



US005390351A

United States Patent [19]

[11] Patent Number: 5,390,351

Di Giulio et al.

[45] Date of Patent: Feb. 14, 1995

[54] SYSTEM FOR COMMUNICATING WITH PLURAL NODES IN PREDETERMINED INTERVALS DEPENDED ON INTEGERS ASSIGNED AND CHANGED BASED UPON CONFIGURATION THEREOF

[75] Inventors: Peter C. Di Giulio, Fairfield; James L. Harman, Southport; David K. Lee, Monroe; Frederick W. Ryan, Jr., New Haven, all of Conn.

[73] Assignee: Pitney Bowes Inc., Stamford, Conn.

[21] Appl. No.: 847,537

[22] Filed: Mar. 6, 1992

[51] Int. Cl.⁶ G06F 1/04; G06F 13/00

[52] U.S. Cl. 395/725; 395/200; 364/221.5; 364/222; 364/231.4; 364/DIG. 1; 364/942.1; 364/940.64; 364/942.5; 364/DIG. 2

[58] Field of Search 395/200, 275, 725; 341/125.52

[56] References Cited

U.S. PATENT DOCUMENTS

4,177,450	12/1979	Sarrand	340/147
4,365,293	12/1982	Holtz	364/200
4,398,264	8/1983	Cooper et al.	364/900
4,456,956	6/1984	El-Gohary et al.	364/200
4,536,838	8/1985	Ringel et al.	364/200
4,550,366	10/1985	Toyama et al.	364/136
4,682,168	7/1987	Chang et al.	340/825.65
4,847,832	7/1989	Chang et al.	370/85
4,972,313	11/1990	Getson, Jr. et al.	364/200
4,972,314	11/1990	Getzinger et al.	395/425
5,005,122	4/1991	Griffin et al.	395/200
5,167,019	11/1992	Fava et al.	395/200
5,167,035	11/1992	Mann et al.	395/575
5,198,990	3/1993	Farzan et al.	364/560
5,208,809	5/1993	Ferguson et al.	370/91
5,287,520	2/1994	Kaiser	395/725

FOREIGN PATENT DOCUMENTS

0133567	8/1984	European Pat. Off.
0200365	3/1986	European Pat. Off.
0230116	12/1986	European Pat. Off.
0355042	2/1989	European Pat. Off.

OTHER PUBLICATIONS

EPO Search Report, Dated Nov. 22, 1993.
 Time Critical Communication Networks: Field Buses 8302 IEEE Network 2 (1988) May, No. 3, New York.
 Choosing A Network For Local Industrial Control, 2119 EDN Electrical Design News 33 (1988), Nov. 24, No. 24 Newton Mass.
 IEEE International Conference On Communications BOSTONICC/89 World Prosperity Through Communication Boston, Mass. Jun. 11-14, 1989.
 Robots In Manufacturing, 8279 Robotics 4 (1988) Jun. No. 2, Amsterdam, The Netherlands.
 Patent application Ser. No. 07/847,542, filed Mar. 6, 1992, Inventor P. DiGiulio, D. Lee, D. Riley and F. Ryan, Jr.
 Patent application Ser. No. 07/847,505, filed Mar. 6, 1992, Inventor P. DiGiulio, D. Lee, D. Riley and F. Ryan, Jr.
 Article entitled "The FIP Protocol" Philippe Leterrier Development Manager.
 C. Bardwell-Jones, "SSD . . ." Proceed. of the 3rd Annual Motion Control Tech. Conf. E., Mar. 1991, Boston, Mass., pp. 1-25.

(List continued on next page.)

Primary Examiner—Thomas C. Lee
Assistant Examiner—Sang Hui Kim
Attorney, Agent, or Firm—Robert H. Whisker; Melvin J. Scolnick

[57] ABSTRACT

A cost-effective motion control system communication architecture is provided that supports a centralized control node, distributed control nodes, and smart I/O peripheral control nodes. Networks designed using this architecture, which employs a serial bus, may be readily modified or expanded. The architecture supports both real-time highly periodic communications and event-driven peer-to-peer communications.

9 Claims, 21 Drawing Sheets

