Case 1:12-cv-01629-UNA Document 3 Filed 11/30/12 Page 1 of 1 PageID #: 23

AO 120 (Rev. 08/10)	·····			
TO: Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450			FILING OR DETH ACTION REGAR	RT ON THE ERMINATION OF AN DING A PATENT OR DEMARK
			1116 you are hereby advised that a	
filed in the U.S. D	istrict Court	for the	District of Delaware	on the following
Trademarks or	\blacksquare Patents. (\square the patent act	tion involve	s 35 U.S.C. § 292.):	
DOCKET NO.	DATE FILED 11/30/2012	U.S. DI	STRICT COURT for the District of	of Delaware
PLAINTIFF			DEFENDANT	
Safe Storage LLC			Silicon Graphics Internation	nal Corp.
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK		HOLDER OF PATENT	OR TRADEMARK
1 6,978,346	12/20/2005	Safe	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					
	Amer	ndment	Answer	Cross Bill	Other Pleading	g
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK		HOLDE	ER 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

DHPN-1002 / Page 1 of 158

Case 1:12-cv-01628-UNA Document 3 Filed 11/30/12 Page 1 of 1 PageID #: 23

AO 120 (Rev. 08/10)

Mail Stop 8TO: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		
filed in the U.S. Dist		for the	1116 you are hereby advised that District of Delaware as 35 U.S.C. § 292.):	a court action has been on the following
DOCKET NO.	DATE FILED 11/30/2012	U.S. DI	STRICT COURT for the District of	of Delaware
PLAINTIFF Safe Storage LLC			DEFENDANT NetApp, Inc.	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK		HOLDER OF PATENT	OR TRADEMARK
1 6,978,346	12/20/2005	Safe	e Storage LLC	
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In the above-entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY			
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PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDH	ER 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

DHPN-1002 / Page 2 of 158

Case 1:12-cv-01627-UNA Document 3 Filed 11/30/12 Page 1 of 1 PageID #: 24

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		
•		-	1116 you are hereby advised that	
filed in the U.S. Dist	rict Court	for the	District of Delaware	on the following
Trademarks or	Patents. (🗌 the patent acti	on involve	s 35 U.S.C. § 292.):	
DOCKET NO.	DATE FILED 11/30/2012	U.S. DISTRICT COURT for the District of Delaware		of Delaware
PLAINTIFF			DEFENDANT	
Safe Storage LLC			Hitachi Data Systems Cor	poration
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK		HOLDER OF PATENT	Γ 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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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:

(BY) DEPUTY CLERK	DATE
	(BY) DEPUTY CLERK

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

Case 1:12-cv-01626-UNA Document 3 Filed 11/30/12 Page 1 of 1 PageID #: 23

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		
			1116 you are hereby advised that	
filed in the U.S. D			District of Delaware	on the following
Trademarks or	\blacksquare Patents. (\square the patent action	ion involve	s 35 U.S.C. § 292.):	
DOCKET NO.	DATE FILED 11/30/2012	U.S. DI	STRICT COURT	of Delaware
PLAINTIFF			DEFENDANT	
Safe Storage LLC			Hewlett-Packard Company	/
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK		HOLDER OF PATENT	Γ 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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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

DHPN-1002 / Page 4 of 158

Case 1:12-cv-01625-UNA Document 3 Filed 11/30/12 Page 1 of 1 PageID #: 24

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			
•	v		1116 you are hereby advised that a		
filed in the U.S. Dis	trict Court	for the	District of Delaware	on the following	
Trademarks or	Patents. (the patent acti	ion involve	s 35 U.S.C. § 292.):		
DOCKET NO.	DATE FILED 11/30/2012	U.S. DISTRICT COURT for the District of Delaware		of Delaware	
PLAINTIFF		DEFENDANT			
Safe Storage LLC	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			
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In the above-entitled case, the following patent(s)/ trademark(s) have been included:

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In the above-entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

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 DATE

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DHPN-1002 / Page 5 of 158

Case 1:12-cv-01624-UNA Document 3 Filed 11/30/12 Page 1 of 1 PageID #: 23

	O: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450		FILING OR DET ACTION REGAR	RT ON THE ERMINATION OF AN RDING A PATENT OR DEMARK
In Complia filed in the U.S. D	ance with 35 U.S.C. § 290 and/or 15		1116 you are hereby advised that District of Delaware	a court action has been on the following
Trademarks or	\blacksquare Patents. (\square the patent actio			
DOCKET NO.	DATE FILED 11/30/2012	U.S. DI	STRICT COURT for the District	of Delaware
PLAINTIFF		.	DEFENDANT	
Safe Storage LLC			Dell Inc.	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK		HOLDER OF PATEN	ſ OR TRADEMARK
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In the above-entitled case, the following patent(s)/ trademark(s) have been included:

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DECISION/JUDGEMENT

CLERK

(BY) DEPUTY CLERK

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DCT 1 2 2005 2	this form, together wit		or <u>Fax</u>	(571) 273-2885	or Patents ginia 22313-1450	hould be completed who
propriate. All factor concerned unless former concerned unless former contracted interface of the contracted inter	below or directed otherwise	Patent, advance orders an in Block 1, by (a) specif	d notification fying a new co	of maintenance fees prespondence address	uired). Blocks 1 through 5 s will be mailed to the current s; and/or (b) indicating a sep	correspondence address a arate "FEE ADDRESS" fe
CURRENT CORRESPONDEN 08791	CE ADDRESS (Note: Use Block 1 for 7590 07/11/2005	any change of address)		Note: A certificate o Fee(s) Transmittal. T	f mailing can only be used f his certificate cannot be used al paper, such as an assignm te of mailing or transmission.	or domestic mailings of t for any other accompanying
12400 WILSHIRE SEVENTH FLOO LOS ANGELES,	R	z ZAFMAN		I hereby certify that States Postal Service addressed to the Ma transmitted to the US	ertificate of Mailing or Tran this Fee(s) Transmittal is bein with sufficient postage for fin all Stop ISSUE FEE address PTO (571) 273-2885, on the	smission g deposited with the Unit st class mail in an envelo above, or being facsimi date indicated below.
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APPLICATION NO.	FILING DATE	FIRST N	NAMED INVEN	TOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/753,245	12/29/2000	Sur	ng-Hoon Baek		51876P219	8804
	MINER	ART UNIT	CL	ASS-SUBCLASS		.011/2003
nonprovisional	SMALL ENTITY YES	ISSUE FEE \$700		S300	TOTAL FEE(S) DUE \$1000	10/11/2005
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"Fee Address" indica	dence address (or Change of (22) attached. atton (or "Fee Address" Indica or more recent) attached. Use D RESIDENCE DATA TO B	e of a Customer register e of a Customer e lister E PRINTED ON THE PA	stered attorney gistered patent d, no name wil TENT (print o		nes of up to f no name is <u>3</u>	ocument has been filed i
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PLEASE NOTE: Unles recordation as set forth i (A) NAME OF ASSIGN FUECTEONICS DESEAR ase check the appropriat The following fee(s) are Sublication Fee (No Advance Order - # co Change in Entity Status a. Applicant claims S Director of the USPTO TE: The Issue Fee and H	TEE AND TELE CON CH INST IT U e assignee category or catego e enclosed: small entity discount permitte of Copies <u>ID</u> s (from status indicated above SMALL ENTITY status. See	(B) RESII HHWNICA TIC TE ries (will not be printed on 4b. Payme A c d) Pay Th Deposi 37 CFR 1.27. b. A the Fee and Publication Fee vill not be accepted from a	the patent) : ent of Fee(s): check in the an yment by credi e Director is h it Account Nun Applicant is not c (if any) or to inyone other th	Y and STATE OR CC Perfublic Individual A sount of the fee(s) is e acard. Form PTO-203 ereby authorized by nber <u>OZ-204</u> longer claiming SMA	OUNTRY) OF Korea Corporation or other private gr nclosed. 18 is attached.	oup entity Governme credit any overpayment, opy of this form). FR 1.27(g)(2).
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PLEASE NOTE: Unles recordation as set forth i (A) NAME OF ASSIGN FLECTLONICS DESEAR ase check the appropriat The following fee(s) are The following fee(s) are Dissue Fee Publication Fee (No Advance Order - # co Change in Entity Status a. Applicant claims S Director of the USPTO DTE: The Issue Fee and H prest as shown by the reco	AND TELE CON CH INSTITUT e assignee category or catego e enclosed: small entity discount permittee of Copies <u>10</u> G (from status indicated above SMALL ENTITY status. See D is requested to apply the Issue Publication Fee (if required) v ords of the United States Part	(B) RESH H W NICA TIC TE ries (will not be printed on 4b. Payme A c Pay A c Pay A c Pay A c Pay A c Pay A c Pay A c Pay A c Pay A c A c A c A c A c A c A c A c	the patent) : ent of Fee(s): check in the an yment by credi e Director is h it Account Nun Applicant is not c (if any) or to inyone other th	Y and STATE OR CC Perfublic Individual C nount of the fee(s) is e a card. Form PTO-203 ereby authorized by, nber 02-200 longer claiming SMA re-apply any previous an the applicant; a reg	DUNTRY) OF Korea Corporation or other private gr nclosed. 18 is attached. charge the required fee(s), or (enclose an extra content of the second of th	oup entity Governme credit any overpayment, opy of this form). FR 1.27(g)(2).

OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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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

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

EXA	AMINER
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. <u>PROSECUTION ON THE MERITS IS CLOSED</u>. 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 <u>THREE MONTHS</u> FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. <u>THIS STATUTORY PERIOD CANNOT BE EXTENDED</u>. 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:	If the SMALL ENTITY is shown as NO:
A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.	A. Pay TOTAL FEE(S) DUE shown above, or
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	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.

