AO 120 (Rev. 08/10)

TO:	**Mail Stop 8** **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the District of Delaware on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	11/30/2012	for the District of Delaware

PLAINTIFF	DEFENDANT
Safe Storage LLC	Silicon Graphics International Corp.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,978,346	12/20/2005	Safe Storage LLC
2			
3			
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the District of Delaware on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	11/30/2012	for the District of Delaware

PLAINTIFF	DEFENDANT
Safe Storage LLC	NetApp, Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,978,346	12/20/2005	Safe Storage LLC
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	11/30/2012	for the District of Delaware

PLAINTIFF	DEFENDANT
Safe Storage LLC	Hitachi Data Systems Corporation

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,978,346	12/20/2005	Safe Storage LLC
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	11/30/2012	for the District of Delaware

PLAINTIFF	DEFENDANT
Safe Storage LLC	Hewlett-Packard Company

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,978,346	12/20/2005	Safe Storage LLC
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

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DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	11/30/2012	for the District of Delaware

PLAINTIFF	DEFENDANT
Safe Storage LLC	Dot Hill Systems Corp.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,978,346	12/20/2005	Safe Storage LLC
2			
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

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AO 120 (Rev. 08/10)

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☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	11/30/2012	for the District of Delaware

PLAINTIFF	DEFENDANT
Safe Storage LLC	Dell Inc.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	6,978,346	12/20/2005	Safe Storage LLC
2			
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

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PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571) 273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

08791 7590 07/11/2005

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

10/13/2005 CCHAU2 00000088 09753245

01 FC:2501 700.00 OP
02 FC:8001 30.00 OP
03 FC:1504 300.00 OP

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Kyuho Alexander	(Depositor's name)
	(Signature)
10/7/05	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/753,245	12/29/2000	Sung-Hoon Baek	51876P219	8804

TITLE OF INVENTION: APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$700	$300	$1000	10/11/2005

EXAMINER	ART UNIT	CLASS-SUBCLASS
LIM, KRISNA	2153	711-114000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 BLAKELY SOKOLOFF TAYLOR ZAFMAN
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Republic of Korea

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☑ Corporation or other private group entity ☐ Government

4a. The following fee(s) are enclosed:
- ☑ Issue Fee
- ☑ Publication Fee (No small entity discount permitted)
- ☑ Advance Order - # of Copies 10

4b. Payment of Fee(s):
- ☑ A check in the amount of the fee(s) is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☑ The Director is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number 02-2666 (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
- ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

The Director of the USPTO is requested to apply the Issue Fee and Publication Fee (if any) or to re-apply any previously paid issue fee to the application identified above.
NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date 10/5/05

Typed or printed name Eric S. Hyman Registration No. 30,139

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UNITED STATES PATENT AND TRADEMARK OFFICE

A

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

08791 7590 07/11/2005

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER
LIM, KRISNA

ART UNIT	PAPER NUMBER
2153	

DATE MAILED: 07/11/2005

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/753,245	12/29/2000	Sung-Hoon Baek	51876P219	8804

TITLE OF INVENTION: APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$700	$300	$1000	10/11/2005

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE REFLECTS A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE APPLIED IN THIS APPLICATION. THE PTOL-85B (OR AN EQUIVALENT) MUST BE RETURNED WITHIN THIS PERIOD EVEN IF NO FEE IS DUE OR THE APPLICATION WILL BE REGARDED AS ABANDONED.

HOW TO REPLY TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL should be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). Even if the fee(s) have already been paid, Part B - Fee(s) Transmittal should be completed and returned. If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

DL-85 (Rev. 07/05) Approved for use through 04/30/2007.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

or Fax **(571) 273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

08791 7590 07/11/2005

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/753,245	12/29/2000	Sung-Hoon Baek	51876P219	8804

TITLE OF INVENTION: APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

APPLN. TYPE	SMALL ENTITY	ISSUE FEE	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$700	$300	$1000	10/11/2005

EXAMINER	ART UNIT	CLASS-SUBCLASS
LIM, KRISNA	2153	711-114000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are enclosed:

☐ Issue Fee

☐ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

4b. Payment of Fee(s):

☐ A check in the amount of the fee(s) is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director is hereby authorized by charge the required fee(s), or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

The Director of the USPTO is requested to apply the Issue Fee and Publication Fee (if any) or to re-apply any previously paid issue fee to the application identified above.
NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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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.
09/753,245	12/29/2000	Sung-Hoon Baek	51876P219	8804

08791 7590 07/11/2005

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER	
LIM, KRISNA	
ART UNIT	**PAPER NUMBER**
2153	

DATE MAILED: 07/11/2005

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 857 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 857 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571) 272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (703) 305-8283.

PTOL-85 (Rev. 07/05) Approved for use through 04/30/2007.

Notice of Allowability	Application No.	Applicant(s)	
	09/753,245	BAEK ET AL.	
	Examiner	Art Unit	
	Krisna Lim	2153	

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the amendment filed 5/11/05*.

2. ☒ The allowed claim(s) is/are *1-9*.

3. ☒ The drawings filed on *23 August 2004 and 29 December 2000* are accepted by the Examiner.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☒ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

KRISNA LIM
PRIMARY EXAMINER

Notice of References Cited	Application/Control No. 09/753,245	Applicant(s)/Patent Under Reexamination BAEK ET AL.	
	Examiner Krisna Lim	Art Unit 2153	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,820,171	11-2004	Weber et al.	711/114
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes

Application/Control No.	Applicant(s)/Patent under Reexamination	
09/753,245	BAEK ET AL.	
Examiner	**Art Unit**	
Krisna Lim	2153	

SEARCHED			
Class	Subclass	Date	Examiner
711	114	6/26/2005	KL
709	250	6/26/2005	KL
710	38	6/26/2005	KL
370	360, 412	6/26/2005	KL

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner
711	**114**	6/26/2005	**KL**
709	250	6/26/2005	KL

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
EAST	6/26/2005	KL

UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231
www.uspto.gov

Bib Data Sheet

CONFIRMATION NO. 8804

SERIAL NUMBER	FILING DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
09/753,245	12/29/2000 RULE	709	2152	51876p219

APPLICANTS

Sung-Hoon Baek, Teajon, KOREA, REPUBLIC OF;
Joong-Bae Kim, Taejon, KOREA, REPUBLIC OF;
Yong-Youn Kim, Taejon, KOREA, REPUBLIC OF;

** CONTINUING DATA **********

** FOREIGN APPLICATIONS **********

REPUBLIC OF KOREA 2000-54807 09/19/2000

IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 04/11/2001

** SMALL ENTITY **

Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
☒ yes ☐ no	KOREA, REPUBLIC OF	6	8	1

35 USC 119 (a-d) conditions met: ☒ yes ☐ no ☐ Met after Allowance

Verified and Acknowledged: Examiner's Signature _____ Initials _____

ADDRESS

08791

TITLE

Apparatus for redundant interconnection between multiple hosts and raid

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
355	No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Issue Classification	Application/Control No.	Applicant(s)/Patent under Reexamination	
	09/753,245	BAEK ET AL.	
	Examiner	Art Unit	
	Krisna Lim	2153	

ISSUE CLASSIFICATION

ORIGINAL CLASS	ORIGINAL SUBCLASS	CROSS REFERENCE(S) CLASS	CROSS REFERENCE(S) SUBCLASS (ONE SUBCLASS PER BLOCK)
711	114	709	250

INTERNATIONAL CLASSIFICATION
G06F 13/00
G06F 12/00
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/

(Assistant Examiner) (Date)

(Legal Instruments Examiner) (Date)

KRISNA LIM
PRIMARY EXAMINER

(Primary Examiner) 6/26/05 (Date)

Total Claims Allowed: 9

O.G. Print Claim(s)	O.G. Print Fig.
1	4

☒ 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
	1		31		61		91		121		151		181
	2		32		62		92		122		152		182
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	4		34		64		94		124		154		184
	5		35		65		95		125		155		185
	6		36		66		96		126		156		186
	7		37		67		97		127		157		187
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	29		59		89		119		149		179		209
	30		60		90		120		150		180		210

Index of Claims

Application/Control No.	Applicant(s)/Patent under Reexamination
09/753,245	BAEK ET AL.
Examiner	**Art Unit**
Krisna Lim	2153

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	+	Restricted	I	Interference	O	Objected

Claim		Date								
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Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	5230	Host and RAID	US-PGPUB; USPAT	OR	ON	2005/06/26 17:56
L2	967	l1 and RAID adj2 controller	US-PGPUB; USPAT	OR	ON	2005/06/26 17:56
L3	62	l2 and network adj4 interface adj4 controller	US-PGPUB; USPAT	OR	ON	2005/06/26 17:57
L4	62	l3 and host	US-PGPUB; USPAT	OR	ON	2005/06/26 17:57
L5	49	l4 and (Hub or switch)	US-PGPUB; USPAT	OR	ON	2005/06/26 17:57
L6	64772	(redundant or duplicate or multiple or backup or standby) adj4 (interconnect$ or connect$ or interface)	US-PGPUB; USPAT	OR	ON	2005/06/26 17:59
L7	1297	l6 and l1	US-PGPUB; USPAT	OR	ON	2005/06/26 17:59
L8	300	l7 and l2	US-PGPUB; USPAT	OR	ON	2005/06/26 17:59
L9	33	l8 and l3	US-PGPUB; USPAT	OR	ON	2005/06/26 18:10
L10	1370	709/250.ccls.	US-PGPUB; USPAT	OR	ON	2005/06/26 18:17
L11	1694	711/114.ccls.	US-PGPUB; USPAT	OR	ON	2005/06/26 18:17
L12	439	710/38.ccls.	US-PGPUB; USPAT	OR	ON	2005/06/26 18:18
L13	1467	370/360, "412".ccls.	US-PGPUB; USPAT	OR	ON	2005/06/26 18:18
L14	4890	l10 or l11 or l12 or l13	US-PGPUB; USPAT	OR	ON	2005/06/26 18:18
L15	905	l14 and l6	US-PGPUB; USPAT	OR	ON	2005/06/26 18:18
L16	262	l15 and RAID	US-PGPUB; USPAT	OR	ON	2005/06/26 18:18
L17	70	l16 and network same interface same controller	US-PGPUB; USPAT	OR	ON	2005/06/26 18:19
L18	62	l17 and (hub or switch)	US-PGPUB; USPAT	OR	ON	2005/06/26 18:19

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2000

Application or Docket Number: 09/753,245

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	8	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	8 minus 20=	*
INDEPENDENT CLAIMS	1 minus 3 =	*
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	355.00	OR	BASIC FEE	710.00
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL	355	OR	TOTAL	

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	* 9	Minus	** 20	= 0
Independent	* 2	Minus	*** 3	= 0
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE	0	OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	* 9	Minus	** 20	=
Independent	* 2	Minus	*** 3	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

REPLY UNDER 37 CFR 1.116
EXPEDITED PROCEDURE
TECHNOLOGY CENTER 2100

Attorney's Docket No.: 051876P219

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for:

Sung-Hoon Baek

Serial No.: 09/753,245

Filed: December 29, 2000

APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

Examiner: John R. Brancolini

Art Group: 2153

AMENDMENT AND RESPONSE TO FINAL OFFICE ACTION

Mail Stop RCE
Commissioner for Patents
Post Office Box 1450
Alexandria, Virginia 22313-1450

Sir:

In connection with the Final Office Action mailed February 10, 2005, regarding the above-referenced application, Applicants respectfully request consideration of the following amendments and remarks below.

IN THE CLAIMS

Please amend claims as follows:

Claim 1 (Currently Amended): An apparatus for a redundant interconnection between multiple hosts and a RAID, comprising:

a ~~plurality of~~first RAID controlling unit~~s~~ and a second RAID controlling unit for processing a requirement of numerous host computers, the first RAID controlling unit including a first network controlling unit and a second network controlling unit, and the second RAID controlling unit including a third network controlling unit and a fourth network controlling unit; and

a plurality of connection units for connecting the ~~plurality of~~first RAID controlling unit~~s~~ and the second RAID controlling unit to the numerous host computers, wherein ~~each of~~ the ~~plurality of~~first RAID controlling unit~~s~~ and the second RAID controlling unit~~includes a plural number of network interface controlling units for~~ directly ~~exchanging~~ exchange information with the numerous host computers ~~and a network interface controlling unit included in another RAID controlling units,~~ through the plurality of connecting units, and the first network controlling unit exchanges information with the fourth network controlling unit, and the second network controlling unit exchanges information with the third network controlling unit.

Claim 2 (Original): The apparatus as recited in claim 1, wherein said respective RAID controlling units are connected to the plurality of individual connecting units.

Claim 3 (Currently Amended): The apparatus as recited in claim 2, wherein ~~said plural number of the network interface controlling units are a~~the first network interface controlling unit ~~being connected~~is coupled to the connecting unit of one side and ~~a~~ the second network interface controlling unit ~~being connected~~is coupled to the connecting unit of another side.

Claim 4 (Currently Amended): The apparatus as recited in claim 3, wherein

the first network interface controlling unit and the third network interface

controlling unit processes the requirement of the numerous host computers; and

the second network interface controlling unit and the fourth network controlling unit is are used for communication between the respective first RAID controlling units and the second RAID controlling unit when the respective first and second RAID controlling units are not faulty and the second network interface controlling unit and the fourth network controlling unit is are used for executing a function of the first network interface controlling unit and the third network controlling unit included in the respective RAID controlling unitswhen the respective one of the first RAID controlling unit and the second RAID controlling unit is faulty.

Claim 5 (Currently Amended): The apparatus as recited in claim 1, wherein said plurality of connecting units have at least three connection ports more than three, the two of the at least three connection ports among them being is connected coupled to said one of the first network interface controlling unit and the third network controlling unit and the rest of the connection ports thereof being provided as a hub equipment connected with the numerous host computers.

Claim 6 (Currently Amended): The apparatus as recited in claim 1, wherein said plurality of connecting units have the at least three connection ports more than three, the two of the at least three connection ports among them being are connected coupled to said one of the first network interface controlling unit and the third network controlling unit and the rest of the connection ports thereof being provided as a network switch equipment connected with the numerous host computers.

Claim 7 (Currently Amended): The apparatus as recited in claim 1, wherein said plurality of connecting units have the at least five connection ports more than five, the four of the at least five connection ports among them being connectedis coupled to said one of the first network interface controlling unit and the third network controlling unit and the rest of the connection ports thereof being provided as a switch connected with the numerous host computers.

Claim 8 (Currently Amended): The apparatus as recited in claim 1, wherein ~~said RAID controlling unit, said network interface controlling unit and said connecting unit are respectively constructed in a pair,~~ the first network interface controlling unit of ~~a~~ the first RAID controlling unit being connected to a first connecting unit, the second network interface controlling unit of said first RAID controlling unit being connected to a second connecting unit, the ~~first~~ third network interface controlling unit of ~~a~~ the second RAID controlling unit being connected to the second connecting unit, and the ~~second~~ fourth network interface controlling unit of the second RAID controlling unit being connected to the first connecting unit.

Claim 9 (Currently Amended): An apparatus for a redundant interconnection between multiple host computers and a RAID, the apparatus comprising:

a plurality of connection units for connecting the host computers and the RAID;

a first and a second RAID controllers, included in the RAID, each of which having a first network interface controller and a second network interface controller for processing requests from the plurality of the host computers connected through the plurality of the connection units,

wherein the first network interface controller in the first RAID controller supplies data to the host computers connected through the plurality of connection units and processes information transmitted from the second network interface controller in the second RAID controller,

wherein the first network interface controller in the second RAID controller supplies data to the host computers connected through the plurality of connection units and processes information transmitted from the second network interface controller in the first RAID controller,

wherein the second network interface controller in the first RAID controller is used for fault tolerance by performing functions of the first network interface controller in the second RAID controller when the second RAID controller is faulty, and

wherein the second network interface controller in the second RAID controller is used for fault tolerance by performing functions of the first network

interface controller in the first RAID controller when the first RAID controller is faulty, and

wherein the first network controlling unit in the first RAID controlling unit exchanges information with the second network controlling unit in the second RAID controlling unit, and the second network controlling unit in the first RAID controlling unit exchanges information with the first network controlling unit in the second RAID controlling unit.

REMARKS

Claims 1-9 were examined and reported in the Office Action. Claims 1-9 are rejected. Claims 1 and 3-9 are amended. Claims 1-9 remain. Applicant notes that the limitations "third network controlling unit" and "fourth network controlling unit" are used to distinguish the first and second network controlling units in each RAID controller. Therefore, no new matter is added.

Applicants request reconsideration of the application in view of the following remarks.

I. 35 U.S.C. §102(b)

It is asserted in the Office Action that claims 1-9 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,812,754 issued to Lui et al. ("Lui"). Applicant respectfully traverses the aforementioned rejection for the following reasons.

According to MPEP §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 USPQ2d 1913, 1920 (Fed. Cir. 1989)). The elements must be arranged as required by the claim, but this is not an ipsissimis verbis test, i.e., identity of terminology is not required. (In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990))."

Applicant's amended claim 1 contains the limitations of "[a]n apparatus for a redundant interconnection between multiple hosts and a RAID, comprising: a first RAID controlling unit and a second RAID controlling unit for processing a requirement of numerous host computers, the first RAID controlling unit including a first network controlling unit and a second network controlling unit, and the second RAID controlling unit including a third network controlling unit and a fourth network controlling unit; and a plurality of connection units for connecting the first

RAID controlling unit and the second RAID controlling unit to the numerous host computers, wherein the first RAID controlling unit and the second RAID controlling unit directly exchange information with the numerous host computers through the plurality of connecting units, and the first network controlling unit exchanges information with the fourth network controlling unit, and the second network controlling unit exchanges information with the third network controlling unit."

Applicant's amended claim 9 contains the limitations of "[a]n apparatus for a redundant interconnection between multiple host computers and a RAID, the apparatus comprising: a plurality of connection units for connecting the host computers and the RAID; a first and a second RAID controllers, included in the RAID, each of which having a first network interface controller and a second network interface controller for processing requests from the plurality of the host computers connected through the plurality of the connection units, wherein the first network interface controller in the first RAID controller supplies data to the host computers connected through the plurality of connection units and processes information transmitted from the second network interface controller in the second RAID controller, wherein the first network interface controller in the second RAID controller supplies data to the host computers connected through the plurality of connection units and processes information transmitted from the second network interface controller in the first RAID controller, wherein the second network interface controller in the first RAID controller is used for fault tolerance by performing functions of the first network interface controller in the second RAID controller when the second RAID controller is faulty, and wherein the second network interface controller in the second RAID controller is used for fault tolerance by performing functions of the first network interface controller in the first RAID controller when the first RAID controller is faulty, and wherein the first network controlling unit in the first RAID controlling unit exchanges information with the second network controlling unit in the second RAID controlling unit, and the second network controlling unit in the first RAID controlling unit exchanges information with the first network controlling unit in the second RAID controlling unit."

In other words, Applicant's claimed invention includes two network interface controlling units in each RAID controlling unit for fault tolerance. The first

network interface controlling unit of one RAID controller is connected to a second network controlling unit of the other RAID controller through a connecting unit. The second network interface controlling unit of the one RAID controller is connected to a first network interface controlling unit of the other RAID controller through the connecting unit. The second network interface controlling unit of one RAID controller receives information from the first network interface controlling unit of the other RAID controller through a connecting unit, such as a switch and a hub, in the normal state. Furthermore, the second network interface controlling unit of one RAID controller performs the role of the first network interface controlling unit of the other RAID controller when the first network interface controlling unit of the other RAID controller is faulty.

Lui discloses a RAID system having a fiber channel arbitrated loop. Lui, however, does not teach, disclose or suggest two network interface controlling units included in each RAID controller. That is, in Fig. 3 of Lui, there only one controller SERDES 336 is shown (where controller SERDES 336 is similar to the RAID controller network interface controller of Applicant's claimed invention). Further, Lui discloses a RAID including only one RAID controlling unit having only one serializer/de-serializer module, which is similar to the RAID controller network interface controller of Applicant's claimed invention.

It is asserted in the Office Action that Liu discloses two network controlling units in a RAID controller because Liu discloses "[the host loops are coupled to either local or remote host computers 108 through port bypass circuits (PBCs) and serializer/de-serializer modules 336 in RAID controllers 302. In this preferred embodiment, only two host connections are shown in each RAID controller 302." This assertion, however, does not teach, disclose or suggest two network controlling units in each RAID controller. Moreover, Liu does not teach, disclose or suggest "... a first RAID controlling unit and a second RAID controlling unit for processing a requirement of numerous host computers, the first RAID controlling unit including a first network controlling unit and a second network controlling unit, and the second RAID controlling unit including a third network controlling unit and a fourth network controlling unit; ... wherein ... the first network controlling unit exchanges information with the fourth network controlling unit, and the second network

controlling unit exchanges information with the third network controlling unit," or "the first network controlling unit in the first RAID controlling unit exchanges information with the second network controlling unit in the second RAID controlling unit, and the second network controlling unit in the first RAID controlling unit exchanges information with the first network controlling unit in the second RAID controlling unit."

Therefore, since Lui does not disclose, teach or suggest all of Applicant's amended claims 1 and 9 limitations, Applicant respectfully asserts that a *prima facie* rejection under 35 U.S.C. § 102(b) has not been adequately set forth relative to Lui. Thus, Applicant's amended claims 1 and 9 are not anticipated by Lui. Additionally, the claims that directly or indirectly depend on claim 1, namely claims 2-8, are also not anticipated by Lui for the same reason.

Accordingly, withdrawal of the 35 U.S.C. § 102(b) rejections for claims 1-9 are respectfully requested.

CONCLUSION

In view of the foregoing, it is believed that all claims now pending, namely 1-9, patentably define the subject invention over the prior art of record and are in condition for allowance and such action is earnestly solicited at the earliest possible date.

If necessary, the Commissioner is hereby authorized in this, concurrent and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17, particularly extension of time fees.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR, & ZAFMAN LLP

Dated: May 9, 2005

By: _____
Steven Laut, Reg. No. 47,736

12400 Wilshire Boulevard
Seventh Floor
Los Angeles, California 90025
(310) 207-3800

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail with sufficient postage in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, Virginia 22313-1450 on May 9, 2005.

_____
Jean Svoboda

RCE
2153

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. 1450
Alexandria, VA 22313-1450

Application No.	09/753,245
Filing Date	December 29, 2000
First Named Inventor	Sung-Hoon Baek
Art Unit	2153
Examiner Name	John R. Barncolini
Attorney Docket Number	51876P219

This is a Request for Continued Examination (RCE) under 37 C.F.R. § 1.114 of the above-identified application.

Request for Continued Examination (RCE) practice under 37 CFR § 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 C.F.R. § 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.
      i. ☐ Consider the amendment(s)/reply under 37 C.F.R. § 1.116 previously filed on
      (Any unentered amendment(s) referred to above will be entered).
      ii. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on
      iii. ☐ Other _____

   b. ☒ Enclosed
      i. ☒ Amendment/Reply
      ii. ☐ Affidavit(s)/Declaration(s)
      iii. ☐ Information Disclosure Statement (IDS)
      iv. ☐ Other _____

2. Miscellaneous

   a. ☐ Suspension of action on the above-identified application is requested under 37 C.F.R. § 1.103(c) for a period of months. (Period of suspension shall not exceed 3 months; Fee under 37 C.F.R. § 1.17(i) required)

   b. ☐ Other _____

3. Fees The RCE fee under 37 C.F.R. § 1.17(e) is required by 37 C.F.R. § 1.114 when the RCE is filed.

   a. ☒ The Director is hereby authorized to charge the following fees, or credit any overpayments, to Deposit Account No. 02-2666.
      i. ☒ RCE fee required under 37 C.F.R. § 1.17(e) and any additional claims fee(s)
      ii. ☐ Extension of time fee (37 C.F.R. § 1.136 and 1.17)
      iii. ☐ Other: ($.00)

   b. ☒ Check in the amount of $395.00 enclosed

   c. ☐ Payment by credit card (Form PTO-2038 enclosd)

05/12/2005 AWONDAF1 00000095 09753245
01 FC:2801 395.00 OP

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Name *(Print/Type)*	Steven Laut	*Registration No. (Attorney/Agent)*	47,736
Signature		Date	May 9, 2005

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

May 9, 2005

Name *(Print/Type)*	**Jean Svoboda**		
Signature		Date	**May 9, 2005**

Based on PTO/SB/30 (09-03) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 02/10/2004.
SEND TO: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

FEE TRANSMITTAL for FY 2005

Patent fees are subject to annual revision.

☒ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT	($)	395.00

Complete if Known	
Application Number	09/753,245
Filing Date	December 29, 2000
First Named Inventor	Sung-Hoon Baek
Examiner Name	John R. Barncolini
Art Unit	2153
Attorney Docket No.	51876p219

METHOD OF PAYMENT *(check all that apply)*

☒ Check ☐ Credit card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 02-2666 Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below
☐ Charge fee(s) indicated below, except for the filing fee
☒ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20.
☒ Credit any overpayments

FEE CALCULATION

1. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims	9	- 20** =	0	X	25.00	=	$0.00
Independent Claims	2	- 3** =	0	X	100.00	=	$0.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	50	2202	25	Claims in excess of 20
1201	200	2201	100	Independent claims in excess of 3
1203	360	2203	180	Multiple Dependent claim, if not paid
1204	300	2204	150	**Reissue independent claims over original patent
1205	300	2205	150	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (1) ($) 0.00

***or number previously paid, if greater, For Reissues, see below*

2. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1251	120	2251	60	Extension for reply within first month	
1252	450	2252	225	Extension for reply within second month	
1253	1,020	2253	510	Extension for reply within third month	
1254	1,590	2254	795	Extension for reply within fourth month	
1255	2,160	2255	1,080	Extension for reply within fifth month	
1401	500	2401	250	Notice of Appeal	
1402	500	2402	250	Filing a brief in support of an appeal	
1403	1,000	2403	500	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
1809	790	1809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	
Other fee (specify)		RCE			

SUBTOTAL (2) ($) 395.00

SUBMITTED BY

Complete (if applicable)

Name (Print/Type)	Steven Laut	Registration No. (Attorney/Agent)	47,736	Telephone	(310) 207-3800
Signature				Date	05/09/05

Based on PTO/SB/17 (12-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 12/15/2004.
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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.
09/753,245	12/29/2000	Sung-Hoon Baek	51876p219	8804

8791 7590 02/10/2005

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER	
BRANCOLINI, JOHN R	

ART UNIT	PAPER NUMBER
2153	

DATE MAILED: 02/10/2005

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

Office Action Summary	Application No.	Applicant(s)	
	09/753,245	BAEK ET AL.	
	Examiner	Art Unit	
	John R Brancolini	2153	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 23 August 2004.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-9 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-9 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 23 August 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This action in response to Amendment filed August 23, 2004.

