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# United States Patent [19]

[11] Patent Number: **5,088,032**

**Bosack**

[45] Date of Patent: **Feb. 11, 1992**

[54] **METHOD AND APPARATUS FOR ROUTING COMMUNICATIONS AMONG COMPUTER NETWORKS**

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[75] Inventor: **Leonard Bosack**, Atherton, Calif.

[57] **ABSTRACT**

[73] Assignee: **Cisco Systems, Inc.**, Menlo Park, Calif.

An improved method and apparatus for routing data transmissions among computer networks. The computer networks are interconnected with a series of gateway circuits. Each gateway identifies all destination computers to which it is connected and identifies the path or paths to each destination computer. For each identified path, the gateway stores the topological delay time for a transmission, the path bandwidth for the narrowest bandwidth segment of a path and a number corresponding to the reliability of the path. When a transmission is received, the gateway examines the various paths in accordance with a predetermined algorithm which also considers the channel occupancy of each path to determine a best path for transmission. The data transmission is then directed over the best path. If more than one path exists, the data may be directed in multiplex fashion over two or more paths with the amount of data on each path being related to the quality of the path. The routing information to destination networks is broadcast periodically by each gateway circuit to its neighboring gateway circuits.

[21] Appl. No.: **149,820**

[22] Filed: **Jan. 29, 1988**

[51] Int. Cl.<sup>5</sup> ..... **H04Q 11/04; H04J 3/26**

[52] U.S. Cl. .... **395/200; 370/94.1; 364/284; 364/284.3; 364/284.4; 364/242.94; 364/229; 364/229.3; 364/229.4; 364/229.5; 364/DIG. 1**

[58] Field of Search ... **364/200 MS File, 900 MS File; 370/94, 94.1, 94.3, 60.1**

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**64 Claims, 11 Drawing Sheets**

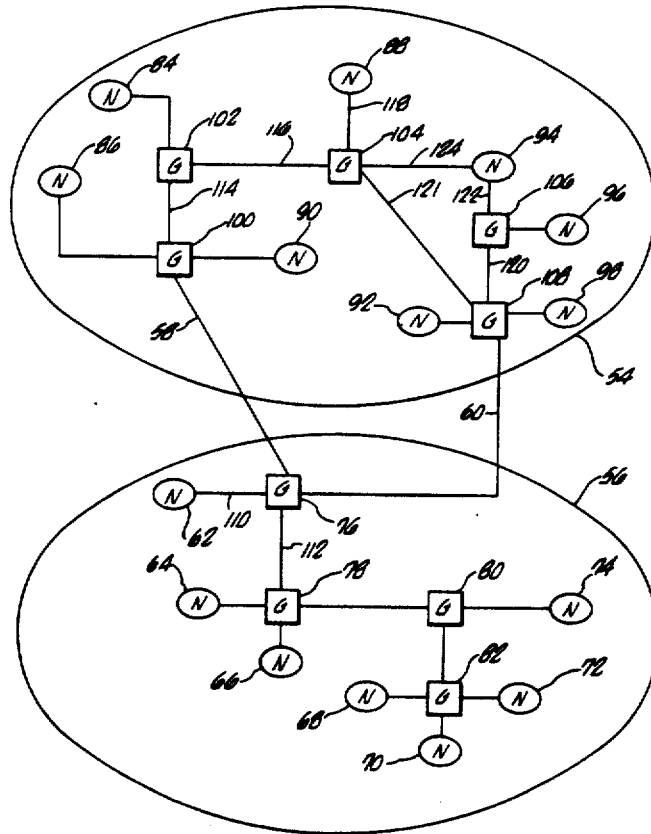


FIG. 1A  
(PRIOR ART)

