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United States Patent [19]

Bergsten

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[54] **DATA STORAGE CONTROLLER PROVIDING MULTIPLE HOSTS WITH ACCESS TO MULTIPLE STORAGE SUBSYSTEMS**

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[21] Appl. No.: **08/828,888**

[22] Filed: **Mar. 31, 1997**

[51] **Int. Cl.**[7] **G06F 12/02**

[52] **U.S. Cl.** **711/114**; 711/148; 711/153; 711/162; 707/204; 714/204

[58] **Field of Search** 707/204; 711/162, 711/148, 114, 153; 714/6

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,889,237	6/1975	Alferness et al.	711/148
4,718,006	1/1988	Nishida	711/148
5,155,845	10/1992	Beal et al.	395/575
5,408,629	4/1995	Tsuchiva et al.	711/151
5,455,932	10/1995	Major et al.	711/162
5,459,842	10/1995	Begun et al. .	
5,459,857	10/1995	Ludlam et al.	395/182.04
5,481,276	1/1996	Dickey et al. .	
5,504,882	4/1996	Chai et al.	395/182.03
5,530,845	6/1996	Hiatt et al. .	
5,588,132	12/1996	Cardoza	711/148
5,615,364	3/1997	Marks	707/202
5,673,381	9/1997	Huai et al.	395/180
5,673,382	9/1997	Cannon et al.	395/182.04
5,675,802	10/1997	Allen et al.	395/703
5,680,580	10/1997	Beardsley et al.	711/162
5,692,147	11/1997	Larson et al. .	
5,699,510	12/1997	Petersen et al.	385/185.07
5,708,769	1/1998	Stallmo	714/6
5,729,735	3/1998	Mayering	707/10
5,740,433	4/1998	Carr et al.	707/202
5,742,792	4/1998	Yanai et al.	711/162
5,765,200	6/1998	McIlvain et al.	711/170
5,768,623	6/1998	Judd et al.	395/857
5,794,013	8/1998	McBrearty	395/500.48
5,926,833	7/1999	Rasulian et al.	711/147

FOREIGN PATENT DOCUMENTS

PCT/US93/05853	6/1993	WIPO .
WO 94/00816	1/1994	WIPO .
PCT/US94/01447	2/1994	WIPO .
WO 94/19743	9/1994	WIPO .

OTHER PUBLICATIONS

Brochure, "CacheXchange: General Description, Legacy Series 690/9090," Andor International, Ltd., 1991.

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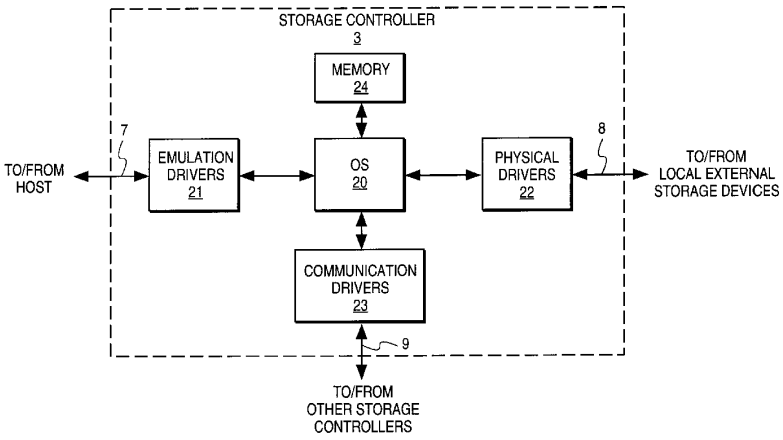
[57] **ABSTRACT**

A computer network comprises a number of storage controllers, each coupled to one of a plurality of storage arrays, each storage array including at least one mass storage device. Each storage controller may be coupled to at least one host processing system and to at least one other storage controller to control access of the host processing systems to the mass storage devices. Multiple copies of data are maintained in storage arrays that are geographically remote to each other, such that any copy can be accessed by any host. Each storage controllers includes an interface with a host that emulates a mass storage device and an interface with a local storage array that emulates a host. The interfaces to the host and local storage arrays are independent of the type of host or devices in the local storage array. Two or more hosts may be dissimilar to each other, and two or more storage arrays may include dissimilar mass storage devices. Hosts access stored data using virtual addressing. During a data access, the storage controller connected to the accessing host maps a virtual address provided by the host to a real physical location in any of the storage arrays, such that the actual location of the data is transparent to the host. The storage controllers provide automatic back-up and error correction as well as write protection of back-up copies.