Claims 1-9 are currently pending in the application.

Drawings

Objections to the drawings are withdrawn due to amendments to the Specification.

Claim Objections

Objections to claims 3 and 8 are withdrawn due to amendment.

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 1-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Lui et al. (US Patent 5812754), hereinafter referred to as Lui.

In regards to claim 1, Lui discloses an apparatus for a redundant interconnection between multiple hosts and a RAID, comprising:

- A plurality of RAID controlling units for processing a requirement of numerous host computers (Figure 3 shows items 302 A and B, separate RAID controllers).

- A plurality of connecting units for connecting the plurality of RAID controlling units to the numerous host computers (In Figure 3, controller chassis 344 contains a plurality of connecting units, the connections between the local hosts and the host loops, see also col 5 lines 36-40).
- Wherein each of the plurality of RIAD controlling units includes a plural number of network interface controlling units for directly exchanging information with the numerous host computers and a network interface controlling unit included in another RAID controlling units, through the plurality of connecting units (each separate RAID unit interacts directly with a host loop, which in turn communicates directly through a port bypass circuit and a serializer/deserializer for communication with the local host, col 5 lines 24-40).

In regards to claim 2, Lui discloses the respective RAID controlling units are connected to the plurality of individual connecting units (Figure 3 shows several individual connecting units connected to the RAID controlling units, see also col 5 lines 36-40).

In regards to claim 3, Lui discloses plural number of the network interfacing controlling units are a first network interface controlling unit being connected to the connecting unit of one side and a second network interface controlling unit being connected to the connecting unit of another side (Figure 3 shows the two separate Raid

controllers, each with a host loop which acts as a network interface controlling unit, as discussed in claim 1).

In regards to claim 4, Lui discloses: the first network interface controlling unit processes the requirement of the numerous host computers (the first host loop is provided for communication to a local host, col 5 lines 36-38); and the second network interface controlling unit is used for communication between the respective RAID controlling units when the respective RAID controlling units are not faulty and the second network interface controlling unit is used for executing a function of the first network interface controlling unit included in the respective RAID controlling units when the respective RAID controlling unit is faulty (when an error is detected, the control of the network interface function can be switched from the first to the second host loop, thereby insuring the fault tolerance is provided, col 6 lines 11-32).

In regards to claim 5, Lui discloses the plurality of connecting units have connection ports more than three, the two connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a hub equipment connected with the numerous host computers (in Figure 3, the connection chassis shows a plurality of connecting units, two of the connection ports being used to connect to the host loops, and the rest used in a hub, or switching manner, for the various host computers).

In regards to claim 6, Lui discloses the plurality of connecting units have the connection ports more than three, the two connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a network switch equipment connected with the numerous host computers (in Figure 3, the connection chassis shows a plurality of connecting units, two of the connection ports being used to connect to the host loops, and the rest used in a hub, or switching manner, for the various host computers).

In regards to claim 7, Lui discloses the plurality of connecting units have the connection ports more than five, the four connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a switch connected with the numerous host computers (in Figure 3, the connection chassis shows a plurality of connecting units, with at least 6 points of connection including the host loops, two of the connection ports being used to connect to the host loops, and the rest used in a hub, or switching manner, for the various host computers).

In regards to claim 8, Lui discloses the RAID controlling unit, the network interface controlling unit and the connecting unit are respectively constructed in pairs, the first network interface controlling unit of a first RAID controlling unit being connected to a first connecting unit, the second network interface controlling unit of said first RAID controlling unit being connected to a second connecting unit, the first network interface

controlling unit of a second RAID controlling unit being connected to the second connecting unit, and the second network interface controlling unit of the second RAID controlling unit being connected to the first connecting unit (in Figure 3, one can see that each of the RAID controlling unit, the network controlling unit [the host loop] and the connecting unit [the chassis back plane individual connections] are in pairs, and the crossover of the fibre wiring allows for the first set of components to communicate with the second set, see also col 6 lines 11-32 for how the bypasses occur between the component sets in case of an error).

In regards to claim 9, Lui discloses apparatus for a redundant interconnection between multiple host computers and a RAID, the apparatus comprising:

- A plurality of connection units for connecting the host computers and the RAID (Figure 3 shows items 302 A and B, separate RAID controllers).
- A first and a second RAID controllers, included in the RAID, each of which having a first network interface controller and a second network interface controller for processing requests from the plurality of the host computers connected through the plurality of the connection units (In Figure 3, controller chassis 344 contains a plurality of connecting units, the connections between the local hosts and the host loops, see also col 5 lines 36-40, additionally figure 7 shows multiple RAID controllers).
- Wherein the first network interface controller in the first RAID controller supplies data to the host computers connected through the plurality of connection units

and processes information transmitted from the second network interface controller in the second RAID controller (each separate RAID unit interacts directly with a host loop via a network controller, which in turn communicates directly through a port bypass circuit and a serializer/deserializer for communication with the local host, col 5 lines 24-40).

- Wherein the first network interface controller in the second RAID controller supplies data to the host computers connected through the plurality of connection units and processes information transmitted from the second network interface controller in the first RAID controller (each separate RAID unit interacts directly with a host loop via a network controller, which in turn communicates directly through a port bypass circuit and a serializer/deserializer for communication with the local host, col 5 lines 24-40).
- Wherein the second network interface controller in the first RAID controller is used for fault tolerance by performing functions of the first network interface controller in the second RAID controller when the second RAID controller is faulty (when an error is detected, the control of the network interface function can be switched from the first to the second host loop, thereby insuring the fault tolerance is provided, col 6 lines 11-32).
- Wherein the second network interface controller in the second RAID controller is used for fault tolerance by performing functions of the first network interface controller in the first RAID controller when the first RAID controller is faulty (when an error is detected, the control of the network interface function can be switched

from the first to the second host loop, thereby insuring the fault tolerance is provided, col 6 lines 11-32).

Response to Arguments

Applicant's arguments as presented in the Remarks section:

1. Lui does not disclose or teach two separate network controlling units included in one RAID controller.

In response to argument 1, the examiner respectfully disagrees with application. As shown in Figure 3, Lui provides multiple RAID controllers. In each controller, multiple, in this case two, network controlling units are shown on the controller backplane. Each of these controller units are directly connected to one of two individual network controlling units on the individual RAID controller, marked on each controller as 326.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John R Brancolini whose telephone number is (571) 272-3948. The examiner can normally be reached on M-Th 7am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenton Burgess can be reached on (571) 272-3949. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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).

JRB

GLENTON B. BURGESS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100

Notice of References Cited	Application/Control No. 09/753,245	Applicant(s)/Patent Under Reexamination BAEK ET AL.	
	Examiner John R Brancolini	Art Unit 2153	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-5,812,754	09-1998	Lui et al.	714/6
*	B	US-6,192,485	02-2001	Takita et al.	714/6
*	C	US-6,609,213	08-2003	Nguyen et al.	714/4
	D	US-			
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	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
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	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims

Application No.	Applicant(s)
09/753,245	BAEK ET AL.
Examiner	**Art Unit**
John R Brancolini	2153

√	Rejected	–	(Through numeral) Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

Claim		Date								
Final	Original	6/10/04	2/4/04							
	1	√	√-							
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Search Notes	Application No.	Applicant(s)	
	09/753,245	BAEK ET AL.	
	Examiner	Art Unit	
	John R Brancolini	2153	

SEARCHED			
Class	Subclass	Date	Examiner
709	201-3, 217-9, 223-4, 239-40	5/11/2004	
709	244		

INTERFERENCE SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	DATE	EXMR
Consult Z. Maung PE 2154 Discuss claims and possible transfer as well as classes for search	5/10/2004	
East Image and Text Search Image 709, 711 Text attached	5/11/2004	
NPL Search IEEE "RAID connectiont"	5/11/2004	
Discuss Amended claims with Dinh Prior Art of record discussed as remaining a 102 rejection	2/4/2005	

41

2153

Attorney's Docket No.: 051876P219

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application for:

Sung-Hoon Baek

Serial No.: 09/753,245

Filed: December 29, 2000

APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

Examiner: John R. Brancolini

Art Group: 2153

AMENDMENT AND RESPONSE TO OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
Post Office Box 1450
Alexandria, Virginia 22313-1450

Sir:

In connection with the Office Action mailed May 20, 2004, regarding the above-referenced application, Applicants respectfully request consideration of the following amendments and remarks below.

IN THE SPECIFICATION

Please amend the paragraph beginning on page 1, line 25 as follows:

As shown in the drawing, ~~such system independently uses two RAID controllers 140, 141, and has an independent connection with network interface controllers 110, 111 of the host computers~~the RAID 130 includes two RAID controllers 140, 141 and each of RAID controllers 140, 141 includes network interface controllers 150, 151. The network interface controllers 150, 151 of the RAID controllers 140, 141 are independently connected to network interface controllers 110, 111 of the host computers 100, 101 through communication links 120, 121 such as a copper line and an optical fiber. That is, such system has twice the bandwidth and twice the performance. However, there is such a problem that a loss of data occurs when one out of two RAID controllers 140, 141 has a trouble, in other words, this system does not become the fault tolerant system.

Please amend the paragraph beginning on page 2, line 8 as follows:

In order to provide fault tolerance not provided in Fig. 1, ~~two RAID controllers 230, 231 and host computers 200, 201 are connected with each other through a hub or switch 210 in one network~~RAID 240 includes two RAID controllers 230, 231 and two RAID controllers 230, 231 and host computers 200, 201 are connected with each other through a hub or switch 210 in one network. The RAID controller 230 includes a pair of network interface controllers 220 and 221 and the RAID controller 231 includes a pair of network interface controllers 222 and 223. Thus, even though one RAID controller 230 or 231 has a trouble, all of the host computers 200, 201 are connected to a RAID controller that does not have a trouble. That is, this RAID controller not having the trouble serves as a role of the controller that has the trouble. Also, since the RAID controllers 230, 231 should exchange information with each other by preparing in advance against some trouble, the RAID controllers 230, 231 are connected with each other through communication controllers 221, 222. However, in this case only a half of performance for the bandwidth provided in Fig. 1 can be obtained.

Please amend the paragraph beginning on page 2, line 26 as follows:

The construction shown in the drawing partially represents a systematic connection between a RAID and host computers, which is extracted from contents disclosed in the U. S. Patent No. 5,812,754. The RAID 340 includes two RAID controllers each of which has network interference controllers 330, 331 and four ports 310, 311, 320 and 321. However, this construction has no any difference from that of Fig. 2, in the structure of a communication network, and in case that one out of two host computers 300, 301 has rather a trouble, there is caused a problem that a network is broken. Thus, this construction is inferior to the construction of Fig. 2.

Please amend the paragraph beginning on page 8, line 14 as follows:

As shown in Fig. 4, the present invention can be constructed by a method of internally installing the hubs 440, 441 in the RAID 490, and as shown in Fig. 5, ~~it can be constructed by using the hubs 510, 520 for use of an external installation~~the host computers 500, 501, 502, 503, 504 and 505 are connected to the RAID 530 by using external hubs 510 and 520.

Please amend the paragraph beginning on page 8, line 19 as follows:

As shown in the drawing, ~~Fig. 6 can have a function of Fig. 4~~a plurality of host computers 600, 601, 602, 604 and 605 are connected to RAID through a network switch 610. In other words, information from a second network interface controller 622 of a first RAID controller 620 is sent to a first network interface controller 632 of a second RAID controller 630, and information from a second network interface controller 632 of the second RAID controller 630 is transmitted to a first network interface controller 621 of the first RAID controller 620. Further, information from the first network interface controller 631 of the second RAID controller 630 is transmitted to the second network interface controller 622 of the first RAID controller 620. Also, information from the first network interface controller 621 of the first RAID controller 620 is sent to the second network interface controller 632 of the second RAID controller 630.

IN THE CLAIMS

Please amend claims as follows:

Claim 1 (Currently Amended): An apparatus for a redundant interconnection between multiple hosts and a RAID, comprising:

a plurality of RAID controlling units for processing a requirement of numerous host computers; and

a plurality of connection units for connecting the plurality of RAID controlling units to the numerous host computers~~; and~~

, wherein each of the plurality of RAID controlling units includes a plural number of network interface controlling units ~~respectively contained into the plurality of RAID controlling units,~~ for directly exchanging information ~~directly~~ with the numerous host computers and ~~an opposite~~ a network interface controlling unit ~~provided within an opposite~~ included in another RAID controlling units, through the plurality of connecting units.

Claim 2 (Original): The apparatus as recited in claim 1, wherein said respective RAID controlling units are connected to the plurality of individual connecting units.

Claim 3 (Currently Amended): The apparatus as recited in claim 2, wherein said ~~each network interface controlling unit is constructed by in a pair, namely two, and is contained into the plurality of RAID controlling units,~~ plural number of the network interface controlling units are a first network interface controlling unit ~~of said network interface controlling unit~~ being connected to the connecting unit of one side and a second network interface controlling unit ~~thereof~~ being connected to the connecting unit of another side.

Claim 4 (Currently Amended): The apparatus as recited in claim 3, wherein ~~said each network interface controlling unit further comprises:~~

the first network interface controlling unit ~~for processing~~ processes the requirement of the numerous host computers; and

the second network interface controlling unit is used for ~~fault tolerance in a~~ communication between the respective RAID controlling units when the respective

RAID controlling units ~~do not have the occurrence of the error,~~ are not faulty and ~~said~~ the second network interface controlling unit ~~being~~ is used for executing a function of the first network interface controlling unit included in the respective RAID controlling units ~~of the RAID controlling unit having the occurrence of the error in case that~~ when ~~one given RAID controlling unit has the occurrence of the error~~ the respective RAID controlling unit is faulty.

Claim 5 (Original): The apparatus as recited in claim 1, wherein said plurality of connecting units have connection ports more than three, the two connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a hub equipment connected with the numerous host computers.

Claim 6 (Original): The apparatus as recited in claim 1, wherein said plurality of connecting units have the connection ports more than three, the two connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a network switch equipment connected with the numerous host computers.

Claim 7 (Original): The apparatus as recited in claim 1, wherein said plurality of connecting units have the connection ports more than five, the four connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a switch connected with the numerous host computers.

Claim 8 (Currently Amended): The apparatus as recited in claim 1, wherein said RAID controlling unit, said network interface controlling unit and said connecting unit are respectively constructed ~~by~~ in a pair, the first network interface controlling unit of a first RAID controlling unit being connected to a first connecting unit, the second network interface controlling unit of said first RAID controlling unit being connected to a second connecting unit, the first network interface controlling unit of a second RAID controlling unit being connected to the second connecting unit, and the second network interface controlling unit of the second RAID controlling unit being connected to the first connecting unit.

Claim 9 (New): An apparatus for a redundant interconnection between multiple host computers and a RAID, the apparatus comprising:

a plurality of connection units for connecting the host computers and the RAID;

a first and a second RAID controllers, included in the RAID, each of which having a first network interface controller and a second network interface controller for processing requests from the plurality of the host computers connected through the plurality of the connection units,

wherein the first network interface controller in the first RAID controller supplies data to the host computers connected through the plurality of connection units and processes information transmitted from the second network interface controller in the second RAID controller,

wherein the first network interface controller in the second RAID controller supplies data to the host computers connected through the plurality of connection units and processes information transmitted from the second network interface controller in the first RAID controller,

wherein the second network interface controller in the first RAID controller is used for fault tolerance by performing functions of the first network interface controller in the second RAID controller when the second RAID controller is faulty, and

wherein the second network interface controller in the second RAID controller is used for fault tolerance by performing functions of the first network interface controller in the first RAID controller when the first RAID controller is faulty.

REMARKS

Claims 1-8 were examined and reported in the Office Action. Claims 1-8 are rejected. Claims 1, 3, 4, and 8 are amended. New claim 9 is added. New Claim 9 is based on the original specification, page 7 line 8 to page 8 line 8, page 9 lines 5 to 14, Fig. 4 and Fig. 5. Therefore, no new matter is added. Claims 1-9 remain.

Applicants request reconsideration of the application in view of the following remarks.

I. In the Drawings

Figures 1, 2 and 3 are objected to because only that which is old is illustrated. The Figures are also objected to for not including reference numerals 450 and 490. Additionally, the Figures are objected to for including reference numerals not mentioned in the specification. Applicant has amended Figures 1-3 with the addition of the legend --Prior Art--. Applicant has added reference numerals 450 and 490 to Figure 4. Applicant has amended the specification to include the reference numerals previously not mentioned in the specification. Approval is respectfully requested.

II. 35 U.S.C. §102(b)

It is asserted in the Office Action that claims 1-8 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,812,754 issued to Liu et al. ("Liu"). Applicant respectfully traverses the aforementioned rejection for the following reasons.

According to MPEP §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 USPQ2d 1913, 1920 (Fed. Cir. 1989)). The elements must be arranged as required by the claim, but this is not an ipsissimis verbis test,

i.e., identity of terminology is not required. (In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990))."

Applicant's amended claim 1 contains the limitations of "[a]n apparatus for a redundant interconnection between multiple hosts and a RAID, comprising: a plurality of RAID controlling units for processing a requirement of numerous host computers; and a plurality of connection units for connecting the plurality of RAID controlling units to the numerous host computers, wherein each of the plurality of RAID controlling units includes a plural number of network interface controlling units for directly exchanging information with the numerous host computers and a network interface controlling unit included in another RAID controlling units, through the plurality of connecting units."

In other words, Applicant's claimed invention includes two network interface controlling units, such as the first network interface controlling unit and the second network interface controlling unit, in one RAID controller for fault tolerance. The first network interface controlling unit of one RAID controller is connected to a second network controlling unit of the other RAID controller through a connecting unit. The second network interface controlling unit of the one RAID controller is connected to a first network interface controlling unit of the other RAID controller through the connecting unit. The second network interface controlling unit of one RAID controller receives information from the first network interface controlling unit of the other RAID controller through a connecting unit, such as a switch and a hub in normal state. Furthermore, the second network interface controlling unit of one RAID controller performs the role of the first network interface controlling unit of the other RAID controller when the first network interface controlling unit of the other RAID controller is faulty.

Lui discloses a RAID system having a fiber channel arbitrated loop. Lui, however, does not teach, disclose or suggest two network interface controlling units included in one RAID controller. That is, in Fig. 3 of Lui, there only one controller SERDES 336 is shown (where controller SERDES 336 is similar to the RAID controller network interface controller of Applicant's claimed invention). Further, Lui discloses a RAID including only one RAID controlling unit having only one serializer/de-

serializer module, which is similar to the RAID controller network interface controller of Applicant's claimed invention. Distinguishable, in Applicant's claimed invention two network interface controllers are included in one RAID controlling unit, which prevents a decrease of bandwidth when the RAID controlling unit is faulty.

Therefore, since Lui does not disclose, teach or suggest all of Applicant's amended claim 1 limitations, Applicant respectfully asserts that a *prima facie* rejection under 35 U.S.C. § 102(b) has not been adequately set forth relative to Lui. Thus, Applicant's amended claim 1 is not anticipated by Lui. Additionally, the claims that directly or indirectly depend on claim 1, namely claims 2-8, are also not anticipated by Lui for the same reason.

Accordingly, withdrawal of the 35 U.S.C. § 102(b) rejections for claims 1-8 are respectfully requested.

CONCLUSION

In view of the foregoing, it is believed that all claims now pending, namely 1-9, patentably define the subject invention over the prior art of record and are in condition for allowance and such action is earnestly solicited at the earliest possible date.

If necessary, the Commissioner is hereby authorized in this, concurrent and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17, particularly extension of time fees.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR, & ZAFMAN LLP

Dated: August 19, 2004

By: _____
Steven Laut, Reg. No. 47,736

12400 Wilshire Boulevard
Seventh Floor
Los Angeles, California 90025
(310) 207-3800

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail with sufficient postage in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P. O. Box 1450, Alexandria, Virginia 22313-1450 on August 19, 2004.

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Jean Svoboda

FIG. 1

--PRIOR ART--

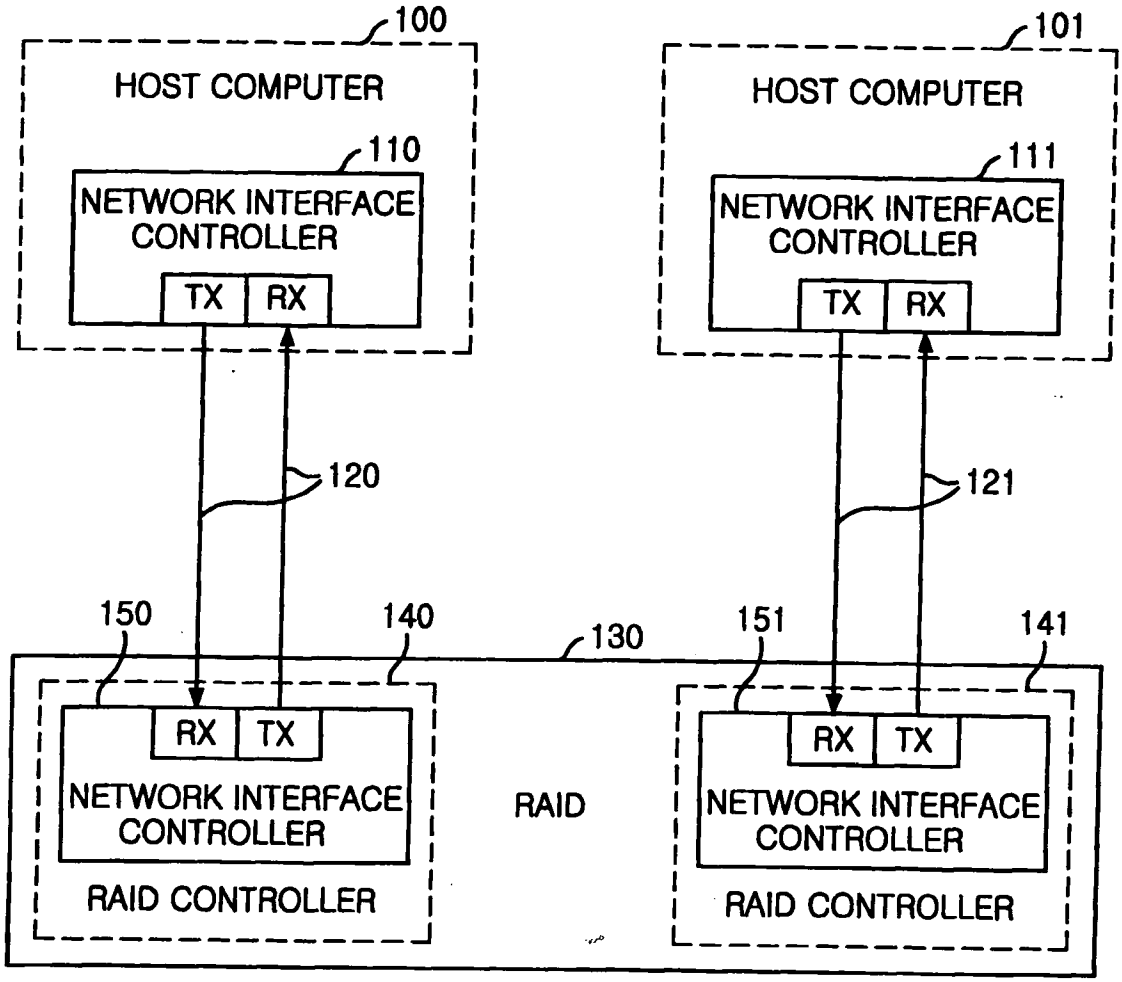
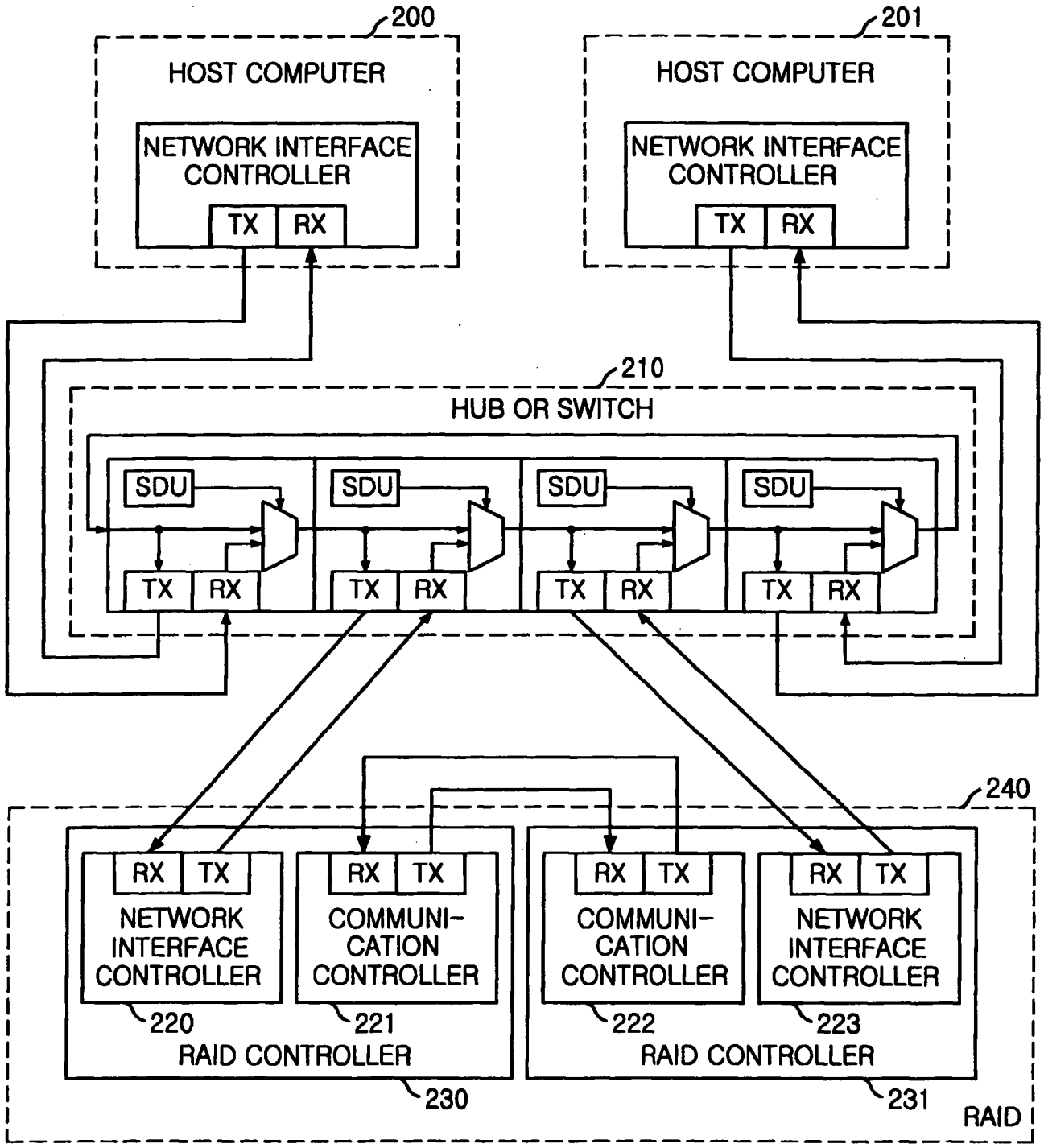


