. That is, a "reservoir" for purposes of the '362 and '764 patents is "a receptacle or chamber for holding a liquid or fluid." Notably, CoolIT expressly stated at the hearing that it would not object to this construction, which is a dictionary definition supplied by CoolIT in its papers. *See* Docket No. 136-4 (Ex. 4). In addition, in its papers, Asetek itself relied on a similar dictionary definition. *See* Docket No. 10 (Asetek's Op. Br. at 10) ("The dictionary definition of 'reservoir' provided by Asetek is 'a part of an apparatus in which a liquid is held.'").

B. <u>"fluidly coupled" ('362 patent) or "coupled" ('764 patent)</u>

Asetek	**CoolIT**	**Cooler Master**	**Court**
fluidly communicating (directly or indirectly)	connected such that fluid can flow directly from one element into the other	[same as CoolIT]	fluidly connected

The parties agree that the term "fluidly coupled" or "coupled" does not appear anywhere in the specifications of the two patents at issue – *i.e.*, the term shows up only in the claims. As to the claims, the term "fluidly coupled" or "coupled" basically shows up in two different contexts:

- The fluid coupling of the two chambers in the reservoir; and
- The fluid coupling of the reservoir to the heat radiator (*i.e.*, fan).

See, e.g., '362 patent, claim 1 (describing "the reservoir including an upper chamber and a lower chamber, the upper chamber and the lower chamber being vertically displaced chambers that are separated from each other by at least a horizontal wall and fluidly coupled together by a plurality of substantially circular passages"); '362 patent, claim 1 (describing "a heat radiator spaced apart from the integrated element, the heat radiator being fluidly coupled to the outlet and inlet of the reservoir"); '764 patent, claim 1 (describing "the pump chamber and the thermal exchange chamber being separate chambers that are fluidly coupled together by the one or more passages"); '764 patent, claim 1 (describing "a heat radiator fluidly coupled to the reservoir").

The basic dispute between the parties is whether "coupled" should be construed to require a direct connection (Defendants' position) whether "coupled" should be more broadly construed to cover either a direct or an indirect connection (Asetek's position).

Looking at the phrase "coupled" in isolation, the Court agrees with Asetek that "common usage of the term . . . supports both direct and indirect connections." *Silicon Image, Inc. v. Genesis Microchip, Inc.*, No. 3:01cv266, 2002 U.S. Dist. LEXIS 28916, at *88 (E.D. Va. Dec. 10, 2002). Furthermore, the fact that the specifications of the patents show only direct connections is not dispositive. "[E]ven where a patent describes *only a single embodiment*, claims will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using words or expressions of manifest exclusion or restriction." *Innova/Pure Water, Inc. v. Safari Water Filtration Sys.*, 381 F.3d 1111, 1117 (Fed. Cir. 2004) (internal quotation marks omitted; emphasis added); *see also Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1328 (Fed. Cir. 2002) (noting that "[t]he record is devoid of 'clear statements of scope' limiting the term appearing in claim 1 to having 'a single pair of legs'")

The case cited by Cooler Master – *In re Abbott Diabetes Care Inc.*, 696 F.3d 1142 (Fed. Cir. 2012) – is not to the contrary. There, the court held that the PTO erred in broadly construing the claim "electrochemical sensor" to include sensors with external wires and cable leads because (1) "every embodiment disclosed in the specification shows an electrochemical sensor without external cables or wires" *and* (2) "the specification contains only disparaging remarks with respect to the external cables and wires of the prior-art sensors." *Id.* at 1149. No such disparagement of indirect coupling is contained in the specification at issue in the case at bar.

Thus, in principle, the Court concludes that the term "coupled" – in isolation – could support either direct or indirect connections.

