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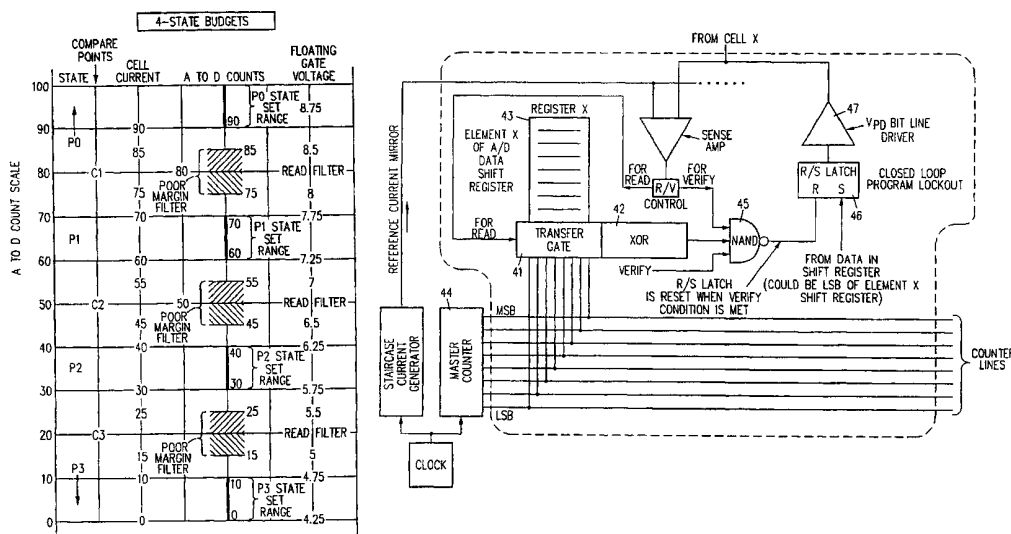
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(54) Title: NOVEL MULTI-STATE MEMORY



(57) Abstract: Maximized multi-state compaction and more tolerance in memory state behavior is achieved through a flexible, self-consistent and self-adapting mode of detection, covering a wide dynamic range. For high density multi-state encoding, this approach borders on full analog treatment, dictating analog techniques including A to D type conversion to reconstruct and process the data. In accordance with the teachings of this invention, the memory array is read with high fidelity, not to provide actual final digital data, but rather to provide raw data accurately reflecting the analog storage state, which information is sent to a memory controller for analysis and detection of the actual final digital data.



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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/15657

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 G11C11/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G11C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|------------|---|-----------------------|
| A          | US 5 629 890 A (ENGH LAWRENCE D ET AL)<br>13 May 1997<br>see column 1, line 39-46<br>see column 5, line 23-40; figures 1,2,7<br>---           | 1-7                   |
| A          | US 5 218 569 A (BANKS GERALD J)<br>8 June 1993<br>see column 7, line 15 - column 11, line 51<br>see column 12, line 42-51; figures 5,8<br>--- | 1-7                   |
| A          | WO 97 22123 A (RUBY PAUL ;FAZIO ALBERT<br>(US); INTEL CORP (US); MI JAMES O (US);<br>AT) 19 June 1997<br>see abstract; figures 16,17<br>---   | 2                     |
| A          | EP 0 725 403 A (SONY CORP) 7 August 1996<br>see page 3, column 9 - page 4, column 3;<br>figure 4<br>---                                       | 1                     |
|            | -/--  |                       |

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
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- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- \*&\* document member of the same patent family

Date of the actual completion of the international search

20 November 1998

Date of mailing of the international search report

08.03.99

Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/15657

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
|------------|--|-----------------------|
| A          | WO 90 12400 A (SUNDISK CORP)<br>18 October 1990<br>see page 4, line 18 - page 5, line 29<br>see page 7, line 1-10<br>----- | 1-7                   |

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 98/ 15657

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. Claims 1-26 : A multi-state non-volatile memory.
2. Claims 27-34 : A detection cell used to measure the wear of an EEPROM type memory.
3. Claims 35-41 : An erasing method for EEPROMs.

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-26

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 98/15657

| Patent document cited in search report |   | Publication date | Patent family member(s) | Publication date |
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