FIG. 2
--PRIOR ART--



REPLACEMENT SHEET

FIG. 3

--PRIOR ART--

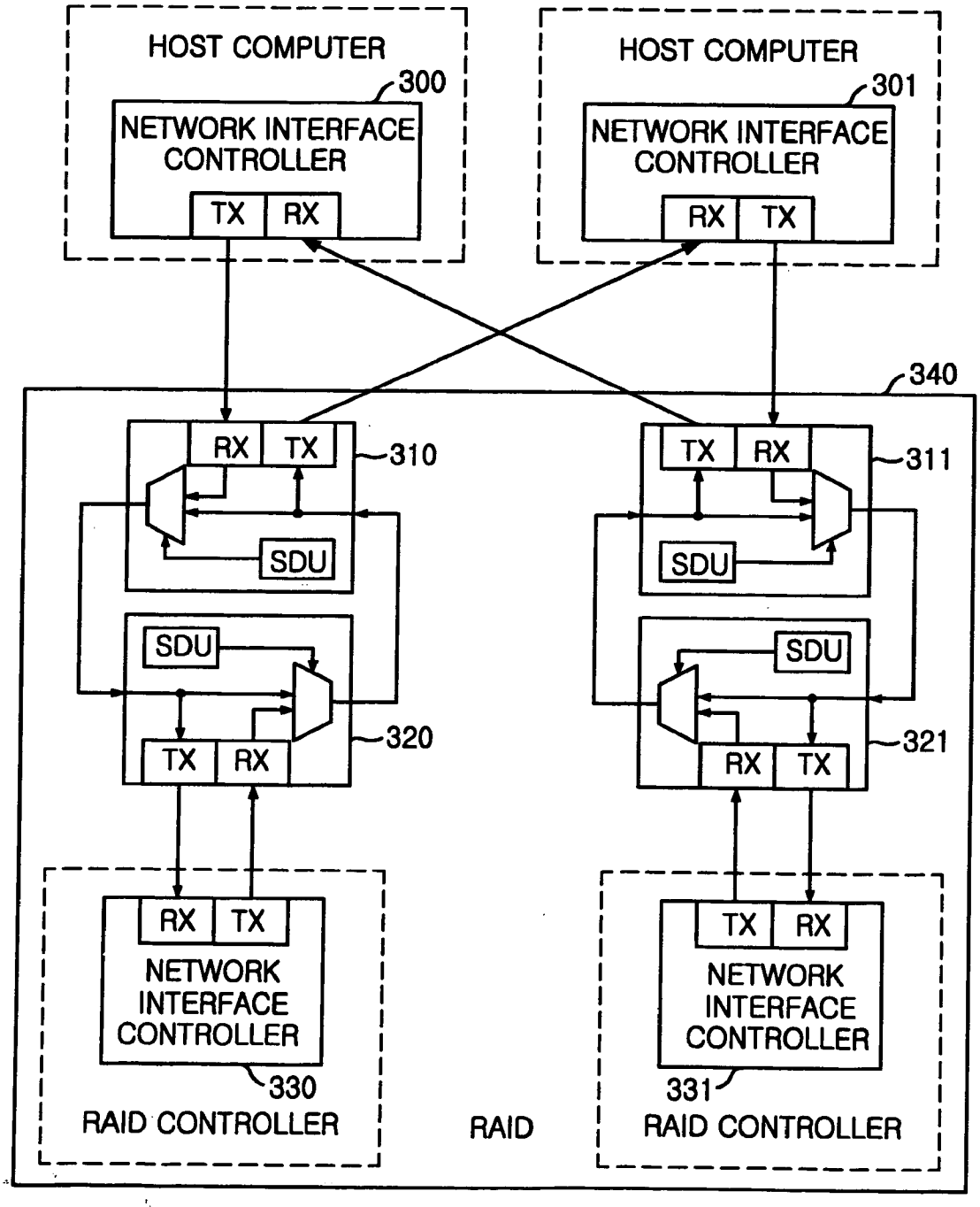
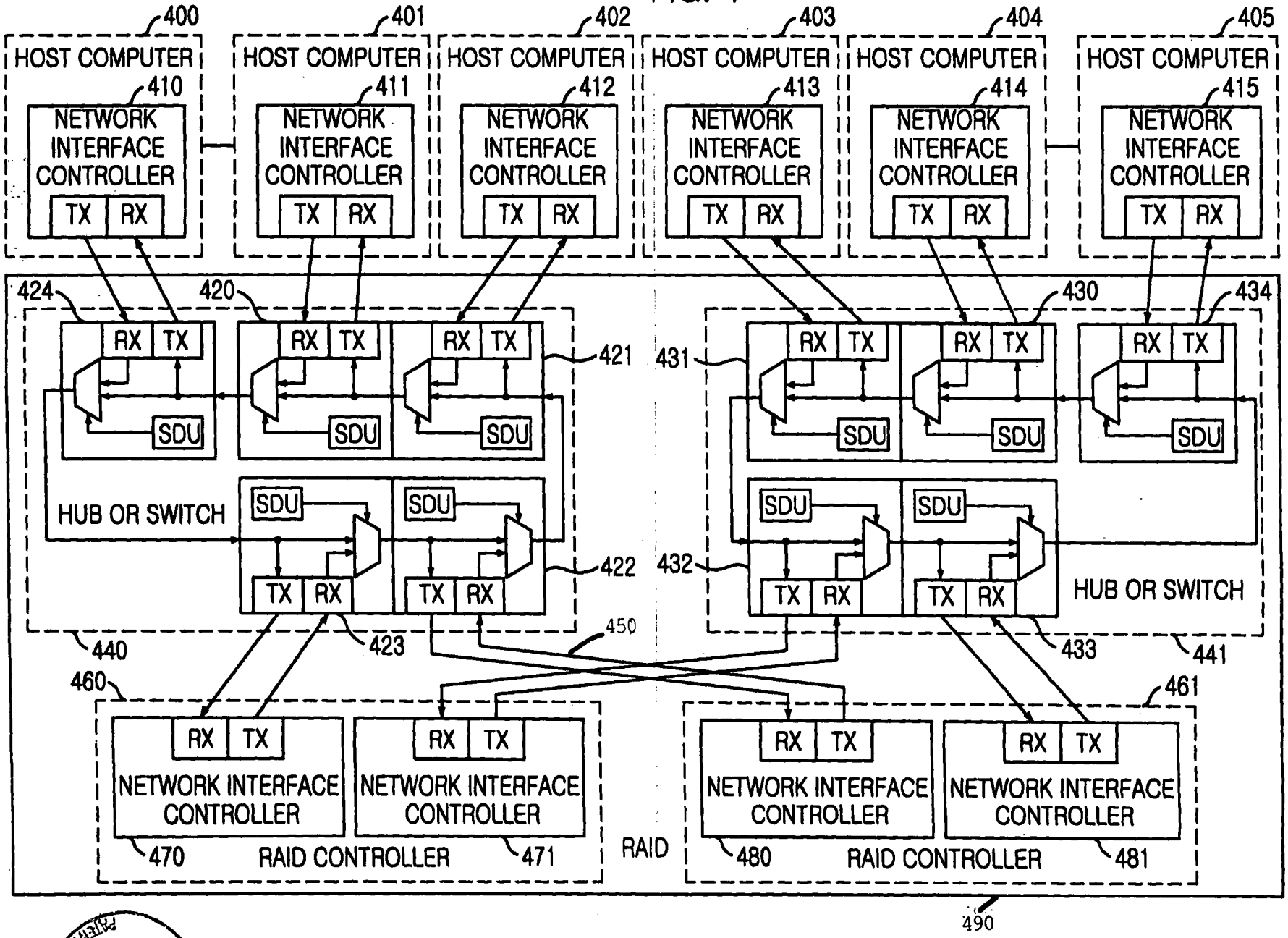


FIG. 4



Blakely, Sokoloff, Taylor & Zafman LLP
(310) 207-3800

Title: APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID - UTILITY

1st Named Inventor: Sung-Hoon Baek

Application No.: 09/753,245

Docket No.: 51876P219

Sheet: 4 of 4

DHPN-1002 / Page 57 of 158

REPLACEMENT SHEET

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application No.	09/753,245
Filing Date	December 29, 2000
First Named Inventor	Sung-Hoon Baek
Art Unit	2153
Examiner Name	John R. Barncolini
Total Number of Pages in This Submission	18
Attorney Docket Number	51876P219

ENCLOSURES ***(check all that apply)***

- [X] Fee Transmittal Form
  - [ ] Fee Attached
- [X] Amendment / Response
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
  - [ ] PTO/SB/08
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Basic Filing Fee
  - [ ] Declaration/POA
- [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [X] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s)
- [ ] After Allowance Communication to Group
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to Group **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [X] Other Enclosure(s) *(please identify below):*

Return receipt postcard

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Steven Laut, Reg. No. 47,736 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	
Date	August 19, 2004

CERTIFICATE OF MAILING/TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Typed or printed name	Jean Svoboda		
Signature		Date	August 19, 2004

Based on PTO/SB/21 (04-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wtr) 06/04/2004.
SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

FEE TRANSMITTAL for FY 2004

Effective 10/01/2004. Patent fees are subject to annual revision.

☒ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT ($) 0.00

Complete if Known	
Application Number	09/753,245
Filing Date	December 29, 2000
First Named Inventor	Sung-Hoon Baek
Examiner Name	John R. Barncolini
Art Unit	2153
Attorney Docket No.	51876p219

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☒ Deposit Account

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

The Commissioner is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☐ Credit any overpayments

☒ Charge any additional fee(s) or underpayment of fees as required under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20.

☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES

			Extra Claims		Fee from below		Fee Paid
Total Claims	9	- 20** =	0	X	9.00	=	$0.00
Independent Claims	2	3** =	0	X	43.00	=	$0.00
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple Dependent claim, if not paid
1204	86	2204	43	**Reissue independent claims over original patent
1205	18	2205	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0.00

***or number previously paid, if greater, For Reissues, see below*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920 *	1804	920 *	Requesting publication of SIR prior to Examiner action	
1805	1,840 *	1805	1,840 *	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1404	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	
1403	290	2403	145	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Prosessing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	1809	385	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($)

SUBMITTED BY

Complete (if applicable)

Name (Print/Type)	Steven Laut	Registration No. (Attorney/Agent)	47,736	Telephone	(310) 207-3800
Signature				Date	08/19/04

Based on PTO/SB/17 (10-03) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 02/10/2004.
SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2000

Application or Docket Number: 09753245

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	8	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	8 minus 20=	*
INDEPENDENT CLAIMS	1 minus 3 =	*
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	355.00	OR	BASIC FEE	710.00
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL	355	OR	TOTAL	

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	* 9	Minus	** 20	= 0
Independent	* 2	Minus	*** 3	= 0
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE	0	OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
***If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/753,245	12/29/2000	Sung-Hoon Baek	51876p219	8804

8791 7590 05/20/2004

BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD, SEVENTH FLOOR
LOS ANGELES, CA 90025

EXAMINER	
BRANCOLINI, JOHN R	
ART UNIT	**PAPER NUMBER**
2153	5

DATE MAILED: 05/20/2004

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

PTO-90C (Rev. 10/03)

Office Action Summary	Application No.	Applicant(s)	
	09/753,245	BAEK ET AL.	
	Examiner	Art Unit	
	John R Brancolini	2153	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 December 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1-8* is/are rejected.

7)☒ Claim(s) *3,8* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 December 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claims 1-8 are pending in the application.

Priority

Priority has been claimed to Korean application number 2000-54807. The effective filing date of the application is September 19, 2000.

Information Disclosure Statement

The information disclosure statement (IDS) was submitted on December 29, 2000. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Drawings

Figures 1, 2 and 3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 450, 490.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description:

Fig 1, items 100, 101, 120, 121, 130, 150, 151.

Fig 2, items 220, 223, 240.

Fig 3, items 310, 311, 320, 321, 330, 331, 340.

Fig 5, items 500, 501, 502, 503, 504, 505, 530.

Fig 6, items 600, 601, 602, 603, 604, 605.

A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

Claims 3 and 8 are objected to because of the following informalities: The phrasing "constructed by a pair". The intended meaning of the phrase is uncertain to the examiner, and for reference purposes in the application of prior art, the examiner is interpreting the phrase to mean "constructed in pairs". Appropriate correction is required.

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 1-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Lui et al. (US Patent 5812754), hereinafter referred to as Lui.

In regards to claim 1, Lui discloses an apparatus for a redundant interconnection between multiple hosts and a RAID, comprising:

- A plurality of RAID controlling units for processing a requirement of numerous host computers (Figure 3 shows items 302 A and B, separate RAID controllers).
- A plurality of connecting units for connecting the plurality of RAID controlling units to the numerous host computers (In Figure 3, controller chassis 344 contains a plurality of connecting units, the connections between the local hosts and the host loops, see also col 5 lines 36-40).
- A plural number of network interface controlling units respectively contained into the plurality of RAID controlling units, for exchanging information directly with the numerous host computers and an opposite network interface controlling unit provided within an opposite RAID

controlling units, through the plurality of connecting units (each separate RAID unit interacts directly with a host loop, which in turn communicates directly through a port bypass circuit and a serializer/deserializer for communication with the local host, col 5 lines 24-40).

In regards to claim 2, Lui discloses the respective RAID controlling units are connected to the plurality of individual connecting units (Figure 3 shows several individual connecting units connected to the RAID controlling units, see also col 5 lines 36-40).

In regards to claim 3, Lui discloses each network interface controlling unit is constructed in a pair, namely two, and is contained into the plurality of RAID controlling units, a first network interface controlling unit of said network interface controlling unit being connected to the connecting unit of one side and a second network interface controlling unit thereof being connected to the connecting unit of another side (Figure 3 shows the two separate Raid controllers, each with a host loop which acts as a network interface controlling unit, as discussed in claim 1).

In regards to claim 4, Lui discloses each network interface controlling unit further comprises: the first network interface controlling unit for processing the requirement of the numerous host computers (the first host loop is provided for communication to a local host, col 5 lines 36-38); and the second network

interface controlling unit used for fault tolerance in a communication between the respective RAID controlling units when the respective RAID controlling units do not have the occurrence of the error, said second network interface controlling unit being for executing a function of the first network interface controlling unit of the RAID controlling unit having the occurrence of the error in case that one given RAID controlling unit has the occurrence of the error (when an error is detected, the control of the network interface function can be switched from the first to the second host loop, thereby insuring the fault tolerance is provided, col 6 lines 11-32).

In regards to claim 5, Lui discloses the plurality of connecting units have connection ports more than three, the two connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a hub equipment connected with the numerous host computers (in Figure 3, the connection chassis shows a plurality of connecting units, two of the connection ports being used to connect to the host loops, and the rest used in a hub, or switching manner, for the various host computers).

In regards to claim 6, Lui discloses the plurality of connecting units have the connection ports more than three, the two connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a network switch equipment connected with the numerous host computers (in Figure 3, the connection chassis shows a plurality

of connecting units, two of the connection ports being used to connect to the host loops, and the rest used in a hub, or switching manner, for the various host computers).

In regards to claim 7, Lui discloses the plurality of connecting units have the connection ports more than five, the four connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a switch connected with the numerous host computers (in Figure 3, the connection chassis shows a plurality of connecting units, with at least 6 points of connection including the host loops, two of the connection ports being used to connect to the host loops, and the rest used in a hub, or switching manner, for the various host computers).

In regards to claim 8, Lui discloses the RAID controlling unit, the network interface controlling unit and the connecting unit are respectively constructed in pairs, the first network interface controlling unit of a first RAID controlling unit being connected to a first connecting unit, the second network interface controlling unit of said first RAID controlling unit being connected to a second connecting unit, the first network interface controlling unit of a second RAID controlling unit being connected to the second connecting unit, and the second network interface controlling unit of the second RAID controlling unit being connected to the first connecting unit (in Figure 3, one can see that each of the RAID controlling unit, the network controlling unit [the host loop] and the

connecting unit [the chassis back plane individual connections] are in pairs, and the crossover of the fibre wiring allows for the first set of components to communicate with the second set, see also col 6 lines 11-32 for how the bypasses occur between the component sets in case of an error).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Takita et al. (US Patent 6192485), a redundant apparatus for connection to a controller, the apparatus including an active unit and a stand-by unit for fault tolerance.
- Nguyen et al. (US Patent 6609213), a method for connecting various computers to a hub which leads to a series of RAID drives, the system including a switching mechanism for fault tolerance.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John R Brancolini whose telephone number is (703) 305-7107. The examiner can normally be reached on M-Th 7am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenton Burgess can be reached on (703) 305-4792. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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).

JRB

FRANTZ B. JEAN
PRIMARY EXAMINER

Notice of References Cited	Application/Control No. 09/753,245	Applicant(s)/Patent Under Reexamination BAEK ET AL.	
	Examiner John R Brancolini	Art Unit 2153	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-5,812,754 A	09-1998	Lui et al.	714/6
	B	US-6,192,485 B1	02-2001	Takita et al.	714/6
	C	US-6,609,213 B1	08-2003	Nguyen et al.	714/4
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Form PTO-1449 (Modified)	Atty Docket No. 51876p219	Application No.
List of Patents & Publications Statement	Applicant(s): Sung-Hoon Baek, et al.	
(Use several sheets if necessary)	Filing Date:	Group No.:

U.S. PATENT DOCUMENTS

Exam. Initials		Document Number	Date	Name	Class	Sub-class	Filing Date (if appropriate)
	AA	5,251,062	10/05/1993	Snitzer et al.			
	AB	5,798,306	08/25/1998	Dickinson, Jr.			
	AC	4,652,536	03/24/2087	Nakajima et al.			
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						
	AJ						
	AK						

FOREIGN PATENT DOCUMENTS

Exam. Initials		Document Number	Date	Country	Class	Sub-class	Translation Yes	Translation No
	AL							
	AM							
	AN							
	AO							
	AP							
	AQ							

OTHER ART (Including Title, Author, Date, Pertinent Pages, etc.)

Exam. Initials		Document Identification
	AR	Tellurite glass: a new candidate for fiber devices by J.S. Wang: Optical Materials 3 (1994) 187-203
	AS	Structure and optical properties of rare earth doped zinc oxyhalide tellurite glasses by D.L. Sidebottom: Journl of Non-Crystalline Solids 222 (1997), pages 282-289
	AT	Raman spectra snd thermal analysis of a new lead-tellurium-germanate glass system by Z. Pan: Journl of Non-Crystalline Solids 210 (1997), pages 130-135

Examiner: _____ Date Considered: May 12, 2004

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

L Number	Hits	Search Text	DB	Time stamp
-	6491	RAID	USPAT; US-PGPUB	2004/05/10 13:36
-	1540	RAID and interconnect	USPAT; US-PGPUB	2004/05/10 10:17
-	352	(RAID and interconnect) and 709.clas.	USPAT; US-PGPUB	2004/05/10 10:17
-	290	((RAID and interconnect) and 709.clas.) and redundant	USPAT; US-PGPUB	2004/05/10 11:16
-	1	(((RAID and interconnect) and 709.clas.) and redundant) and RAID.ti.	USPAT; US-PGPUB	2004/05/10 10:35
-	91	((RAID and interconnect) and 709.clas.) and redundant and @ad<20000919	USPAT; US-PGPUB	2004/05/10 11:26
-	6	RAID.ti. and redundant.ti.	USPAT; US-PGPUB	2004/05/10 13:36
-	1777	saitoh.in.	USPAT; US-PGPUB	2004/05/10 15:15
-	17	saitoh.in. and internet	USPAT; US-PGPUB	2004/05/10 15:15
-	1	5812754.pn.	USPAT; US-PGPUB	2004/05/11 13:25
-	58	5812754.URPN.	USPAT	2004/05/11 13:14
-	25	redundant.ti. and 709.clas. and @ad>20001228	USPAT; US-PGPUB	2004/05/11 13:26
-	5	"753245"	USPAT; US-PGPUB	2004/05/11 14:02
-	252	711/114.ccls. and interconnect	USPAT; US-PGPUB	2004/05/11 14:03
-	149	711/114.ccls. and interconnect and @ad<20001229	USPAT; US-PGPUB	2004/05/11 14:03
-	5	711/114.ccls. and interconnect and @ad<20001229 and redundant.ti.	USPAT; US-PGPUB	2004/05/11 14:03
-	62	711/114.ccls. and interconnect and @ad<20001229 and fault	USPAT; US-PGPUB	2004/05/11 14:03
-	44	711/114.ccls. and interconnect and @ad<20001229 and fault and RAID	USPAT; US-PGPUB	2004/05/13 08:55
-	2	("6275859" | "6370142").PN.	USPAT	2004/05/13 09:05

01-03-01 A

Please type a plus sign (+) inside this box → [+]

PTO/SB/05 (09-00)
Approved for use through 10/31/2002 OMB 0651-0032
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	51876p219
First Inventor or Application Identifier	Sung-Hoon Baek
Title	APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE
Express Mail Label No.	em014066885us

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

1. [X] Fee Transmittal Form *(e.g. PTO/SB/17)* *(Submit an original, and a duplicate for fee processing)*
2. [X] Applicant claims small entity status. See 37 CFR 1.27.
3. [X] Specification — Total Pages: 14
   (preferred arrangement set forth below)
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to sequence listing, a table, or a computer program listing appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings (if filed)
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
4. [X] Drawing(s) *(35 U.S.C.113)* — Total Sheets: 6
5. Oath or Declaration — Total Pages: 2
   a. [X] Newly executed (original copy)
   b. [ ] Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional with Box 18 completed)*
      i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. [ ] Application Data Sheet. See 37 CFR 1.76.
7. [ ] CD-ROM or CD-R in duplicate, large table or Computer Program *(Appendix)*
8. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   a. [ ] Computer Readable Form (CFR)
   b. [ ] Specification Sequence Listing on.
      i. [ ] CD-ROM or CD-R (2 copies), or
      ii [ ] Paper
   c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. [X] Assignment Papers (cover sheet & document(s))
10. [ ] 37 CFR 3.73(b) Statement *(when there is an assignee)* [ ] Power of Attorney
11. [ ] English Translation Document *(if applicable)*
12. [X] Information Disclosure Statement (IDS)/PTO - 1449 [X] Copies of IDS Citations
13. [ ] Preliminary Amendment
14. [X] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
15. [X] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. [ ] Request and Certification under 35 USC 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
17. [X] Other: Request for priority

18. **If a CONTINUING APPLICATION**, *check appropriate box, and supply the requisite information below and in a preliminary amendment:*
[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No:____/____

Prior application Information: Examiner_____ *Group/Art Unit:* _____

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

[X] *Customer Number or Bar Code Label* *08791* or [ ] *Correspondence address below*

Name	BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP				
Address	12400 Wilshire Boulevard, Seventh Floor				
City	Los Angeles	State	California	Zip Code	90025
Country	U.S.A.	Telephone	(310) 207-3800	Fax	(310) 820-5988

Name (Print/Type)	Thomas M. Coester, Reg. No. 39,637		
Signature	Thomas Coester	Date	12/29/00

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

PTO/SB/17 (09-00)
Approved for use through 10/31/2002. OMB 0651-0032
Patent and Trademark Office: U S DEPARTMENT OF COMMERCE

FEE TRANSMITTAL for FY 2001

Petent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT ($) 395.00

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Sung-Hoon Baek, et al.
Examiner Name	
Group Art Unit	
Attorney Docket Number	51876p219

METHOD OF PAYMENT (check one)

1. ☒ The Commissioner is hereby authorized to charge indicated fees and credit any over payments to.