40 Claims, 18 Drawing Sheets



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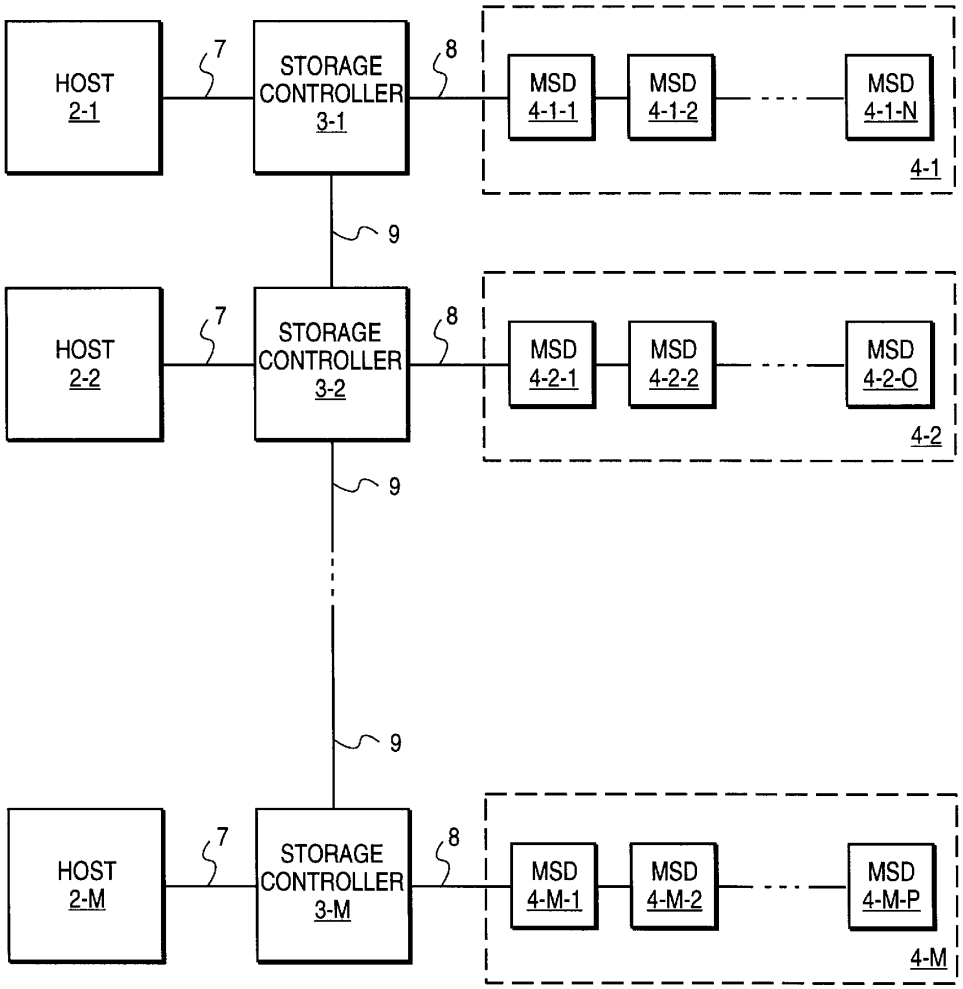

FIG. 1

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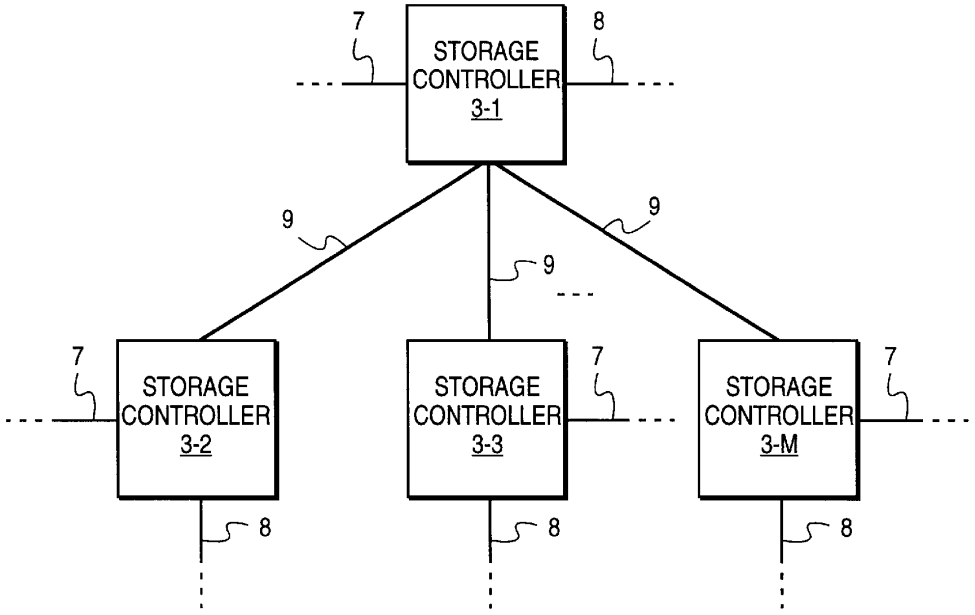