That being said, the term "coupled" as used in the patents is not in isolation but is usually accompanied by a phrase specifying the means of the connection. For example, claim 1 of the '362 patent describes "the reservoir including an upper chamber and a lower chamber, the upper chamber and the lower chamber being vertically displaced chambers that are separated from each other by at least a horizontal wall and fluidly coupled together *by a plurality of substantially circular passages*." '362 patent, claim 1 (emphasis added). Where the means of connection are specified, the Court concludes that that is the exclusive means by which the coupling can be accomplished. Thus, for claim 1 of the '362 patent, the chambers must only be connected by a plurality of substantially circular passages and nothing more. The heat radiator, for example, could not be inserted as a part of the connection without violating the language of the claim. *See* Docket No. 136 (CoolIT's Resp. Br. at 12) ("Asetek amended its infringement contentions to argue that the two separate chambers could be 'coupled' – indirectly – through the outlet tube, *the radiator*, and the inlet tube.")[2] (emphasis added).

Notably, the court in *City of Aurora v. PS Systems, Inc.*, No. 07-cv-2371-PAB-BNB, 2010 U.S. Dist. LEXIS 61935 (D. Colo. June 2, 2010), reached a similar conclusion when presented with a similar set for facts. In *Aurora*, the court examined, *inter alia,* a claim that specified that the patented system included "'at least one aquifer well coupled to the underground reservoir *by piping*.'" *Id.* at *41. The court took note that

> [t]he parties first disagree about the implications of the term "coupled." The City of Aurora insists that, in the context of this patent, the term "couple" signifies a direct connection between the aquifer well and the underground water storage reservoir. Defendant patentees, citing to a District of Delaware case, urge that the connection may be direct or indirect and, in fact, may be so indirect as to encompass infiltration ditches and ponds above the underground reservoir [*e.g.*, an infiltration pond could establish the necessary link between the aquifer well and the reservoir].

Id. at *41-42. The court ultimately found in the city's favor rather than the defendant-patentees', explaining as follows:

> There are two cases, of which the Court is aware, which define the term "coupled." The case cited by defendants, *Silicon Graphics, Inc. [v. nVidia Corp.]*, held that "the ordinary meaning [of couple] in this context is 'coupled or connected, directly or indirectly.'" 58 F. Supp. 2d at 346. In *Bradford Co. v. ConTeyor North America, Inc.*, 603 F.3d 1262, 2010 WL 1711307, at *3, 6-7 (Fed. Cir. 2010), the Federal Circuit recently held that the phrase "coupled to" means "linked together, connected or joined" and often deserves a broad construction to include indirect means of connection.

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[2] To the extent Asetek relies on the Tilton declaration to assert that there could be indirect coupling via the radiator, *see* Docket No. 148 (Tilton Decl. ¶ 9) (emphasis added), the Court rejects that reliance for several reasons. First, Asetek failed to identify Dr. Tilton as a witness in the parties' Joint Claim Construction and Prehearing Statement. *See* Pat. L.R. 4-3(e) (providing that, in the parties' Joint Claim Construction and Prehearing Statement, they are to include information as to "[w]hether any party proposes to call one or more witnesses at the Claim Construction Hearing, the identity of each such witness, and for each witness, a summary of his or her testimony, including for any expert, each opinion to be offered related to claim construction"). Second, Dr. Tilton's opinion is directly contrary to the language of the claims which mentions coupling via passages only, and nothing more.

> The distinction between a direct and an indirect connection, which was the focus in *Bradford* and *Silicon Graphics, Inc.*, is not particularly helpful in the present case. Both of those cases dealt with the question of whether two items would qualify as "coupled" if they were indirectly joined through a third, intermediary structure. *See Bradford Co.*, 603 F.3d 1262, 2010 WL 1711307, at *7; *Silicon Graphics, Inc.*, 58 F. Supp. 2d 331, 345-46. Unlike the patents in *Bradford* or *Silicon Graphics*, Claim 1 of the '218 Patent identifies the specific means by which the two primary items – here, the aquifer and the underground reservoir – are to be coupled. Claim 1 explains that they are coupled "by piping." The specification makes clear that "piping" includes the entire mechanical system of wells, wellheads, pumps, pump houses, valves, and pipe configurations. Additional intermediary steps or diversions may well be contemplated under Claim 1. *However, one skilled in the art would not understand "piping," as the term is used in the '218 Patent, to include infiltration ponds or infiltration ditches.* Therefore, such infiltration structures may not serve as the element which connects the underground reservoir.