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

☒ Charge Any Additional Fee Required Under 37CFR 1.16 and 1.17

☒ Applicant claims small entity status. See 37 CFR 1.27

2. ☐ Payment Enclosed:

☐ Check ☐ Money Order ☐ Other

FEE CALCULATION

1. FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	710	201	355	Utility filing fee	$355
106	320	206	160	Design filing fee	
107	490	207	245	Plant filing fee	
108	710	208	355	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 355.00

2. EXTRA CLAIM FEES

	Extra Claims		Fee from below		Fee Paid
Total Claims 8	-20** = 0	X	$9.00	=	0.00
Independent Claims 1	-3** = 0	X	$40.00	=	0.00
Multiple Dependent				=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	80	202	40	Independent claims in excess of 3
104	270	204	135	Multiple Dependent claim
109	80	209	40	**Reissue independent claims over original patent
110	18	210	9	**Reissue claims in excess of 20 and over orginal patent

SUBTOTAL (2) ($) 0.00

***or number of previously paid, if greater; For Reissues, see above*

FEE CALCULATION (continued)

3. ADDITIONAL FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for *ex parte* reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for response within first month	
116	390	216	195	Extension for response within second month	
117	890	217	445	Extension for response within third month	
118	1,390	218	695	Extension for response within fourth month	
128	1,890	228	945	Extension for response within fifth month	
119	310	219	155	Notice of Appeal	
120	310	220	155	Filing a brief in support of an appeal	
121	270	221	135	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidably	
141	1,240	241	620	Petition to revive - unintentionally	
142	1,240	242	620	Utility issue fee (or reissue)	
143	440	243	220	Design issue fee	
144	600	244	300	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	180	126	180	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	40
146	710	246	355	Filing a submission after final rejection (37 CFR 1.129(a))	
149	710	249	355	For each additional invention to be examined (37 CFR 1.129(b))	
179	710	279	355	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	

Other fee (specify) _____

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 40.00

SUBMITTED BY

Typed or Printed Name	Thomas M. Coester, Reg. No. 39,637			Complete (if applicable) Reg. Number	
Signature	Thomas Coester	Date	12/29/00	Deposit Account User ID	02-2666

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

Our Ref. No.: 51876.P219
Express Mail No. EM014066885US

UTILITY APPLICATION FOR UNITED STATES PATENT

FOR

APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

Inventor(s): Sung-Hoon Baek et al.

APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

Field of the Invention

The present invention relates to an apparatus for a redundant interconnection between multiple host computers and a redundant arrays of inexpensive disks (hereinafter, referred to as 'RAID'); and, more particularly, to an apparatus for a redundant interconnection between multiple host computers and multiple controllers of the RAID, which is capable of supporting a fault tolerance of the RAID controllers and simultaneously heightening performance.

Prior Art of the Invention

A RAID is a storage system based on a large capacity and a high performance, by using much quantity of disks, and is a fault tolerant system in which the disks or controllers etc. have a redundant nature. In general, the RAID has two controllers, which are used like a method shown in Fig. 1 or 2.

Fig. 1 is an exemplary block diagram showing a general connection method between the host computers and the RAID having the conventional two controllers.

As shown in the drawing, such system independently uses two RAID controllers 140, 141, and has an independent connection with network interface controllers 110, 111 of the host computers. That

is, such system has twice the bandwidth and twice the performance. However, there is such a problem that a loss of data occurs when one out of two RAID controllers 140,141 has a trouble, in other words, this system does not become the fault tolerant system.

Fig. 2 is an exemplary block diagram of a general host interface system having a communication interface for an error recovery between the conventional two controllers.

In order to provide fault tolerance not provided in Fig. 1, two RAID controllers 230, 231 and host computers 200, 201 are connected with each other through a hub or switch 210 in one network. Thus, even though one RAID controller 230 or 231 has a trouble, all of the host computers 200, 201 are connected to a RAID controller that does not have a trouble. That is, this RAID controller not having the trouble serves as a role of the controller that has the trouble. Also, since the RAID controllers 230, 231 should exchange information with each other by preparing in advance against some trouble, the RAID controllers 230, 231 are connected with each other through communication controllers 221, 222. However, in this case only a half of performance for the bandwidth provided in Fig. 1 can be obtained.

Fig. 3 is an exemplary block diagram showing a wiring method between a conventional RAID and the host computers.

The construction shown in the drawing partially represents a systematic connection between a RAID and host computers, which is extracted from contents disclosed in the U.S. Patent No. 5,812,754. However, this construction has no any difference from that of Fig. 2, in the structure of a communication network, and

in case that one out of two host computers 300, 301 has rather a trouble, there is caused a problem that a network is broken. Thus, this construction is inferior to the construction of Fig. 2.

Summary of the Invention

Therefore, it is an object of the present invention to provide an apparatus for a redundant interconnection between multiple host computers and a RAID, which is capable of supporting a fault tolerance of a RAID controller and simultaneously heightening a performance.

In accordance with the present invention, the apparatus for a redundant interconnection between multiple hosts and a RAID comprises a plurality of RAID controllers for processing requests of numerous host computers connected with one another through an industrial standard communication network such as fibre channel and performing fault tolerant function; a plurality of connecting units for connecting the plurality of RAID controllers to the numerous host computers; and a plural number of network interface controllers respectively contained into the plurality of RAID controllers, the network interface controllers being for exchanging information directly with each of opposite network interface controllers provided within the numerous host computers and within opposite RAID controllers, through the plurality of connecting units.

Brief Description of the Drawings

The above and other objects and features of the instant invention will become apparent from the following description of preferred embodiments taken in conjunction with the accompanying drawings, in which:

Fig. 1 is an exemplary block diagram showing a general connection system between host computers and a RAID having conventional two controllers;

Fig. 2 indicates an exemplary block diagram of a general host interface system having a communication interface for an error recovery between the conventional two controllers;

Fig. 3 illustrates an exemplary block diagram of a wiring method between a conventional RAID and host computers;

Fig. 4 is a block diagram showing one embodiment of a host interface system as an internal installment system between a RAID and host computers in accordance with the present invention;

Fig. 5 depicts a block diagram providing one embodiment of a host interface system as an external installment system between a RAID and host computers in the present invention; and

Fig. 6 is a block diagram showing one embodiment of a host interface system as a network switch between a RAID and host computers in the invention.

Preferred Embodiment of the Invention

Hereinafter, preferred embodiments of the present invention

will be described in detail with reference to the accompanying drawings.

Fig. 4 is a block diagram showing one embodiment of a host matching system as an internal installment system between a RAID and host computers in accordance with the present invention.

As shown in Fig. 4, in the inventive host interface system, a communication circuit is provided in order for an error recovery between two RAID controllers 460, 461, and the bandwidth between two groups as the host computers 400 to 405 and two RAID controllers 460, 461 becomes twice the single connection bandwidth. Also, in the inventive host interface system, even though one RAID controller 460 or 461 has an occurrence of a trouble, the bandwidth becomes twice the single connection bandwidth.

That is to say, in a RAID 490, two RAID controllers 460, 461 and hubs 440, 441 exist, and in each of the RAID controllers 460, 461, a pair of network interface controllers 470, 471; 480, 481 are provided. Herewith, the hubs 440, 441 are provided to connect a system connected to these hubs by one network and maintain the network even though one system has an occurrence of a trouble or a short of a line, and it can be as a hub or a switch. Hereinafter, they are named a "hub" altogether.

Hub ports, 420 to 424, 430 to 434, shown in Fig. 4 indicate an example for a simple internal structure of a fibre channel arbitrated loop hub, and this is based on an already well-known technique, thus there will be herein no more description therefore in the invention. The hub observes its corresponding communication network standard.

A network, in which the RAID controllers, the hubs and the host computers are connected with one another, corresponds to the industrial standard communication network such as fibre channel, asynchronous transfer mode (ATM) and InfiniBand etc. and they are hereinafter named a 'network'.

Network interface controllers, 410 to 415, contained into the host computers, 400 to 405, and the network interface controllers 470, 471, 480, 481 of the RAID controllers 460, 461 are connected with one another by two networks through two hubs 440, 441, and according to a sort of the networks, the network interface controller becomes a fibre channel controller, an ATM controller and an InfiniBand controller etc.

At this time, a communication line, representatively shown as 450 in the drawing, for connecting the network interface controller to the hub is a copper line or an optical fibre, which is matched to a corresponding standard.

Meanwhile, two network interface controllers 470, 471 of the first RAID controller 460 are respectively connected to two different hub ports 423, 432, and two network interface controllers 480, 481 of the second RAID controller 461 are respectively connected to two different hub ports 422, 433. The rest ports 420, 421, 424, 430, 431, 434 of the hubs 440, 441 are connected to the host computers 400 to 405. Just, there is no distinction between the hub ports 420 to 424 of the first hub 440 at all. Also, there is no distinction between the hub ports 430 to 434 of the second hub 441 at all.

The hub port connected to the host computer among the hub

ports of the hub 440, namely, 420, 421, 424, is more than one, and there is no limitation to the maximum number. Further, What it is connected to the host computer among the hub ports of the second hub 441, namely, 430, 431, 434, is more than one, and there is no limitation to the maximum number. The hub ports 424, 434 and the host computers 400, 405, which are shown as dot lines in Fig. 4, mean that there is no, or more than one hub port or host computer.

Since, in such construction, two independent networks are constructed; it has twice the bandwidth of the single network, and a communication passage between two RAID controllers needed to perform the fault tolerant function of two RAID controllers 460, 461 is formed. Thus, information from the second network interface controller 471 of the first RAID controller 460 is sent to the first network interface controller 481 of the second RAID controller 461. Also, information from the second network interface controller 480 of the second RAID controller 461 is transmitted to the first network interface controller 470 of the first RAID controller 460. Further, information from the first network interface controller 481 of the second RAID controller 461 is transmitted to the second network interface controller 471 of the first RAID controller 460, and information from the first network interface controller 470 of the first RAID controller 460 is sent to the second network interface controller 480 of the second RAID controller 461.

The first network interface controllers 470, 480 of two RAID controllers 460, 461 respectively supply data of the host computers 400 to 402 connected to the first hub 440 and the host computer 403 to 405 connected to the second hub 441, and process information

transmitted from the opposite network interface controllers 471, 481.

If any one out of two RAID controllers 460, 461 has an occurrence of an error, the RAID controller having the error occurrence is removed from the network, and a second network interface controller of an opposite RAID controller not having the error occurrence takes over a function of a first network interface controller of the RAID controller having the error occurrence.

Fig. 5 is a block diagram providing one embodiment of the host interface system as an external installation system between the RAID and the host computers in the present invention.

As shown in Fig. 4, the present invention can be constructed by a method of internally installing the hubs 440, 441 in the RAID 490, and as shown in Fig. 5, it can be constructed by using the hubs 510, 520 for use of an external-installation.

Fig. 6 is a block diagram showing one embodiment of the host interface system as a network switch between the inventive RAID and host computers.

As shown in the drawing, Fig. 6 can have a function of Fig. 4. In other words, information from a second network interface controller 622 of a first RAID controller 620 is sent to a first network interface controller 632 of a second RAID controller 630, and information from a second network interface controller 632 of the second RAID controller 630 is transmitted to a first network interface controller 621 of the first RAID controller 620. Further, information from the first network interface controller 631 of the second RAID controller 630 is transmitted to the second network

interface controller 622 of the first RAID controller 620. Also, information from the first network interface controller 621 of the first RAID controller 620 is sent to the second network interface controller 632 of the second RAID controller 630.

Just, there is no distinction between respective ports, representatively 611, of a network switch 610 at all and also, the internal structure of a network switch 610 can be configured according to a selection of a user (not shown in Fig. 6).

In accordance with the present invention, as afore-mentioned, even in a case of an error occurrence in a RAID controller, there exist two independent networks and two network interface controllers, and the bandwidth of a single network can be twice maintained. Accordingly, a function of fault tolerance between two RAID controllers can be constructed without a drop of the bandwidth.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without deviating from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. An apparatus for a redundant interconnection between multiple hosts and a RAID, comprising:

a plurality of RAID controlling units for processing a requirement of numerous host computers;

a plurality of connecting units for connecting the plurality of RAID controlling units to the numerous host computers; and

a plural number of network interface controlling units respectively contained into the plurality of RAID controlling units, for exchanging information directly with the numerous host computers and an opposite network interface controlling unit provided within an opposite RAID controlling units, through the plurality of connecting units.

2. The apparatus as recited in claim 1, wherein said respective RAID controlling units are connected to the plurality of individual connecting units.

3. The apparatus as recited in claim 2, wherein said each network interface controlling unit is constructed by a pair, namely two, and is contained into the plurality of RAID controlling units, a first network interface controlling unit of said network interface controlling unit being connected to the connecting unit of one side and a second network interface controlling unit thereof being connected to the connecting unit of another side.

4. The apparatus as recited in claim 3, wherein said each network interface controlling unit further comprises:

the first network interface controlling unit for processing the requirement of the numerous host computers; and

the second network interface controlling unit used for fault tolerance in a communication between the respective RAID controlling units when the respective RAID controlling units do not have the occurrence of the error, said second network interface controlling unit being for executing a function of the first network interface controlling unit of the RAID controlling unit having the occurrence of the error in case that one given RAID controlling unit has the occurrence of the error.

5. The apparatus as recited in claim 1, wherein said plurality of connecting units have connection ports more than three, the two connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a hub equipment connected with the numerous host computers.

6. The apparatus as recited in claim 1, wherein said plurality of connecting units have the connection ports more than three, the two connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a network switch equipment connected with the numerous host computers.

7. The apparatus as recited in claim 1, wherein said plurality of connecting units have the connection ports more than five, the four connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a switch connected with the numerous host computers.

8. The apparatus as recited in claim 1, wherein said RAID controlling unit, said network interface controlling unit and said connecting unit are respectively constructed by a pair, the first network interface controlling unit of a first RAID controlling unit being connected to a first connecting unit, the second network interface controlling unit of said first RAID controlling unit being connected to a second connecting unit, the first network interface controlling unit of a second RAID controlling unit being connected to the second connecting unit, and the second network interface controlling unit of the second RAID controlling unit being connected to the first connecting unit.

Abstract of the Disclosure

The apparatus for a redundant interconnection between multiple hosts and a redundant array of inexpensive disks (hereinafter, referred to as 'RAID'), which is capable of supporting a fault tolerance of RAID controllers and simultaneously heightening a performance, comprises a plurality of RAID controlling units for processing a requirement of numerous host computers connected with one another through the industrial standard communication network and for fault tolerance; a plurality of connecting units for connecting the plurality of RAID controlling units to the numerous host computers; and a plural number of network interface controlling units respectively contained into the plurality of RAID controlling units, for exchanging information directly with an opposite network interface controlling unit provided within an opposite RAID controlling unit and the numerous host computers, through the plurality of connecting units.

Attorney Docket No.: 51876p219

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

SUNG-HOON BAEK, ET AL.

Application No.:

Filed:

For: **APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID - UTILITY**

Art Group:

Examiner:

Assistant Commissioner for Patents
Washington, D.C. 20231

TRANSMITTAL OF FORMAL DRAWINGS

Sir:

Enclosed herewith for filing in the above-identified U.S. Patent Application are the formal drawings, 6 sheets including 6 Figures. Applicant hereby authorizes any additional extension or petition fees under 37 C.F.R. §1.17 or credit for any overpayment to our Deposit Account No. 02-2666. A copy of the Fee Transmittal sheet is enclosed.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN

Dated: 12/29/00

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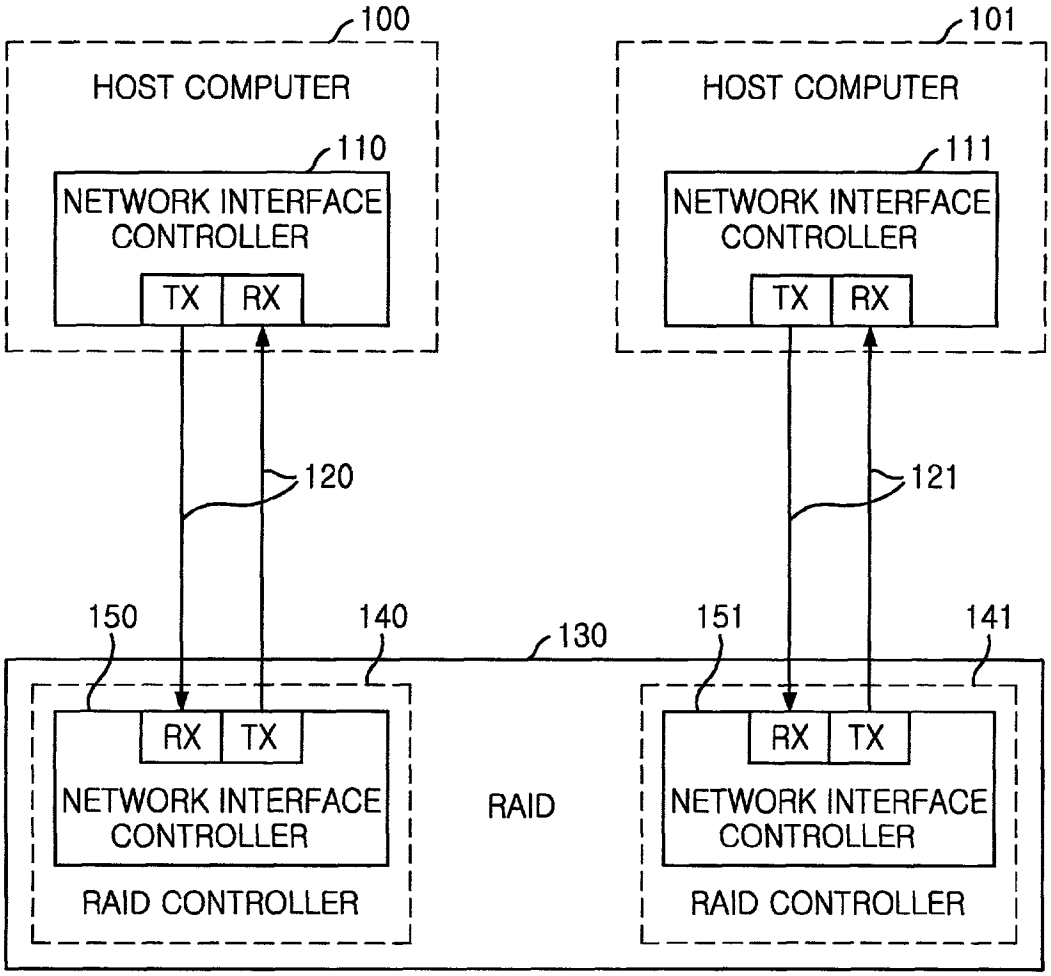
FIG. 1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HOST COMPUTER
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NETWORK INTERFACE CONTROLLER
TX
RX
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HOST COMPUTER
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121
150
140
130
151
141
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RAID CONTROLLER
RAID
RX
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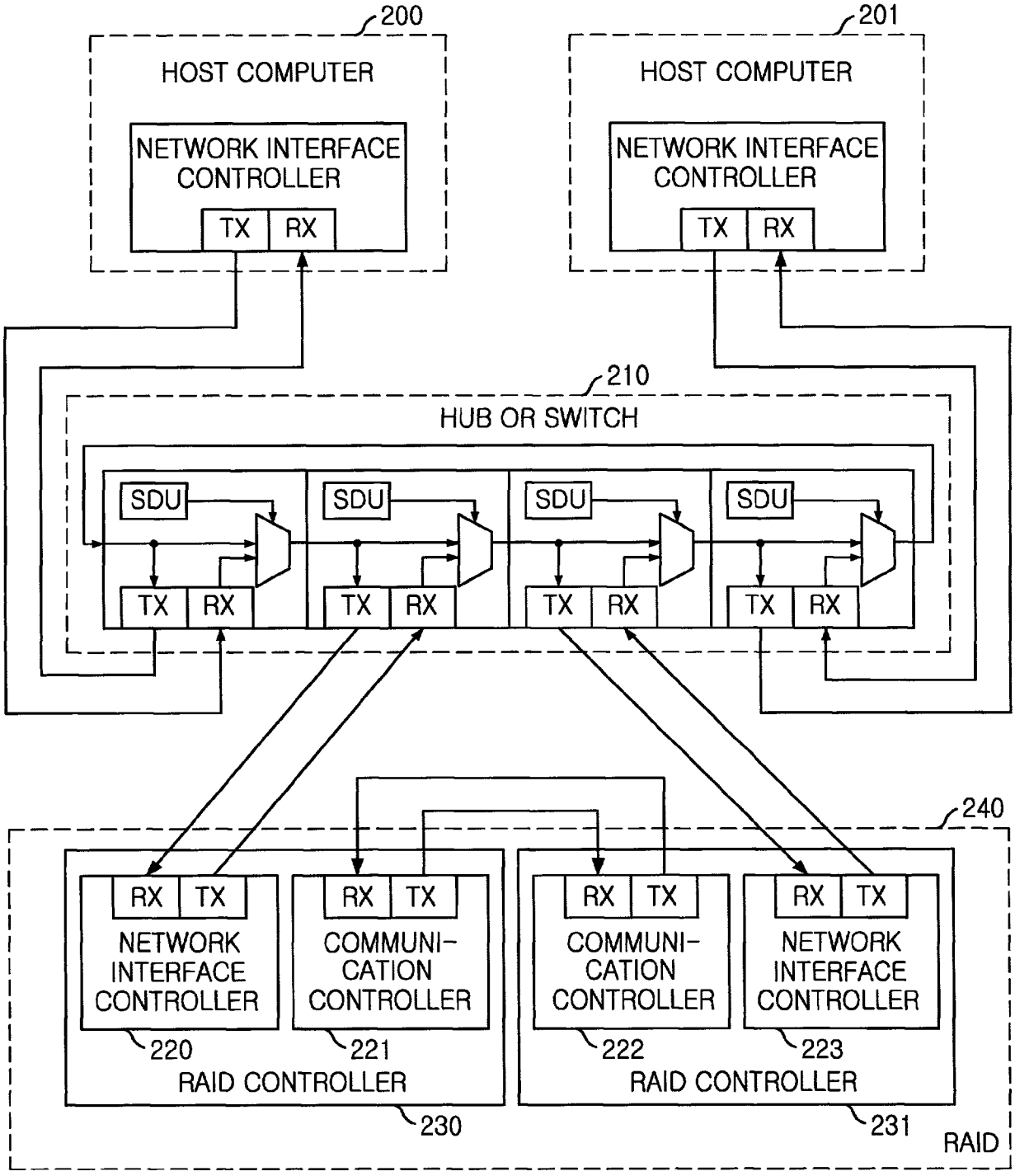
NETWORK INTERFACE CONTROLLER
RAID CONTROLLER

FIG. 2


200
HOST COMPUTER
NETWORK INTERFACE CONTROLLER
TX
RX
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HOST COMPUTER
NETWORK INTERFACE CONTROLLER
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RX
210
HUB OR SWITCH
SDU
SDU
SDU
SDU
TX
RX
TX
RX
TX
RX
TX
RX
240
RX
TX
NETWORK INTERFACE CONTROLLER
RX
TX
COMMUNI-CATION CONTROLLER
RX
TX
COMMUNI-CATION CONTROLLER
RX
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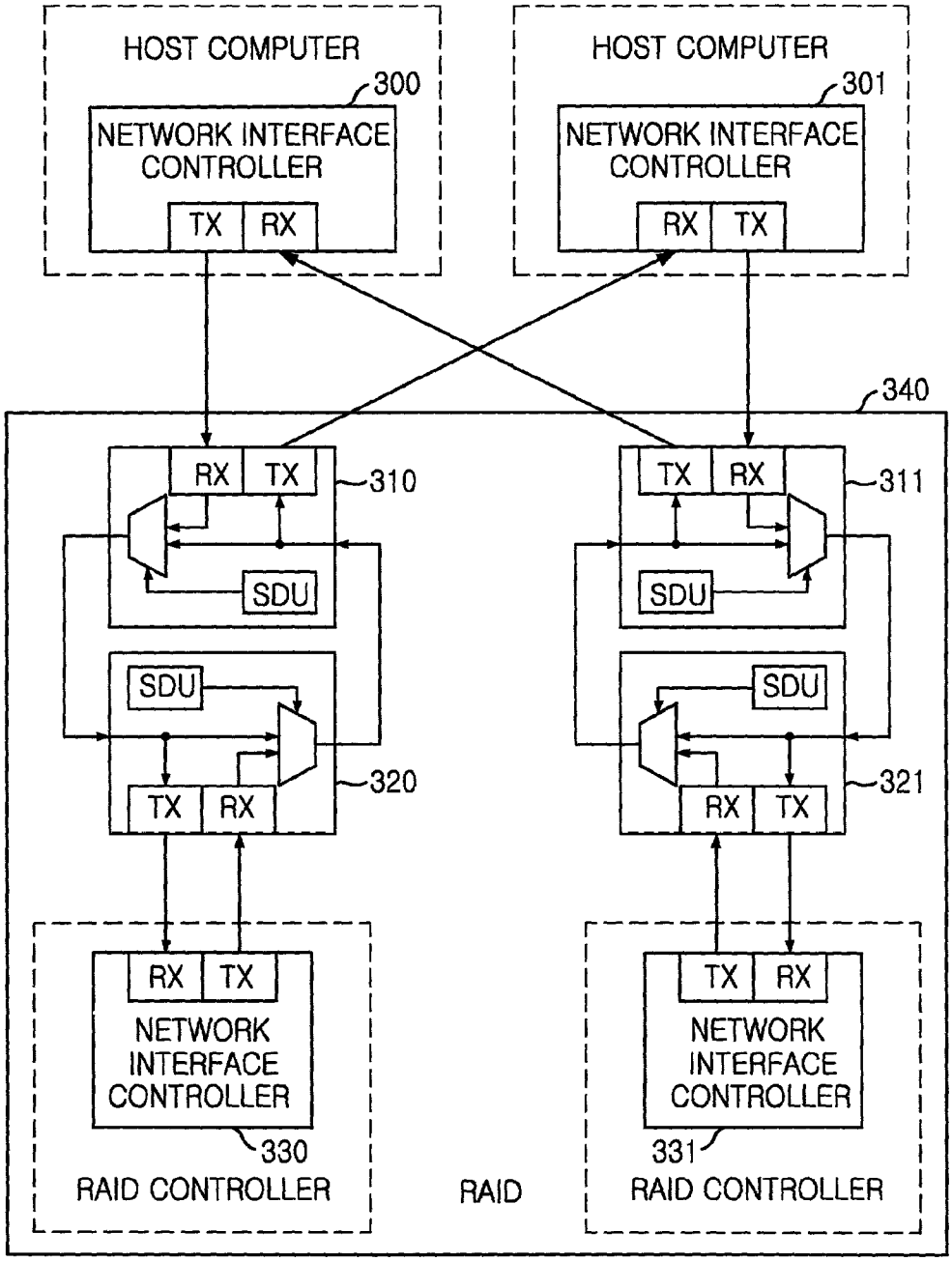
221
RAID CONTROLLER
230
222
223
RAID CONTROLLER
231
RAID

