



(12) **United States Patent**
Toombs et al.

(10) **Patent No.:** **US 6,279,114 B1**
(45) **Date of Patent:** **Aug. 21, 2001**

(54) **VOLTAGE NEGOTIATION IN A SINGLE HOST MULTIPLE CARDS SYSTEM**

(75) Inventors: **Thomas N. Toombs**, Los Gatos, CA (US); **Micky Holtzman**, Kfar Vradim (IL)

(73) Assignee: **SanDisk Corporation**, Sunnyvale, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/185,649**

(22) Filed: **Nov. 4, 1998**

(51) Int. Cl.⁷ **G06F 1/26; G06F 15/177**

(52) U.S. Cl. **713/300; 713/1; 710/8**

(58) Field of Search **713/300-310, 713/1, 2, 100; 710/8-19; 307/125-131; 323/265-272**

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,730,251	3/1988	Aakre et al. .	
4,910,655	3/1990	Ashkin et al. .	
4,912,627	3/1990	Ashkin et al. .	
4,918,598	4/1990	Ashkin et al. .	
4,985,920	1/1991	Seki .	
4,992,970 *	2/1991	Igarashi	702/64
4,999,787	3/1991	McNally et al. .	
5,016,223	5/1991	Kimura et al. .	
5,068,894	11/1991	Hoppe .	
5,131,091	7/1992	Mizuta .	
5,226,006	7/1993	Wang et al. .	
5,237,609	8/1993	Kimura .	
5,293,424	3/1994	Holtey et al. .	
5,319,705	6/1994	Halter et al. .	
5,361,005	11/1994	Slattery et al. .	
5,367,149	11/1994	Takahira .	
5,418,752	5/1995	Harari et al. .	
5,426,432	6/1995	Sanemitsu .	
5,428,685	6/1995	Kadooka et al. .	
5,450,365 *	9/1995	Adachi	365/226

5,490,117	2/1996	Oda et al. .	
5,499,242	3/1996	Lee et al. .	
5,534,801 *	7/1996	Wu et al.	327/72
5,559,965	9/1996	Oztaskin et al. .	
5,592,641	1/1997	Fandrich et al. .	
5,594,686	1/1997	Hazen et al. .	
5,613,130 *	3/1997	Teng et al.	713/300
5,613,135	3/1997	Sakai et al. .	

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

296 13 771 U	8/1996	(DE) .
844628	2/1996	(JP) .
WO9701825	1/1997	(WO) .
WO9729454	8/1997	(WO) .
WO9738370	10/1997	(WO) .
WO9738371	10/1997	(WO) .

OTHER PUBLICATIONS

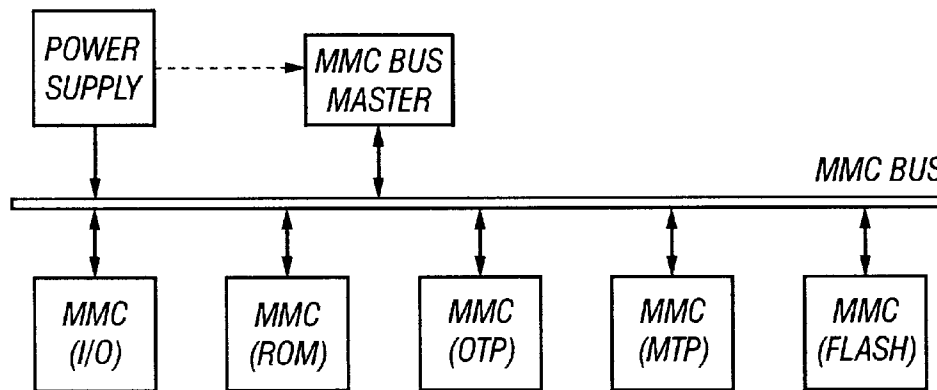
“The MultiMediaCard System Specification,” *MMCA Technical Committee*, Version 1.4,(Official Release Feb. 1988) pp. 1-106.

Primary Examiner—Sumati Lefkowitz
(74) *Attorney, Agent, or Firm*—Skjerven Morrill MacPherson LLP

(57) **ABSTRACT**

A low cost data storage and communication system. The low cost data storage and communication system has a host and at least one card connected to the host. A voltage negotiator located in the system for determining a common operating voltage range that is a common demonminator of all independent operating voltage ranges of all of the cards connected to the system. In addition, there is a novel feature of partitioning the memory storages of the card. This feature provides the host the ability to simultaneously erase any combination of sectors in a single erase group, or any combination of the entire erase groups. Another feature provided by this novel method of partitioning the memory storages is the ability to write protect any combination of memory groups in the card.

