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Nijima et al.

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[54] **NONVOLATILE MEMORY WITH CLUSTER-ERASE FLASH CAPABILITY AND SOLID STATE FILE APPARATUS USING THE SAME**

Primary Examiner—Terrell W. Fears
Attorney, Agent, or Firm—Matthew J. Bussan

[75] Inventors: **Hideto Nijima**, Tokyo; **Hideo Asano**, Machida; **Yoshinori Sakaue**, Tokyo; **Takashi Toyooka**, Kawasaki, all of Japan

[57] ABSTRACT

A nonvolatile memory with cluster-erase flash capability. A cluster information sector is included in each of N clusters, the cluster information sector of each cluster being written with the sequence number assigned to the cluster so that no two clusters have the same sequence number. When erasing a given sector, a controller saves its sequence number prior to erasure. Then, when initializing a given erased sector, the controller sets its sequence number to a value greater than the current maximum sequence number. The controller writes user data to sectors other than the cluster information sector for the cluster thus initialized according to their address sequence. Accordingly, an invalid sector can be distinguished from a valid sector without using an overwrite approach.

[73] Assignee: **International Business Machines Corporation**, Armonk, N.Y.

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[22] Filed: **Feb. 23, 1994**

[30] Foreign Application Priority Data

Feb. 24, 1993 [JP] Japan 5-035228

[51] Int. Cl.⁶ **G11C 13/00**

[52] U.S. Cl. **365/218; 361/185.29**

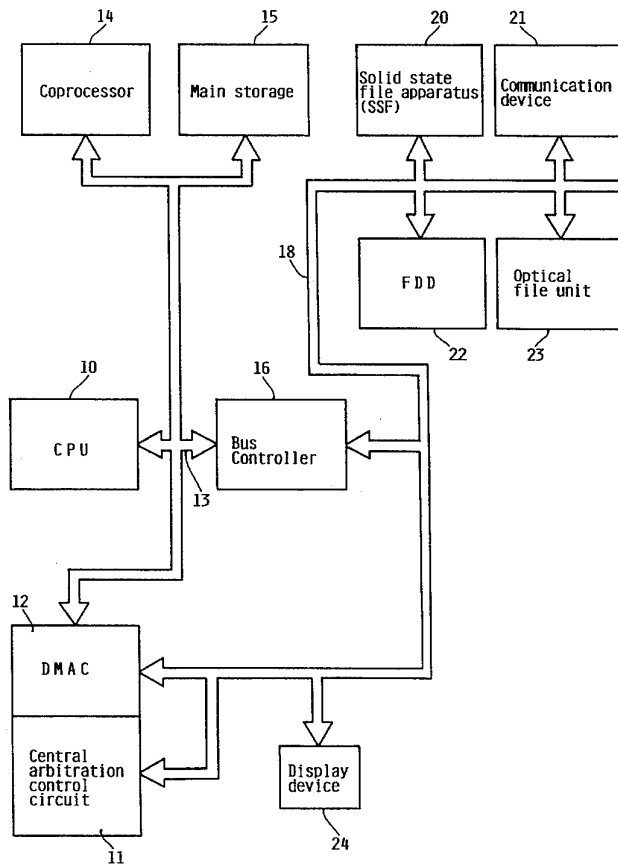
[58] Field of Search 365/230.01, 218, 365/900

[56] References Cited

U.S. PATENT DOCUMENTS

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17 Claims, 12 Drawing Sheets