FIG. 3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300
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HOST COMPUTER
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TX
310
SDU
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RX
311
SDU
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320
SDU
RX
TX
321
RX
TX
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RAID CONTROLLER
RAID
TX
RX
NETWORK INTERFACE CONTROLLER
331
RAID CONTROLLER

FIG. 4

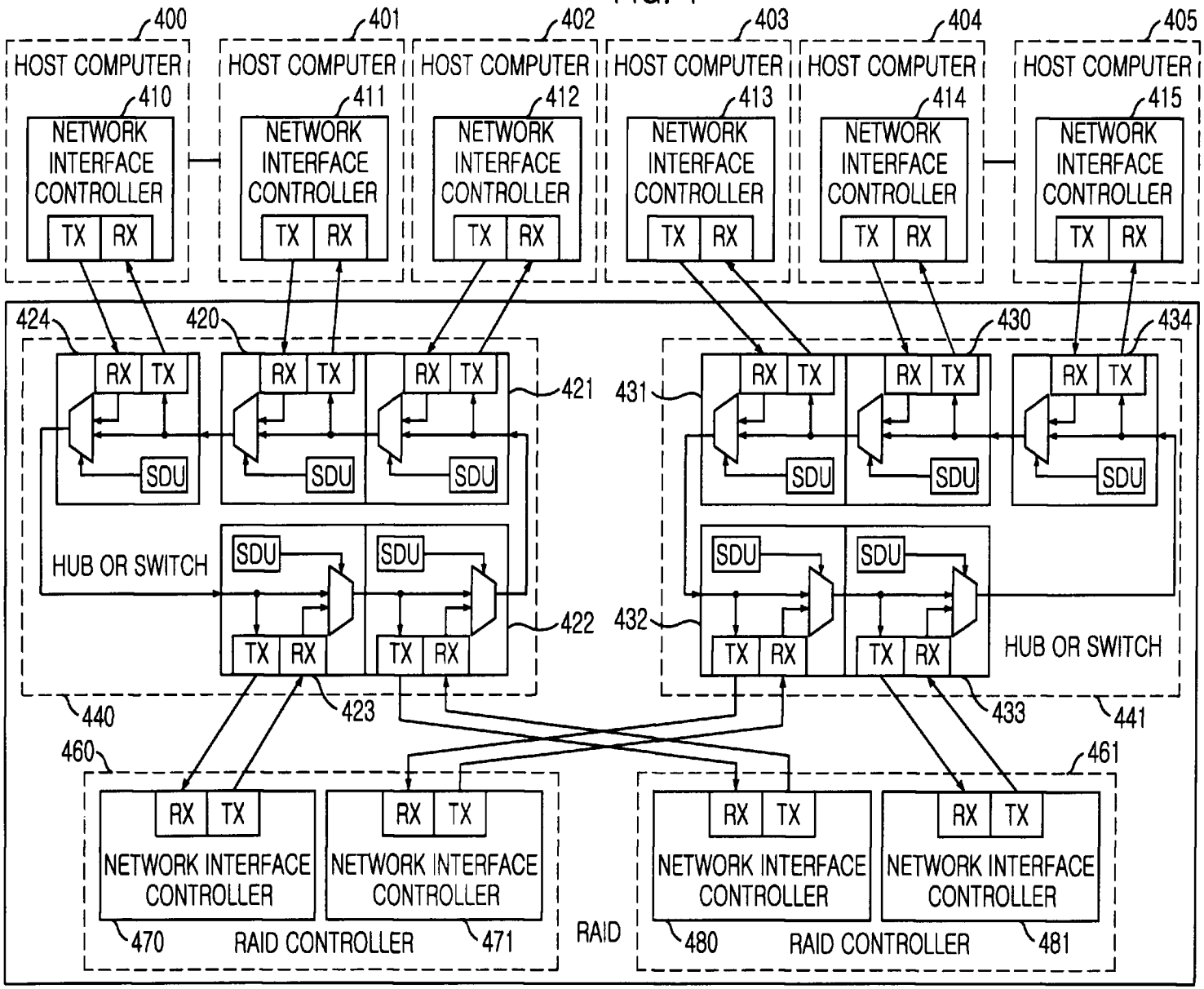


FIG. 5

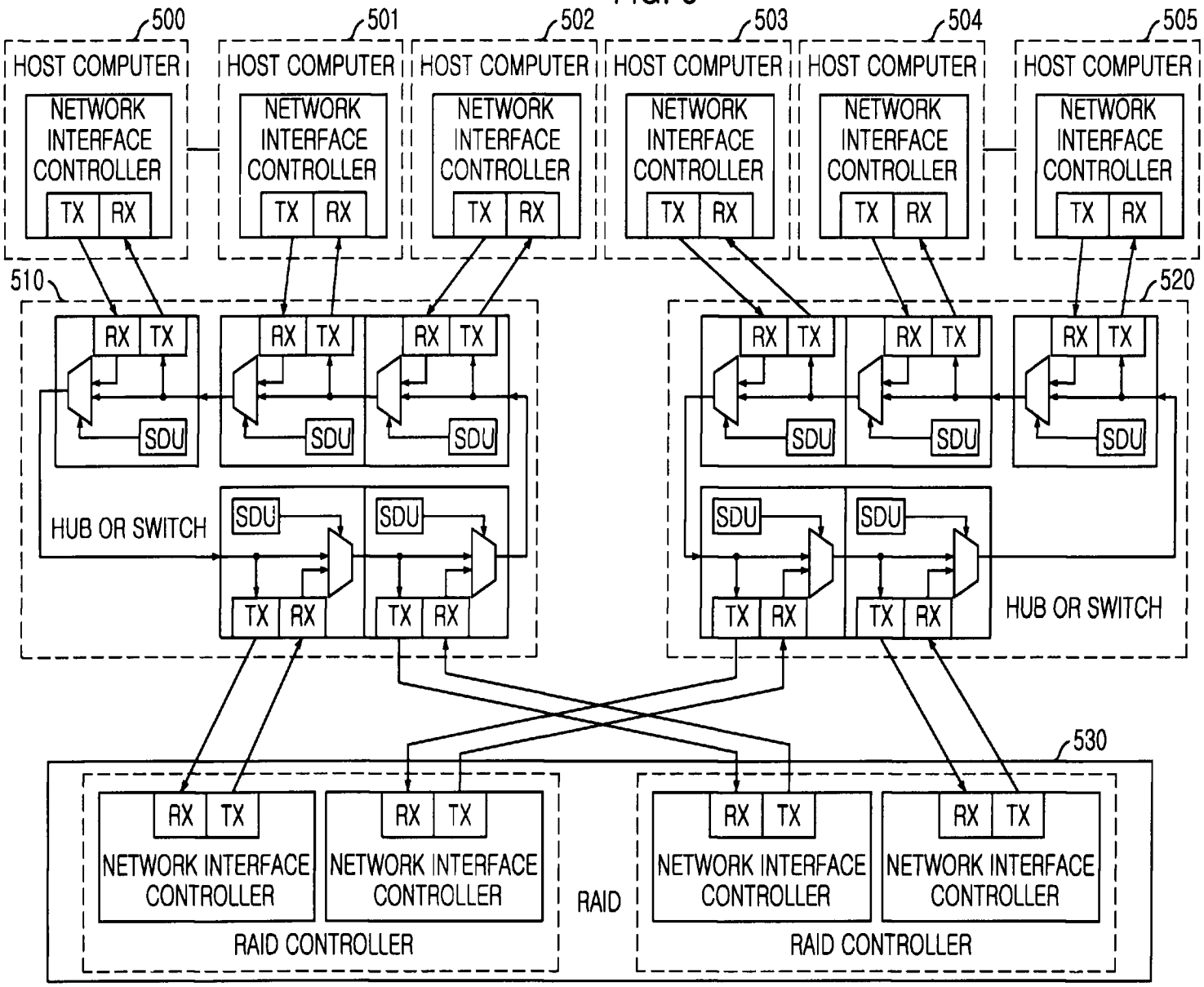
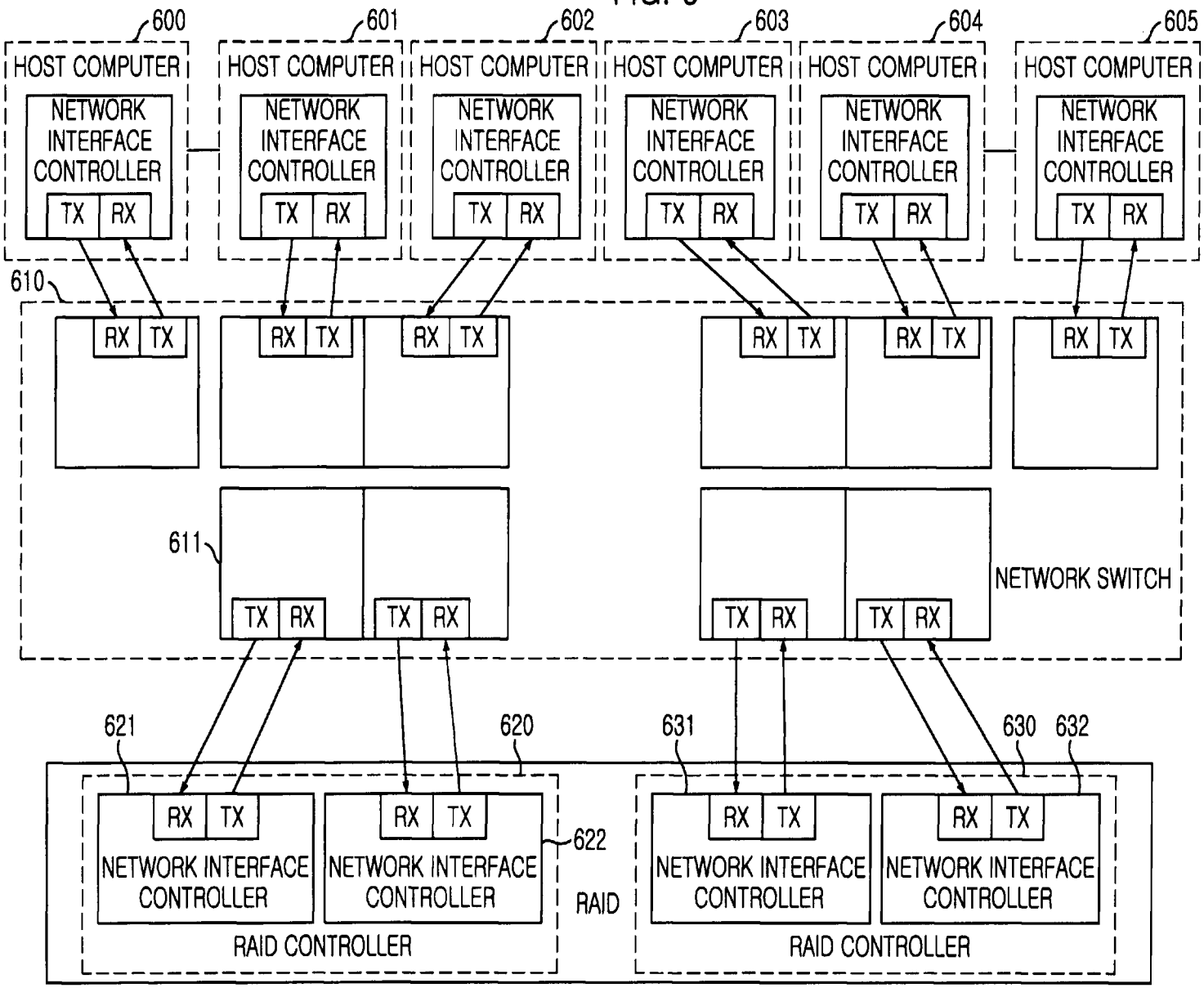


FIG. 6



Our Ref.: 51876.P219

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first an joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

the specification of which

__x__ is attached hereto.

_____ was filed on _____ as

Application Serial No. _____

and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I do not know and do not believe that the same was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, ant that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby claim foreign priority benefits under Title 35,, United States Code, Section 119, of ay foreign application(s) for patent or invertor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
2000-54807	REPUBLIC OF KOREA	19 / 09 / 2000	X	
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status -- patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status -- patented, pending, abandoned)

I hereby appoint BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN, a firm including: Bradley J. Bereznak, revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further 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 that such wilful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's Signature _____ Date Nov. 1 2000

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Inventor's Signature _____ Date Nov. 1. 2000

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Full Name of Fourth/Joint Inventor _____

Inventor's Signature _____ Date _____

Residence _____ (City, State) Citizenship _____ (Country)

Post Office Address _____

Full Name of Fifth/Joint Inventor _____

Inventor's Signature _____ Date _____

Residence _____ (City, State) Citizenship _____ (Country)

Post Office Address _____

JC921 U.S. PTO 09/753245 12/29/00

JC541 19237

ISSUE CLASSIFICATION	
Class	Subclass

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PATENT NUMBER

U.S. UTILITY Patent Application

O.I.P.E.	PATENT DATE
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APPLICATION NO.	CONT/PRIOR	CLASS	SUBCLASS	ART UNIT	EXAMINER
09/753245	F	709	249	2153	Brancolini

APPLICANTS
Sung-Hoon Baek
Joong-Bae Kim
Yong-Youn Kim

TITLE
Apparatus for redundant interconnection between multiple hosts and raid

PTO-2040
12/99

ISSUING CLASSIFICATION

ORIGINAL		CROSS REFERENCE(S)						
CLASS	SUBCLASS	CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					
INTERNATIONAL CLASSIFICATION								
				☐ Continued on Issue Slip Inside File Jacket				

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	Sheets Drwg.	Figs. Drwg.	Print Fig.	Total Claims	Print Claim for O.G.

☐ The term of this patent subsequent to ________ (date) has been disclaimed.	________ (Assistant Examiner) ________ (Date)	NOTICE OF ALLOWANCE MAILED
☐ The term of this patent shall not extend beyond the expiration date of U.S Patent. No. ________	________ (Primary Examiner) ________ (Date)	ISSUE FEE Amount Due / Date Paid
☐ The terminal ____ months of this patent have been disclaimed.	________ (Legal Instruments Examiner) ________ (Date)	ISSUE BATCH NUMBER

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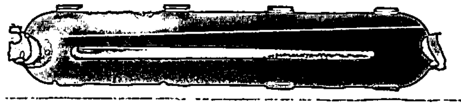

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Class	Sub.	Date	Exmr.
709	201, 202 203 217, 218 219 223, 224 239, 240 244	5-11-04	[signature]
711	114		

SEARCH NOTES
(INCLUDING SEARCH STRATEGY)

	Date	Exmr.
Consult Z. Maung PE 2154 Discussed Clm 1 & Possible transfer Classes for search	5-10-04	[signature]
East Search Image: 709, 711 Text: "Redundant Connection RAID" US, EPO, JPO NPL Search IEEExplore "RAID Connection"	5-11-04	[signature]

INTERFERENCE SEARCHED

Class	Sub.	Date	Exmr.

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ISSUE SLIP STAPLE AREA (for additional cross references)

POSITION	INITIALS	ID NO.	DATE
FEE DETERMINATION			
O.I.P.E. CLASSIFIER		20	11/30
FORMALITY REVIEW	Zm	927	04/11/01
RESPONSE FORMALITY REVIEW			

INDEX OF CLAIMS

✔	Rejected	N	Non-elected
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—	(Through numeral)... Canceled	A	Appeal
÷	Restricted	O	Objected

Claim		Date
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UTILITY PATENT APPLICATION TRANSMITTAL

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Attorney Docket No.	51876p219
First Inventor or Application Identifier	Sung-Hoon Baek
Title	APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE
Express Mail Label No.	em014066885us

JC921 U.S. PTO 09/747245 12/29/00

JC974 U.S. PTO 12/29/00

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. ☒ Fee Transmittal Form *(e.g. PTO/SB/17)*
(Submit an original, and a duplicate for fee processing)
2. ☒ Applicant claims small entity status. See 37 CFR 1.27.
3. ☒ Specification *Total Pages* 14
(preferred arrangement set forth below)
- Descriptive title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to sequence listing, a table, or a computer program listing appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (if filed)
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

4. ☒ Drawing(s) *(35 U.S.C.113)* *Total Sheets* 6
5. Oath or Declaration *Total Pages* 2
a. ☒ Newly executed (original copy)
b. ☐ Copy from a prior application (37 CFR 1.63(d))
(for continuation/divisional with Box 18 completed)
i. ☐ DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☐ Application Data Sheet. See 37 CFR 1.76.
7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program *(Appendix)*
8. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
a. ☐ Computer Readable Form (CFR)
b. ☐ Specification Sequence Listing on:
i. ☐ CD-ROM or CD-R (2 copies); or
ii. ☐ Paper
c. ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. ☒ Assignment Papers (cover sheet & document(s))
10. ☐ 37 CFR 3.73(b) Statement *(when there is an assignee)* ☐ Power of Attorney
11. ☐ English Translation Document *(if applicable)*
12. ☒ Information Disclosure Statement (IDS)/PTO - 1449 ☒ Copies of IDS Citations
13. ☐ Preliminary Amendment
14. ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
15. ☒ Certified Copy of Priority Document(s)
(if foreign priority is claimed)
16. ☐ Request and Certification under 35 USC 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
17. ☒ Other: Request for priority

18. **If a CONTINUING APPLICATION**, *check appropriate box, and supply the requisite information below and in a preliminary amendment:*
☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: ____/____
Prior application Information: Examiner ____ *Group/Art Unit:* ____
For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

☒ *Customer Number of Bar Code Label* *08791* or ☐ *Correspondence address below*

Name	BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP				
Address	12400 Wilshire Boulevard, Seventh Floor				
City	Los Angeles	State	California	Zip Code	90025
Country	U.S.A.	Telephone	(310) 207-3800	Fax	(310) 820-5988

Name (Print/Type)	Thomas M. Coester, Reg. No. 39,637		
Signature	Thomas Coester	Date	12/29/00

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231.

FEE TRANSMITTAL for FY 2001

Petent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT ($) 395.00

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Sung-Hoon Baek, et al.
Examiner Name	
Group Art Unit	
Attorney Docket Number	51876p219

METHOD OF PAYMENT (check one)

1. ☒ The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

Deposit Account Number: 02-2666

Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

☒ Charge Any Additional Fee Required Under 37CFR 1.16 and 1.17

☒ Applicant claims small entity status. See 37 CFR 1.27

2. ☐ Payment Enclosed:

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FEE CALCULATION

1. FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	710	201	355	Utility filing fee	$355
106	320	206	160	Design filing fee	
107	490	207	245	Plant filing fee	
108	710	208	355	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 355.00

2. EXTRA CLAIM FEES

	Extra Claims		Fee from below		Fee Paid
Total Claims	8 -20** =	0	X $9.00	=	0.00
Independent Claims	1 -3** =	0	X $40.00	=	0.00
Multiple Dependent				=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	80	202	40	Independent claims in excess of 3
104	270	204	135	Multiple Dependent claim
109	80	209	40	**Reissue independent claims over original patent
110	18	210	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0.00

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FEE CALCULATION (continued)

3. ADDITIONAL FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
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Other fee (specify) _____

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SUBTOTAL (3) ($) 40.00

SUBMITTED BY				Complete (if applicable)	
Typed or Printed Name	Thomas M. Coester, Reg. No. 39,637			Reg. Number	
Signature	Thomas Coester	Date	12/29/00	Deposit Account User ID	02-2666

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01-03-01 A

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JC974 U.S. PTO 12/29/00

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	51876p219
First Inventor or Application Identifier	Sung-Hoon Baek
Title	APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE
Express Mail Label No.	em014066885us

JC921 U.S. PTO 09/747345 12/29/00

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Prior application Information: Examiner ____ *Group/Art Unit:* ____

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Group Art Unit	
Attorney Docket Number	51876p219

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#2

Attorney Docket No.: 51876p219

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:	
SUNG-HOON BAEK, ET AL.	Art Group:
Application No.:	Examiner:
Filed:	
For: **APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID - UTILITY**	

Assistant Commissioner for Patents
Washington, D.C. 20231

TRANSMITTAL OF FORMAL DRAWINGS

Sir:

Enclosed herewith for filing in the above-identified U.S. Patent Application are the formal drawings, 6 sheets including 6 Figures. Applicant hereby authorizes any additional extension or petition fees under 37 C.F.R. §1.17 or credit for any overpayment to our Deposit Account No. 02-2666. A copy of the Fee Transmittal sheet is enclosed.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN

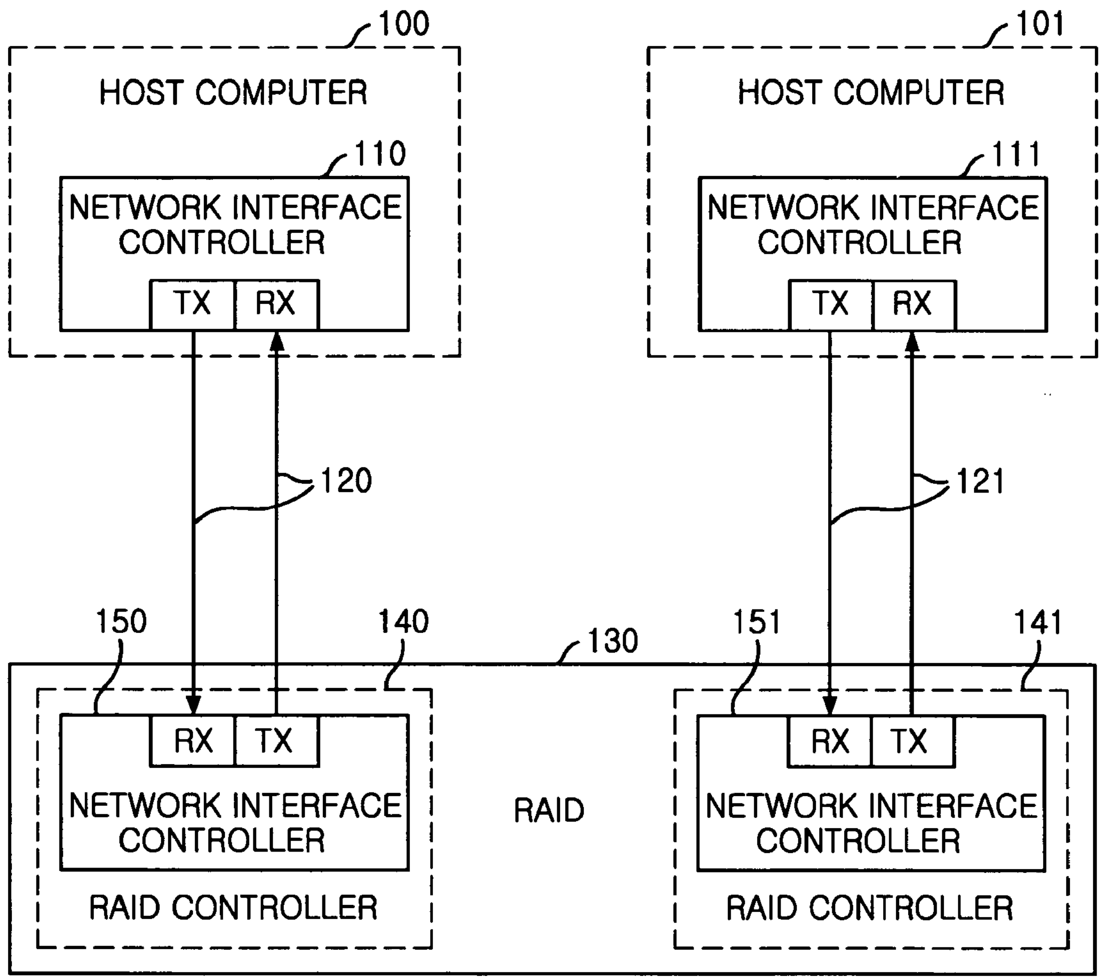
Dated: 12/29/00

Thomas Coester

Thomas M. Coester, Reg. No. 39,637

12400 Wilshire Blvd., 7th Floor
Los Angeles, California 90025
Telephone: (310) 207-3800

FIG. 1


100
HOST COMPUTER
110
NETWORK INTERFACE CONTROLLER
TX
RX
101
HOST COMPUTER
111
NETWORK INTERFACE CONTROLLER
TX
RX
120
121
150
140
130
151
141
RX
TX
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RAID CONTROLLER
RAID
RX
TX
NETWORK INTERFACE CONTROLLER
RAID CONTROLLER