Page 1 of 3

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

		PART B ·	- FEE(S) T	RANSMITTAL		
Complete and send the			or <u>Fa</u>	Commissioner fo P.O. Box 1450 Alexandria, Virg x (571) 273-2885	or Patents ;inia 22313-1450	
INSTRUCTIONS: This for appropriate. All further corr indicated unless corrected by maintenance fee notification	m should be used for tran respondence including the l below or directed otherwise is.	smitting the ISSUE Patent, advance order in Block 1, by (a)	FEE and PU ers and notific specifying a n	BLICATION FEE (if requ ation of maintenance fees v ew correspondence address	ired). Blocks 1 through 5 s vill be mailed to the current ; and/or (b) indicating a sepa	hould be completed where correspondence address as arate "FEE ADDRESS" for
08791 75	R			papers. Each addition have its own certificat Ce I hereby certify that the States Postal Service addressed to the Ma	mailing can only be used fusion of the second secon	ent or formal drawing, must smission g deposited with the United rst class mail in an envelope ; above, or being facsimile
APPLICATION NO.	FILING DATE	F	IRST NAMED II	NVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/753,245	12/29/2000	· · · · ·	Sung-Hoon	Baek	51876P219	
TITLE OF INVENTION: A					· · · · ·	
APPLN. TYPE	SMALL ENTITY	ISSUE FE	E	PUBLICATION FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$700		\$300	\$1000	10/11/2005
EXAM		ART UNI	r	CLASS-SUBCLASS		
· ·	RISNA	2153		711-114000		
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PLEASE NOTE: Unless	an assignee is identified b 1 37 CFR 3.11. Completion EE	elow, no assignee d of this form is NOT (B)	ata will appea a substitute for RESIDENCE	r on the patent. If an assig r filing an assignment. : (CITY and STATE OR CC	nee is identified below, the o PUNTRY) Corporation or other private gr	
4a. The following fee(s) are	enclosed:		Payment of Fe	()		
Issue Fee Publication Fee (No s	small entity discount permitte			the amount of the fee(s) is e v credit card. Form PTO-203		
	f Copies		The Direct		charge the required fee(s) or	r credit any overpayment, to
5. Change in Entity Status	(from status indicated above MALL ENTITY status. See	e)			ALL ENTITY status. See 37 (
The Director of the USPTO NOTE: The Issue Fee and P interest as shown by the rece	is requested to apply the Iss Publication Fee (if required) ords of the United States Pat	ue Fee and Publicati will not be accepted ent and Trademark	ion Fee (if any) from anyone o Office.	or to re-apply any previous ther than the applicant; a rep	sly paid issue fee to the applic gistered attorney or agent; or	cation identified above. the assignee or other party in
Authorized Signature	<u> </u>			Date		
Typed or printed name _		<u> </u>	<u></u>		n No	
ritorandria, virginia 22010	.1400				the public which is to file (ar minutes to complete, includi comments on the amount of t d Trademark Office, U.S. Dep SS. SEND TO: Commissioner t displays a valid OMB contro	

	<u>ted States Patent A</u>	AND I KADEMARK OFFICE	UNITED STATES DEPART United States Patent and T Address: COMMISSIONER F(P.O. Box 1450 Alexandria, Virginia 2231 www.uspto.gov	rademark Office OR PATENTS
APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/753,245	12/29/2000	Sung-Hoon Baek	51876P219	8804
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LOS ANGELES, C	CA 90025-1030		2153	
			DATE MAILED: 07/11/200	5 ,

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.

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	Application No.	Applicant(s)			
	09/753,245	BAEK ET AL.			
Notice of Allowability	Examiner	Art Unit			
	Krisna Lim	2153			
The MAILING DATE of this communication ap All claims being allowable, PROSECUTION ON THE MERITS herewith (or previously mailed), a Notice of Allowance (PTOL-8 NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT of the Office or upon petition by the applicant. See 37 CFR 1.3	S (OR REMAINS) CLOSED ir 5) or other appropriate commu RIGHTS. This application is s 13 and MPEP 1308.	this application. If not included included included in due course.			
1. This communication is responsive to <u>the amendment file</u>	<u>u 3/11/05</u> .				
2. The allowed claim(s) is/are <u>1-9</u> .					
3. The drawings filed on <u>23 August 2004 and 29 December</u>	<u>r 2000</u> are accepted by the Ex	aminer.			
 4. Acknowledgment is made of a claim for foreign priority a) All b) Some* c) None of the: 1. Certified copies of the priority documents hat 2. Certified copies of the priority documents hat 3. Copies of the certified copies of the priority documents hat 3. Copies of the certified copies of the priority documents hat 3. Copies of the certified copies of the priority documents hat 3. Copies of the certified copies of the priority documents hat 3. Copies of the certified copies of the priority documents hat 3. Copies of the certified copies of the priority documents hat certified copies not received: Applicant has THREE MONTHS FROM THE "MAILING DATE noted below. Failure to timely comply will result in ABANDON THIS THREE-MONTH PERIOD IS NOT EXTENDABLE. 5. A SUBSTITUTE OATH OR DECLARATION must be sub INFORMAL PATENT APPLICATION (PTO-152) which give including changes required by the Notice of Draftspering including changes required by the attached Examine Paper No./Mail Date	we been received. we been received in Application documents have been received E" of this communication to file MENT of this application. mitted. Note the attached EXA ives reason(s) why the oath of sust be submitted. erson's Patent Drawing Review 	n No d in this national stage application from a reply complying with the requirement MINER'S AMENDMENT or NOTICE (declaration is deficient. (PTO-948) attached in the Office action of the drawings in the front (not the back) of R 1.121(d).	nts OF		
7. DEPOSIT OF and/or INFORMATION about the dep	osit of BIOLOGICAL MATE	ERIAL must be submitted. Note the			
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3. Information Disclosure Statements (PTO-1449 or PTO/SE Paper No./Mail Date	3/08), 7. 🗌 Examiner's	Amendment/Comment			
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Notice of References Cited	Application/Control No. 09/753,245	Applicant(s)/Patent Under Reexamination BAEK ET AL.	
Notice of References Offer	Examiner	Art Unit	
	Krisna Lim	2153	Page 1 of 1

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*	Ä	US-6,820,171	11-2004	Weber et al.	711/114
	в	US-			
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FOREIGN PATENT DOCUMENTS

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U.S. Patent and Trademark Office PTO-892 (Rev. 01-2001)

Part of Paper No. 062605



Application/Control No.	Applicant(s)/Patent under Reexamination				
09/753,245	BAEK ET AL.				
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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						

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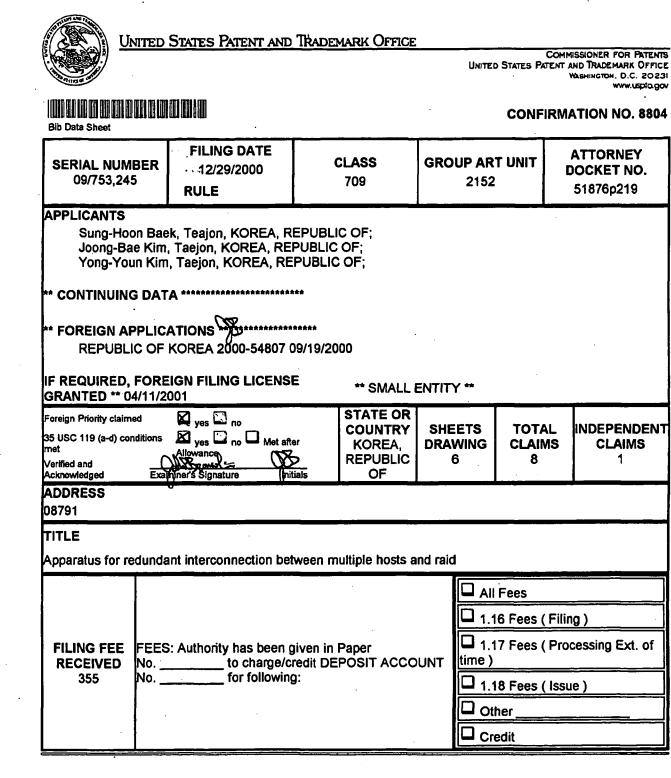
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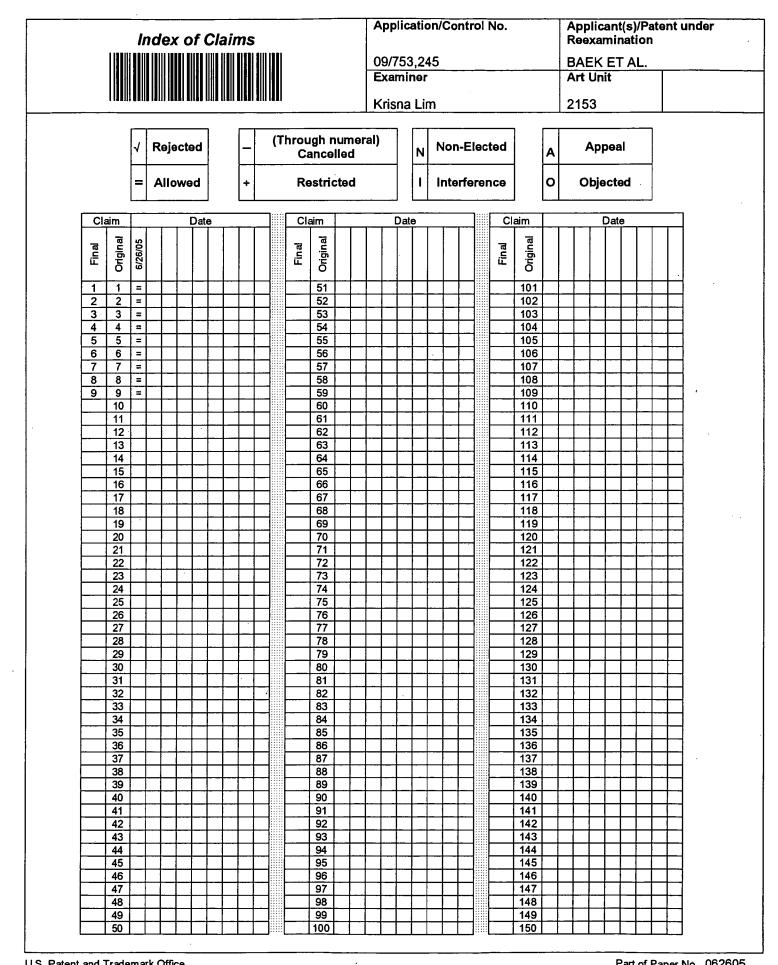


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Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L	5230	Host and RAID	US-PGPUB; USPAT	OR	ON	2005/06/26 17:56
L2	967	11 and RAID adj2 controller	US-PGPUB; USPAT	OR	ON	2005/06/26 17:56
L3	62	I2 and network adj4 interface adj4 controller	US-PGPUB; USPAT	OR	ON	2005/06/26 17:57
L4	62	13 and host	US-PGPUB; USPAT	OR	ON	2005/06/26 17:57
L5	49	IA 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	17 and 12	US-PGPUB; USPAT	OR	ON	2005/06/26 17:59
L9	33	18 and 13	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
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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

Examiner: John R. Brancolini

Serial No.: 09/753,245

Filed: December 29, 2000

APPARATUS FOR REDUNDANT INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

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 units 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 <u>plurality offirst</u> RAID controlling units and the second RAID controlling unit to the numerous host computers, wherein each of the <u>plurality offirst</u> RAID controlling units and the <u>second RAID controlling unit includes a plural number of network interface</u> controlling units for directly exchanging <u>exchange</u> 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<u>the</u> first network interface controlling unit being connected<u>is coupled</u> to the connecting unit of one side and <u>a-the</u> second network interface controlling unit <u>being connectedis</u> <u>coupled</u> to the connected<u>is</u> <u>coupled</u> to the connected<u>is</u>

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

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

Claim 5 (Currently Amended): The apparatus as recited in claim 1, wherein said plurality of connecting units have <u>at least three</u> connection ports more than three, the two <u>of the at least three</u> connection ports among them being is <u>connected coupled</u> to <u>said one of the first</u> network interface controlling unit <u>and the third network controlling unit</u> and the rest <u>of the connection</u> 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 <u>at least three</u> connection ports more than three, the two <u>of the at least three</u> connection ports among them being <u>are</u> connected <u>coupled</u> to <u>said one of the first</u> network interface controlling unit <u>and the</u> third network controlling unit and the rest <u>of the</u> 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 <u>at least five</u> connection ports more than five, the four <u>of the at least five</u> connection ports among them being connected<u>is coupled</u> to said one of the first network interface controlling unit <u>and</u> the third network controlling unit and the rest <u>of the</u> 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

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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 "<u>third</u> network controlling unit" and "<u>fourth</u> 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. <u>35 U.S.C. §102(b)</u>

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 when the first network interface controlling unit of the other RAID controller when the first network interface controlling unit of the other RAID controller when the first network interface controlling unit of the other RAID controller when 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/deserializer 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."

