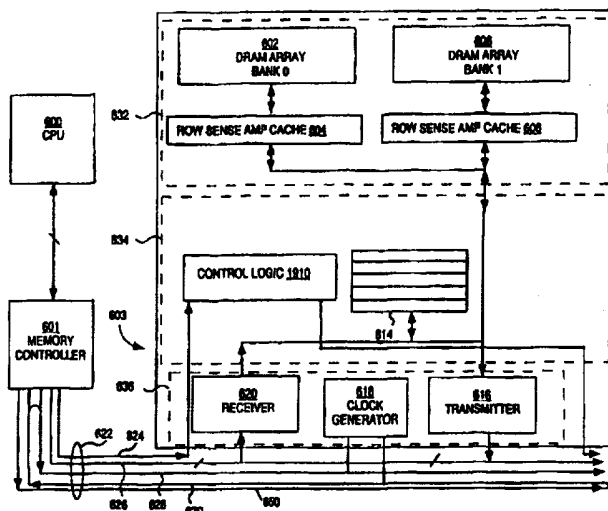


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(54) Title: PROTOCOL FOR COMMUNICATION WITH DYNAMIC MEMORY



(57) Abstract

A system and method for performing data transfers within a computer system is provided. The system includes a controller configured to dynamically adjust the interleave of the communications required to perform a series of data transfer operations to maximize utilization of the channel over which the communications are to be performed. The controller is able to vary the time interval between the transmission of control information that requests a data transfer and the performance of the data transfer by signaling the beginning of the data transfer with a strobe signal sent separate from the control information. The controller is able to defer the determination of how much data will be transferred in the operation by initiating the termination of a data transfer with a termination signal. The method provides a technique for distinguishing between identical control signals that are carried on the same line. The system includes a memory device with control circuitry that allows no more than one memory bank powered by any given power supply line to perform sense or precharge operations.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 96/16835

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 G06F13/16

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)

IPC 6 G06F G11C

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 339 224 A (IBM CORPORATION) 2 November 1989 see abstract see page 3, line 31 - page 4, line 40 see page 7, line 44 - page 8, line 38 see claims 1-6 ---	1-21, 36-42
A	EP 0 535 670 A (BULL HN INFORMATION SYSTEMS INC.) 7 April 1993 see page 2, line 46 - page 3, line 13 see page 4, line 30 - page 5, line 58 see claims 1-10 ---	1-21, 36-42
A	FR 2 695 227 A (ATON SYSTEMES) 4 March 1994 see page 1, line 31 - page 2, line 5 see page 4, line 8 - page 6, line 18 --- -/--	1-13, 36-42



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 96/16835

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 188 759 A (BURR-BROWN LIMITED) 7 October 1987 see page 1, line 35 - line 60 see page 2, line 62 - page 3, line 19 ---	22-26
A	"Instruction Translator" IBM TECHNICAL DISCLOSURE BULLETIN, vol. 15, no. 3, August 1972, NEW YORK, US, page 920 XP002046741 see the whole document ---	22-26
A	US 5 404 327 A (HOUSTON) 4 April 1995 see column 2, line 5 - line 40 see column 10, line 1 - line 44 see claims 1-6 ---	27-30
X	PATENT ABSTRACTS OF JAPAN vol. 12, no. 266 (P-735), 26 July 1988 & JP 63 050998 A (TOSHIBA CORPORATION), 3 March 1988, see abstract ---	35
Y	---	31
Y	US 5 036 493 A (NIELSEN) 30 July 1991 see column 1, line 53 - column 2, line 7 see column 4, line 32 - column 5, line 19 see claim 1; figure 2 ---	31
A	---	32-34
A	US 5 251 178 A (CHILDERS) 5 October 1993 see abstract see column 4, line 38 - line 65 see claims 1-11 -----	31-35

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 96/ 16835

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

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

see annexed 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 fee, this Authority did not invite payment of any additional fee.

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.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International Application No. PCT/ US 96/16835

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims 1-21, 36-42: Dynamic variation of time interval between control information requesting a data transfer being transmitted, and the data transfer itself.
2. Claims 22-26: Construction of an operation code such that each control line corresponds to a bit value in the operation code.
3. Claims 27-25: Establishing the necessity for, and the sequencing of, internal memory core operations to be performed by a plurality of memory devices.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 96/16835

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