FIG. 2

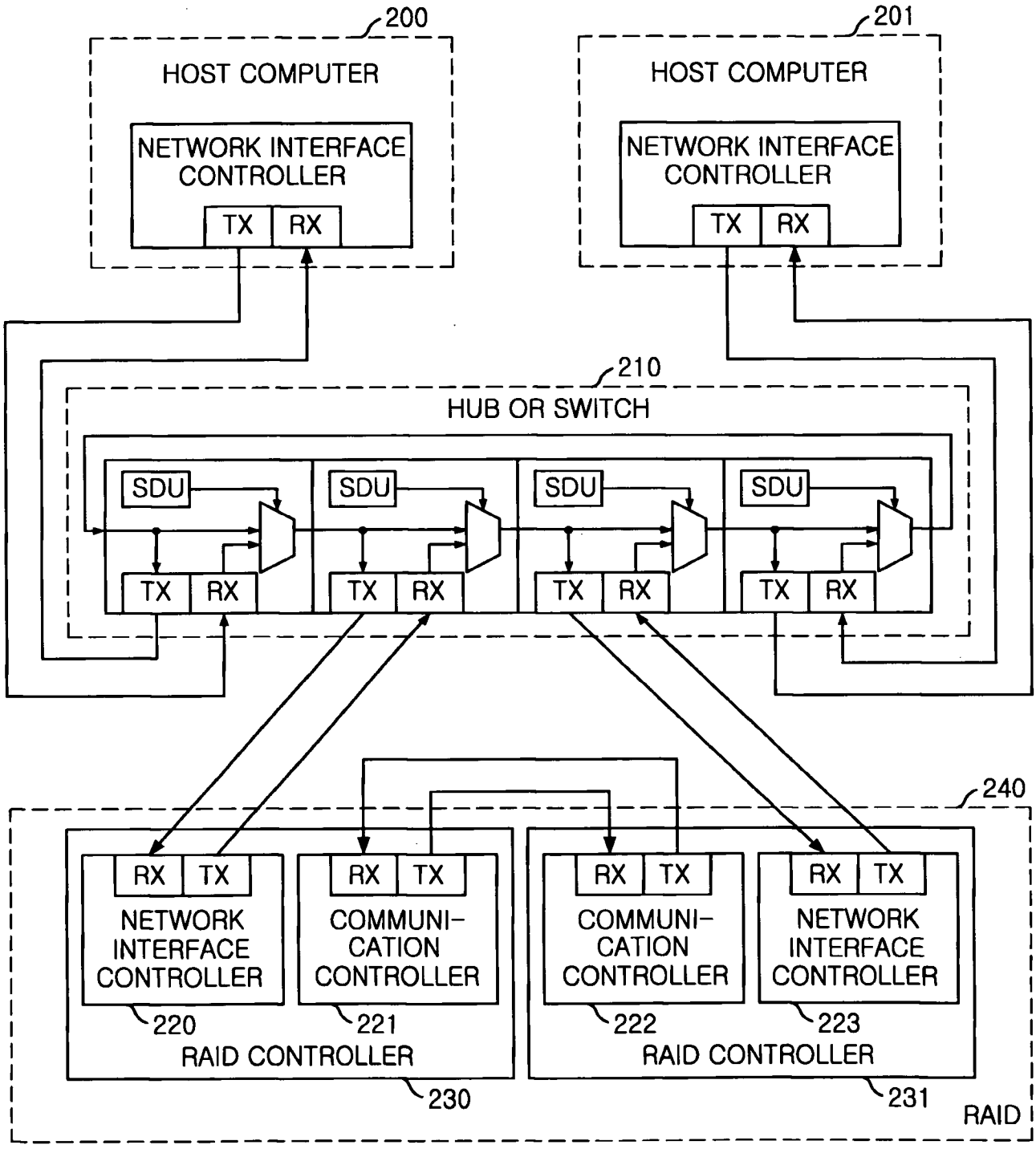
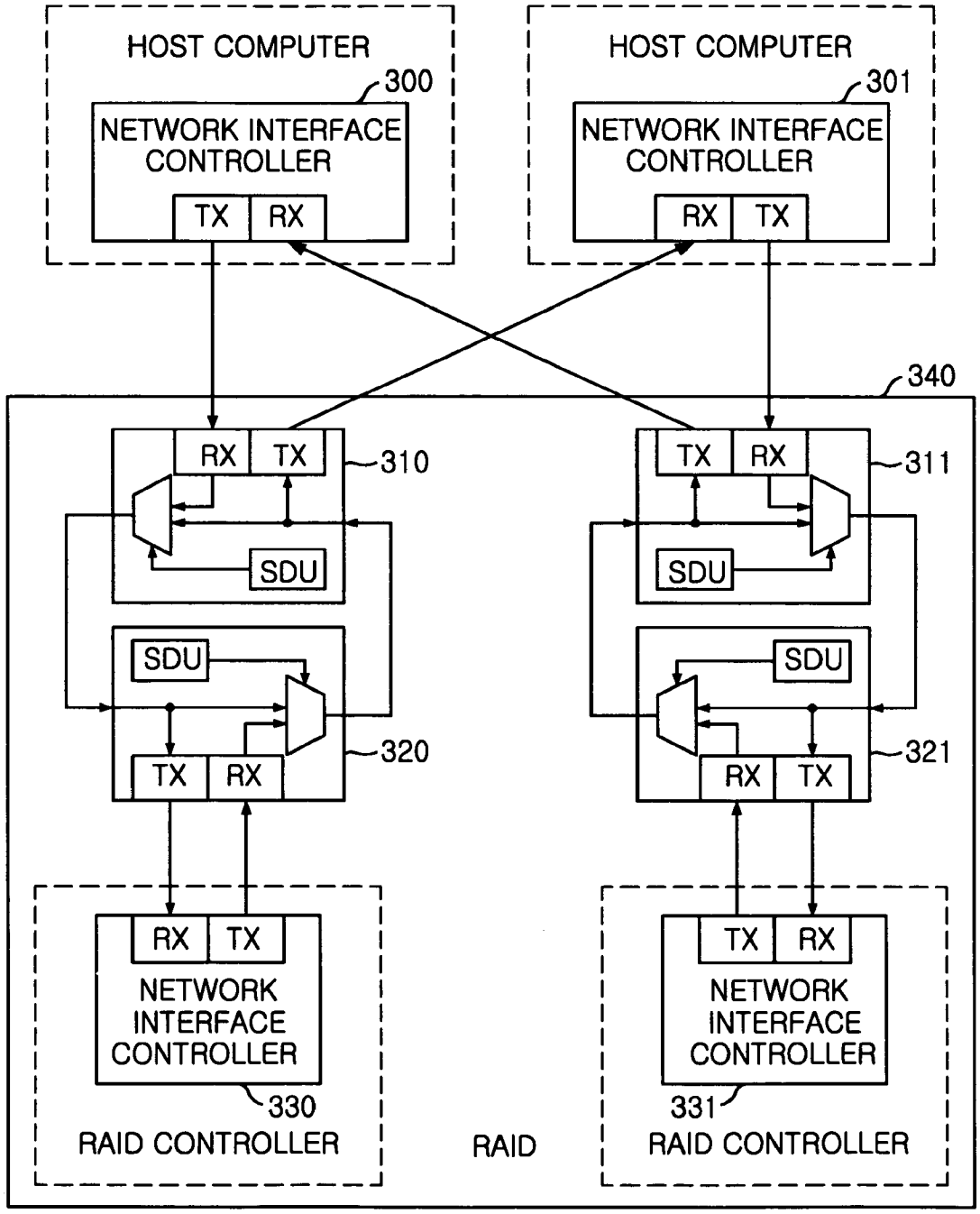

200
HOST COMPUTER
NETWORK INTERFACE CONTROLLER
TX
RX
201
HOST COMPUTER
NETWORK INTERFACE CONTROLLER
TX
RX
210
HUB OR SWITCH
SDU
SDU
SDU
SDU
TX
RX
TX
RX
TX
RX
TX
RX
240
RX
TX
NETWORK INTERFACE CONTROLLER
220
RX
TX
COMMUNI-CATION CONTROLLER
221
RAID CONTROLLER
230
RX
TX
COMMUNI-CATION CONTROLLER
222
RX
TX
NETWORK INTERFACE CONTROLLER
223
RAID CONTROLLER
231
RAID

FIG. 3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RX
311
SDU
SDU
TX
RX
320
SDU
RX
TX
321
RX
TX
NETWORK INTERFACE CONTROLLER
330
RAID CONTROLLER
RAID
TX
RX
NETWORK INTERFACE CONTROLLER
331
RAID CONTROLLER

FIG. 4

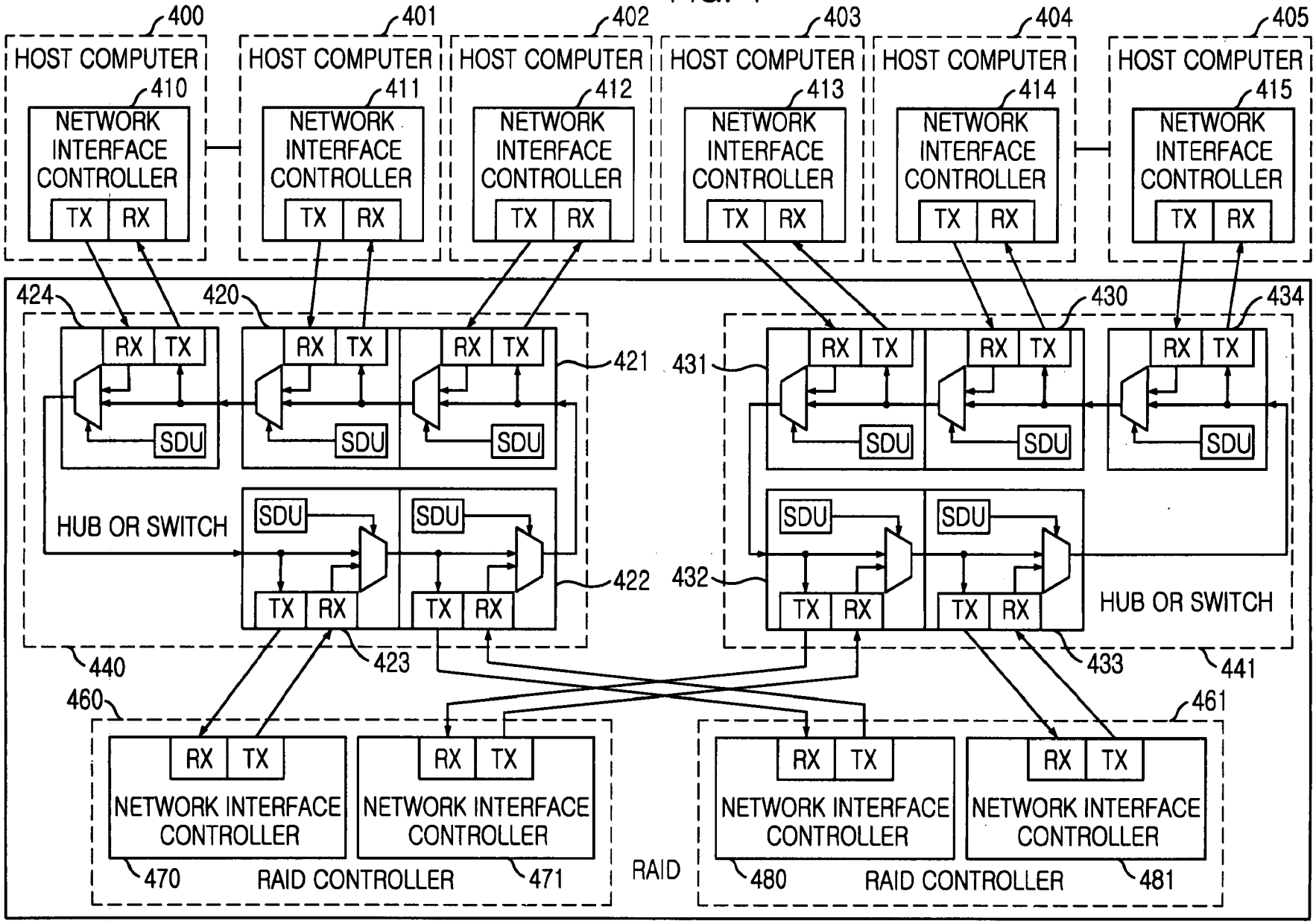


FIG. 5

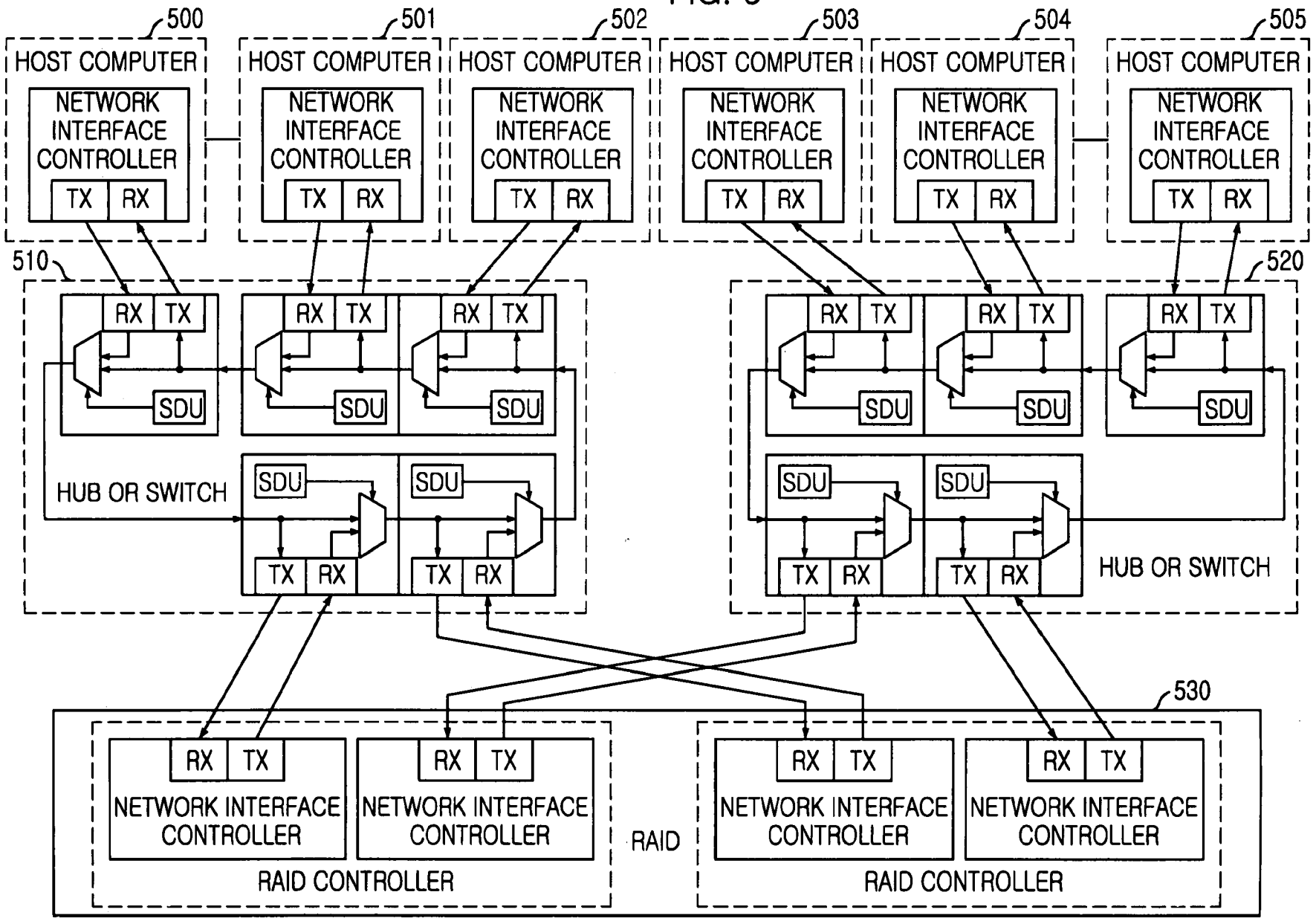
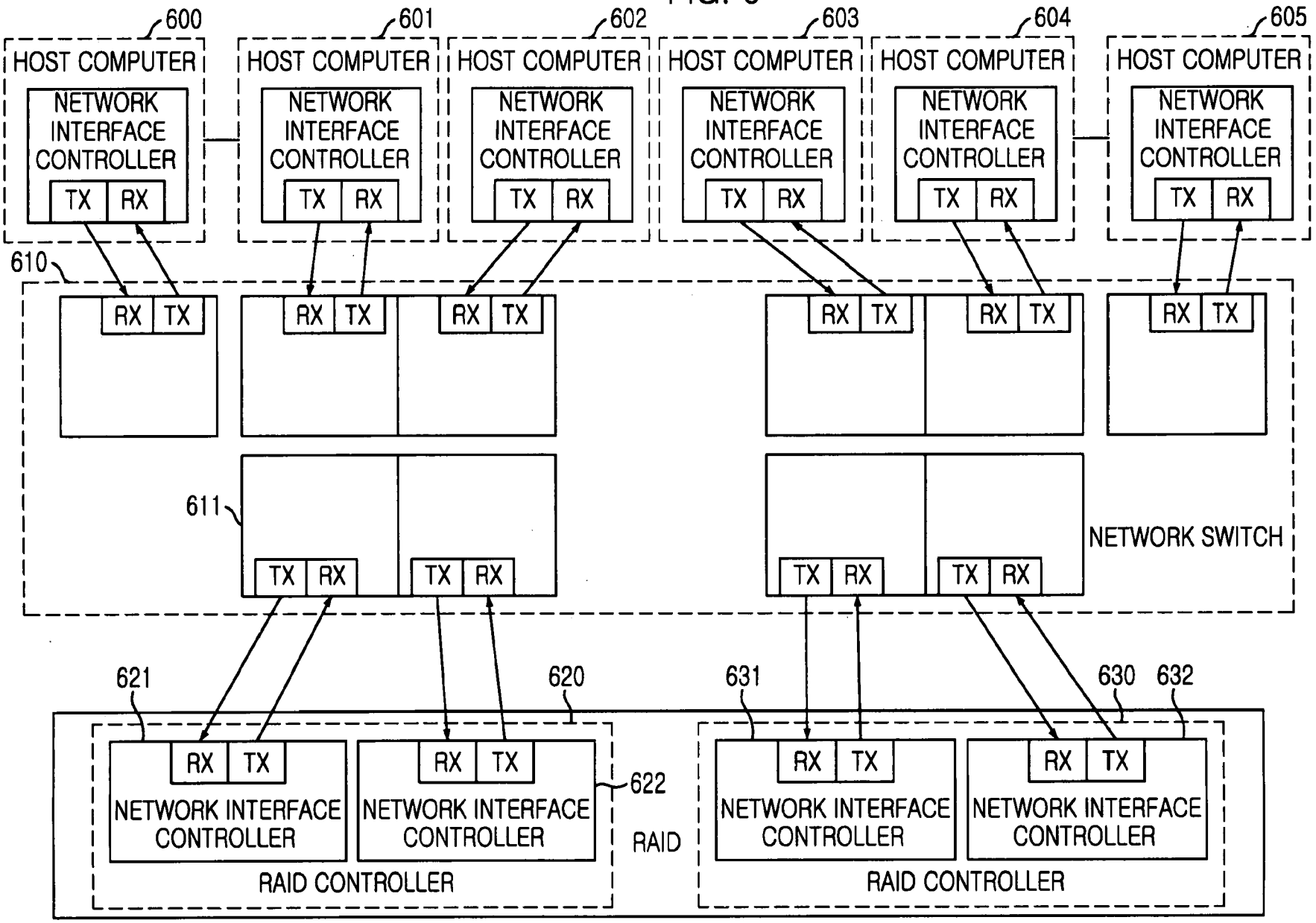


FIG. 6



Our Ref. No.: 51876.P219
Express Mail No. EM014066885US

UTILITY APPLICATION FOR UNITED STATES PATENT

FOR

APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

Inventor(s): Sung-Hoon Baek et al.

APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

Field of the Invention

The present invention relates to an apparatus for a redundant interconnection between multiple host computers and a redundant arrays of inexpensive disks (hereinafter, referred to as 'RAID'); and, more particularly, to an apparatus for a redundant interconnection between multiple host computers and multiple controllers of the RAID, which is capable of supporting a fault tolerance of the RAID controllers and simultaneously heightening performance.

Prior Art of the Invention

A RAID is a storage system based on a large capacity and a high performance, by using much quantity of disks, and is a fault tolerant system in which the disks or controllers etc. have a redundant nature. In general, the RAID has two controllers, which are used like a method shown in Fig. 1 or 2.

Fig. 1 is an exemplary block diagram showing a general connection method between the host computers and the RAID having the conventional two controllers.

As shown in the drawing, such system independently uses two RAID controllers 140, 141, and has an independent connection with network interface controllers 110, 111 of the host computers. That

is, such system has twice the bandwidth and twice the performance. However, there is such a problem that a loss of data occurs when one out of two RAID controllers 140,141 has a trouble, in other words, this system does not become the fault tolerant system.

Fig. 2 is an exemplary block diagram of a general host interface system having a communication interface for an error recovery between the conventional two controllers.

In order to provide fault tolerance not provided in Fig. 1, two RAID controllers 230, 231 and host computers 200, 201 are connected with each other through a hub or switch 210 in one network. Thus, even though one RAID controller 230 or 231 has a trouble, all of the host computers 200, 201 are connected to a RAID controller that does not have a trouble. That is, this RAID controller not having the trouble serves as a role of the controller that has the trouble. Also, since the RAID controllers 230, 231 should exchange information with each other by preparing in advance against some trouble, the RAID controllers 230, 231 are connected with each other through communication controllers 221, 222. However, in this case only a half of performance for the bandwidth provided in Fig. 1 can be obtained.

Fig. 3 is an exemplary block diagram showing a wiring method between a conventional RAID and the host computers.

The construction shown in the drawing partially represents a systematic connection between a RAID and host computers, which is extracted from contents disclosed in the U.S. Patent No. 5,812,754. However, this construction has no any difference from that of Fig. 2, in the structure of a communication network, and

in case that one out of two host computers 300, 301 has rather a trouble, there is caused a problem that a network is broken. Thus, this construction is inferior to the construction of Fig. 2.

Summary of the Invention

Therefore, it is an object of the present invention to provide an apparatus for a redundant interconnection between multiple host computers and a RAID, which is capable of supporting a fault tolerance of a RAID controller and simultaneously heightening a performance.

In accordance with the present invention, the apparatus for a redundant interconnection between multiple hosts and a RAID comprises a plurality of RAID controllers for processing requests of numerous host computers connected with one another through an industrial standard communication network such as fibre channel and performing fault tolerant function; a plurality of connecting units for connecting the plurality of RAID controllers to the numerous host computers; and a plural number of network interface controllers respectively contained into the plurality of RAID controllers, the network interface controllers being for exchanging information directly with each of opposite network interface controllers provided within the numerous host computers and within opposite RAID controllers, through the plurality of connecting units.

Brief Description of the Drawings

The above and other objects and features of the instant invention will become apparent from the following description of preferred embodiments taken in conjunction with the accompanying drawings, in which:

Fig. 1 is an exemplary block diagram showing a general connection system between host computers and a RAID having conventional two controllers;

Fig. 2 indicates an exemplary block diagram of a general host interface system having a communication interface for an error recovery between the conventional two controllers;

Fig. 3 illustrates an exemplary block diagram of a wiring method between a conventional RAID and host computers;

Fig. 4 is a block diagram showing one embodiment of a host interface system as an internal installment system between a RAID and host computers in accordance with the present invention;

Fig. 5 depicts a block diagram providing one embodiment of a host interface system as an external installment system between a RAID and host computers in the present invention; and

Fig. 6 is a block diagram showing one embodiment of a host interface system as a network switch between a RAID and host computers in the invention.

Preferred Embodiment of the Invention

Hereinafter, preferred embodiments of the present invention

will be described in detail with reference to the accompanying drawings.

Fig. 4 is a block diagram showing one embodiment of a host matching system as an internal installment system between a RAID and host computers in accordance with the present invention.

As shown in Fig. 4, in the inventive host interface system, a communication circuit is provided in order for an error recovery between two RAID controllers 460, 461, and the bandwidth between two groups as the host computers 400 to 405 and two RAID controllers 460, 461 becomes twice the single connection bandwidth. Also, in the inventive host interface system, even though one RAID controller 460 or 461 has an occurrence of a trouble, the bandwidth becomes twice the single connection bandwidth.

That is to say, in a RAID 490, two RAID controllers 460, 461 and hubs 440, 441 exist, and in each of the RAID controllers 460, 461, a pair of network interface controllers 470, 471; 480, 481 are provided. Herewith, the hubs 440, 441 are provided to connect a system connected to these hubs by one network and maintain the network even though one system has an occurrence of a trouble or a short of a line, and it can be as a hub or a switch. Hereinafter, they are named a "hub" altogether.

Hub ports, 420 to 424, 430 to 434, shown in Fig. 4 indicate an example for a simple internal structure of a fibre channel arbitrated loop hub, and this is based on an already well-known technique, thus there will be herein no more description therefore in the invention. The hub observes its corresponding communication network standard.

A network, in which the RAID controllers, the hubs and the host computers are connected with one another, corresponds to the industrial standard communication network such as fibre channel, asynchronous transfer mode (ATM) and InfiniBand etc. and they are hereinafter named a 'network'.

Network interface controllers, 410 to 415, contained into the host computers, 400 to 405, and the network interface controllers 470, 471, 480, 481 of the RAID controllers 460, 461 are connected with one another by two networks through two hubs 440, 441, and according to a sort of the networks, the network interface controller becomes a fibre channel controller, an ATM controller and an InfiniBand controller etc.

At this time, a communication line, representatively shown as 450 in the drawing, for connecting the network interface controller to the hub is a copper line or an optical fibre, which is matched to a corresponding standard.

Meanwhile, two network interface controllers 470, 471 of the first RAID controller 460 are respectively connected to two different hub ports 423, 432, and two network interface controllers 480, 481 of the second RAID controller 461 are respectively connected to two different hub ports 422, 433. The rest ports 420, 421, 424, 430, 431, 434 of the hubs 440, 441 are connected to the host computers 400 to 405. Just, there is no distinction between the hub ports 420 to 424 of the first hub 440 at all. Also, there is no distinction between the hub ports 430 to 434 of the second hub 441 at all.

The hub port connected to the host computer among the hub

ports of the hub 440, namely, 420, 421, 424, is more than one, and there is no limitation to the maximum number. Further, What it is connected to the host computer among the hub ports of the second hub 441, namely, 430, 431, 434, is more than one, and there is no limitation to the maximum number. The hub ports 424, 434 and the host computers 400, 405, which are shown as dot lines in Fig. 4, mean that there is no, or more than one hub port or host computer.

Since, in such construction, two independent networks are constructed; it has twice the bandwidth of the single network, and a communication passage between two RAID controllers needed to perform the fault tolerant function of two RAID controllers 460, 461 is formed. Thus, information from the second network interface controller 471 of the first RAID controller 460 is sent to the first network interface controller 481 of the second RAID controller 461. Also, information from the second network interface controller 480 of the second RAID controller 461 is transmitted to the first network interface controller 470 of the first RAID controller 460. Further, information from the first network interface controller 481 of the second RAID controller 461 is transmitted to the second network interface controller 471 of the first RAID controller 460, and information from the first network interface controller 470 of the first RAID controller 460 is sent to the second network interface controller 480 of the second RAID controller 461.