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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

CERTIFICATE OF MAILING

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

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 Svobod

01PE MAY 1 1 2005		
REQUEST	Application No.	09/753,245
FOR	Filing Date	December 29, 2000
CONTINUED EXAMINATION (RCE)	First Named Inventor	Sung-Hoon Baek
TRANSMITTAL	Art Unit	2153
Address to: Mail Stop RCE Commissioner for Patents	Examiner Name	John R. Barncolini
P.O. 1450 Alexandria, VA 22313-1450	Attorney Docket Number	51876P219
application. Request for Continued Examination (RCE) practice under 37 CFR § 1.114 does not a or to any design application. See Instruction Sheet for RCEs (not to be submitted to th 1. Submission required under 37 C.F.R. § 1.114 Note: If the RCE amendments enclosed with the RCE will be entered in the order in which they wish to have any previously filed unentered amendment(s) entered, applicant a. Previously submitted. If a final Office action is outstan action may be considered as a submission even if this box is not i. i. Consider the amendment(s)/reply under 37 C.F.R. § (Any unentered amendment(s) referred to above will be entered). ii. Consider the arguments in the Appeal Brief or Replinit. iii. Other b. Enclosed ii. Affidavit(s)/Declaration(s) iv. Other a. Suspension of action on the above-identified application months. (Period of suspension shall not exceed 3 months).	e USPTO) on page 2. is proper, any previously were filed unless applicant must request non-entry of s ding, any amendments ot checked. 3 1.116 previously filed y Brief previously filed mmation Disclosure Sta er	filed unentered amendments and instructs otherwise. If applicant does not uch amendment(s). is filed after the final Office on on
 3. Fees The RCE fee under 37 C.F.R. § 1.17(e) is required by 37 C.F.R. § 1 a. The Director is hereby authorized to charge the followin No. 02-2666. i. RCE fee required under 37 C.F.R. § 1.17(e) and an 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) WARNING: Information on this form may become pub be included on this form. Provide credit card information 	ng fees, or credit any o y additional claims fee 05/12/2005 AWDNDAF1 01 FC:2801 lic. Credit card inform	overpayments, to Deposit Account (s) 00000095 09753245 395.00 0P nation should not
SIGNATURE OF APPLICANT, ATTORN	EY, OR AGENT REQU	RED
Name (Print/Type) Steven Laut	Registration No. (At	tomey/Agent) 47,736
Signature	Date	May 9, 2005
CERTIFICATE OF MAILING OF I hereby certify that this correspondence is being deposited with the United States Post mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P.O. Box	al Service on the date show	
Name (Print/Type) Jean Svoboda		
Signature	Date	May 9, 2005

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

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for FY 2005	Filing Date		ber 29, 200)()		
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	Examiner Name		Barncolin	i		
Applicant claims small entity status. See 37 CFR 1.27.	Art Unit	2153	Dameonn	1		
TOTAL AMOUNT OF PAYMENT (\$) 395.00	Attorney Docket N		19			
METHOD OF PAYMENT (check all that apply)						
Check Credit card Money Order None	Other (please iden	tify):				
		•	Sokoloff Ta	vlor & Zafman I I P		
 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 Charge any additional fee(s) or underpayment of fee(s) under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20. 						
FEE CALCULATION						
1. EXTRA CLAIM FEES Claims Extra Claims Fee from below FeePad Total Claims 9 20° = 0 × 25.00 Independent 9 2 3° = 0 × 100.00 Multiple Dependent - 0° × 100.00 = = 0 Large Entity Small Entity - Fee fee Fee fee						
Large Entity Small Entity						
Fee Fee Fee Fee Code (\$) Fee Description		-	eePaid			
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2053 130 2053 130 Non-English specification						
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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)						
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1809 790 1809 395 Filing a submission after final rejection (37 CFR § 1.1						
1810 790 2810 395 For each additional invention to be examined (37 CFR § 1.129(b))						
Other fee (specify) RCESUBTOTAL (2) (\$) 395.00						
SUBMITTED BY Complete (if applicable)						
Name (Brist/Tuna) Stanuar Law	Registration No. (Attorney/Agent)	47,736	Telephone	(310) 207-3800		
Signature	<u> </u>	<u> </u>	Date	05/09/05		
Based on PTO/SB/17 (12-04) as modified by Blakely. Sokoloff. Taylor & Zafman (wit) 12/15/2004.			12400			

Based on PTO/SB/17 (12-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wir) 12/15/200 SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

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	TED STATES PATEN	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 7	590 02/10/2005		EXAM	INER
BLAKELY SOKOLOFF TAYLOR & ZAFMAN 12400 WILSHIRE BOULEVARD		BRANCOLINI, JOHN R		
SEVENTH FLOOR		ART UNIT	PAPER NUMBER	
LOS ANGELE	S, CA 90025-1030		2153	
			DATE MAILED: 02/10/200	5

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

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		Application No.	Applicant(s)		
Office Action Summary		09/753,245	BAEK ET AL.		
		Examiner	Art Unit		
	John R Brancolini	2153			
eriod f	The MAILING DATE of this communication or Reply	n appears on the cover sheet w	ith the correspondence address		
THE - Exte afte - If th - If No - Fail Any	HORTENED STATUTORY PERIOD FOR R MAILING DATE OF THIS COMMUNICATION ensions of time may be available under the provisions of 37 Cf r SIX (6) MONTHS from the mailing date of this communication e period for reply specified above is less than thirty (30) days, o period for reply is specified above, the maximum statutory p ure to reply within the set or extended period for reply will, by s reply received by the Office later than three months after the ned patent term adjustment. See 37 CFR 1.704(b).	ON. FR 1.136(a). In no event, however, may a in. a reply within the statutory minimum of thir eriod will apply and will expire SIX (6) MON statute, cause the application to become Al	reply be timely filed ty (30) days will be considered timely. NTHS from the mailing date of this communication. BANDONED (35 U.S.C. § 133).		
Status					
1)⊠	Responsive to communication(s) filed on	23 August 2004.			
· _	· · · _	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 un				
Disposit	tion of Claims				
4)⊠	Claim(s) <u>1-9</u> is/are pending in the applicat	ion.			
•	4a) Of the above claim(s) is/are with				
5)	Claim(s) is/are allowed.				
6)🛛	Claim(s) <u>1-9</u> is/are rejected.				
7)	Claim(s) is/are objected to.				
8)	Claim(s) are subject to restriction a	nd/or election requirement.			
Applicat	tion Papers				
9)	The specification is objected to by the Exa	miner.			
10)🛛	The drawing(s) filed on 23 August 2004 is/	are: a) accepted or b) of	pjected to by the Examiner.		
	Applicant may not request that any objection to	o the drawing(s) be held in abeya	nce. See 37 CFR 1.85(a).		
_	Replacement drawing sheet(s) including the ∞	•	•••••••••••••••••••••••••••••••••••••••		
11)	The oath or declaration is objected to by the	e Examiner. Note the attache	d Office Action or form PTO-152.		
Priority	under 35 U.S.C. § 119				
-	Acknowledgment is made of a claim for for		§ 119(a)-(d) or (f).		
	1. Certified copies of the priority docur				
	2. Certified copies of the priority docur				
	3. Copies of the certified copies of the		received in this National Stage		
	application from the International Bu	Ireau (PCT Rule 17 2(a))			
u .	See the attached detailed Office action for a	• • • • • •			

1) 🖾	Notice	of R	eferences	Cited	(PT	0-892)

- 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:

 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).

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

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
×	Α	US-5,812,754	09-1998	Lui et al.	714/6
¥	В	US-6,192,485	02-2001	Takita et al.	714/6
*	С	US-6,609,213	08-2003	Nguyen et al.	714/4
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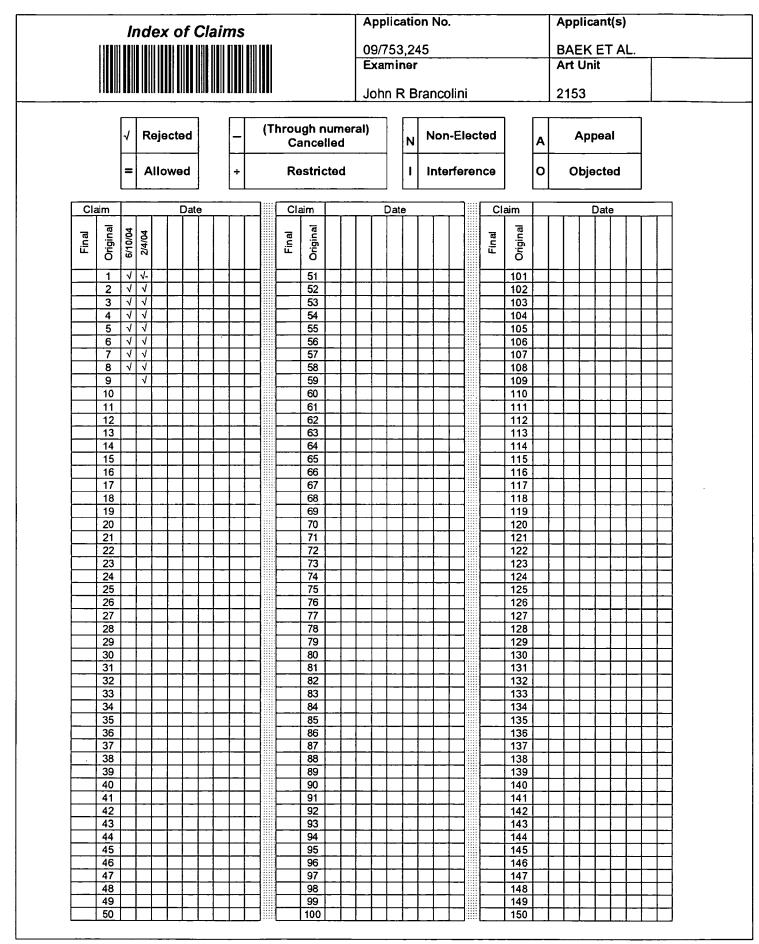
FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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*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.



