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[Continued on next page]

(54) Title: MULTI-TIERED CACHE WITH STORAGE MEDIUM AWARENESS

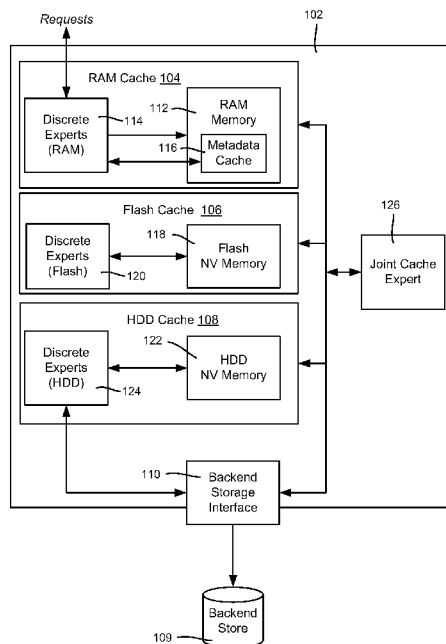
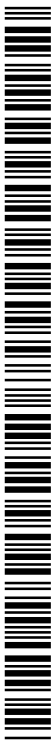


FIG. 1

(57) Abstract: The subject disclosure is directed towards a multi-tiered cache having cache tiers with different access properties. Objects are written to a selected a tier of the cache based upon object-related properties and/or cache-related properties. In one aspect, objects are stored in an active log among a plurality of logs. The active log is sealed upon reaching a target size, with a new active log opened. Garbage collecting is performed on a sealed log, such as the sealed log with the most garbage therein.



WO 2013/192024 A3



**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*
- *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))*

**(88) Date of publication of the international search report:**  
19 June 2014

**Published:**

- *with international search report (Art. 21(3))*

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/US2013/045755

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. G06F12/08  
 ADD. G06F12/12

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 practicable, search terms used)  
 EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/137061 A1 (YANG QING [US] ET AL) 31 May 2012 (2012-05-31) paragraphs [0022], [0023], [0030], [0038], [0126], [0205] - [0207]; figures 36-38	1-9
X	EP 1 605 361 A2 (MARVELL WORLD TRADE LTD [BB]) 14 December 2005 (2005-12-14) paragraphs [0078], [0089], [0091], [0092]; figures 5,8a,9,10	1-9
X	US 2009/327584 A1 (TETRICK R SCOTT [US] ET AL) 31 December 2009 (2009-12-31) paragraphs [0012] - [0014], [0024] - [0026]; figures 1,2	1-9

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 application or patent 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

Date of the actual completion of the international search <b>30 September 2013</b>	Date of mailing of the international search report <b>24/04/2014</b>
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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 <b>Nielsen, Ole</b>
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2013/045755

## 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.:

1-9

### 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: 1-9

Multi-tiered cache in which a tier is selected for writing based on object-related or cache-related properties.

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2. claim: 10

Maintaining a plurality of logs including a active log and a sealed log

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2013/045755
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012137061	A1	31-05-2012	US 2012137059 A1
			US 2012137061 A1
			US 2012144098 A1
			US 2012144099 A1
EP 1605361	A2	14-12-2005	CN 1707400 A
			CN 1866161 A
			CN 1866162 A
			EP 1605361 A2
			EP 1607836 A2
			EP 1621972 A2
			JP 4621540 B2
			JP 4740673 B2
			JP 4749786 B2
			JP 2005353090 A
			JP 2006012180 A
			JP 2006040255 A
			TW I379235 B
			TW I390411 B
			TW I390444 B
			US 2005278559 A1
			US 2008222357 A1
			US 2008222437 A1
			US 2010235660 A1
			US 2014052887 A1
US 2009327584	A1	31-12-2009	CN 101981555 A
			DE 112009000431 T5
			GB 2473348 A
			US 2009327584 A1
			US 2012203960 A1
			WO 2010002647 A2