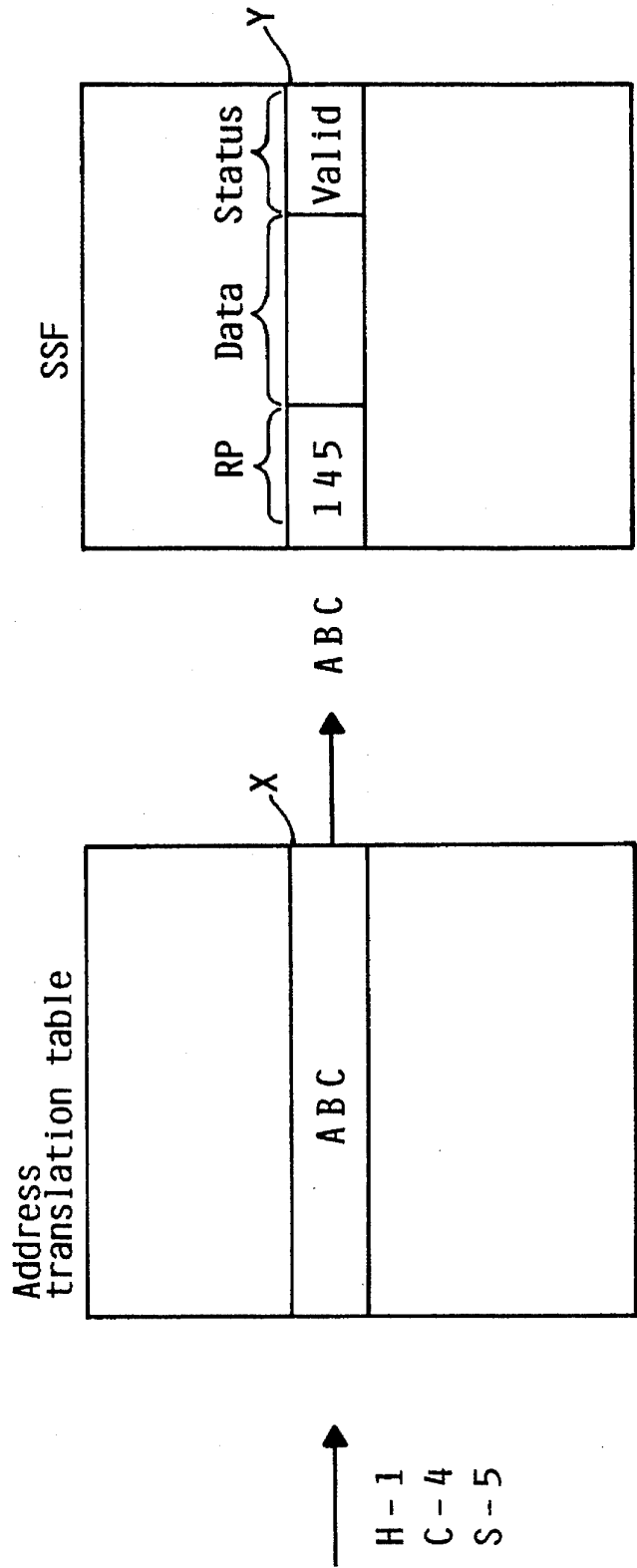


FIG. 1 (PRIOR ART)