U.S. Patent and Trademark Office

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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	B				
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INTERFERENCE SEARCHED						
Class	Subclass	Date	Examiner			
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SEARCH NOT (INCLUDING SEARCH		······
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Consult Z. Maung PE 2154 Discuss claims and possible transfer as well as classes for search	5/10/2004	- Por
East Image and Text Search Image 709, 711 Text attached	5/11/2004	B
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	×

U.S. Patent and Trademark Office

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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

RECEIVED

AUG 2 7 2004

Technology Center 2100

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 networkRAID 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 230, 231 are connected with each other through communication controllers 230, 231 are connected with each other through communication controllers 230, 231 are connected with each other through communication controllers 230, 231 are connected with each other through communication controllers 230, 231 are connected with each other through communication

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. <u>The RAID 340 includes two RAID</u> <u>controllers each of which has network interference controllers 330, 331 and four ports 310, 311, 320 and 321.</u> 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<u>the host</u> 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. 4a 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

<u>, wherein each of the plurality of RAID controlling units includes</u> a plural number of network interface controlling units respectively contained into the plurality of RAID controlling units, for <u>directly</u> exchanging information directly with the numerous host computers and an opposite <u>a</u> network interface controlling unit provided within an opposite <u>included in another</u> 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, <u>plural</u> <u>number of the network interface controlling units are</u> 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 <u>is</u> 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 of the second RAID controlling unit being 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. <u>In the Drawings</u>

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. <u>35 U.S.C. §102(b)</u>

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.' (<u>Richardson v. Suzuki</u> <u>Motor Co.</u>, 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. (<u>In re Bond</u>, 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 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 when the first network interface controlling unit of the other RAID controller when the first network interface controlling unit of the other RAID controller when the first network interface controlling unit of the other RAID controller when the first network interface controlling unit of 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/deserializer 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

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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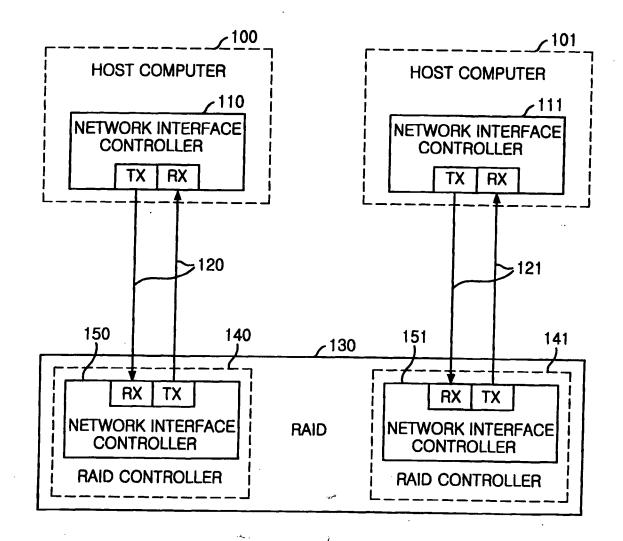


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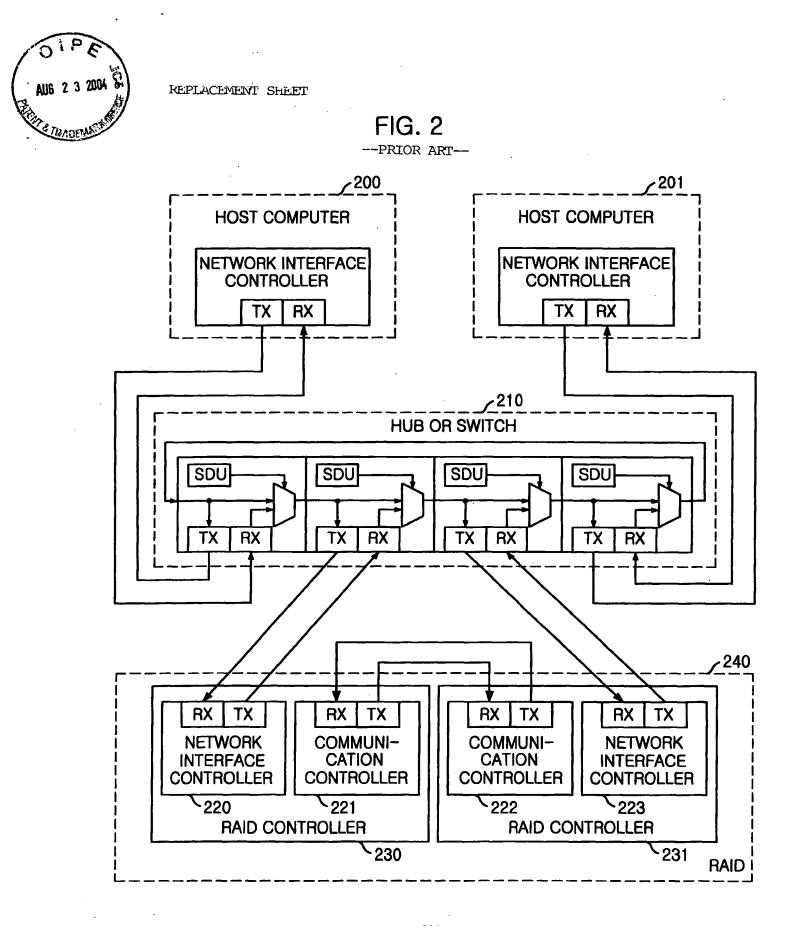
REPLACEMENT SHEET

FIG. 1

--PRIOR ART--



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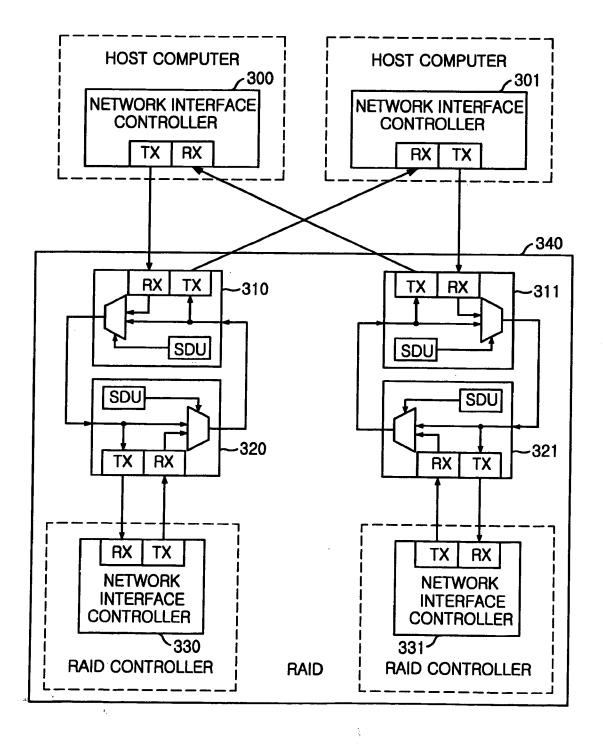
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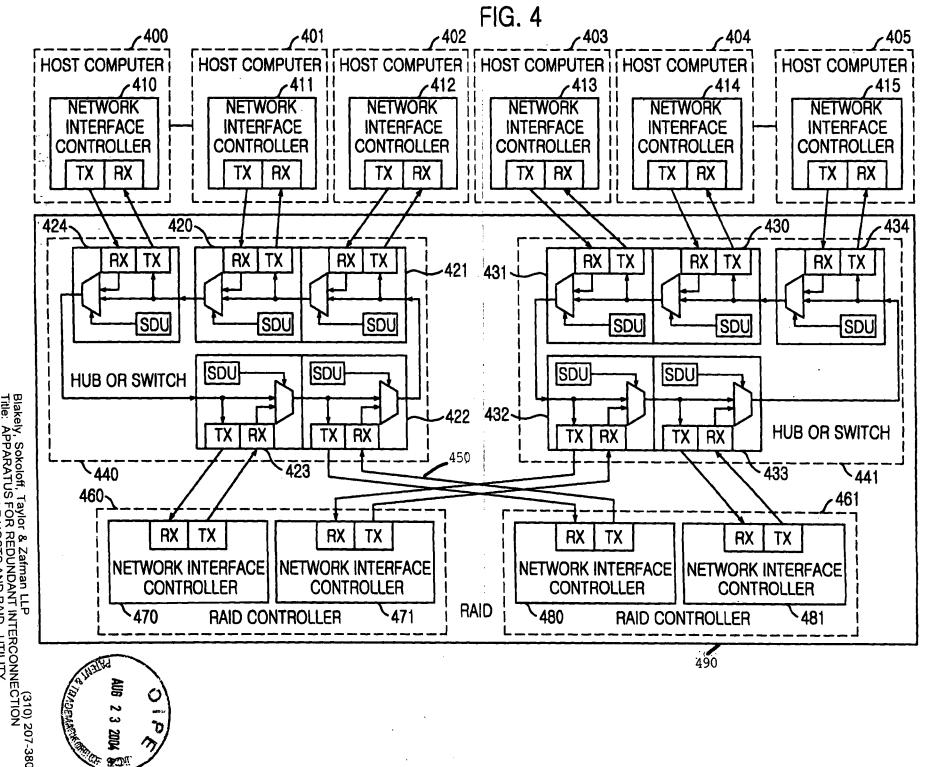
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FIG. 3





Blakely, Sokoloff, Taylor & Zafman LLP(310) 207-3800Title: APPARATUS FOR REDUNDANT INTERCONNECTIONBETWEEN MULTIPLE HOSTS AND RAID - UTILITY1st Named Inventor: Sung-Hoon BaekApplication No.: 09/753,245Docket No.: 51876P219Sheet: 3 of 4DHPN-1002 / Page 56 of 158



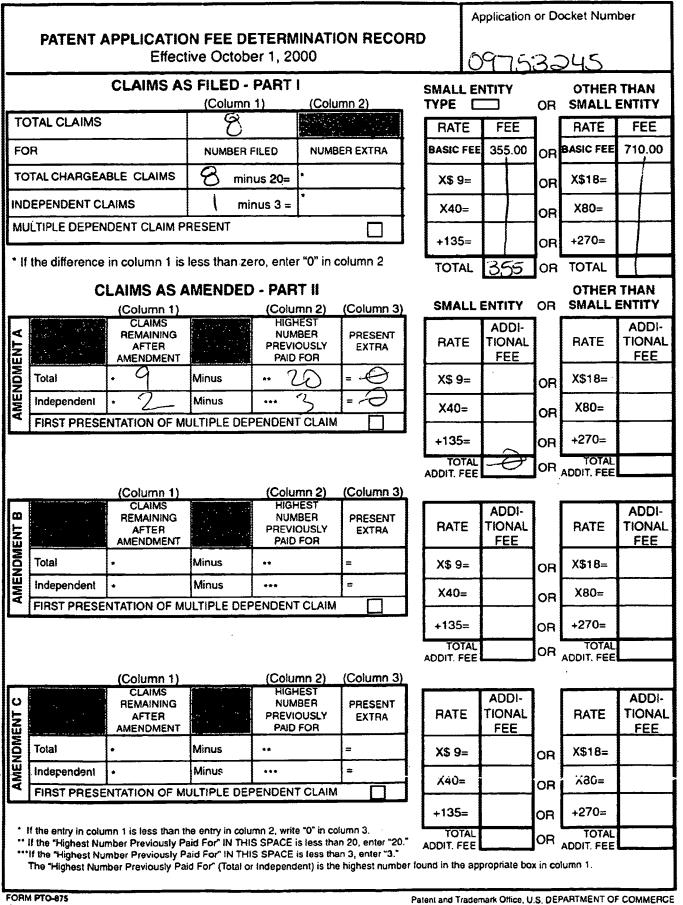
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SUBMITTED BY Complete (if applicable) Name (Prov/Type) Stavior 1 dut Name (Prov/Type) Stavior 1 dut		" Sleven Laul	(A	attorney/Age	nt)	4	1,130				
Name (Print/Type) Steven Laut Registration No. (Attorney/Agent) 47,736 Telephone (310) 207-3800								Date	08/19	3/04	

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



(Rev. 8/00)

DHPN-1002 / Page 60 of 158

			UNITED STATES DEPAR United States Patent and Address: COMMISSIONER F P.O. Box 1430 Alexandria, Virginia 223 www.uspto.gov	Trademark Office OR PATENTS
APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO
09/753,245	12/29/2000	Sung-Hoon Baek	51876p219	8804
8791 75	90 05/20/2004		EXAM	INER
	OKOLOFF TAYLOR & RE BOULEVARD, SEVI		BRANCOLI	NI, JOHN R
LOS ANGELES		IN THI FLOOR	ART UNIT	PAPER NUMBER
	,		2153	

