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(54) **NON-VOLATILE MEMORY AND METHOD WITH MULTI-STREAM UPDATE TRACKING**

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(*) Notice: Subject to any disclaimer, the term of this
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U.S.C. 154(b) by 272 days.

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(Continued)

Related U.S. Application Data

Primary Examiner—Hiep T. Nguyen

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filed on Dec. 16, 2004, now Pat. No. 7,315,916.

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(51) **Int. Cl.**
G06F 12/00 (2006.01)

(57) **ABSTRACT**

(52) **U.S. Cl.** **711/103**

(58) **Field of Classification Search** 711/103;
365/185.33

See application file for complete search history.

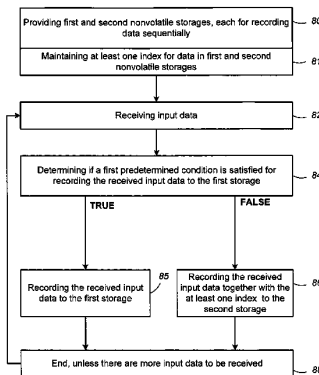
Update data to a non-volatile memory may be recorded in at
least two interleaving streams such as either into an update
block or a scratch pad block depending on a predetermined
condition. The scratch pad block is used to buffered update
data that are ultimately destined for the update block.
Synchronization information about the order recording of
updates among the streams is saved with at least one of the
streams. This will allow the most recently written version of
data that may exist on multiple memory blocks to be
identified. In one embodiment, the synchronization informa-
tion is saved in a first block and is a write pointer that
points to the next recording location in a second block. In
another embodiment, the synchronization information is a
time stamp.

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41 Claims, 43 Drawing Sheets



Updating Using Two Streams With Index Stored In One Stream

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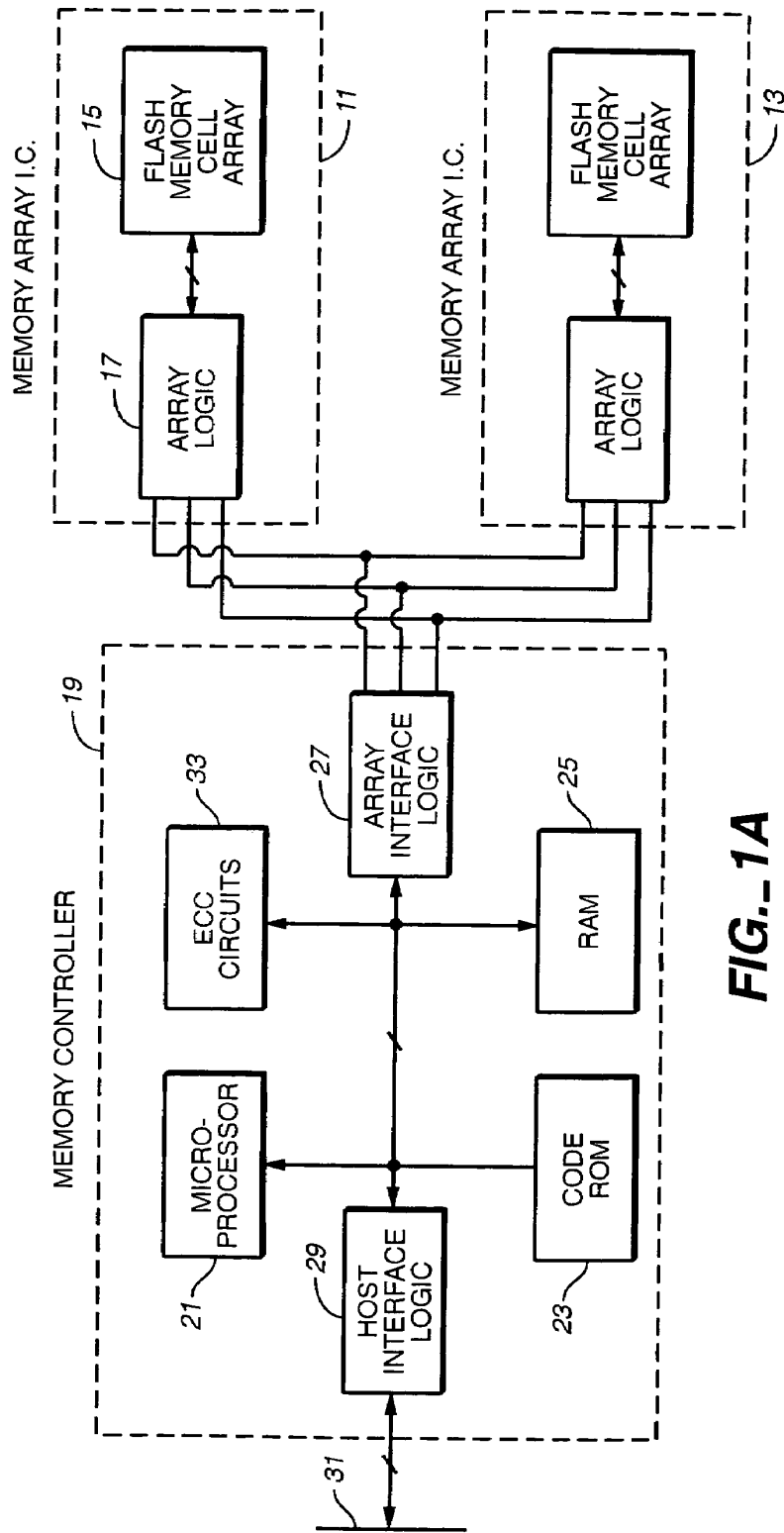