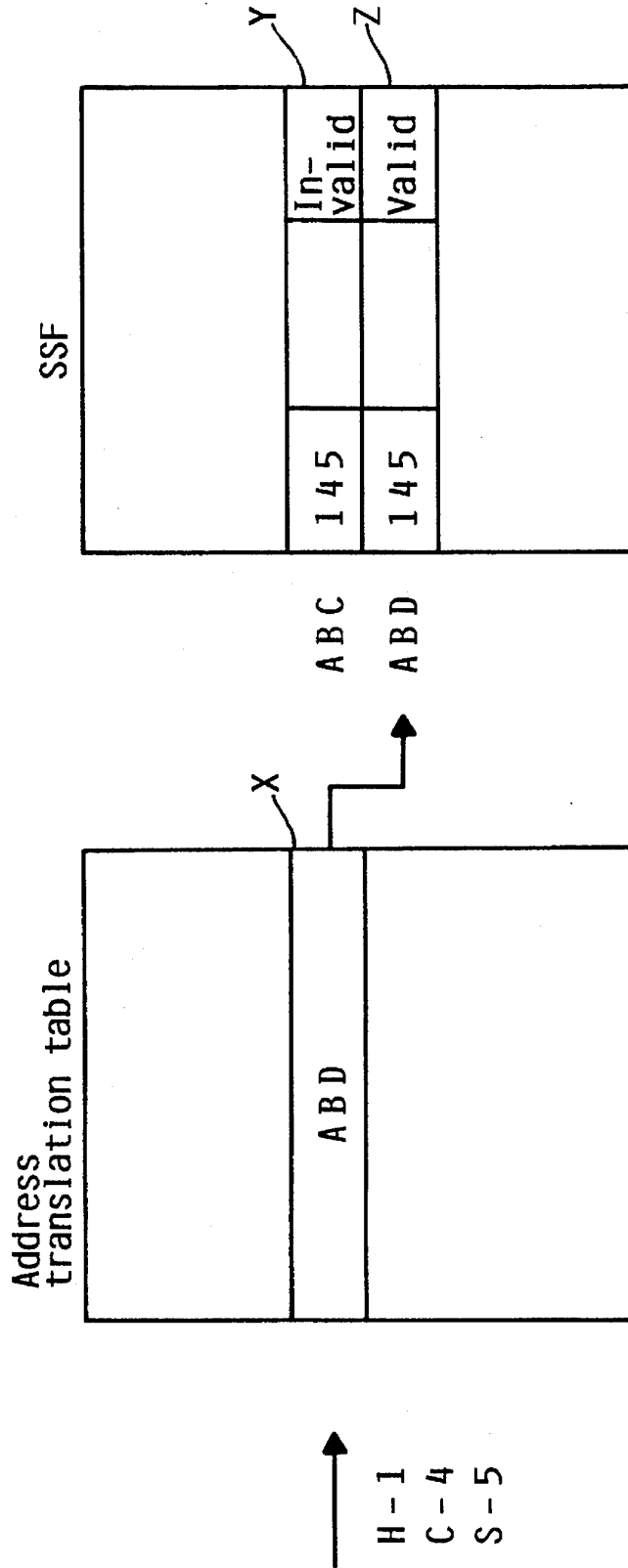


FIG. 2 (PRIOR ART)