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

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		Application No.	Applicant(s)	\sim
	r	09/753,245	BAEK ET AL.	đ
•	Office Action Summary	Examiner	Art Unit	
		John R Brancolini	2153	
 Period for	The MAILING DATE of this communicat Reply			ress
THE M/ - Extension after SC - If the per - If NO per - Failure Any rep	RTENED STATUTORY PERIOD FOR AILING DATE OF THIS COMMUNICA ons of time may be available under the provisions of 3 X (6) MONTHS from the mailing date of this communic eriod for reply specified above is less than thirty (30) dd eriod for reply is specified above, the maximum statuto to reply within the set or extended period for reply will, dy received by the Office later than three months after patent term adjustment. See 37 CFR 1.704(b).	TION. 7 CFR 1.136(a). In no event, however, may a r ation. ays, a reply within the statutory minimum of third ry period will apply and will expire SIX (6) MON by statute, cause the application to become AB	eply be timely filed ty (30) days will be considered timely. ITHS from the mailing date of this com BANDONED (35 U.S.C. § 133).	munication.
Status				
1)🛛 R	Responsive to communication(s) filed o	on <u>29 December 2000</u> .		
2a) 🗌 T	his action is FINAL. 2b)	igtriangleq This action is non-final.		
•	ince this application is in condition for	•		nerits is
С	losed in accordance with the practice	under Ex parte Quayle, 1935 C.D). 11, 453 O.G. 213.	
Dispositio	n of Claims			
4)⊠ C	Claim(s) <u>1-8</u> is/are pending in the appli	cation.		
4;	a) Of the above claim(s) is/are v	withdrawn from consideration.		
·	Claim(s) is/are allowed.			
-	Claim(s) <u>1-8</u> is/are rejected.			
-	Claim(s) <u>3,8</u> is/are objected to.			
8) 🗌 C	Claim(s) are subject to restriction	n and/or election requirement.		
Applicatio	n Papers			
9) 🗌 Ti	ne specification is objected to by the E	xaminer.		
10)⊠ TI	he drawing(s) filed on <u>29 December 20</u>	<u>200</u> is/are: a)□ accepted or b)⊠	objected to by the Examir	ner.
	pplicant may not request that any objectio			
	teplacement drawing sheet(s) including the	• •	• •	• •
11)[_] []	he oath or declaration is objected to by	/ the Examiner. Note the attached	d Office Action or form PTO)-152.
Priority un	der 35 U.S.C. § 119			
a) 1 2	cknowledgment is made of a claim for All b) Some * c) None of: Certified copies of the priority doe Certified copies of the priority doe	cuments have been received. cuments have been received in A	pplication No	tane
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* Se	e the attached detailed Office action for		received.	
Attachment(s	-			
	of References Cited (PTO-892) of Draftsperson's Patent Drawing Review (PTO-		Summary (PTO-413) s)/Mail Date	
	of Draftsperson's Patent Drawing Review (PTO- ation Disclosure Statement(s) (PTO-1449 or PTC		nformal Patent Application (PTO-1	52)

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DETAILED ACTION

Claims 1-8 are pending in the application.

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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 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://pairdirect.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (tollfree).

FRANTZ B. JEAN

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Notice of	References	Cited
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Application/Control No. 09/753,245	Applicant(s)/Patent Under Reexamination BAEK ET AL.		
Examiner	Art Unit		
John R Brancolini	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
	В	US-6,192,485 B1	02-2001	Takita et al.	714/6
	с	US-6,609,213 B1	08-2003	Nguyen et al.	714/4
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FOREIGN PATENT DOCUMENTS

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	N					
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NON-PATENT DOCUMENTS

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

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Exam. Initials		Document Number	Date	Name	Class	Sub- class	Filing Date (if appropriate)
XX	ĂA	5,251,062	10/05/1993	Snitzer et al.			
	AB	5,798,306	08/25/1998	Dickinson, Jr.			
Ø	AC	4,652,536	03/24/2087	Nakajima et al.			
,	AD						
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FOREIGN PATENT DOCUMENTS

Exam. Initials		Document Number	Date	Country	Class	Sub- class	Trans Yes	slation No
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	AN							•
	AO							
	AP							
	AQ							

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

Exam. Initials		Document Identification	
S	AR	Tellurite glass: a new candidate for fiber devices by J.S. Wang: Optical Materials 3 (1994) 187-203	
SS .	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	
5	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: R, 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

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

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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

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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.

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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

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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.

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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 25 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

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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.

5 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.

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Brief Description of the Drawings

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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 20 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.

25 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.

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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'.

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dung dung dan unung onen gener An Auch Marin dens dana Ar 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 10 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. 15Also, 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 20 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.

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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

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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

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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.

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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.

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What is claimed is:

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

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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 Hard and Hard and Hard Hard 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.

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

20 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 25 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.

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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.

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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.

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Abstract of the Disclosure

The apparatus for a redundant interconnection between multiple hosts and a redundant array of inexpensive disks 5 (hereinafter, referred to as 'RAID'), which is capable of fault tolerance of RAID controllers and supporting a 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 10 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 15 controlling unit provided within an opposite RAID controlling unit and the numerous host computers, through the plurality of connecting units.

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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

Assistant Commissioner for Patents Washington, D.C. 20231

Art Group: Examiner:

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

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

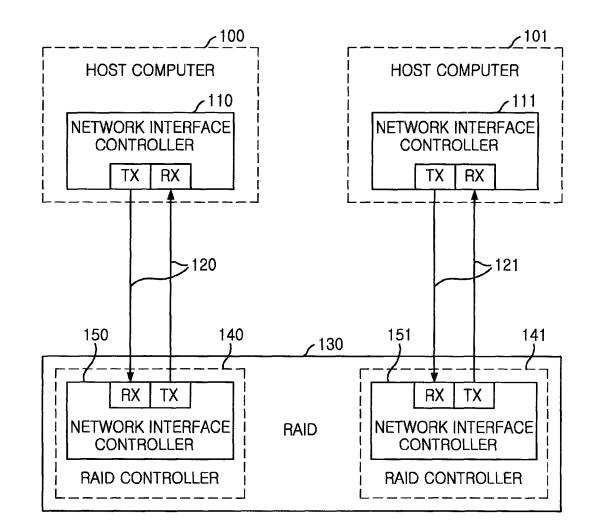
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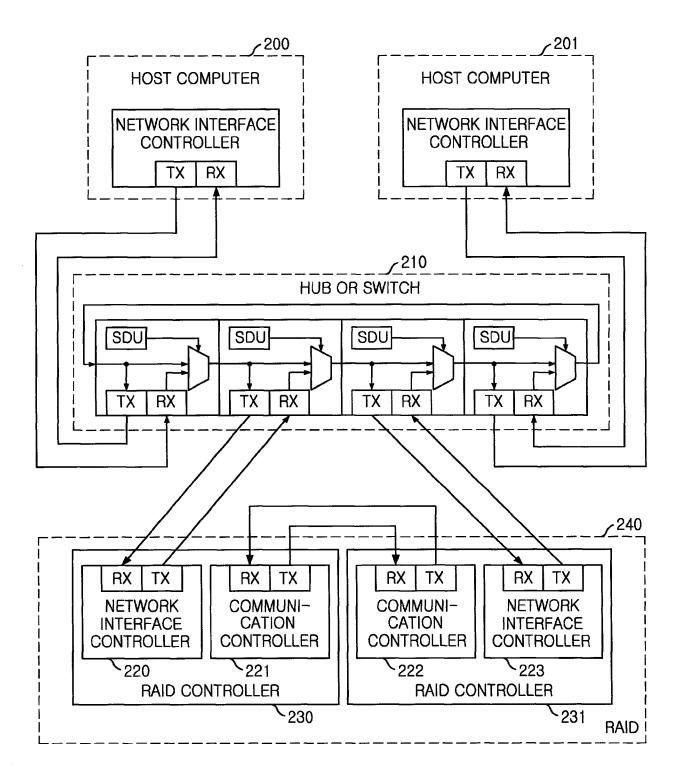
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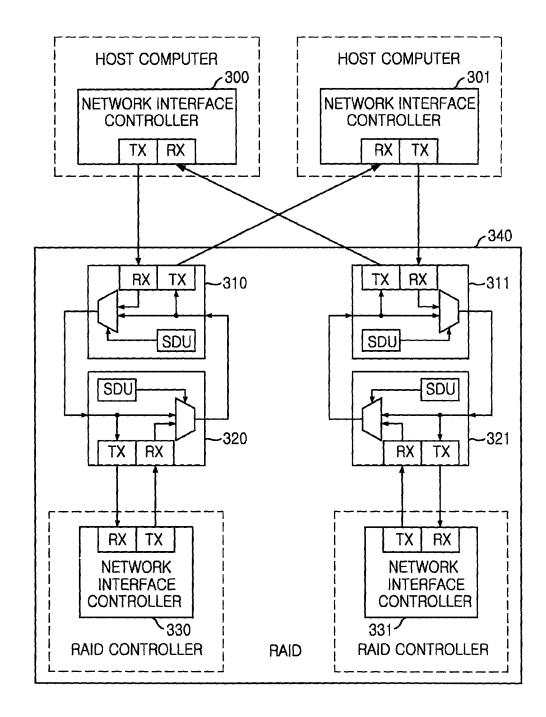


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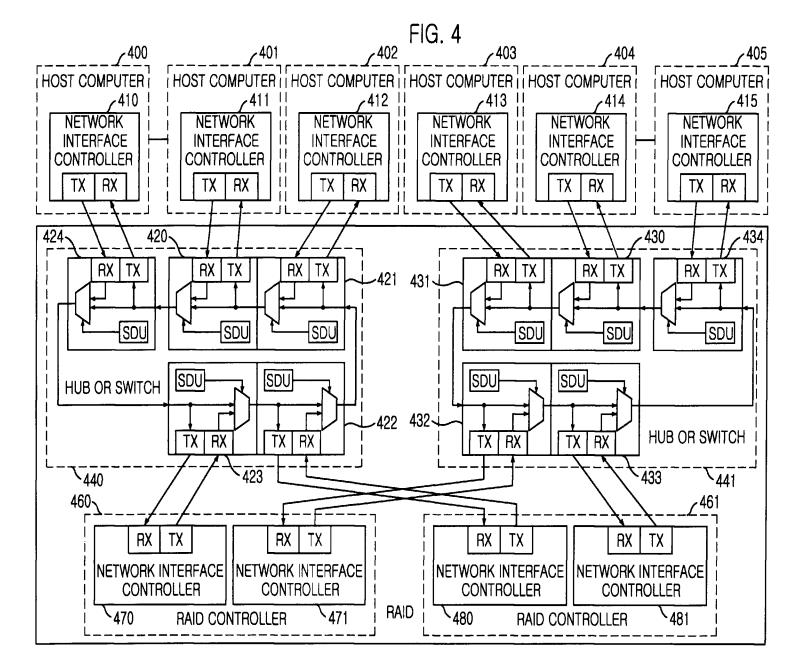
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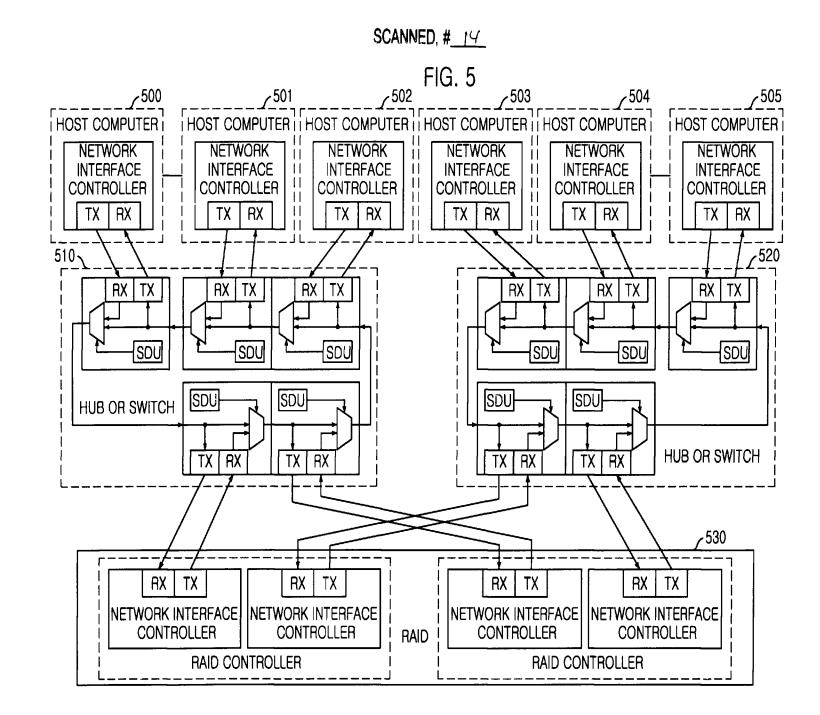


