

United States Patent [19]

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Luick et al.

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[54] **MULTIPROCESSOR CACHE COHERENCE DIRECTED BY COMBINED LOCAL AND GLOBAL TABLES** 5,895,487 4/1999 Boyd et al. 711/122
 5,897,664 4/1999 Nesheim et al. 711/206

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[75] Inventors: **David Arnold Luick; John Christopher Willis; Philip Braun Winterfield**, all of Rochester, Minn.

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[73] Assignee: **International Business Machines Corporation**, Armonk, N.Y.

Sandra Johnson Baylor et al., "An Evaluation of Cache Coherence Protocols for MIN-Based Multiprocessors", International Symposium on Shared Memory Multiprocessing, pp. 230-241, Apr. 1991.

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

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[21] Appl. No.: **08/724,628**

Primary Examiner—John W. Cabeca

[22] Filed: **Oct. 1, 1996**

Assistant Examiner—Pierre-Michel Bataille

[51] Int. Cl.⁷ **G06F 12/00**

Attorney, Agent, or Firm—Terrance A. Meador; David A. Hall; Karuna Ojanen

[52] U.S. Cl. **711/141; 711/118; 711/146; 711/144; 711/124**

[58] Field of Search 711/118, 130, 711/165, 141, 146-148, 124, 152, 144

[57] **ABSTRACT**

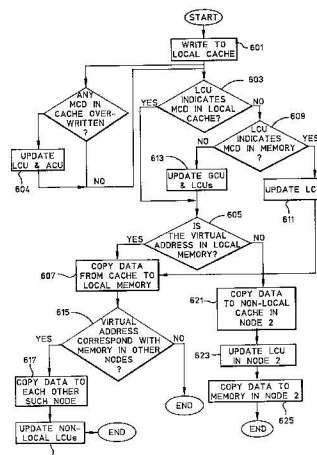
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A method and apparatus for maintaining coherence between shared data stored within a plurality of memory devices, each memory device residing in a different node within a tightly coupled multiprocessor system. Each node includes a "local coherence unit" and an associated processor. A cache unit is associated with each memory/processor pair. Each local coherence unit maintains a table which indicates whether the most current copy of data stored within the node resides in the local memory, in the local cache, or in a non-local cache. The present invention includes a "global coherence" unit coupled to each node via the logical interconnect. The global coherence unit includes an interconnect monitoring device and a global coherence table. When data which resides within the memory of a first node is transferred to a second node, the interconnect monitoring device updates the global coherence table to indicate that the data is being shared. The global coherence table also preferably indicates in which node a copy of the most current data resides.

6 Claims, 7 Drawing Sheets



Petition for *Inter Partes* Review of
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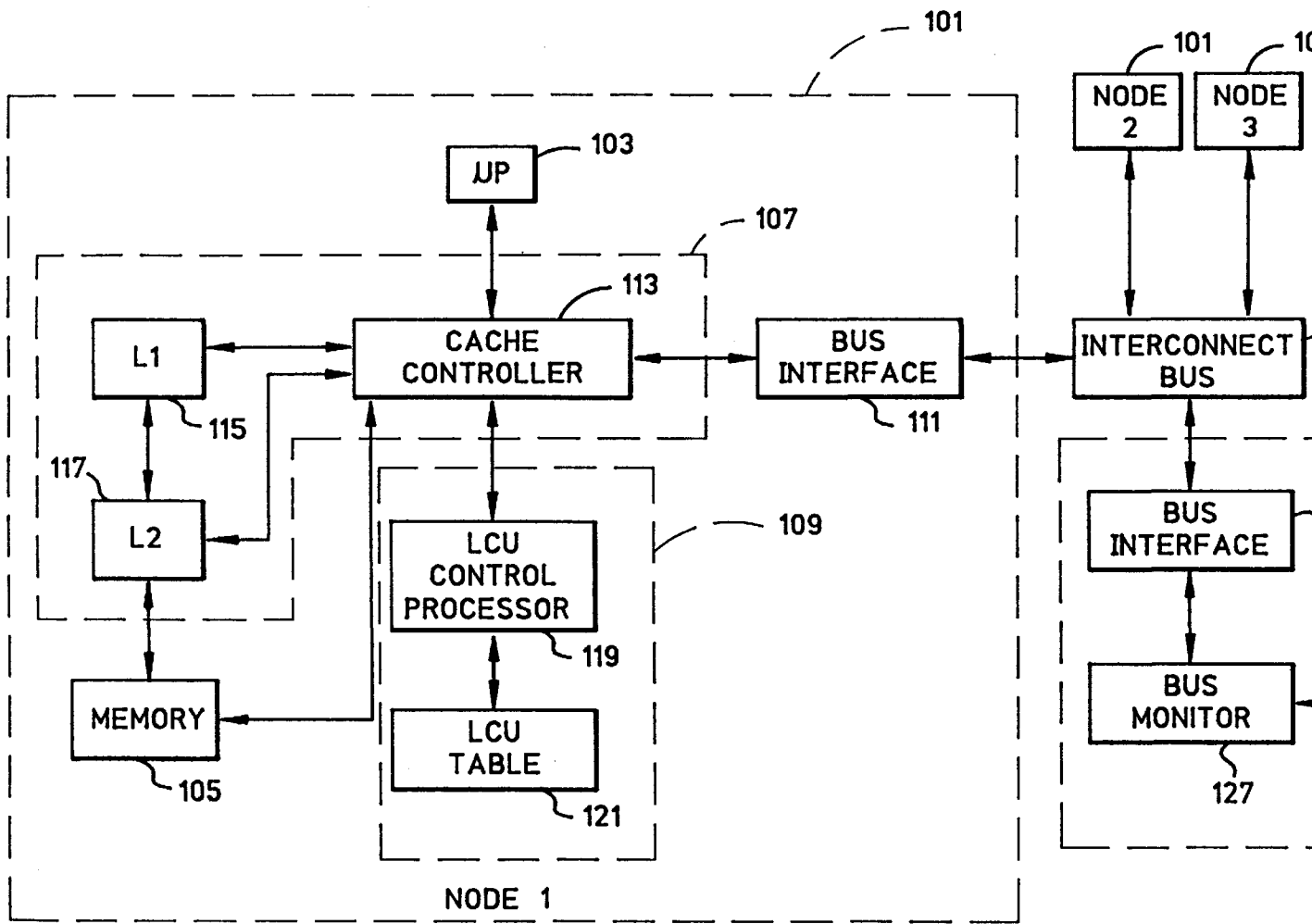