Id. at *42-43 (emphasis added).

Because "coupled" in isolation could support indirect connections but "coupled" as used in the patents often specifies the means for connection, the Court concludes that a construction incorporating terms such as "direct" or "indirect" would not be helpful to the jury. Accordingly, the Court shall simply construe "fluidly coupled" to mean "fluidly connected." The parties, however, should be mindful of the Court's ruling here that, where a means of coupling is specified, that is the exclusive means of connection.

C. "substantially circular passages"

Asetek	CoolIT	Cooler Master	Court
generally circular passages	indefinite and lacks written description; or circular passages	indefinite and lacks written description; or circular holes	plain and ordinary meaning

As indicated by the chart above, both CoolIT and Cooler Master make an initial challenge to the term "substantially circular passages" on the ground that it is indefinite and lacks written description. *See* 35 U.S.C. § 112(a)-(b) (providing that "[t]he specification shall contain a written description of the invention" and that "[t]he specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention").

The Court, however, shall not entertain invalidity arguments at this juncture of the proceedings. Invalidity defenses are usually addressed at summary judgment, not as a part of claim construction. *See, e.g., PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1307 (Fed. Cir. 2008) (stating that "[c]ompliance with the written description requirement is a question of fact [that] is amenable to summary judgment in cases where no reasonable fact finder could return a verdict for the nonmoving party"); *ASM America, Inc. v. Genus, Inc.*, No. C-01-2190 EDL, 2002 U.S. Dist. LEXIS 15348, at *42 (N.D. Cal. Aug. 15, 2002) ("conclud[ing] that the Federal Circuit's statements that indefiniteness is intertwined with claim construction mean only that the Court must attempt to determine what a claim means before it can determine whether the claim is invalid for indefiniteness, and not that the Court must determine indefiniteness during the claim construction proceedings").[3] This approach is particularly warranted given that Judge Tigar is the assigned judge for the Cooler Master case.

The Court therefore restricts itself to the issue of claim construction. Here, Asetek asks that the term "substantially circular passages" be construed as "generally circular passages," while CoolIT proposes "circular passages" and Cooler Master "circular holes."

The Court agrees with Asetek that both of Defendants' constructions are problematic because they effectively "read the word 'substantially' out of the claim." Docket No. 127 (Asetek's Op. Br. at 18). Cooler Master protests that it "does not contend that the required circle needs to be proven geometrically to be perfect to meet the claim limitation, but rather it must look circular to one of ordinary skill in the art." Docket No. 137 (Cooler Master's Resp. Br. at 17). However, Cooler Master's proposed construction of the term does not make this point clear in any way. Similarly, to the extent CoolIT argues that "[t]he claims require passages that are shaped *like* a circle, as opposed to some other geometric shape such as a square, rectangle, or triangle," Docket

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[3] *Cf. 3M Innovative Props. Co. v. Tredegar Corp.*, 725 F.3d 1315, 1333 (Fed. Cir. 2013) (stating that, "[i]n order to be indefinite, reasonable efforts at claim construction must *result in a definition* that does not provide sufficient particularity or clarity to inform a skilled artisan of the bounds of the claim") (emphasis added).

No. 136 (CoolIT's Resp. Br. at 12) (emphasis added), its proposed construction does not suggest this point in any fashion.

The Court also rejects Cooler Master's suggestion that "passages" should be construed to mean "holes." According to Cooler Master "holes" is more readily understandable than "passages," *see* Docket No. 137 (Resp. Br. at 17), but the term "passages" is not a confusing term. Moreover, the connotation of the two words is somewhat different, and nothing in the patents suggests that "passages" and "holes" are equivalent. Because nothing in the patents indicates that "passages" suggests that it should be interpreted other than in its plain and ordinary meaning, the Court shall not construe the term any further.

Likewise, the Court need not construe the term "substantially" any further.