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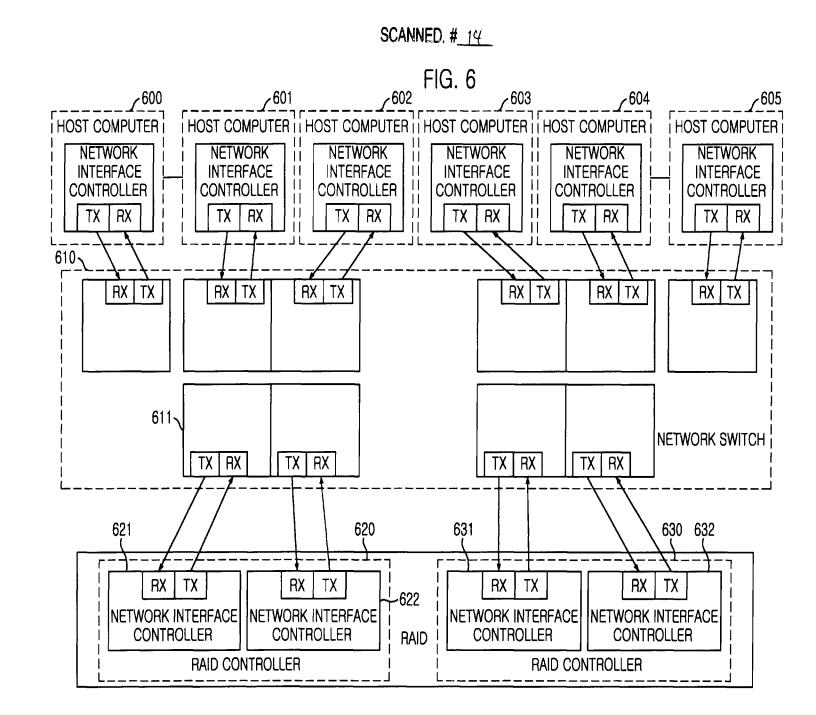
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DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

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

as

INTERCONNECTION BETWEEN MULTIPLE HOSTS AND RAID

the specification of which

_x is attached hereto.

_____ was filed on

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, and 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 Ap	plication(s)		Claim	
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)

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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 willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full Name of Sole/First Inventor BAEK, SUNG-HOC)N
Inventor's Signature	Date 1/01.1 2200
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Full Name of Second/Joint Inventor KIM, JOONG-BA	λE
Inventor's Signature Kum Jornp-boe	Date Nov. 1. 2600
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(City, State)	(Country)
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305-390, KOREA	
Full Name of Third/Joint Inventor KIM, YONG-YOUN	
Inventor's Signature	Date Nov. 1. m
Residence TAEJON	Citizenship REPUBLIC OF KOREA
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KOREA	
Full Name of Fourth/Joint Inventor	
Inventor's Signature	Date
Residence	Citizenship
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Full Name of Fifth/Joint Inventor	
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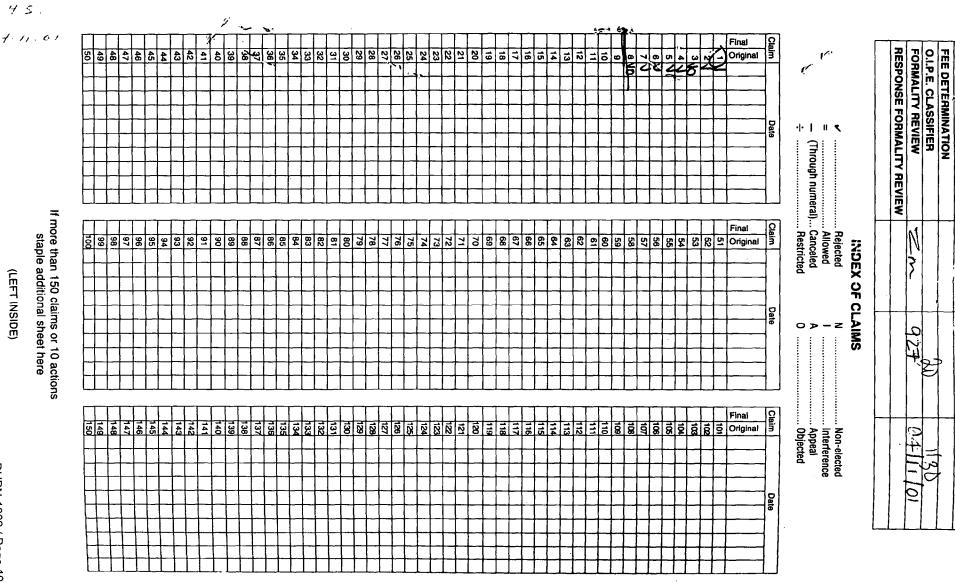
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid O UTILITY PATENT APPLICATION TRANSMITTAL (Only for new nonprovisional applications under 37 CFR 1.53(b)) Application Identifier See MPEP chapter 600 concerning utility patent application contents See MPEP chapter 600 concerning utility patent application contents 1 Fee Transmittal Form (e.g. PTO/SB/17) (Submit an original, and a duplicate for tee processing) 2 Applicant claims small entity status. See 37 CFR 1.27. 3 Specification (pretered arrangement set forth below) • Descriptive title of the Invention • Cross Reference to sequence listing, a table, or a computer program listing appendix • Background of the Invention • Brief Description of the Invention • Brief Description of the Invention • Brief Description of the Drawings (if filed)	/EEN MULTINER
Attorney Docket No. 51876p219 Attorney Docket No. 51876p219 Attorney Docket No. 51876p219 First Inventor or Application Identifier Sung-Hoon Back Title APPARATUS FOR REDUNDANT INTERCONNECTION BETW Computer new nonprovisional applications under 37 CFR 1.53(b) Application under 37 CFR 1.53(b) Application contents APPLICATION ELEMENTS Application contents ADDRESS TO: Assistant Commissioner for P See MPEP chapter 600 oncerning utility patent application contents ADDRESS TO: Assistant Commissioner for P See MPEP chapter 600 oncerning utility patent application contents ADDRESS TO: Assistant Commissioner for P See 37 CFR 1.27. Applicant claims small entity status. See 37 CFR 1.27. Application Addition washington, DC 20231 Nucleotide and/or Amino Acid Sequence Su (frapplications Corporated anangement set forth below) Image: statement Regarding Fed sponsored R & D Specification Sequence Listing on: i. CD-ROM or CD-R (2 copies ii. CD-R	Patents Table or Ibmission
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FEE CALCULATION	115	110	215	55	Extension for response within first month	
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107 490 207 245 Plant filing fee	121	270	221	135	Request for oral hearing		
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114 150 214 75 Provisional filing fee	140	110	240	55	Petition to revive - unavoidably		
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102 80 202 40 Independent claims in excess of 3			070	000	examined (37 CFR 1.129(b))		
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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