FIG. 1

CACHE LINE 1	CACHE LINE 2	CACHE LINE 3	...	CACHE LINE n
0	1	1	...	0
201	201	201		201

CACHE LINE 1	CACHE LINE 2	CACHE LINE 3	...	CACHE LINE n
01	00	10	...	00
203	203	203		203

VIRTUAL ADDRESS	NODE 1	NODE 2	NODE n
000000	1	0	0	1
⋮				
010100	1	1	0	0
010101	1	0	0	1
⋮				
011110	0	1	0	1
	205	205	205	205

FIG. 2C

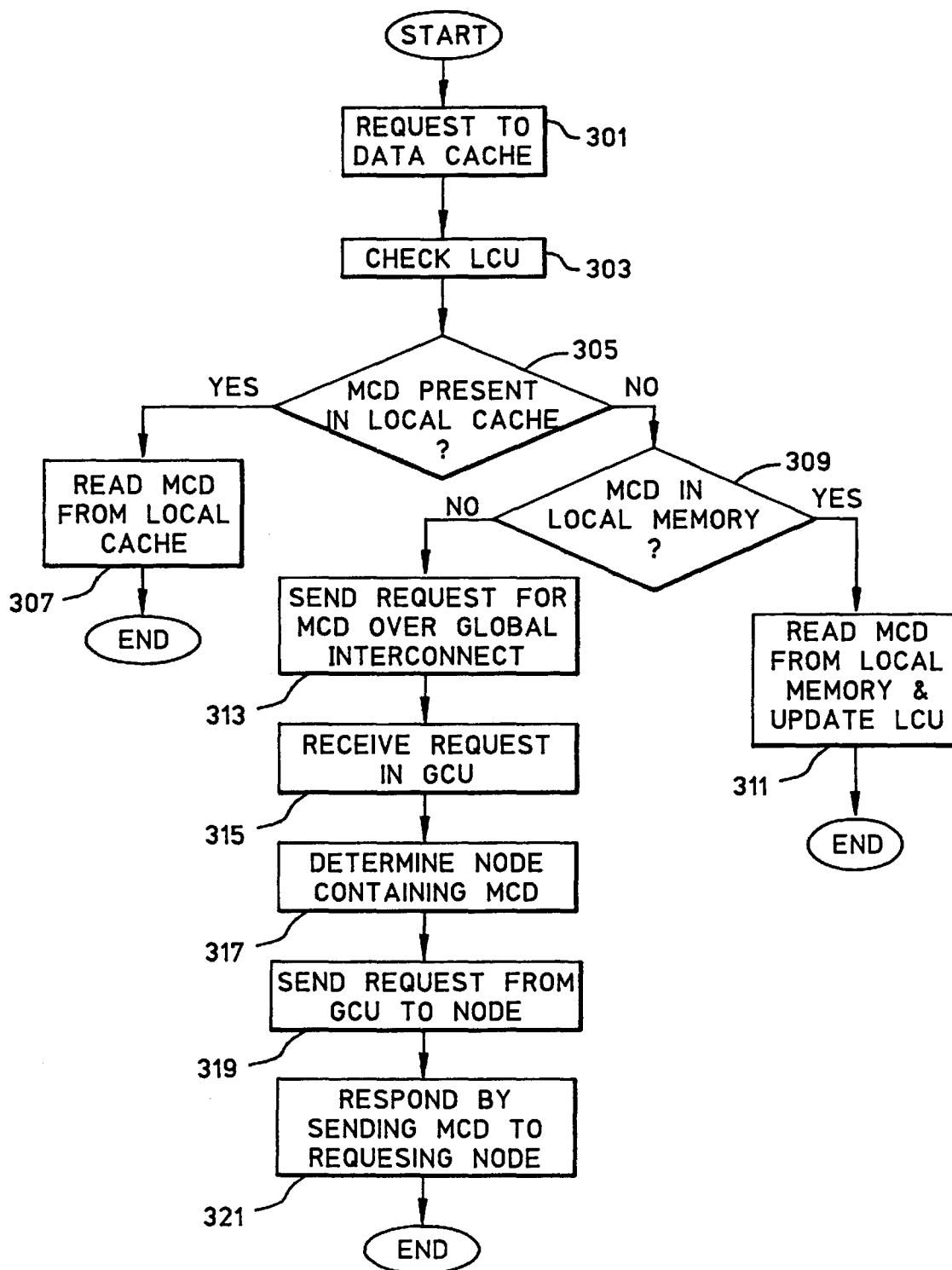


FIG. 3

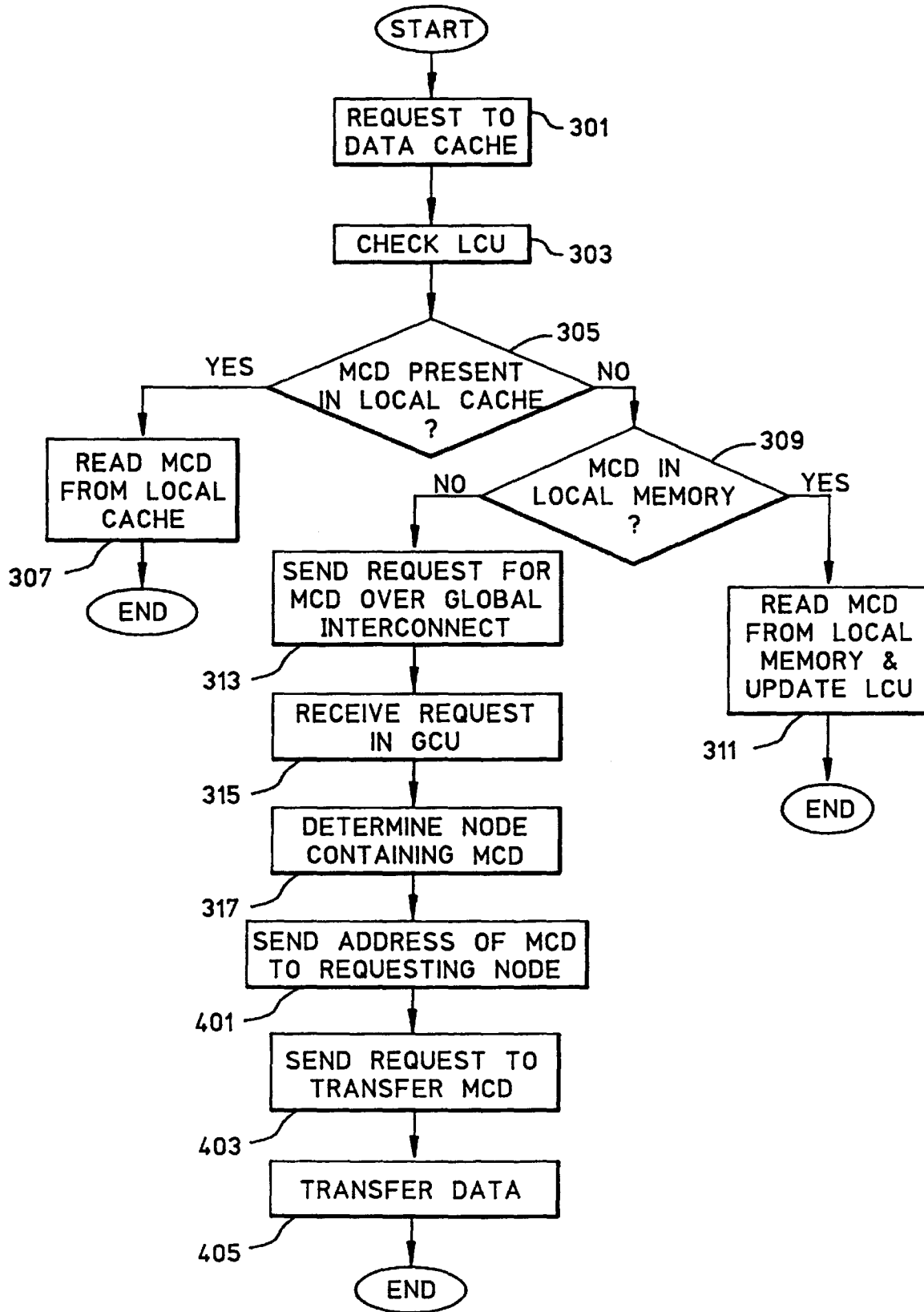


FIG. 4

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