The first network interface controllers 470, 480 of two RAID controllers 460, 461 respectively supply data of the host computers 400 to 402 connected to the first hub 440 and the host computer 403 to 405 connected to the second hub 441, and process information

transmitted from the opposite network interface controllers 471, 481.

If any one out of two RAID controllers 460, 461 has an occurrence of an error, the RAID controller having the error occurrence is removed from the network, and a second network interface controller of an opposite RAID controller not having the error occurrence takes over a function of a first network interface controller of the RAID controller having the error occurrence.

Fig. 5 is a block diagram providing one embodiment of the host interface system as an external installation system between the RAID and the host computers in the present invention.

As shown in Fig. 4, the present invention can be constructed by a method of internally installing the hubs 440, 441 in the RAID 490, and as shown in Fig. 5, it can be constructed by using the hubs 510, 520 for use of an external-installation.

Fig. 6 is a block diagram showing one embodiment of the host interface system as a network switch between the inventive RAID and host computers.

As shown in the drawing, Fig. 6 can have a function of Fig. 4. In other words, information from a second network interface controller 622 of a first RAID controller 620 is sent to a first network interface controller 632 of a second RAID controller 630, and information from a second network interface controller 632 of the second RAID controller 630 is transmitted to a first network interface controller 621 of the first RAID controller 620. Further, information from the first network interface controller 631 of the second RAID controller 630 is transmitted to the second network

interface controller 622 of the first RAID controller 620. Also, information from the first network interface controller 621 of the first RAID controller 620 is sent to the second network interface controller 632 of the second RAID controller 630.

Just, there is no distinction between respective ports, representatively 611, of a network switch 610 at all and also, the internal structure of a network switch 610 can be configured according to a selection of a user (not shown in Fig. 6).

In accordance with the present invention, as afore-mentioned, even in a case of an error occurrence in a RAID controller, there exist two independent networks and two network interface controllers, and the bandwidth of a single network can be twice maintained. Accordingly, a function of fault tolerance between two RAID controllers can be constructed without a drop of the bandwidth.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without deviating from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. An apparatus for a redundant interconnection between multiple hosts and a RAID, comprising:

a plurality of RAID controlling units for processing a requirement of numerous host computers;

a plurality of connecting units for connecting the plurality of RAID controlling units to the numerous host computers; and

a plural number of network interface controlling units respectively contained into the plurality of RAID controlling units, for exchanging information directly with the numerous host computers and an opposite network interface controlling unit provided within an opposite RAID controlling units, through the plurality of connecting units.

2. The apparatus as recited in claim 1, wherein said respective RAID controlling units are connected to the plurality of individual connecting units.

3. The apparatus as recited in claim 2, wherein said each network interface controlling unit is constructed by a pair, namely two, and is contained into the plurality of RAID controlling units, a first network interface controlling unit of said network interface controlling unit being connected to the connecting unit of one side and a second network interface controlling unit thereof being connected to the connecting unit of another side.

4. The apparatus as recited in claim 3, wherein said each network interface controlling unit further comprises:

the first network interface controlling unit for processing the requirement of the numerous host computers; and

the second network interface controlling unit used for fault tolerance in a communication between the respective RAID controlling units when the respective RAID controlling units do not have the occurrence of the error, said second network interface controlling unit being for executing a function of the first network interface controlling unit of the RAID controlling unit having the occurrence of the error in case that one given RAID controlling unit has the occurrence of the error.

5. The apparatus as recited in claim 1, wherein said plurality of connecting units have connection ports more than three, the two connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a hub equipment connected with the numerous host computers.

6. The apparatus as recited in claim 1, wherein said plurality of connecting units have the connection ports more than three, the two connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a network switch equipment connected with the numerous host computers.

7. The apparatus as recited in claim 1, wherein said plurality of connecting units have the connection ports more than five, the four connection ports among them being connected to said network interface controlling unit and the rest connection ports thereof being provided as a switch connected with the numerous host computers.

8. The apparatus as recited in claim 1, wherein said RAID controlling unit, said network interface controlling unit and said connecting unit are respectively constructed by a pair, the first network interface controlling unit of a first RAID controlling unit being connected to a first connecting unit, the second network interface controlling unit of said first RAID controlling unit being connected to a second connecting unit, the first network interface controlling unit of a second RAID controlling unit being connected to the second connecting unit, and the second network interface controlling unit of the second RAID controlling unit being connected to the first connecting unit.

Abstract of the Disclosure

The apparatus for a redundant interconnection between multiple hosts and a redundant array of inexpensive disks (hereinafter, referred to as 'RAID'), which is capable of supporting a fault tolerance of RAID controllers and simultaneously heightening a performance, comprises a plurality of RAID controlling units for processing a requirement of numerous host computers connected with one another through the industrial standard communication network and for fault tolerance; a plurality of connecting units for connecting the plurality of RAID controlling units to the numerous host computers; and a plural number of network interface controlling units respectively contained into the plurality of RAID controlling units, for exchanging information directly with an opposite network interface controlling unit provided within an opposite RAID controlling unit and the numerous host computers, through the plurality of connecting units.

Ref.: 51876.P219

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first an joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

the specification of which

__x__ is attached hereto.

_____ was filed on _____ as

Application Serial No. _____

and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I do not know and do not believe that the same was ever known or used in the United States of America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, ant that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby claim foreign priority benefits under Title 35,, United States Code, Section 119, of ay foreign application(s) for patent or invertor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
2000-54807	REPUBLIC OF KOREA	19 / 09 / 2000	X	
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status -- patented, pending, abandoned)
(Application Serial No.)	(Filing Date)	(Status -- patented, pending, abandoned)

I hereby appoint BLAKELY, [redacted]OLOFF, TAYLOR & ZAFMAN, a fi[redacted]cluding: Bradley J. Bereznak, revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further 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 that such wilful false statements may jeopardize the validity of the application or any patent issued thereon.

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Full Name of Fourth/Joint Inventor _____

Inventor's Signature _____ Date _____

Residence _____ (City, State) Citizenship _____ (Country)

Post Office Address _____

Full Name of Fifth/Joint Inventor _____

Inventor's Signature _____ Date _____

Residence _____ (City, State) Citizenship _____ (Country)

Post Office Address _____

UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231
www.uspto.gov

Bib Data Sheet

CONFIRMATION NO. 8804

SERIAL NUMBER	FILING DATE / RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
09/753,245	12/29/2000	709	2152	51876p219

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Joong-Bae Kim, Taejon, KOREA, REPUBLIC OF;
Yong-Youn Kim, Taejon, KOREA, REPUBLIC OF;

**** CONTINUING DATA ***************************

**** FOREIGN APPLICATIONS *********************

REPUBLIC OF KOREA 2000-54807 09/19/2000

IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 04/11/2001

** SMALL ENTITY **

		STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
Foreign Priority claimed	☒ yes ☐ no	KOREA, REPUBLIC OF	6	8	1
35 USC 119 (a-d) conditions met	☒ yes ☐ no ☐ Met after Allowance				
Verified and Acknowledged	Examiner's Signature / Initials				

ADDRESS

08791

TITLE

Apparatus for redundant interconnection between multiple hosts and raid

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
355	No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

01/05/2001 VYANG1 00000042 09753245
01 FC:201 355.00 OP

PTO-1556
(5/87)

*U.S. GPO: 2000-468-987/39595

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2000

Application or Docket Number: 09753245

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	8	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	8 minus 20=	*
INDEPENDENT CLAIMS	1 minus 3 =	*
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
BASIC FEE	355.00	OR	BASIC FEE	710.00
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL	355	OR	TOTAL	

CLAIMS AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)
AMENDMENT A		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	*	Minus	**	=
	Independent	*	Minus	***	=
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
RATE	ADDI-TIONAL FEE		RATE	ADDI-TIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

		(Column 1)		(Column 2)	(Column 3)
AMENDMENT B		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	*	Minus	**	=
	Independent	*	Minus	***	=
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDI-TIONAL FEE		RATE	ADDI-TIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

		(Column 1)		(Column 2)	(Column 3)
AMENDMENT C		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
	Total	*	Minus	**	=
	Independent	*	Minus	***	=
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDI-TIONAL FEE		RATE	ADDI-TIONAL FEE
X$ 9=		OR	X$18=	
X40=		OR	X80=	
+135=		OR	+270=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
***If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

CLAIMS ONLY

SERIAL NO.	FILING DATE
09753945	
APPLICANT(S)	

CLAIMS

	AS FILED		AFTER 1st AMENDMENT		AFTER 2nd AMENDMENT	
	IND.	DEP.	IND.	DEP.	IND.	DEP.
1	1					
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3		1				
4		1				
5		1				
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TOTAL IND.	1					
TOTAL DEP.	1					
TOTAL CLAIMS	8					

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99						
100						
TOTAL IND.						
TOTAL DEP.						
TOTAL CLAIMS						

* *MAY BE USED FOR ADDITIONAL CLAIMS OR ADMENDMENTS*

FORM PTO-2022 (1-98)

U.S.DEPARTMENT OF COMMERCE
Patent and Trademark Office

*U.S. GPO: 1998-443-593/89152

#3

Attorney Docket No.: 51876p219
Express Mail No.: em014066885us

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

SUNG-HOON BAEK, ET AL.

For: **APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID - UTILITY**

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Request for Priority

Sir:

Applicant respectfully requests a convention priority for the above-captioned application, namely Korean application number 2000-54807 filed September 19, 2000.

☒ A certified copy of the document is being submitted herewith.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN

Dated:

Thomas Coester

Thomas M. Coester, Reg. No. 39,637

12400 Wilshire Blvd., 7th Floor
Los Angeles, California 90025
Telephone: (310) 207-3800

<Priority Document Translation>

THE KOREAN INDUSTRIAL

PROPERTY OFFICE

This is to certify that the following application annexed hereto is a true copy from the records of the Korean Industrial Property Office.

Application Number : 2000-54807 (Patent)

Date of Application : September 19, 2000

Applicant(s) : ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE

October 18, 2000

COMMISSIONER

대 한 민 국 특 허 청
KOREAN INDUSTRIAL PROPERTY OFFICE

별첨 사본은 아래 출원의 원본과 동일함을 증명함.

This is to certify that the following application annexed hereto is a true copy from the records of the Korean Industrial Property Office.

출 원 번 호 : 특허출원 2000년 제 54807 호
Application Number

출 원 년 월 일 : 2000년 09월 19일
Date of Application

출 원 인 : 한국전자통신연구원
Applicant(s)

2000 년 10 월 18 일

특 허 청
COMMISSIONER

CERTIFIED COPY OF
PRIORITY DOCUMENT

【서류명】 특허출원서
【권리구분】 특허
【수신처】 특허청장
【참조번호】 0002
【제출일자】 2000.09.19
【발명의 명칭】 다중 호스트 컴퓨터와 레이드 사이의 중복연결을 위한 장치
【발명의 영문명칭】 The Apparatus for Redundant Interconnection between Multiple Hosts and RAID
【출원인】
【명칭】 한국전자통신연구원
【출원인코드】 3-1998-007763-8
【대리인】
【성명】 특허법인 신성 정지원
【대리인코드】 9-2000-000292-3
【포괄위임등록번호】 2000-051975-8
【대리인】
【성명】 특허법인 신성 원석희
【대리인코드】 9-1998-000444-1
【포괄위임등록번호】 2000-051975-8
【대리인】
【성명】 특허법인 신성 박해천
【대리인코드】 9-1998-000223-4
【포괄위임등록번호】 2000-051975-8
【발명자】
【성명의 국문표기】 백승훈
【성명의 영문표기】 BAEK,Sung Hoon
【주민등록번호】 741208-1691110
【우편번호】 305-390
【주소】 대전광역시 유성구 전민동 339-17번지 103호
【국적】 KR
【발명자】
【성명의 국문표기】 김중배
【성명의 영문표기】 KIM,Joong Bae

【주민등록번호】 601123-1109134
【우편번호】 305-390
【주소】 대전광역시 유성구 전민동 나래아파트 105-701
【국적】 KR
【발명자】
【성명의 국문표기】 김용연
【성명의 영문표기】 KIM,Yong Youn
【주민등록번호】 570807-1063533
【우편번호】 305-333
【주소】 대전광역시 유성구 어은동 99 한빛아파트 117-1002
【국적】 KR
【심사청구】 청구
【취지】 특허법 제42조의 규정에 의한 출원, 특허법 제60조의 규정에 의한 출원심사 를 청구합니다. 대리인
특허법인 신성 정지원 (인) 대리인
특허법인 신성 원석희 (인) 대리인
특허법인 신성 박해천 (인)
【수수료】
【기본출원료】 19 면 29,000 원
【가산출원료】 0 면 0 원
【우선권주장료】 0 건 0 원
【심사청구료】 8 항 365,000 원
【합계】 394,000 원
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【감면후 수수료】 197,000 원
【첨부서류】 1. 요약서·명세서(도면)_1통

【요약서】

【요약】

본 발명은 다중 호스트 컴퓨터와 독립 디스크 중복배열(RAID : Redundant Array of Inexpensive Disks, 이하 '레이드'라 함) 사이의 중복연결을 위한 장치에 관한 것으로, 레이드 제어기의 결함허용을 지원함과 동시에 성능을 높일 수 있는 다중 호스트 컴퓨터와 레이드 사이의 중복연결을 위한 장치를 제공하기 위하여, 다중 호스트 컴퓨터와 레이드 사이의 중복연결 장치에 있어서, 산업 표준 통신망을 통하여 연결된 복수의 호스트 컴퓨터들의 요구를 처리하고 결함허용 기능을 수행하기 위한 다수 개의 레이드 제어 수단; 상기 다수의 레이드 제어 수단과 상기 다수의 호스트 컴퓨터 사이를 연결하기 위한 다수 개의 연결 수단; 및 상기 각 다수의 레이드 제어 수단 내에 포함되어 상기 다수의 연결 수단을 통하여 상기 다수의 호스트 컴퓨터 및 상대 레이드 제어수단 내의 상대 망 정합 제어 수단과 직접 정보를 교환하는 다수 개의 망 정합 제어 수단을 포함하며, 레이드 시스템 등에 이용됨.

【대표도】

도 4

【색인어】

레이드(RAID), 파이버 채널(Fibre Channel), 중복연결, 결함허용, 망 허브, 망 스위치

【명세서】

【발명의 명칭】

다중 호스트 컴퓨터와 레이드 사이의 중복연결을 위한 장치{The Apparatus for Redundant Interconnection between Multiple Hosts and RAID}

【도면의 간단한 설명】

도 1 은 종래의 두 제어기를 가지는 레이드와 호스트 컴퓨터들 사이의 일반적인 연결방식의 구성예시도.

도 2 는 종래의 두 제어기 사이에 오류복구를 위한 통신정합을 가지는 일반적인 호스트 정합방식의 구성예시도.

도 3 은 종래의 레이드와 호스트 컴퓨터 사이의 결선방식의 구성예시도.

도 4 는 본 발명에 따른 레이드와 호스트 컴퓨터 사이의 내장 시스템으로서의 호스트 정합방식의 일실시예 구성도.

도 5 는 본 발명에 따른 레이드와 호스트 컴퓨터 사이의 외장 시스템으로서의 호스트 정합방식의 일실시예 구성도.

도 6 은 본 발명에 따른 레이드와 호스트 컴퓨터 사이의 망 스위치로서의 호스트 정합방식의 일실시예 구성도.

* 도면의 주요 부분에 대한 부호의 설명

400 : 호스트 컴퓨터 440 : 허브 또는 스위치

460 : 레이드 제어기 490 : 레이드

【발명의 상세한 설명】

【발명의 목적】

【발명이 속하는 기술분야 및 그 분야의 종래기술】

<10> 본 발명은 다중 호스트 컴퓨터와 독립 디스크 중복배열(RAID : Redundant Array of Inexpensive Disks, 이하 '레이드'라 함) 사이의 중복연결을 위한 장치에 관한 것으로, 더욱 상세하게는 레이드 제어기의 결함허용을 지원함과 동시에 성능을 높일 수 있는 다중 호스트 컴퓨터와 레이드의 다중 제어기 사이의 중복연결을 위한 장치에 관한 것이다.

<11> 레이드는 다량의 디스크를 이용하는 고성능과 대용량의 저장 장치이며, 디스크나 제어기 등에 중복성이 있는 결함 허용 시스템이다. 일반적으로 레이드에는 두 개의 제어기가 있고, 이 두 제어기는 도 1 이나 도 2 와 같은 방법으로 사용되었다.

<12> 도 1 은 종래의 두 제어기를 가지는 레이드와 호스트 컴퓨터들 사이의 일반적인 연결방식의 구성예시도이다.

<13> 이러한 시스템은, 도면에 도시된 바와 같이, 두 레이드 제어기(140,141)를 독립적으로 이용하고 호스트 컴퓨터의 제어기(110,111)와 독립적인 연결을 가지고 있어서 두 배의 대역폭과 두 배의 성능을 가진다. 그러나, 두 레이드 제어기(140, 141) 중 하나에 고장이 발생하면 데이터의 손실이 발생하게 되는 문제점이 있다. 즉, 결함허용 시스템이 되지 못한다.

<14> 도 2 는 종래의 두 제어기 사이에 오류복구를 위한 통신정합을 가지는 일반적인 호

스트 정합방식의 구성예시도이다.

<15> 도 1 이 갖지 못한 결함허용을 제공하기 위해서 두 레이드 제어기(230,231)와 호스트 컴퓨터(200,201)들이 허브 또는 스위치(210)를 통하여 하나의 망으로 연결되어 있다. 그래서 하나의 레이드 제어기(230 또는 231)가 고장나더라도 모든 호스트 컴퓨터(200,201)는 고장나지 않은 레이드 제어기와 연결되므로, 이 고장나지 않은 레이드 제어기가 고장난 제어기의 역할까지 수행하게 된다. 그리고, 고장에 대비하여, 레이드 제어기(230,231)들은 서로 정보를 주고 받아야 하므로 통신 제어기(221,222)를 통하여 연결되어 있다. 하지만, 이러한 시스템의 경우에는 도 1 이 가지는 대역폭의 절반의 성능 밖에 갖지 못하는 문제점이 있었다.

<16> 도 3 은 종래의 레이드와 호스트 컴퓨터 사이의 결선방식의 구성예시도이다.

<17> 도면에 도시된 구성은 미국특허 5,812,754의 내용 중, 레이드와 호스트 컴퓨터-간의 시스템 연결에 대한 부분이다. 하지만 이에 따른 구성은 통신망의 구조가 도 2 와 다른 바가 없고, 오히려 두 호스트 컴퓨터(300,301) 중에 하나가 고장나면 망이 끊어지는 문제점이 있으므로 도 2 의 구성보다 못한 방식이다.

【발명이 이루고자 하는 기술적 과제】

<18> 본 발명은, 상기 문제점을 해결하기 위하여 안출된 것으로, 레이드 제어기의 결함허용을 지원함과 동시에 성능을 높일 수 있는 다중 호스트 컴퓨터와 레이드 사이의 중복연결을 위한 장치를 제공하는데 그 목적이 있다.

【발명의 구성 및 작용】

<19> 상기 목적을 달성하기 위한 본 발명의 장치는, 다중 호스트 컴퓨터와 레이드 사이의 중복연결 장치에 있어서, 산업 표준 통신망을 통하여 연결된 다수의 호스트 컴퓨터들의 요구를 처리하고 결함허용 기능을 수행하기 위한 다수 개의 레이드 제어 수단; 상기 다수의 레이드 제어 수단과 상기 다수의 호스트 컴퓨터 사이를 연결하기 위한 다수 개의 연결 수단; 및 상기 각 다수의 레이드 제어 수단 내에 포함되어 상기 다수의 연결 수단을 통하여 상기 다수의 호스트 컴퓨터 및 상대 레이드 제어수단 내의 상대 망 정합 제어 수단과 직접 정보를 교환하는 다수 개의 망 정합 제어 수단을 포함한다.

<20> 상술한 목적, 특징들 및 장점은 첨부된 도면과 관련한 다음의 상세한 설명을 통하여 보다 분명해 질 것이다. 이하, 첨부된 도면을 참조하여 본 발명에 따른 바람직한 일실시예를 상세히 설명한다.

<21> 도 4 는 본 발명에 따른 레이드와 호스트 컴퓨터 사이의 내장 시스템으로서의 호스트 정합방식의 일실시예 구성도이다.

<22> 도면에 도시된 바와 같이, 본 발명은 두 개의 레이드 제어기(460,461) 사이의 오류복구를 위한 통신회로를 가지며, 두 집단의 호스트 컴퓨터(400 내지 405)들과 두 레이드 제어기(460,461) 사이의 대역폭이 단일 연결 대역폭의 두 배가 되고, 하나의 레이드 제어기(460 또는 461)에 고장이 발생하더라도 대역폭이 단일 연결 대역폭의 두 배가 되는 호스트 정합방식이다.

<23> 즉, 레이드(490)에 두 개의 레이드 제어기(460,461)와 허브(440,441; 여기에 연결된 시스템을 하나의 망으로 연결시켜주며, 한 시스템에 고장이 발생하거나 선이 단락되

어도 망이 유지되는 장치로서, 허브 또는 스위치가 있으며, 이하, 이것들을 통틀어 '허브'라고 칭한다)가 존재하고, 각 레이드 제어기(460,461)에는 한 쌍의 망 정합 제어기(470,471 ; 480,481)가 있다.

<24> 도 4 에 도시된 허브 포트(420 내지 424, 430 내지 434)의 그림은 파이버 채널 아비트레이티드 루프(Fibre Channel Arbitrated Loop) 허브의 간단한 내부구조의 예로서, 이미 공지된 기술이므로, 본 발명에서는 더 이상 설명하지 않기로 한다. 허브는 해당 통신 망 규격을 준수한다.

<25> 상기 레이드 제어기와 허브와 호스트 컴퓨터가 연결되어 있는 망은 산업 표준 통신망이다. 이러한 통신망에는 대표적으로 파이버 채널(Fibre Channel)과 비동기식 전송 모드(ATM : Asynchronous Transfer Mode)와 인피니밴드(InfiniBand) 등이 있다. 이하, 이것들을 '망'이라 칭한다.

<26> 호스트 컴퓨터들(400 내지 405)이 갖고있는 망 정합 제어기(410 내지 415)와 레이드 제어기(460,461)의 망 정합 제어기(470,471,480,481)는 두 허브(440, 441)를 통하여 두 개의 망으로 연결되어 있으며, 망의 종류에 따라서 망 정합 제어기는 파이버 채널 제어기, ATM 제어기, 인피니밴드(InfiniBand) 제어기 등이 된다.

<27> 이때, 망정합 제어기 와 허브 사이를 잇는 통신선(대표 : 450)은 해당 규격에 맞는 구리선이나 광섬유이다.

<28> 한편, 첫째 레이드 제어기(460)의 두 망 정합 제어기들(470,471)은 각각 두개의 다른 허브 포트(423,432)에 연결되고, 둘째 레이드 제어기(461)의 두 망 정합 제어기들(480,481)도 각각 두개의 다른 허브 포트(422,433)에 연결된다. 허브(440,441)의 나머지

포트들(420,421,424,430,431,434)은 호스트 컴퓨터들(400 내지 405)과 연결된다. 단, 첫째 허브(440)의 허브 포트들(420 내지 424) 사이의 구분은 전혀 없다. 또한, 둘째 허브(441)의 허브 포트들(430 내지 434) 사이의 구분도 전혀 없다.

<29> 첫째 허브(440)의 허브 포트 중 호스트 컴퓨터와 연결되는 것(420,421,424)은 한개 이상이며, 최대 갯수의 제한은 없다. 또한 둘째 허브(441)의 허브 포트 중 호스트 컴퓨터와 연결되는 것(430,431,434)도 한개 이상이며, 최대 갯수의 제한은 없다. 도 4 에서 점선으로 표기된 허브 포트들(424,434)과 호스트 컴퓨터들(400, 405)은 없거나 한 개 이상임을 의미한다.

<30> 상기의 방법으로 구성하면, 두개의 독립된 망이 구성되므로 단일 망의 두배 대역폭을 가지고, 두 레이드 제어기(460,461)의 결함허용 기능을 위해서 필요한 두 레이드 제어기 간의 통신 통로가 형성된다. 그래서, 첫째 레이드 제어기(460)의 둘째 망 정합 제어기(471)가 보내는 정보는 둘째 레이드 제어기의 첫째 망 정합 제어기(481)가 받고, 둘째 레이드 제어기(461)의 둘째 망 정합 제어기(480)가 보내는 정보는 첫째 레이드 제어기(460)의 첫째 망 정합 제어기(470)가 받는다. 또한 둘째 레이드 제어기(461)의 첫째 망 정합 제어기(481)가 보내는 정보는 첫째 레이드 제어기(460)의 둘째 망 정합 제어기(471)가 받고, 첫째 레이드 제어기(460)의 첫째 망 정합 제어기(470)가 보내는 정보는 둘째 레이드 제어기(461)의 둘째 망 정합 제어기(480)가 받는다.

<31> 두 레이드 제어기들(460,461)의 첫째 망 정합 제어기들(470,480)은 각각 첫째 허브(440)에 연결된 호스트 컴퓨터들(400 내지 402)과 둘째 허브(441)에 연결된 호스트 컴퓨터들(403 내지 405)의 데이터를 공급하고, 상대 망 정합 제어기(471, 481)가 보내는 정보를 처리한다.

<32> 두 레이드 제어기들(460,461) 중 어느 하나에 오류가 발생하면, 두 허브들(440,441)에 의해서, 오류가 발생된 레이드 제어기는 망에서 제거되고, 오류가 나지 않은 상대 레이드 제어기의 둘째 망 정합 제어기가 오류 발생된 레이드 제어기의 첫째 망 정합 제어기의 기능을 물려받는다.

<33> 도 5 는 본 발명에 따른 레이드와 호스트 컴퓨터 사이의 외장 시스템으로서의 호스트 정합방식의 일실시예 구성도이다.

