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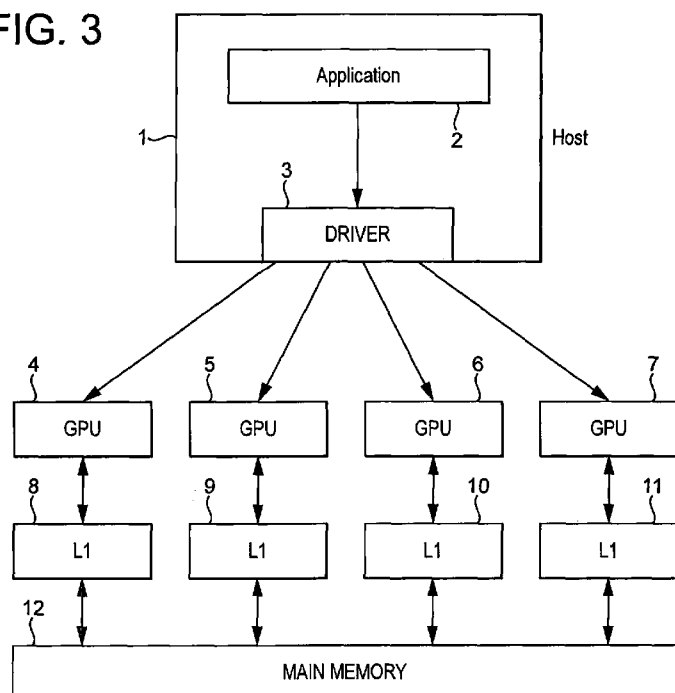
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[Continued on next page]

(54) Title: DATA PROCESSING SYSTEMS

FIG. 3

(57) **Abstract:** A data processing system includes one or more processors 4, 5, 6, 7 operable to initiate atomic memory requests for execution threads and plural data caches 8, 9, 10, 11 that are used to store data needed to perform an atomic memory operation when an atomic memory operation is to be performed. When atomic operations are to be performed against a data cache, the results of atomic operations that are to access the same memory location are accumulated in a temporary cache line in the data cache pending the arrival in the cache of the "true" cache line from memory. The accumulated results of the atomic operations stored in the temporary cache line are then combined with the cache line from memory when the cache line arrives in the cache. Individual atomic values can also be reconstructed once the cache line arrives at the cache.



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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ADD.

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)

G06T 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.
A	US 8 108 610 B1 (GLASCO DAVID B [US] ET AL) 31 January 2012 (2012-01-31) abstract column 1, lines 5-67 -----	1-31
A	US 2011/154000 A1 (FRYMAN JOSHUA B [US] ET AL) 23 June 2011 (2011-06-23) paragraphs [0002] - [0004] -----	1-31
A	US 5 742 785 A (STONE HAROLD STUART [US] ET AL) 21 April 1998 (1998-04-21) abstract column 1, line 10 - column 5, line 60 -----	1-31

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Further documents are listed in the continuation of Box C.

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See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 8108610	B1	31-01-2012	NONE

US 2011154000	A1	23-06-2011	CN 102103482 A 22-06-2011
			DE 102010053095 A1 30-06-2011
			JP 5451579 B2 26-03-2014
			JP 2011129104 A 30-06-2011
			TW 201131472 A 16-09-2011
			US 2011154000 A1 23-06-2011

US 5742785	A	21-04-1998	JP 2500101 B2 29-05-1996
			JP H06222936 A 12-08-1994
			US 5742785 A 21-04-1998