16 Claims, 39 Drawing Sheets



U.S. PATENT DOCUMENTS

5,613,159	3/1997	Colnot .	5,708,715	1/1998	Vicard .	
5,623,637	4/1997	Jones et al. .	5,708,799	* 1/1998	Gafken et al.	326/37
5,627,416	* 5/1997	Kantner	5,757,171	* 5/1998	Babcock	323/271
5,634,132	* 5/1997	Pearce et al.	5,758,171	* 5/1998	Ramamurthy et al.	713/300
5,644,750	7/1997	Iijima .	5,764,761	6/1998	Vicard .	
5,666,412	9/1997	Handelman et al. .	5,773,901	* 6/1998	Kantner	307/125
5,668,760	9/1997	Hazen .	5,774,546	6/1998	Handelman et al. .	
5,673,316	9/1997	Auerbach et al. .	5,930,496	* 7/1999	MacLaren et al.	439/55
5,678,021	10/1997	Pawate et al. .	5,958,056	* 9/1999	Lehmann	713/310

* cited by examiner

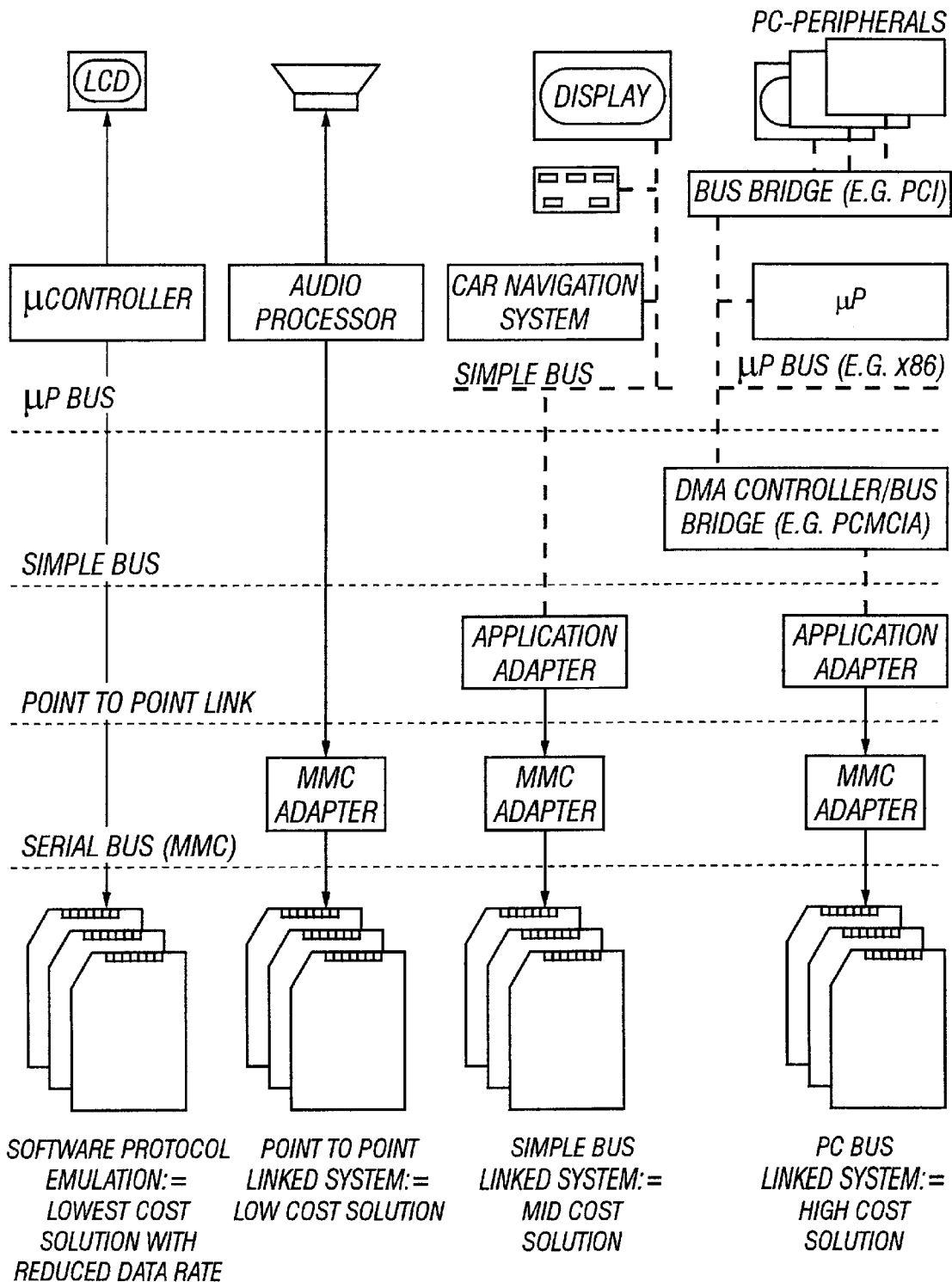


FIG. 1

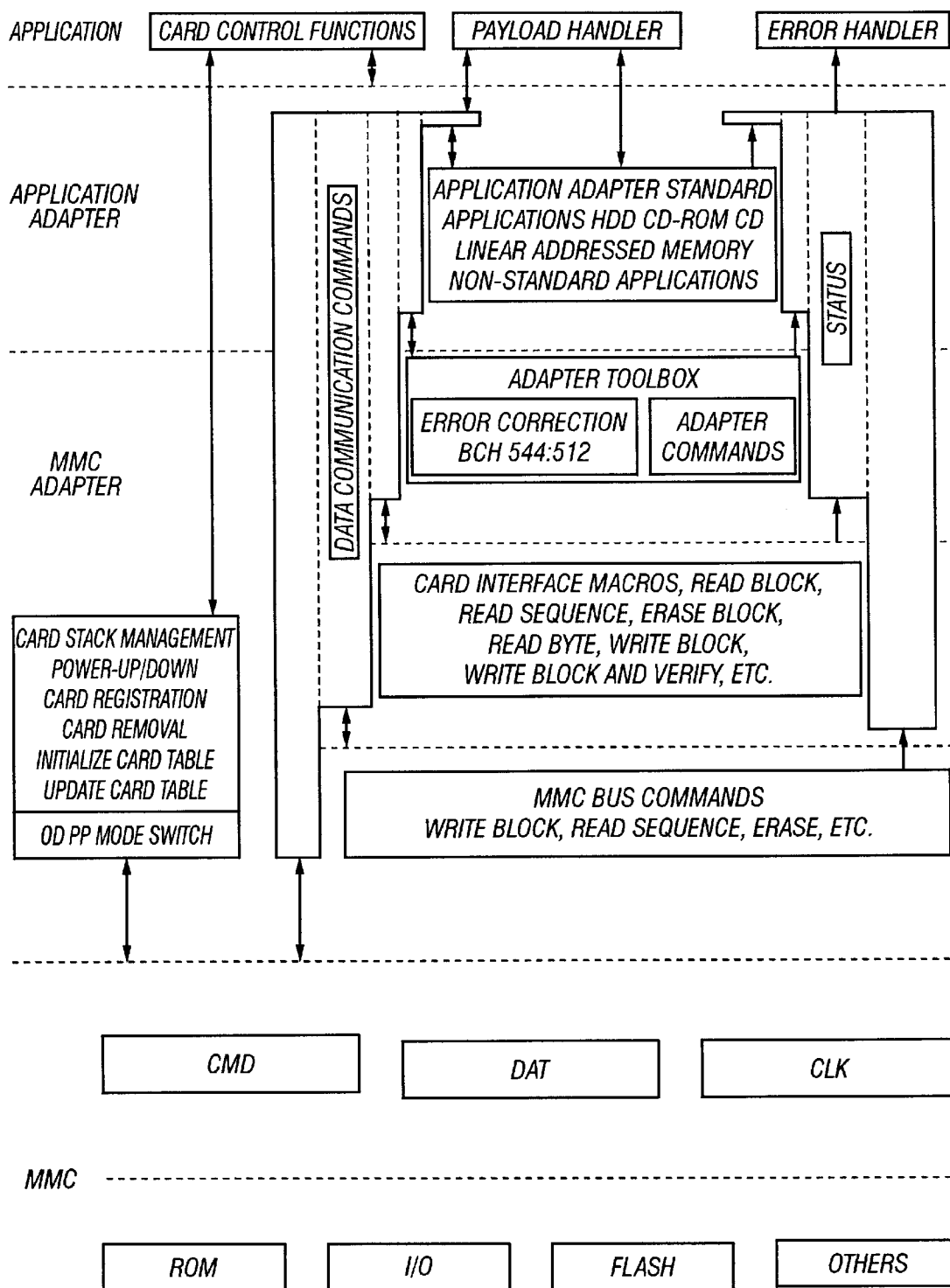


FIG. 2

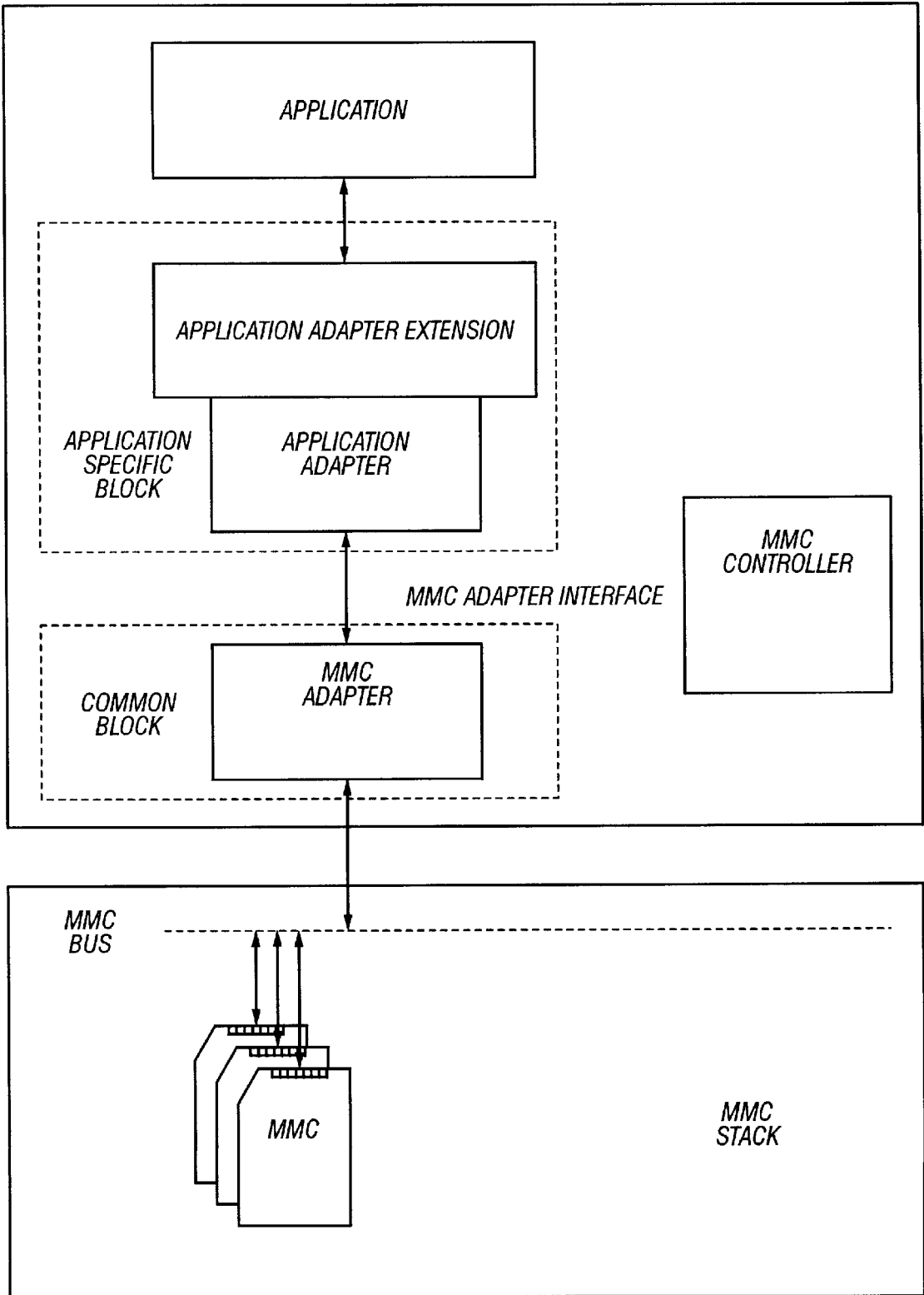


FIG. 3

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.