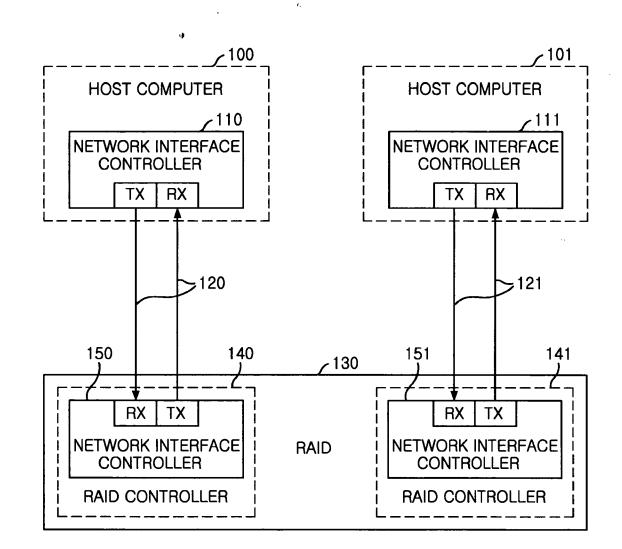
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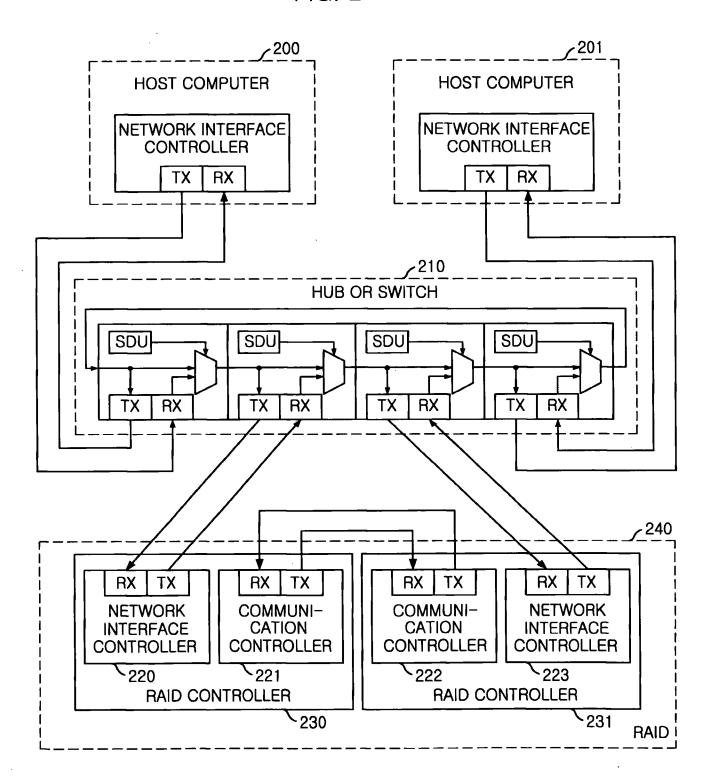
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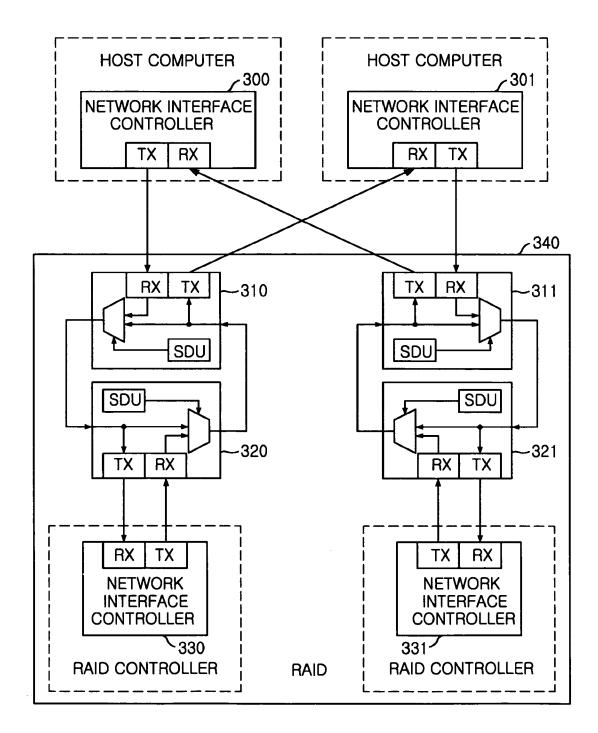
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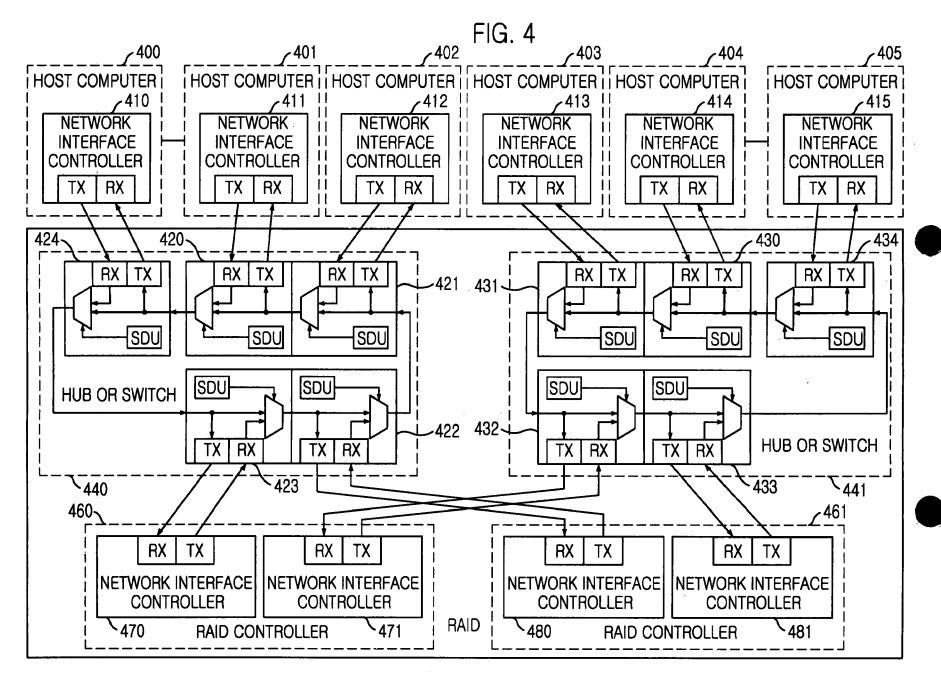
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FIG. 3

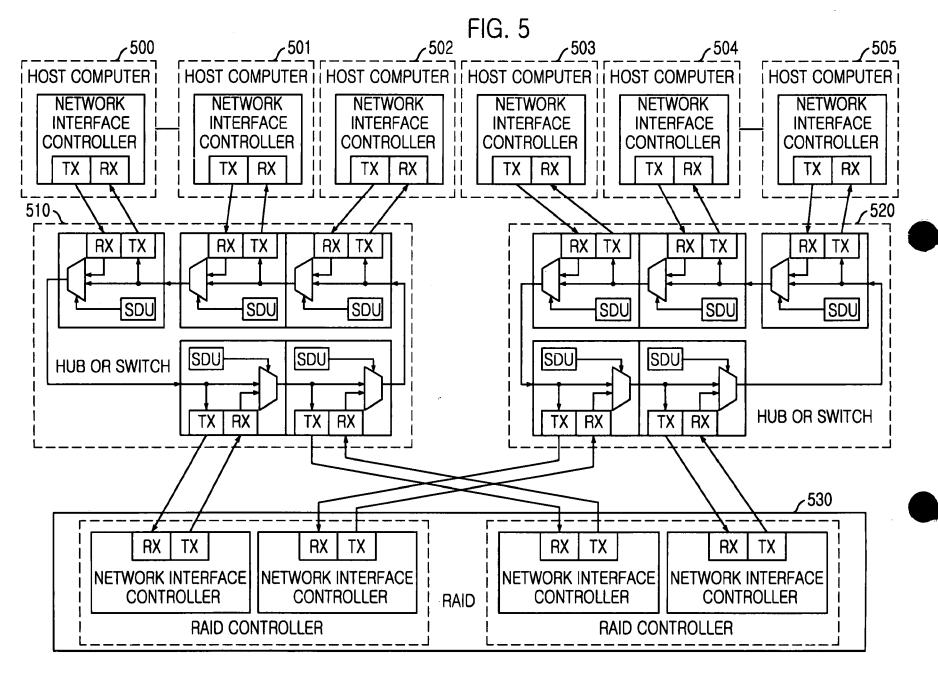


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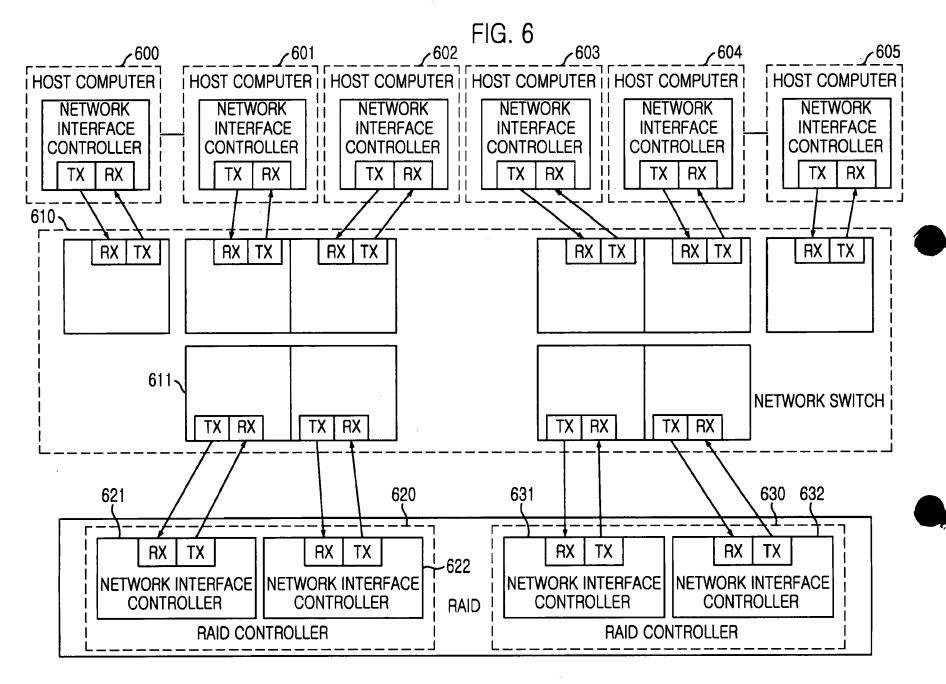


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UTILITY APPLICATION FOR UNITED STATES PATENT

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

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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.

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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.

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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 10 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 15 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 20 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 25 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.

5 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 15 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 20 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.

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Brief Description of the Drawings

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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.

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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'.

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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

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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

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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 for the first network interface controller 631 of the second RAID controller 630 is transmitted to the second network

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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.

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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:

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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.

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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 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.

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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.

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Abstract of the Disclosure

The apparatus for a redundant interconnection between multiple hosts and a redundant array of inexpensive disks 5 (hereinafter, referred to as 'RAID'), which is capable of supporting а 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 10 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 15 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.

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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

<u>x</u> is attached hereto.

was filed on

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, and 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.

as

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 Fo	reign Ap	olication(s)		Prior <u>Clain</u>	
2000-		REPUBLIC OF KOREA	19 / 09 / 2000	<u>X</u>	
(Nurr	nber)	(Country)	(Day/Month/Year Filed)	Yes	No
(Num	nber)	(Country)	(Day/Month/Year Filed)	Yes	No
(Num	nber)	(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)

Ref.: 51876. P219

I hereby appoint BLAKELY, State KOLOFF, TAYLOR & ZAFMAN, a file scluding: 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.

Full Name of Sole/First Inventor BAEK, SUNG-HOON	
Inventor's Signature	Date 1/01 / 2000
Residence TAEJON	Citizenship REPUBLIC OF KOREA
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Full Name of Second/Joint Inventor KIM, JOONG-BAE	
Inventor's Signature Kim Joang-how	Date 1. 2000
Residence TAEJON	Citizenship REPUBLIC OF KOREA
(City, State)	
	ONG, YUSONG-GU, TAEJON,
<u> </u>	
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KOKEA	
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Inventor's Signature	Date
Residence	Citizenship
(City, State)	(Country)
Post Office Address	
Full Name of Fifth/Joint Inventor	
Inventor's Signature	Date
Residence	Citizenship
(City, State) Post Office Address	(Country)







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UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS UNITED STATES PATENT AND TRADEMARK OFFICE WASHINGTON, D.C. 2023I WVW.USPTO.GOV

Bib Data Sheet

CONFIRMATION NO. 8804

SERIAL NUMBE 09/753,245	ΞR	FILING DATE 12/29/2000 RULE	C	C LASS 709	GRO	UP AR 2152		D	ATTORNEY OCKET NO. 51876p219
Joong-Bae Yong-Youn	Kim, Kim,	k, Teajon, KOREA, RI Taejon, KOREA, REI , Taejon, KOREA, RE A ******	PUBLIC PUBLIC	OF;					
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TITLE									
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Attorney Docket No.: 51876p219 Express Mail No.: em014066885us



#### IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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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 Coest

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

1

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

DHPN-1002 / Page 134 of 158



청

# 대 한 민 국 특 허 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.



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【서류명】	특허출원서
【권리구분】	특허
【수신처】	특허청장
【참조번호】	0002
【제출일자】	2000.09.19
【발명의 명칭】	다중 호스트 컴퓨터와 레이드 사이의 중복연결을 위한 장 치
【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】	20000519758
【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 305-390 【우편번호】 대전광역시 유성구 전민동 나래아파트 105-701 【주소】 【국적】 KR 【발명자】 【성명의 국문표기】 김용연 KIM, Yong Youn 【성명의 영문표기】 "😚 【주민등록번호】 570807-1063533 305-333 【우편번호】 대전광역시 유성구 어은동 99 한빛아파트 117-1002 【주소】 【국적】 KR 청구 【심사청구】 특허법 제42조의 규정에 의한 출원, 특허법 제60조의 규정 【취지】 에 의한 출원심사 를 청구합니다. 대리인 특허법인 신성 정지원 (인) 대리인 특허법인 신성 원석희 (인) 대리인 특허법인 신성 박해천 (인) 【수수료】 면 29.000 원 【기본출원료】 19 면 0 원 【가산출원료】 0 () 원 건 【우선권주장료】 0 365,000 원 【심사청구료】 8 항 【합계】 394,000 원 【감면사유】 정부출연연구기관 【감면후 수수료】 197.000 원 【첨부서류】 1. 요약서·명세서(도면)_1통

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#### 【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 컴퓨터 와 레이드 사이의 중복연결을 위한 장치를 제공하기 위하여, 다중 호스트 컴퓨터와 레이 드 사이의 중복연결 장치에 있어서, 산업 표준 통신망을 통하여 연결된 복수의 호스트 컴퓨터들의 요구를 처리하고 결함허용 기능을 수행하기 위한 다수 개의 레이드 제어 수 단; 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, 레이 드 시스템 등에 이용됨.