<34> 본 발명은 도 4 에 도시된 바와 같이 레이드(490)에 허브들(440,441)을 내장하는 방법으로 구성할 수도 있고, 도 5 에 도시된 바와 같이 외장형 허브들(510, 520)을 이용하여 구성할 수도 있다.

<35> 도 6 은 본 발명에 따른 레이드와 호스트 컴퓨터 사이의 망 스위치로서의 호스트 정합방식의 일실시예 구성도이다.

<36> 도면에 도시된 바와 같이, 도 6 은 도 4 에 도시된 기능을 가질 수 있다. 즉, 첫째 레이드 제어기(620)의 둘째 망 정합 제어기(622)가 보내는 정보는 둘째 레이드 제어기(630)의 첫째 망 정합 제어기(632)가 받고, 둘째 레이드 제어기(630)의 둘째 망 정합 제어기(632)가 보내는 정보는 첫째 레이드 제어기(620)의 첫째 망 정합 제어기(621)가 받는다. 또한 둘째 레이드 제어기(630)의 첫째 망 정합 제어기(631)가 보내는 정보는 첫째 레이드 제어기(620)의 둘째 망 정합 제어기(622)가 받고, 첫째 레이드 제어기(620)의 첫째 망 정합 제어기(621)가 보내는 정보는 둘째 레이드 제어기(630)의 둘째 망 정합 제어기(632)가 받는다.

<37> 단, 망 스위치(610)의 각 포트(대표:611)의 구분은 전혀 없다.

<38> 이상에서 설명한 본 발명은 전술한 실시예 및 첨부된 도면에 의해 한정되는 것이 아니고, 본 발명의 기술적 사상을 벗어나지 않는 범위 내에서 여러 가지 치환, 변형 및 변경이 가능하다는 것이 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자에게 있어 명백할 것이다.

【발명의 효과】

<39> 상기와 같은 본 발명은, 레이드 제어기의 오류 발생 시에도 두 개의 독립된 망과 두 개의 망 정합 제어기가 존재하므로 단일 망 대역폭의 두 배를 유지할 수 있어, 대역폭의 저하없이 두 레이드 제어기 사이의 결함허용 기능을 구성할 수 있는 효과가 있다.

【특허청구범위】

【청구항 1】

다중 호스트 컴퓨터와 레이드(RAID : Redundant Array of Inexpensive Disks) 사이의 중복연결 장치에 있어서,

산업 표준 통신망을 통하여 연결된 다수의 호스트 컴퓨터들의 요구를 처리하고 결함허용 기능을 수행하기 위한 다수 개의 레이드 제어 수단;

상기 다수의 레이드 제어 수단과 상기 다수의 호스트 컴퓨터 사이를 연결하기 위한 다수 개의 연결 수단; 및

상기 각 다수의 레이드 제어 수단 내에 포함되어 상기 다수의 연결 수단을 통하여 상기 다수의 호스트 컴퓨터 및 상대 레이드 제어 수단 내의 상대 망 정합 제어 수단과 직접 정보를 교환하는 다수 개의 망 정합 제어 수단

을 포함하는 다중 호스트 컴퓨터와 레이드 사이의 중복연결 장치.

【청구항 2】

제 1 항에 있어서,

상기 각 레이드 제어 수단은,

상기 다수의 연결 수단과 각각 연결되는 것을 특징으로 하는 다중 호스트 컴퓨터와 레이드 사이의 중복 연결 장치.

【청구항 3】

제 1 항에 있어서,

상기 각 망 정합 제어 수단은,

2개씩 쌍을 이뤄 상기 다수의 레이드 제어 수단에 포함되어, 제 1 망 정합 제어 수단은 일측의 연결 수단과 연결되고, 제 2 망 정합 제어 수단은 타측의 연결 수단과 연결되는 것을 특징으로 하는 다중 호스트 컴퓨터와 레이드 사이의 중복 연결 장치.

【청구항 4】

제 3 항에 있어서,

상기 각 망 정합 제어 수단은,

상기 다수의 호스트 컴퓨터들의 요구를 처리하는 상기 제 1 망 정합 제어 수단; 및

상기 각 레이드 제어 수단에 오류가 발생하지 않을 시에 결함허용을 위한 상기 각 레이드 제어 수단 간의 통신에 이용되고, 소정의 어느 하나의 레이드 제어 수단에 오류가 발생한 경우에 상기 오류 발생 레이드 제어 수단의 제 1 망 정합 제어 수단의 기능을 수행하기 위한 제 2 망 정합 제어 수단

을 더 포함하는 다중 호스트 컴퓨터와 레이드 사이의 중복연결 장치.

【청구항 5】

제 1 항에 있어서,

상기 다수의 연결 수단은,

세 개 이상의 연결 포트를 가지고 있어, 두 연결 포트는 상기 망 정합 제어 수단과 연결되고, 나머지 연결 포트들은 다수의 호스트 컴퓨터들과 연결되는 산업 표준 망 허브 장치인 것을 특징으로 하는 다중 호스트 컴퓨터와 레이드 사이의 중복 연결 장치.

【청구항 6】

제 1 항에 있어서,

상기 다수의 연결 수단은,

세 개 이상의 연결 포트를 가지고 있어, 두 연결 포트는 상기 망 정합 제어 수단과 연결되고, 나머지 연결 포트들은 다수의 호스트 컴퓨터들과 연결되는 망 스위치 장치인 것을 특징으로 하는 다중 호스트 컴퓨터와 레이드 사이의 중복 연결 장치.

【청구항 7】

제 1 항에 있어서,

상기 다수의 연결 수단은,

다섯 개 이상의 연결 포트를 가지고 있어, 네 연결 포트는 상기 망 정합 제어 수단과 연결되고, 나머지 연결 포트들은 다수의 호스트 컴퓨터들과 연결되는 산업 표준 망 스위치인 것을 특징으로 하는 다중 호스트 컴퓨터와 레이드 사이의 중복 연결 장치.

【청구항 8】

제 1 항 내지 제 5 항 중 어느 한 항에 있어서,

상기 레이드 제어 수단과 상기 망 정합 제어 수단과 상기 연결 수단이 각각 쌍으로 이루어지되,

첫째 레이드 제어 수단의 첫째 망 정합 제어 수단이 첫째 연결 수단에 연결되고,

상기 첫째 레이드 제어 수단의 둘째 망 정합 제어 수단이 둘째 연결 수단에 연결되고,

둘째 레이드 제어 수단의 첫째 망 정합 제어 수단이 상기 둘째 연결 수단에 연결되고,

상기 둘째 레이드 제어 수단의 둘째 망 정합 제어 수단이 상기 첫째 연결 수단에 연결된 것을 특징으로 하는 다중 호스트 컴퓨터와 레이드 사이의 중복 연결 장치.

【도면】

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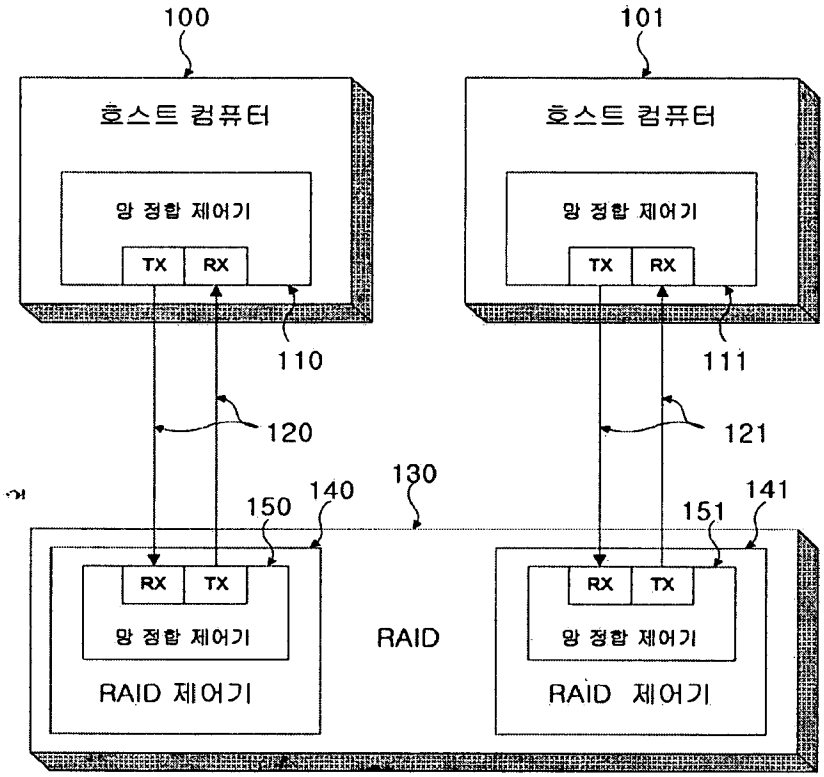
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110
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150
151
RX
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망 정합 제어기
RAID
RAID 제어기
RAID 제어기

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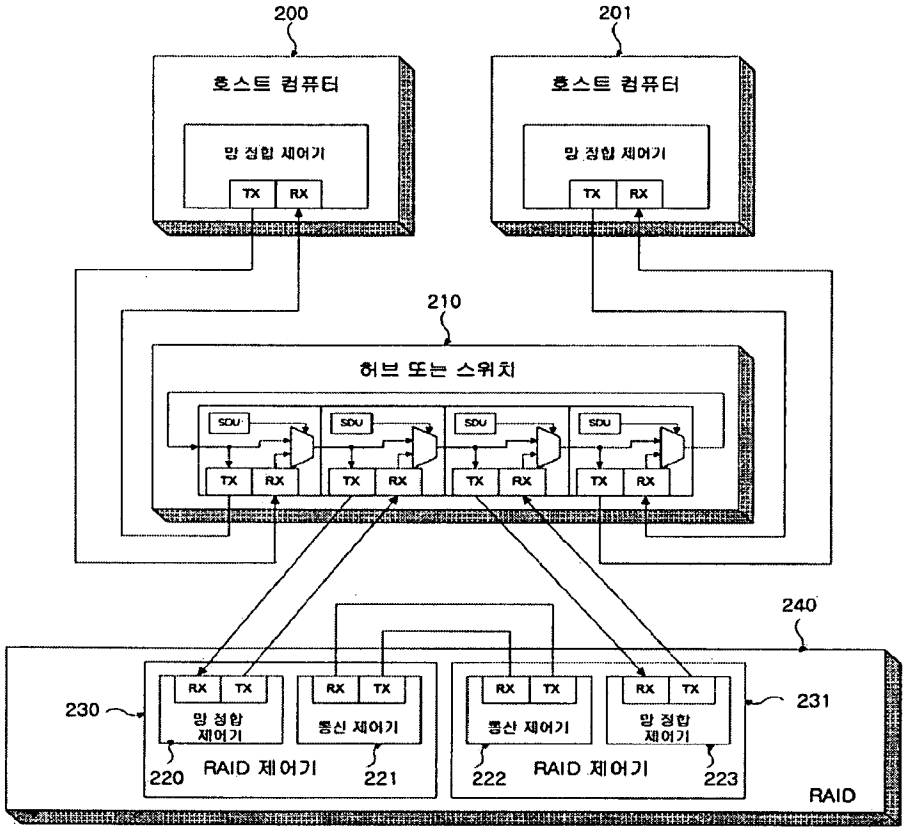
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TX
RX
210
허브 또는 스위치
SDU
SDU
SDU
SDU
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TX
RX
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TX
RX
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230
RX
TX
망 정합 제어기
RX
TX
통신 제어기
220
RAID 제어기
221
RX
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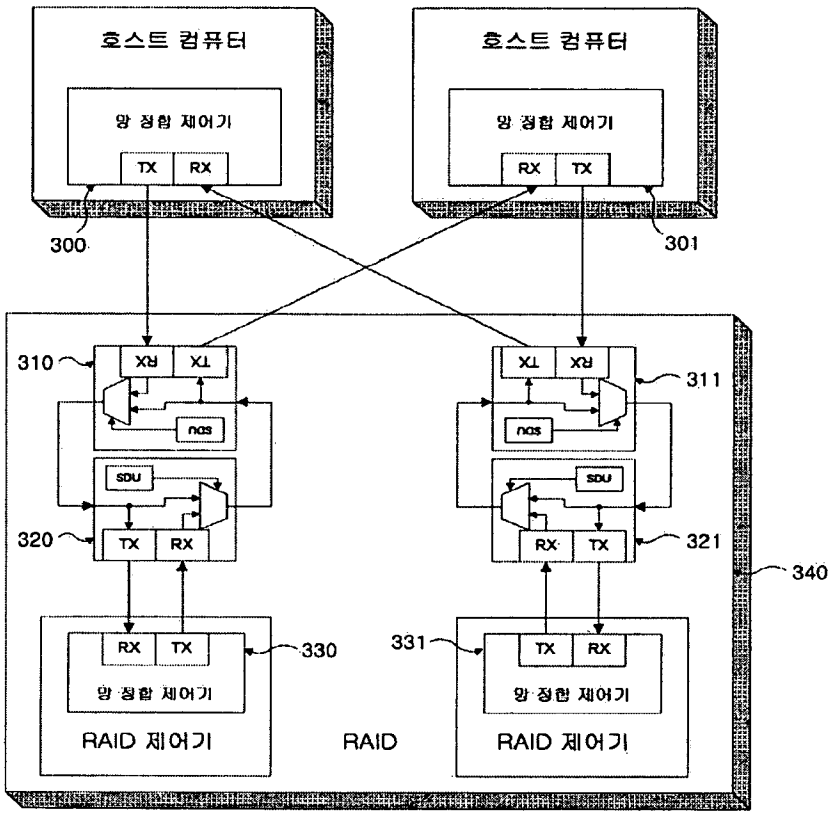
RAID

【도 3】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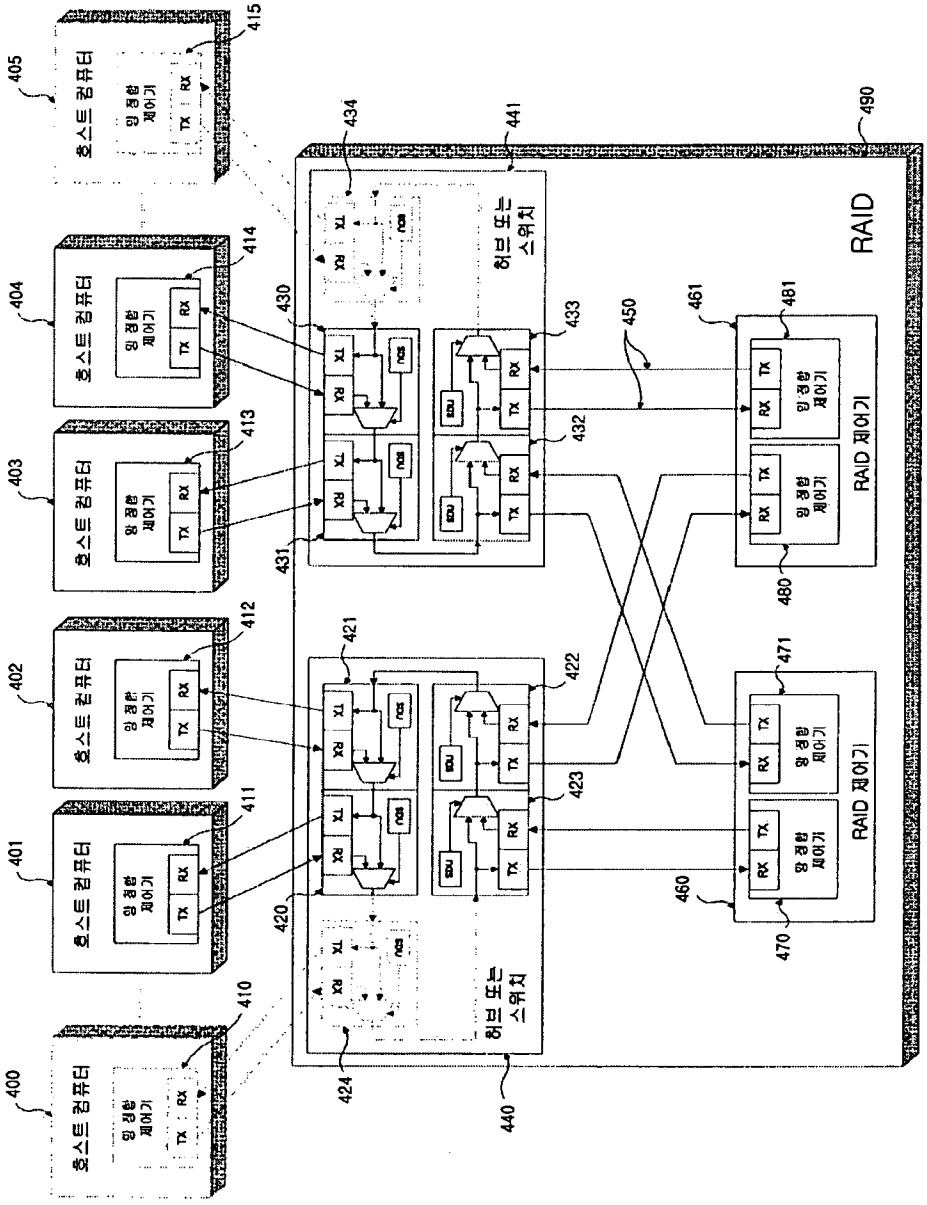
RAID 제어기
RAID
RAID 제어기

【도 4】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RAID
RAID 제어기
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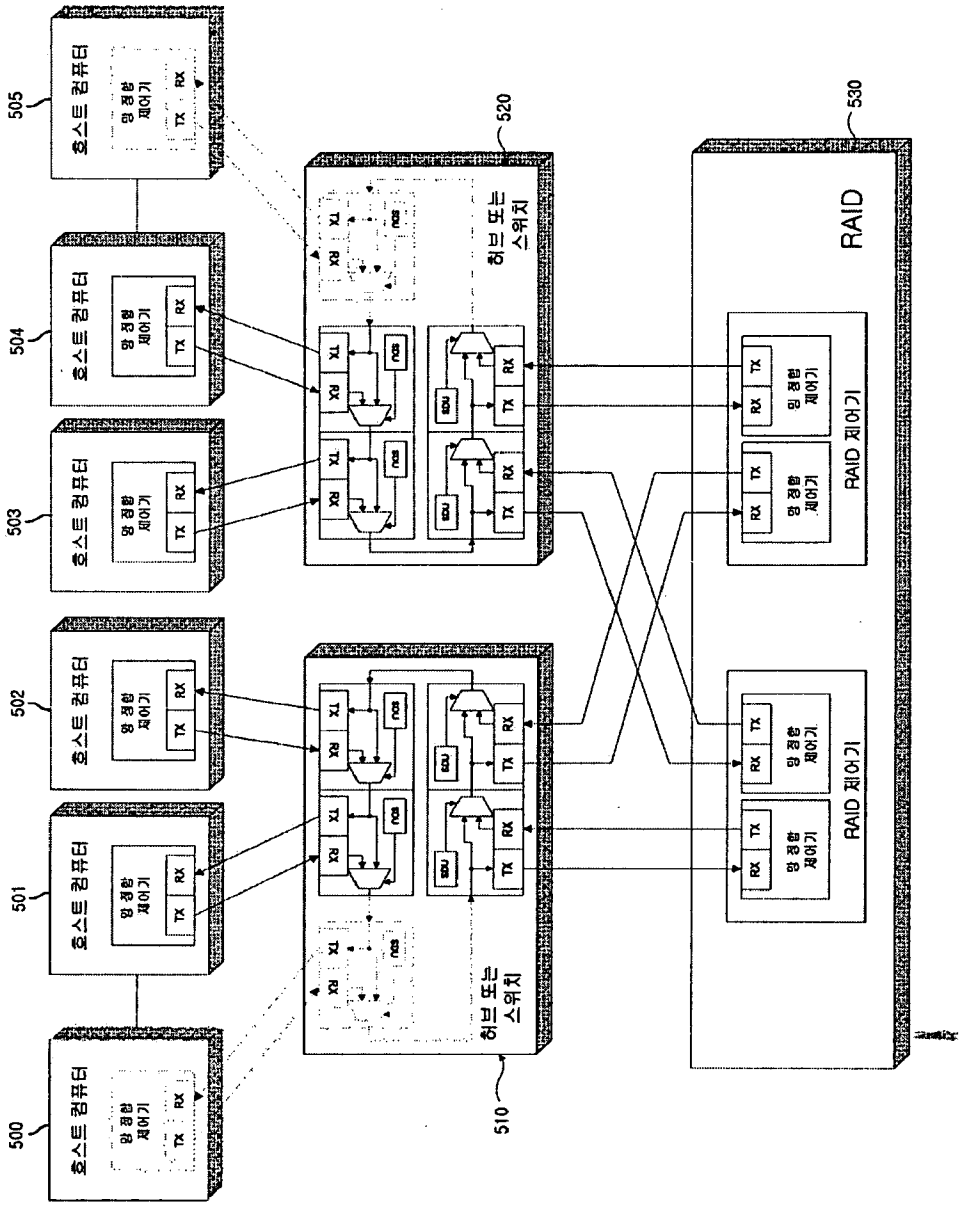
【도 5】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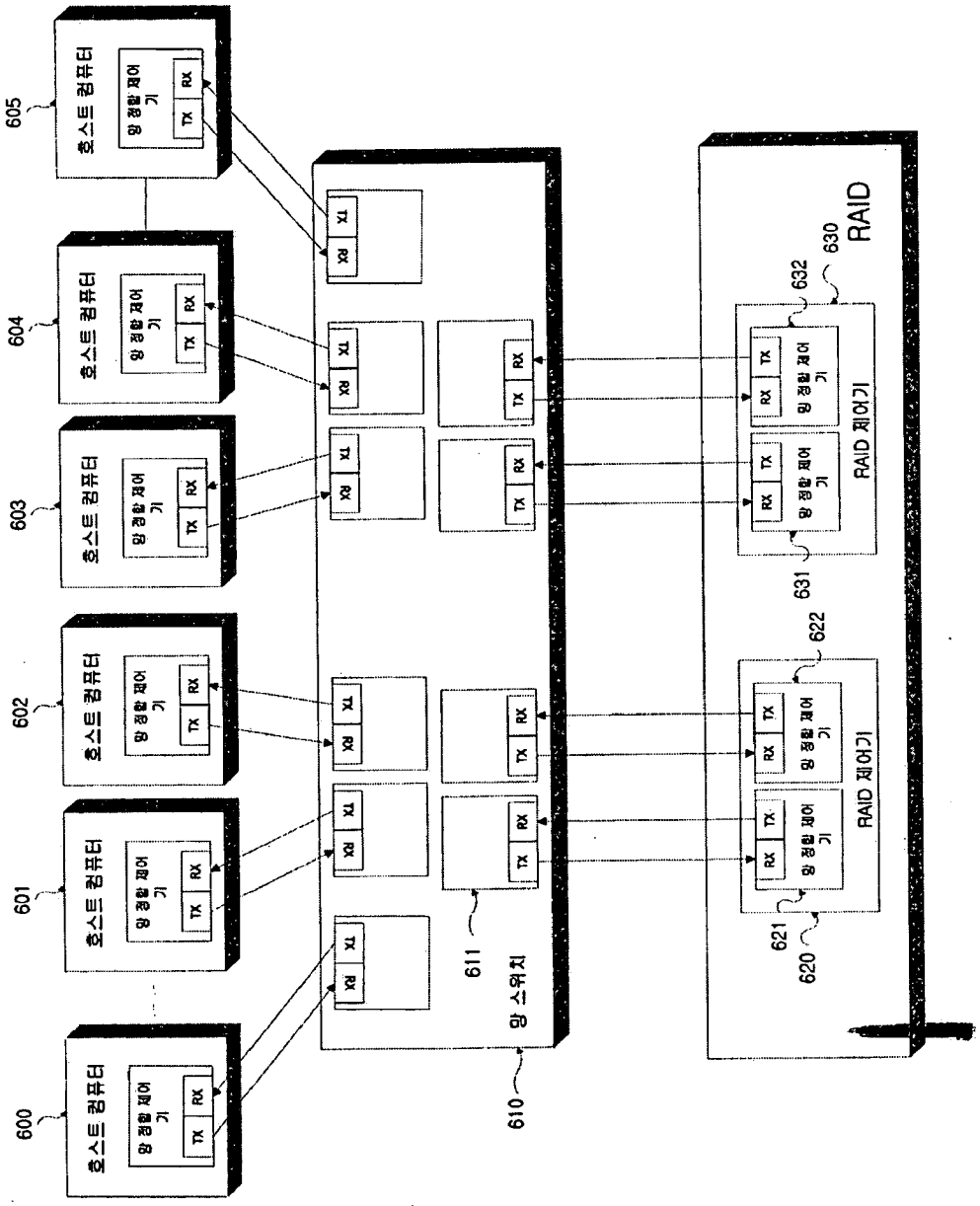
허브 또는 스위치
RAID
RAID 제어기

【도 6】


호스트 컴퓨터
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RAID
630
631
632
620
621
622
RAID 제어기

Attorney Docket No.: 51876p219
Express Mail No.: em014066885us

#4

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:	
SUNG-HOON BAEK, ET AL.	Art Group:
Application No.:	Examiner:
Filed:	
For: **APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID - UTILITY**	

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. §1.97

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Pursuant to Rule 1.97, Applicant desires to make of record the reference(s) set forth on the attached Form PTO 1449. A copy of each reference is submitted herewith.

It is hereby stated that this Information Disclosure Statement is being filed within three months of the filing date of the subject application, therefore no petition or fee is required. However, in the event a petition is needed for consideration of this Information Disclosure Statement, Applicant hereby so petitions. Please charge any additional fee due to Deposit Account 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: 12/29/00

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Information Disclosure Statements
U.S. Patent Application for APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID Our Ref. No. P00E6002/US/jw
Reference Nos. : US5251062, US5798306, US4652536 Papers : (1) Tellurite glass : a new candidate for fiber devices (2) Structure and optical properties of rare earth-doped zinc oxyhalide tellurite glasses (3) Raman spectra and thermal analysis of a new lead-tellurium-germanate glass system