

(19) World Intellectual Property Organization
International Bureau



(10) International Publication Number
WO 2010/070427 A3

(43) International Publication Date
24 June 2010 (24.06.2010)

(51) International Patent Classification:
G06F 12/02 (2006.01)

(21) International Application Number:
PCT/IB2009/007784

(22) International Filing Date:
15 December 2009 (15.12.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
12/316,924 17 December 2008 (17.12.2008) US

(71) Applicant (for all designated States except US): SANDISK IL LTD. [IL/IL]; 7 Atir Yeda St., 44425 Kfar Saba (IL).

(72) Inventor; and

(75) Inventor/Applicant (for US only): LASSER, Menahem [IL/IL]; 4 Dolev St., 44864 Kohav Yair (IL).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,

CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

[Continued on next page]

(54) Title: RUGGEDIZED MEMORY DEVICE

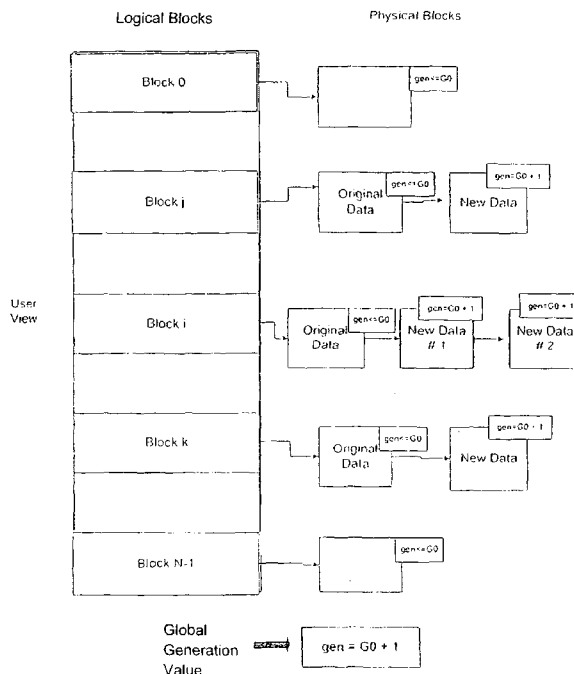


FIG. 8D

(57) Abstract: A non-volatile storage device with built-in ruggedized features is disclosed. The device processes a write command to a logical block address by writing the data from the command to a non-volatile memory within the non-volatile storage device and conditionally associating the data received from the command with its corresponding logical block address. Two or more received write commands define a set of commands associated with an atomic transaction. When an end of set command is received, the device unconditionally associates the received data with each write command with its corresponding logical block address. If a power loss interrupts the reception of a set of commands, the non-volatile storage device may recover the last consistent data state before the atomic transaction was started. A write command transaction identifier allows the device to associate the command with a thread of commands that define an atomic transaction in a multithreaded system.



WO 2010/070427 A3

(88) Date of publication of the international search report:
26 August 2010

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2009/007784

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F12/02

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2005/066770 A2 (SANDISK CORP [US]; SINCLAIR ALAN W [GB]) 21 July 2005 (2005-07-21) paragraph [0159] - paragraph [0160] -----	1-29, 32, 33

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.
- *Z* document member of the same patent family

Date of the actual completion of the international search

7 April 2010

Date of mailing of the international search report

12/07/2010

Name and mailing address of the ISA/

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

Authorized officer

Filip, Liviu

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2009/007784

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 all searchable 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.:

1-29, 32, 33

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: 1-29, 32, 33

A method of processing an atomic transaction in a non-volatile storage device, comprising:
receiving a set of commands at the non-volatile storage device, wherein the set of commands comprises a plurality of write commands, and each write command is associated with a corresponding logical block address and comprises data;
processing each of the plurality of write commands, comprising:
(i) writing the data from each write command to a non-volatile memory within the non-volatile storage device;
and
(ii) conditionally associating the data received from each write command with its corresponding logical block address;
receiving an end of set command indicating an end of the set of commands;
and
in response to receiving the end of set command, and without moving the data within the non-volatile storage device, for each logical block address that is associated with a write command in the set of commands, unconditionally associating with the logical block address the data of the last command of the set of commands conditionally associated with the logical block address.

2. claims: 30, 31

A method of processing a read command in a non-volatile storage device, comprising:
receiving a read command, wherein the read command specifies requested data;
selecting data in response to receiving the read command according to one of two read procedures, wherein a first read procedure comprises selecting a most recently written version of the requested data not associated with an open transaction, and a second read procedure comprises selecting a most recently written version of the requested data; and
returning the data.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2009/007784

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
WO 2005066770	A2	21-07-2005	CN 1922571 A	28-02-2007
			EP 1700204 A1	13-09-2006
			JP 2007517325 T	28-06-2007
			KR 20070012630 A	26-01-2007
			TW 280581 B	01-05-2007
			US 2005144367 A1	30-06-2005
