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(54) **Title:** HANDLING OPERATION COLLISIONS IN A NON-VOLATILE MEMORY

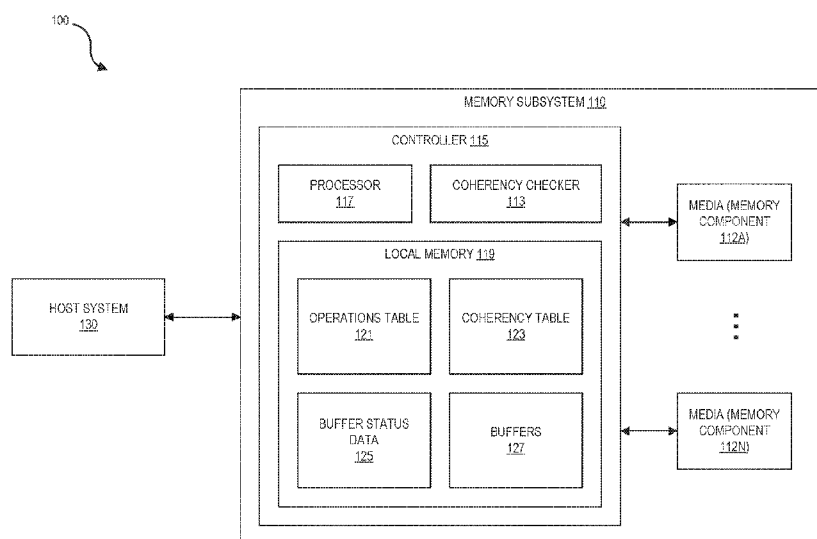


FIG. 1

(57) **Abstract:** A first operation identifier is assigned to a first operation directed to a memory component, the first operation identifier having an entry in a first data structure that associates the first operation identifier with a first plurality of buffer identifiers. It is determined whether the first operation collides with a prior operation assigned a second operation identifier, the second operation identifier having an entry in the first data structure that associates the second operation identifier with a second plurality of buffer identifiers. It is determined whether the first operation is a read or a write operation. In response to determining that the first operation collides with the prior operation and that the first operation is a read operation, the first plurality of buffer identifiers are updated with a buffer identifier included in the second plurality of buffer identifiers.

SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,
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A. CLASSIFICATION OF SUBJECT MATTER**G06F 13/18(2006.01)i, G06F 13/16(2006.01)i**

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

B. FIELDS SEARCHEDMinimum documentation searched (classification system followed by classification symbols)
G06F 13/18; G06F 009/00; G06F 12/00; G06F 12/10; G06F 13/16; G06F 13/368; G06F 9/44Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: assign, identifier, collision, update, memory buffer**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2005-0283591 A1 (CHERYL SENTER BRASHEARS et al.) 22 December 2005 Paragraphs [0025], [0041], [0112]; claim 71; and figure 3	1-20
A	US 2017-0075827 A1 (AVAGO TECHNOLOGIES GENERAL IP (SINGAPORE) PTE. LTD.) 16 March 2017 Paragraphs [0012]-[0013], [0021]-[0022]; and figure 1	1-20
A	US 2007-0234310 A1 (WENJIE ZHANG et al.) 04 October 2007 Paragraphs [0010], [0027], [0047]; and figure 4	1-20
A	US 2014-0025902 A1 (VIVEK DHOGALE) 23 January 2014 Paragraphs [0022], [0064]; and figure 2	1-20
A	KR 10-2016-0023871 A (MICROSOFT TECHNOLOGY LICENSING, LLC) 03 March 2016 Paragraphs [0041], [0138]; and figure 1	1-20



Further documents are listed in the continuation of Box C.



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INTERNATIONAL SEARCH REPORT

Information on patent family members

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PCT/US2019/061013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2005-0283591 A1	22/12/2005	EP 0663083 A1 JP 2000-148480 A JP 2000-148481 A JP 2000-148483 A JP 2000-148490 A JP 2000-148491 A JP 2000-148492 A JP 2000-148493 A JP 2000-148494 A JP 2000-181708 A JP 2003-131870 A JP 2003-131871 A JP 2003-131872 A JP 2003-177913 A JP 2005-025788 A JP 2005-050371 A JP 2005-141780 A JP 2005-149525 A JP 2005-166046 A JP 2005-174364 A JP 2005-216326 A JP 2005-235233 A JP 2005-243050 A JP 2005-322269 A JP 2005-353091 A JP 2006-048713 A JP 2006-073025 A JP 2006-277776 A KR 10-0248903 B1 US 2002-0188829 A1 US 2003-0056089 A1 US 2004-0128487 A1 US 2005-0188184 A1 US 2007-0101106 A1 US 2009-0217001 A1 WO 94-08287 A1	19/07/1995 30/05/2000 30/05/2000 30/05/2000 30/05/2000 30/05/2000 30/05/2000 30/05/2000 30/05/2000 30/06/2000 09/05/2003 09/05/2003 09/05/2003 27/06/2003 27/01/2005 24/02/2005 02/06/2005 09/06/2005 23/06/2005 30/06/2005 11/08/2005 02/09/2005 08/09/2005 17/11/2005 22/12/2005 16/02/2006 16/03/2006 12/10/2006 15/03/2000 12/12/2002 20/03/2003 01/07/2004 25/08/2005 03/05/2007 27/08/2009 14/04/1994
US 2017-0075827 A1	16/03/2017	None	
US 2007-0234310 A1	04/10/2007	US 7836435 B2	16/11/2010
US 2014-0025902 A1	23/01/2014	KR 10-2014-0011929 A US 9171594 B2	29/01/2014 27/10/2015
KR 10-2016-0023871 A	03/03/2016	CN 105408895 A EP 3011480 A1 JP 2016-524250 A JP 6408568 B2 US 10216629 B2	16/03/2016 27/04/2016 12/08/2016 17/10/2018 26/02/2019

INTERNATIONAL SEARCH REPORT

Information on patent family members

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PCT/US2019/061013Patent document
cited in search reportPublication
datePatent family
member(s)Publication
date

US 2014-0379991 A1	25/12/2014
US 2017-199818 A1	13/07/2017
US 2019-146917 A1	16/05/2019
US 9519591 B2	13/12/2016
WO 2014-205298 A1	24/12/2014