FIG. 2

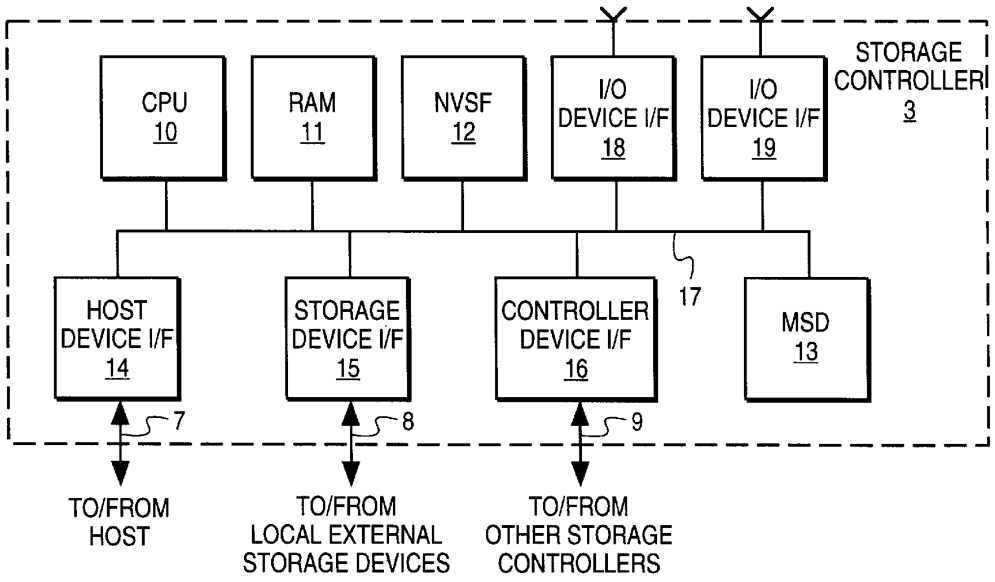

FIG. 3

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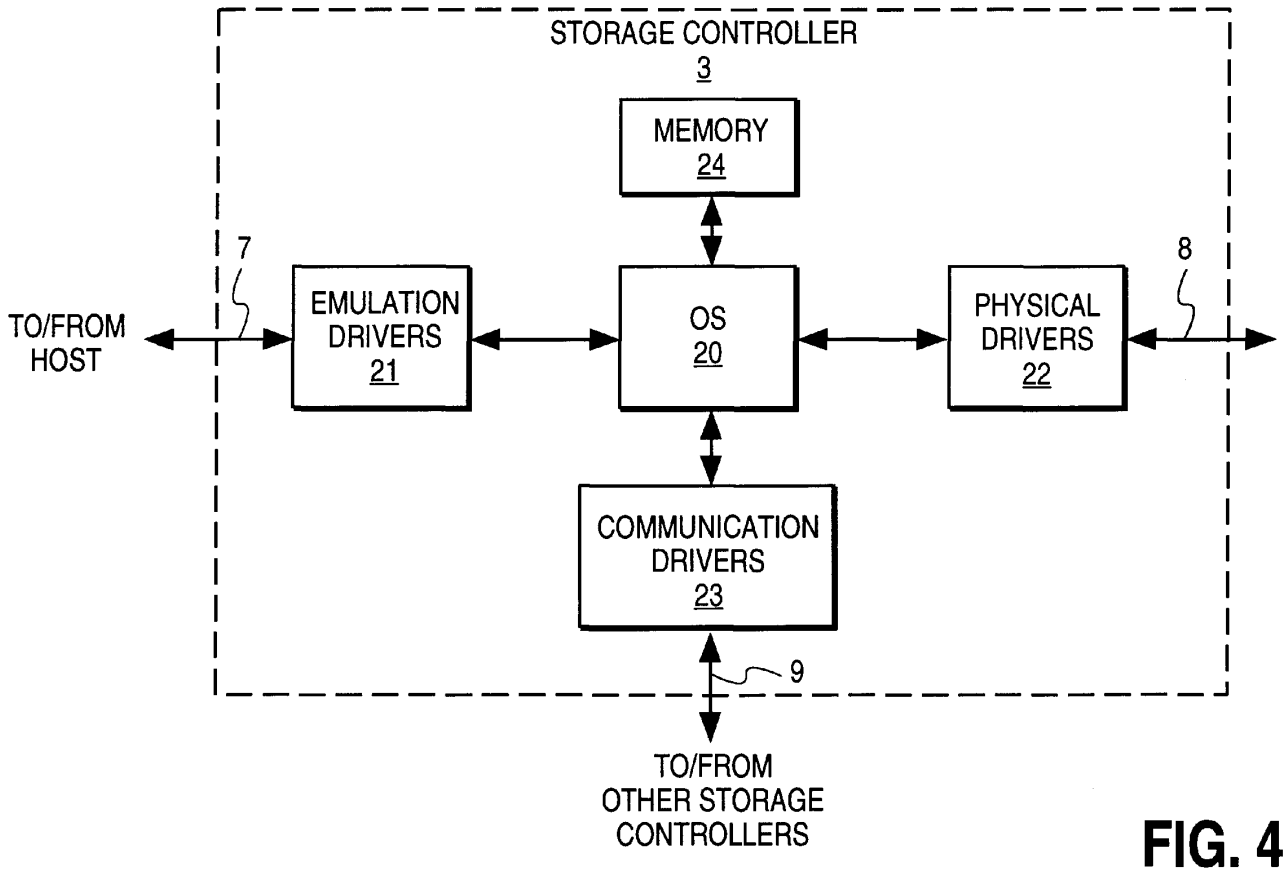

FIG. 4