D. "vertically displaced chambers" ('362 patent) or "vertically spaced apart ('764 patent)"

Asetek	CoolIT	Cooler Master	Court
vertically arranged (with reference to each other and the heat exchanging interface) chambers	indefinite and lacks written description; or the upper chamber is farther away from the heat exchanging interface and separated from the lower chamber by at least a horizontal wall	indefinite and lacks written description; or the upper chamber/pump chamber being farther away from the heat exchanging interface, and separated from the lower chamber/heat exchanging chamber by at least a horizontal/intermediat e wall	vertically arranged (with reference to each other and the heat exchanging interface) chambers

As above, the Court shall not entertain the invalidity arguments presented by Defendants.

Turning to construction, the Court finds both CoolIT and Cooler Master's constructions problematic because they, in effect, read out the "vertical" requirement. As Asetek argues, "defining a distance alone [*i.e.*, farther away] does not clarify spatial orientation." Docket No. 148 (Reply at 20); *see also* Docket No. 127 (Asetek's Op. Br. at 22) (stating that "merely stating the upper/pump chamber is 'farther away from the heat exchanging interface' does not provide the directional orientation that would assist a jury in understanding 'vertically' in the claims"). To the extent CoolIT and Cooler Master's concern is that Asetek is trying to avoid a construction that puts the lower/thermal exchange chamber closer to the heat exchanging interface, that concern is unwarranted. Asetek does not dispute that that has to be the case. *See* Docket No. 148 (Reply at 19-20) (arguing that it "has never taken the position" that the two chambers could be transposed; also stating that the lower/thermal exchange chamber "contains the heat exchange interface"). In any event, the claims on their face demand such. *See, e.g.*, '362 patent, claim 1 (referring to "a boundary wall of the lower chamber being formed by the heat exchanging interface")

Finally, CoolIT and Cooler Master's constructions which make reference to a separation by a horizontal or intermediate wall are not appropriate because, as Asetek notes, (1) for the '362 patent, such language is "redundant of other claim language, which already states the upper and the lower chambers are 'separated . . . by at least a horizontal wall.'" Docket No. 127 (Asetek's Op. Br. at 22) (quoting claim 1); and (2) for the '764 patent, there is no such limitation in the patent at all – *i.e.*, there is only a requirement that the chambers be separate. *See, e.g.*, '764 patent, claim 1 (making no reference to a horizontal or intermediate wall).

Accordingly, the Court adopts Asetek's construction as the more appropriate construction.

E. <u>"horizontally spaced apart"</u>

Asetek	CoolIT	Cooler Master	Court
spaced apart in the horizontal direction (with reference to the vertically displaced/spaced apart chambers)	plain ordinary meaning	indefinite and lacks written description; or being placed at different locations on a horizontal plane	spaced apart in the horizontal direction (with reference to the vertically displaced/spaced apart chambers)

As above, the Court shall not entertain the invalidity arguments presented by Defendants.

Turning to construction, the Court takes note that the main dispute here is really between Asetek and Cooler Master. That dispute boils down to whether "horizontal" means exactly horizontal (*i.e.*, on the same horizontal plane). Cooler Master takes this position, while Asetek maintains that horizontal could also mean, in effect, "roughly" horizontal. The "horizontal" relationship at issue is that between the "reservoir . . . at a first location" and "a heat radiator . . . at a second location." '764 patent, claim 14 (referring to a "heat radiator configured to be positioned at a second location horizontally spaced apart from the first location").

Cooler Master's position is dependent on the premise that both the reservoir and radiator are located on the motherboard – *i.e.*, Cooler Master asserts that, because the motherboard is a board and because both the reservoir and radiator must be on the motherboard, the reservoir and radiator must be exactly horizontal from one another. *See* Docket No. 137 (Cooler Master's Resp. Br. at 18).

The problem for Cooler Master is that there is limited support for its contention that the radiator must be on the motherboard. For example, although Cooler Master takes the position that the language of claim 14 of the '362 patent supports its position, the Court does not agree. Claim 14 of the '362 patent provides in relevant part as follows:

> **14.** A cooling system for a processing unit positioned on a motherboard of a computer, comprising:
>
> a reservoir configured to be coupled to the processing unit positioned on the motherboard at a first location . . .
>
> a heat radiator configured to be positioned at a second location horizontally spaced apart from the first location when the reservoir is coupled to the processing unit . . . .

