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- (71) Applicant (for all designated States except US): MICRON TECHNOLOGY, INC. [US/US]; 8000 So. Federal Way, Boise, Idaho 83716-9632 (US).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): RADKE, William Henry [US/US]; 90 Cleland Ave., Los Gatos, California 95030 (US).
- (74) Agents: CLISE, Timothy B et al.; Schwegman, Lundberg & Woessner, P.A., P.O. Box 2938, Minneapolis, Minnesota 55402 (US).

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(54) Title: ERROR CORRECTION FOR MEMORY

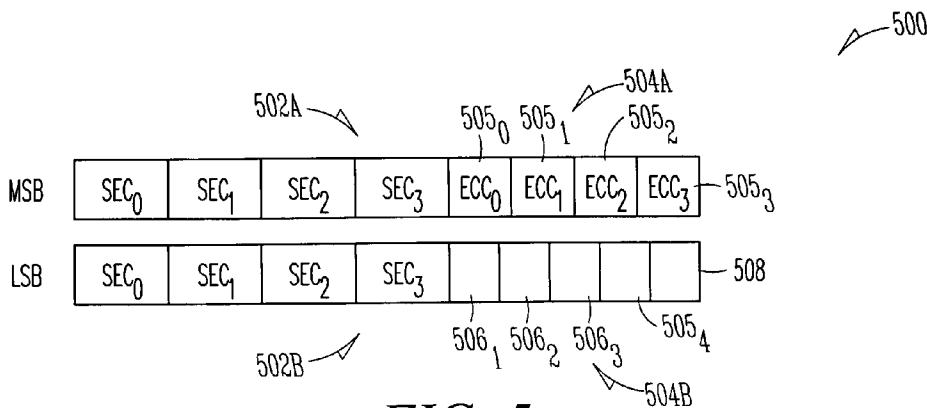


FIG. 5

(57) Abstract: Methods and devices operate to apply and provide differing levels of error correction within a multi-level, non-volatile memory. In an example, the differing level of error correction is provided within one page of a row of multi-level cells relative to other pages stored within the same row of multi-level cells.

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/008436

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F11/10

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)
G06F

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)

EPO-Internal, WPI Data, INSPEC, COMPENDEX, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/043042 A (UNIV RAMOT [IL]; LITSYN SIMON [IL]; ALROD IDAN [IL]; SHARON ERAN [IL];) 19 April 2007 (2007-04-19)	1,2,5
Y	page 2, line 7 - line 13 page 3, line 23 - line 28 page 4, line 24 - line 31 page 5, line 10 - page 7, line 6 page 7, line 24 - page 8, line 14 page 9, line 14 - line 18 claims 1,3	3,4
Y	----- US 2002/048202 A1 (HIGUCHI YOSHINOBU [JP]) 25 April 2002 (2002-04-25) paragraphs [0025] - [0029], [0031], [0033], [0034] figures 2-4 ----- -/--	3,4

Further documents are listed in the continuation of Box C.

See patent family 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

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

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

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European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Johansson, Ulf

INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006/013529 A (KONINKL PHILIPS ELECTRONICS NV [NL]; EGNER SEBASTIAN [NL]; LAMBERT NIC) 9 February 2006 (2006-02-09) page 2, line 15 - line 23 page 3, line 19 - page 4, line 13 page 5, line 3 - page 6, line 18 page 8, line 9 - line 21 figures 1,2 -----	1-5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/008436

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 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 No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

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

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

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.:

1-5

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5

Memory, comprising: a plurality of memory cells to store data for a page and at least one other page, the page of data being associated with an amount of data to be used for at least one of correcting and detecting error associated with the page of data that is different than an amount of data to be used for at least one of correcting and detecting error associated with the other page of data.

2. claims: 6-11

Memory, comprising: a control circuit; and a row of multi-level cells operatively coupled to the control circuit, the multilevel cells to store at least a first page and a second page, the first page being associated with a first error correcting code, the second page being associated with a second error correction code that is different than the first error correction.

3. claims: 12-16

Non-volatile memory, comprising: a input/output circuit; and an array of addressable, multilevel cells operatively coupled to the input/output circuit, the matrix of multilevel cells including a row of multilevel cells to store at least a most significant bit page and a least significant bit page, the most significant bit page including a higher error rate than the least significant bit page, the most significant bit page including a greater number of error correction bits than the least significant bit page.

4. claims: 17-23

Memory, comprising: a input/output circuit; an array of addressable, multilevel cells operatively coupled to the input/output circuit, the matrix of multilevel cells including a row of multilevel cells to store at least a most significant bit page and a least significant bit page, the most significant bit page including a different error rate than the least significant bit page; wherein one of the most significant bit page and the least significant bit page including a lower error rate; and wherein the lower error rate page is to store error correction data for the lower error rate page and the other page.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

5. claims: 24-28

Error correction in a memory, comprising: calculating first error correction data for a first page of a row of multi-level memory cells; calculating second error correction data for a second page of the row of multi-level memory cells; and storing data including the first error correction data and second error correction data in the row of multi-level memory cells.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		JP 2009512055 T	19-03-2009
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