NetApp Ex. 1007, pg. 4

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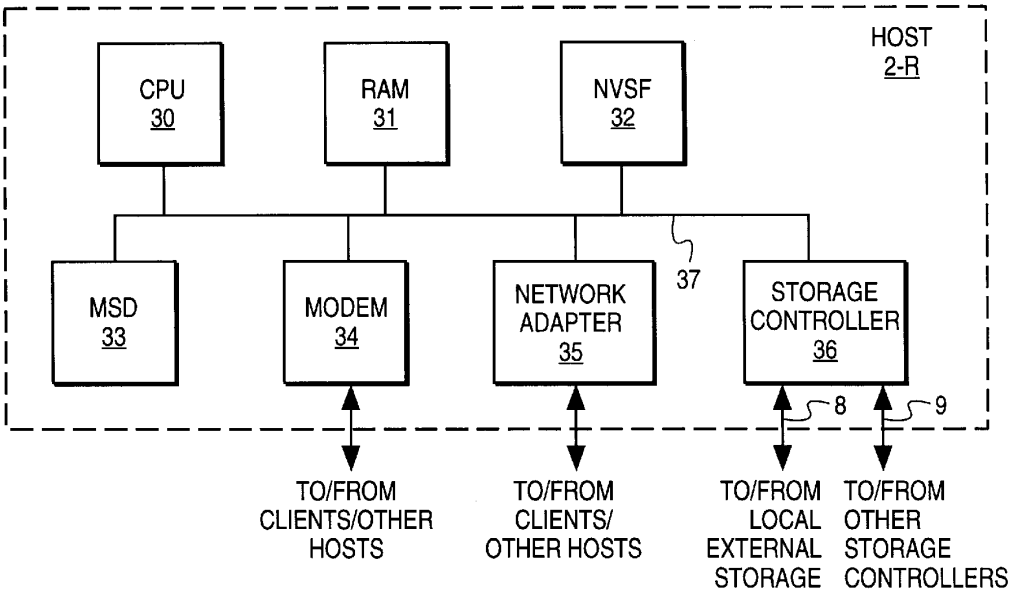

FIG. 5

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