FIG.- 1A

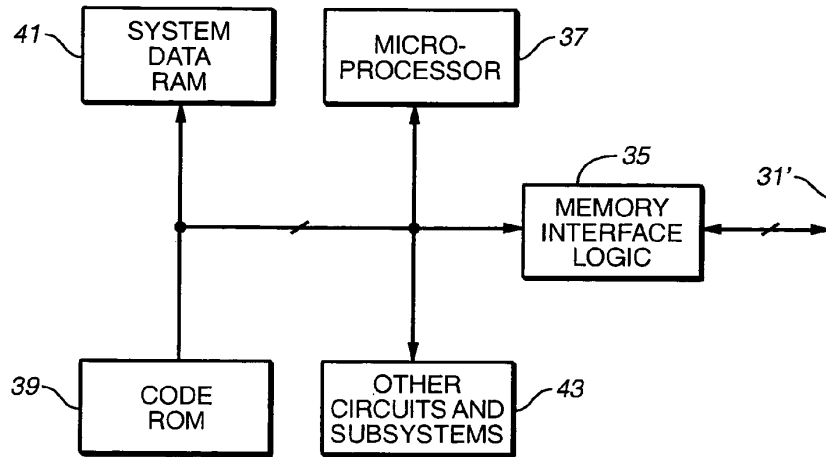


FIG. 1B

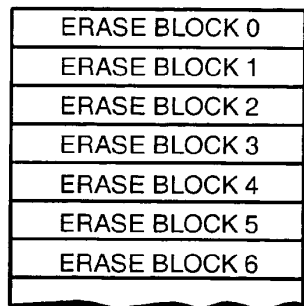


FIG. 2

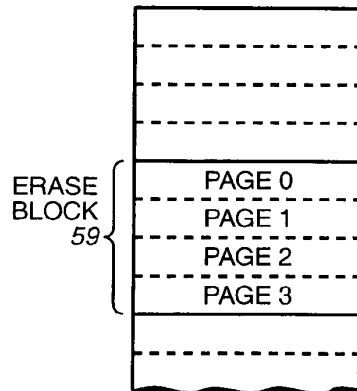