#### 【대표도】

도 4

【색인어】

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

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#### 【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 연 결방식의 구성예시도.

도 2 는 종래의 두 제어기 사이에 오류복구를 위한 통신정합을 가지는 일반적인 호 아, 스트 정합방식의 구성예시도.

도 3 은 종래의 레이드와 호스트 컴퓨터 사이의 결선방식의 구성예시도.

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

도 5 는 본 발명에 따른 레이드와 호스트 컴퓨터 사이의 외장 시스템으로서의 호스 트 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

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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 다 중 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 제어 기가 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 연 결방식의 구성예시도이다.
- <13> 이러한 시스템은, 도면에 도시된 바와 같이, 두 레이드 제어기(140,141)를 독립적 으로 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

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· . .

스트 정합방식의 구성예시도이다.

<15> 도 1 이 갖지 못한 결함허용을 제공하기 위해서 두 레이트 제어기(230,231)와 호스 트 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 제어 기가 고장난 제어기의 역할까지 수행하게 된다. 그리고, 고장에 대비하여, 레이드 제어 기(230,231)들은 서로 정보를 주고 받아야 하므로 통신 제어기(221,222)를 통하여 연결 되어 있다. 하지만, 이러한 시스템의 경우에는 도 1 이 가지는 대역폭의 절반의 성능 밖 에 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-간 의 시스템 연결에 대한 부분이다. 하지만 이에 따른 구성은 통신망의 구조가 도 2 와 다 른 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 결함 허용을 지원함과 동시에 성능을 높일 수 있는 다중 호스트 컴퓨터와 레이드 사이의 중복 연결을 위한 장치를 제공하는데 그 목적이 있다.

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【발명의 구성 및 작용】

- < 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; 상기다수의 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 제어수단과 직접 정보를 교환하는 다수 개의 망 정합 제어 수단을 포함한다.</p>
  - <20> 상술한 목적, 특징들 및 장점은 첨부된 도면과 관련한 다음의 상세한 설명을 통하 여 보다 분명해 질 것이다. 이하, 첨부된 도면을 참조하여 본 발명에 따른 바람직한 일· 실시예를 상세히 설명한다.

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

- <22> 도면에 도시된 바와 같이, 본 발명은 두 개의 레이드 제어기(460,461) 사이의 오류 복구를 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 제 어기(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 연결 된 시스템을 하나의 망으로 연결시켜주며, 한 시스템에 고장이 발생하거나 선이 단락되

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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 아 비트레이티드 루프(Fibre Channel Arbitrated Loop) 허브의 간단한 내부구조의-예로서, 이미 공지된 기술이므로, 본 발명에서는 더 이상 설명하지 않기로 한다. 허브는 해당 통 신 망 규격을 준수한다.
- <25> 상기 레이드 제어기와 허브와 호스트 컴퓨터가 연결되어 있는 망은 산업 표준 통신 망이다. 이러한 통신망에는 대표적으로 파이버 채널(Fibre Channel)과 비동기식 전송 모
   도 드(ATM : Asynchronous Transfer Mode)와 인피니밴드(InfiniBand) 등이 있다. 이하, 이 것들을 '망'이라 칭한다.
  - <26> 호스트 컴퓨터들(400 내지 405)이 갖고있는 망 정합 제어기(410 내지 415)와 레이 드 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 제 어기, 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 다 른 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

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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 컴퓨 터와 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 이 상임을 의미한다.
- - <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 컴퓨 터들(403 내지 405)의 데이터를 공급하고, 상대 망 정합 제어기(471, 481)가 보내는 정 보를 처리한다.

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- <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 않 은 상대 레이드 제어기의 둘째 망 정합 제어기가 오류 발생된 레이드 제어기의 첫째 망 정합 제어기의 기능을 물려받는다.
- <3> 도 5 는 본 발명에 따른 레이드와 호스트 컴퓨터 사이의 외장 시스템으로서의 호스 트 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 이용 하여 구성할 수도 있다.
- <35 도 6 은 본 발명에 따른 레이드와 호스트 컴퓨터 사이의 망 스위치로서의 호스트 정합방식의 일실시예 구성도이다.
- S6> 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 제 어기(632)가 보내는 정보는 첫째 레이드 제어기(620)의 첫째 망 정합 제어기(621)가 받 는다. 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 제 어기(632)가 받는다.

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

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<3> 이상에서 설명한 본 발명은 전술한 실시에 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 있 어 명백할 것이다.

【발명의 효과】

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<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, 대역 폭의 저하없이 두 레이드 제어기 사이의 결함허용 기능을 구성할 수 있는 효과가 있다.

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【특허청구범위】

【청구항 1】

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

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

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.

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【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 수 단은 일측의 연결 수단과 연결되고, 제 2 망 정합 제어 수단은 타측의 연결 수단과 연결 되는 것을 특징으로 하는 다중 호스트 컴퓨터와 레이드 사이의 중복 연결 장치.

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【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 오류 가 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,

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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 수단 과 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 쌍으 로 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 연결 되고,

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

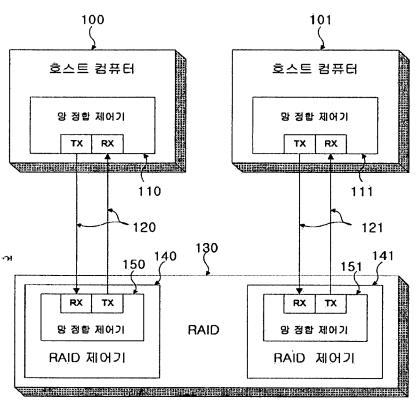
상기 둘째 레이드 제어 수단의 둘째 망 정합 제어 수단이 상기 첫째 연결 수단에 … 연결된 것을 특징으로 하는 다중 호스트 컴퓨터와 레이드 사이의 중복 연결 장치.

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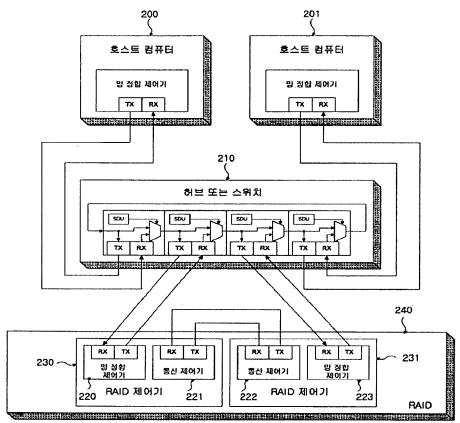


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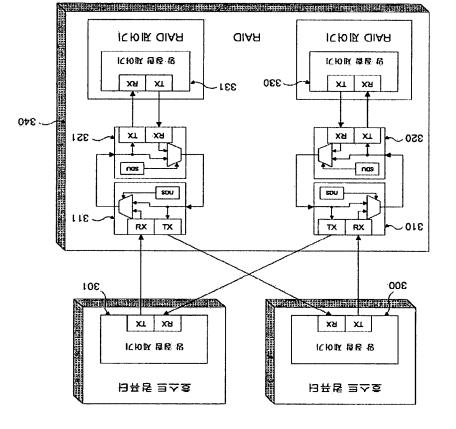


【도면】

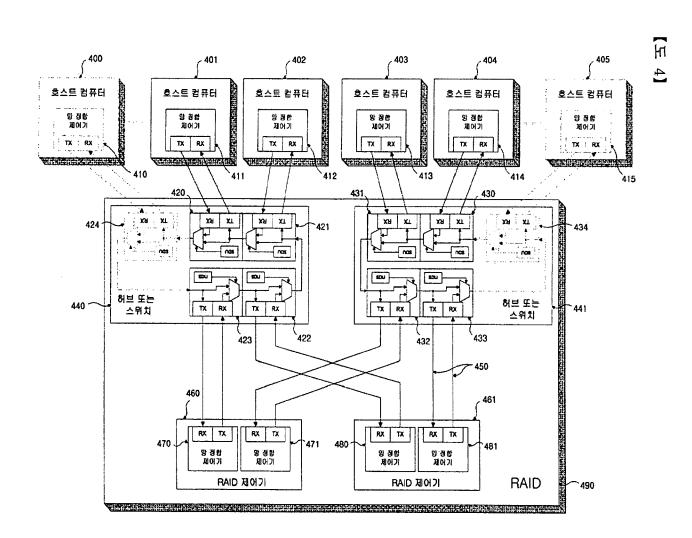
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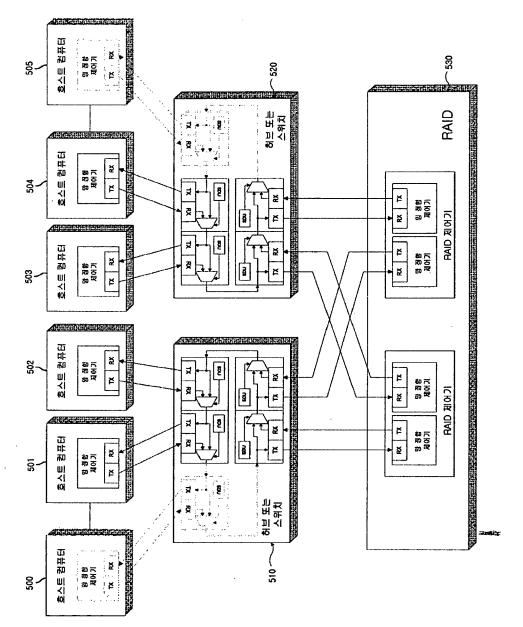
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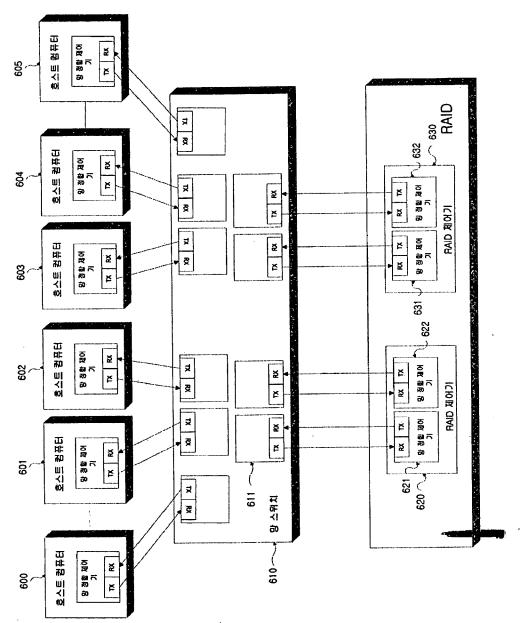
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【도 6】



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#### 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:

### 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

/ homas

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