In its papers, Cooler Master argues that "[t]he use of 'second' as the modifier in relation to the 'first' location on the motherboard compels a conclusion that the second location must also be on the motherboard." Docket No. 137 (Cooler Master's Resp. Br. at 18). But Cooler Master has not read the text of claim 14 correctly. Claim 14 does not refer to a CPU (central processing unit) positioned at a "first location on the motherboard." Rather, claim 14 describes a CPU positioned "on the motherboard at a first location." Thus, claim 14 simply reflects that the motherboard is at a first location, not that there is a first and second location on the motherboard. Thus, consistent with the claim language, the radiator could be at a second location apart from the motherboard.

In addition, FIG. 8 of the '362 patent suggests that the radiator does not have to be on the same exact horizontal plane as the reservoir. *See* '362 patent, FIG. 8.

Cooler Master's best argument is based on the prosecution history, but even here there are problems. In its responsive brief, Cooler Master points out that,

> [i]n the March 21, 2012 Reply to Office action, the [patent] applicant amended claims 83 and 86 (which were later issued as claims 14 and 17 of the '362 patent) in order to overcome the examiner's rejection. In the response, the inventor explained that "amended independent claim 83 recites a cooling system for a processing unit positioned on a motherboard of a computer, including a reservoir configured to be coupled to the processing unit positioned on the motherboard at a first location, . . . , and a heat radiator configured to be positioned *at a second location of the motherboard* horizontally spaced apart from the first location when the reservoir is coupled to the processing unit."

Docket No. 137 (Cooler Master's Resp. Br. at 19) (emphasis in original); *see also* Docket No. 137-7 (Carman Decl., Ex. E) (Reply to Office Action at 5-7, 12-13).

While "'the prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be,'" *Abbott Labs. v. Sandoz, Inc.*, 566 F.3d 1282, 1289 (Fed. Cir. 2009), here, the added language regarding a second location of the motherboard was deleted before issuance of the patent (a point that no party contests). Admittedly, there is nothing in the record as to why this language was deleted. However, as a matter of common sense, the deletion seems unremarkable – *i.e.*, while the CPU must be on the motherboard (and thus the reservoir/heat exchanging interface which are attached to the CPU), there is no obvious or apparent functional need for the heat radiator to be on the motherboard as well. Indeed, because the heat radiator and its fan must exhaust heat from within a chassis to the outside, it would make little sense to require the radiator and fan to be placed on the motherboard rather than mounted, *e.g.*, on the chassis wall. In any event, the lack of any reason for the deletion simply makes the prosecution history ambiguous at best. The Federal Circuit has expressly held that "[i]t is inappropriate to limit a broad definition of a claim term based on prosecution history that is itself ambiguous." *Inverness Medical Switzerland GmbH v. Warner Lambert Co.*, 309 F.3d 1373, 1382 (Fed. Cir. 2002); *see also Harris Corp. v. Federal Express Corp.*, 502 Fed. Appx. 957, 964 (Fed. Cir. 2013) (stating that, "[a]s a general rule, prosecution history cannot overcome the natural reading of the claim when the alleged disavowal is ambiguous"); *SunRace Roots Enter. Co., Ltd. v. SRAM Corp.*, 336 F.3d 1298, 1306 (Fed. Cir. 2003) (stating that, "'[a]lthough [it] is correct that the prosecution history is always relevant to claim construction, it is also true that the prosecution history may not be used to infer the intentional narrowing of a claim absent the applicant's clear disavowal of claim coverage'").

Accordingly, the Court adopts the construction proposed by Asetek, and not Cooler Master. The Court declines to rest on plain and ordinary meaning as proposed by CoolIT as here there is ambiguity as to whether "horizontal" means exactly horizontal.

IV. CONCLUSION

The disputed claim terms of the patents-in-suit are hereby construed as set forth above.

IT IS SO ORDERED.

Dated: December 3, 2013

EDWARD M. CHEN
United States District Judge