FIG. 4

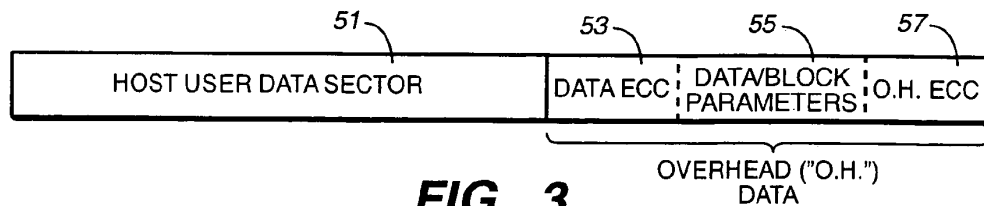
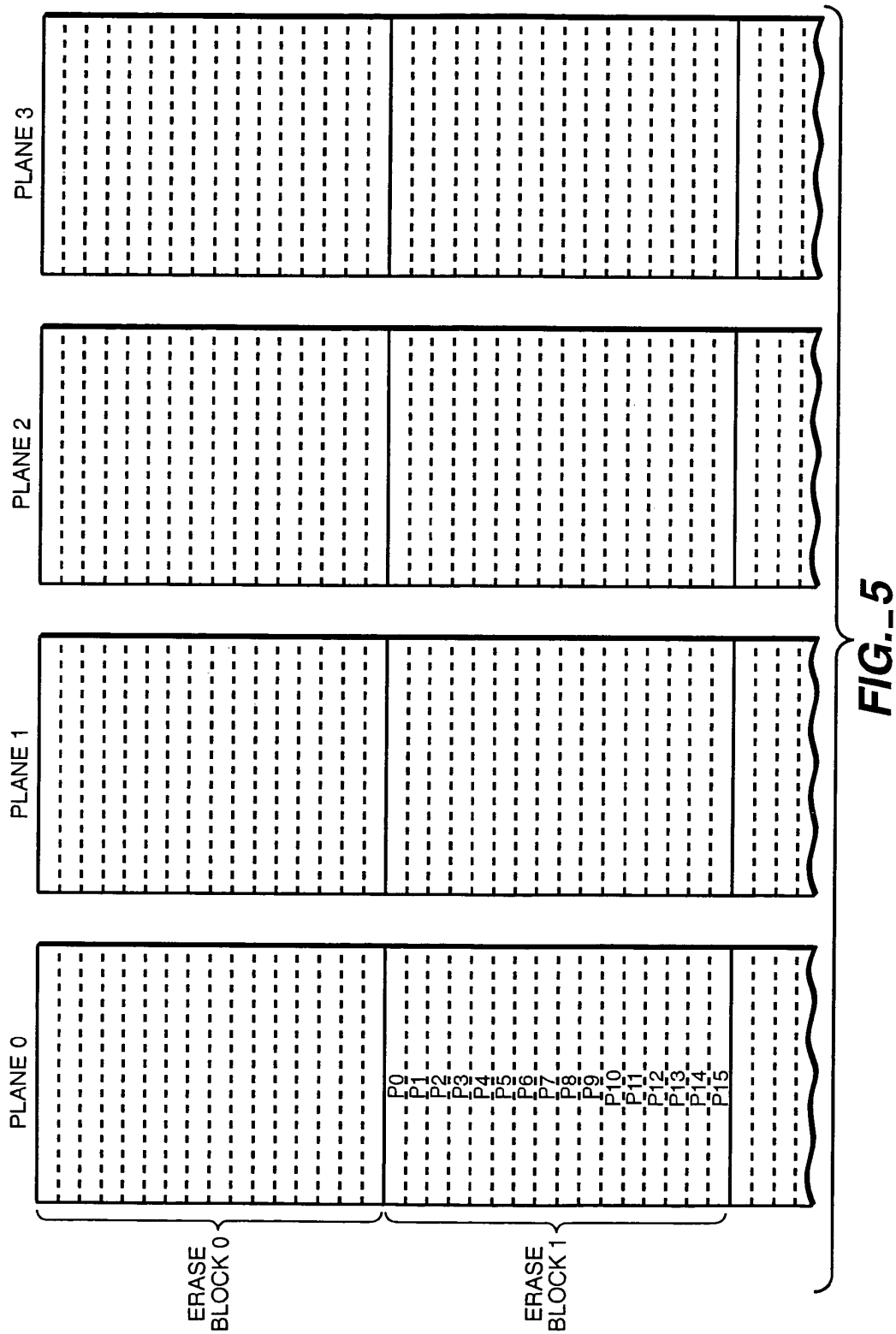


FIG. 3



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