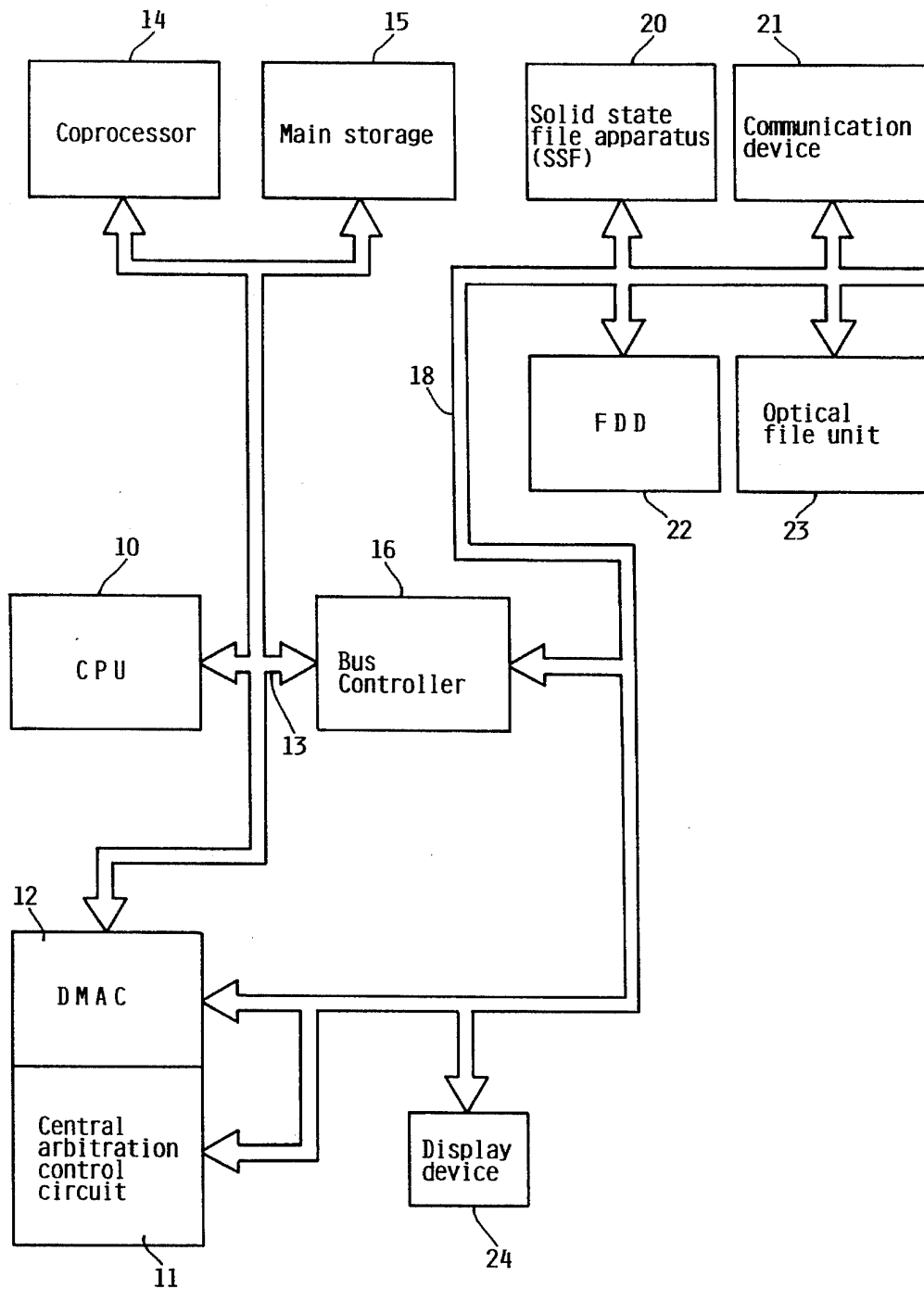


FIG. 3

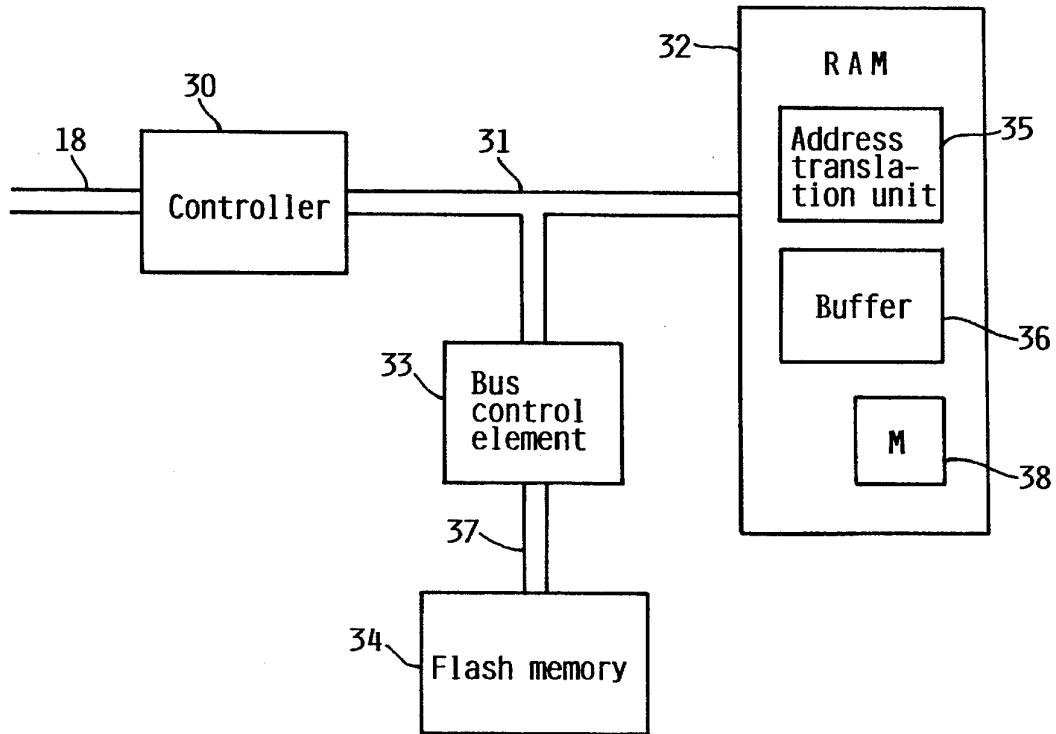


FIG. 4

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