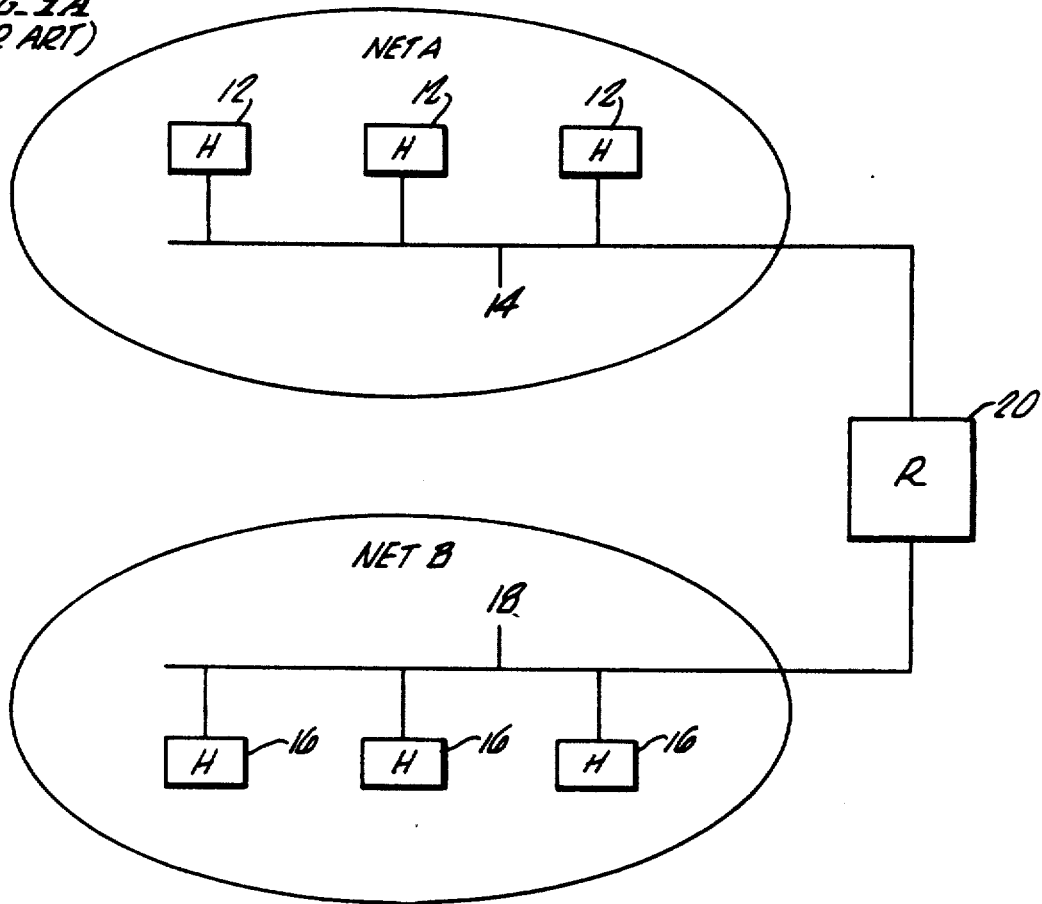
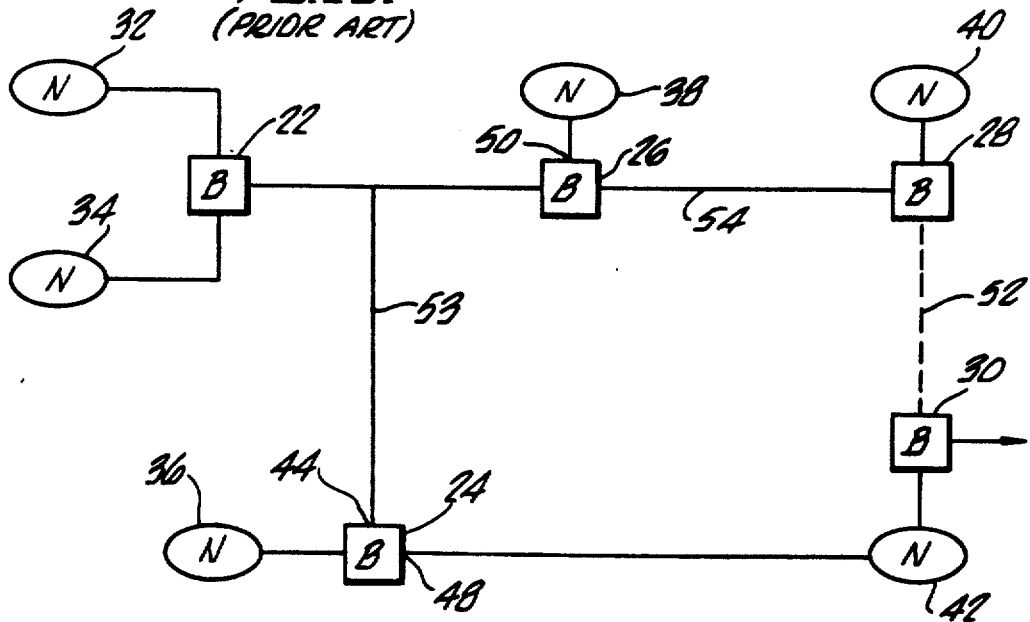


FIG. 1B.  
(PRIOR ART)



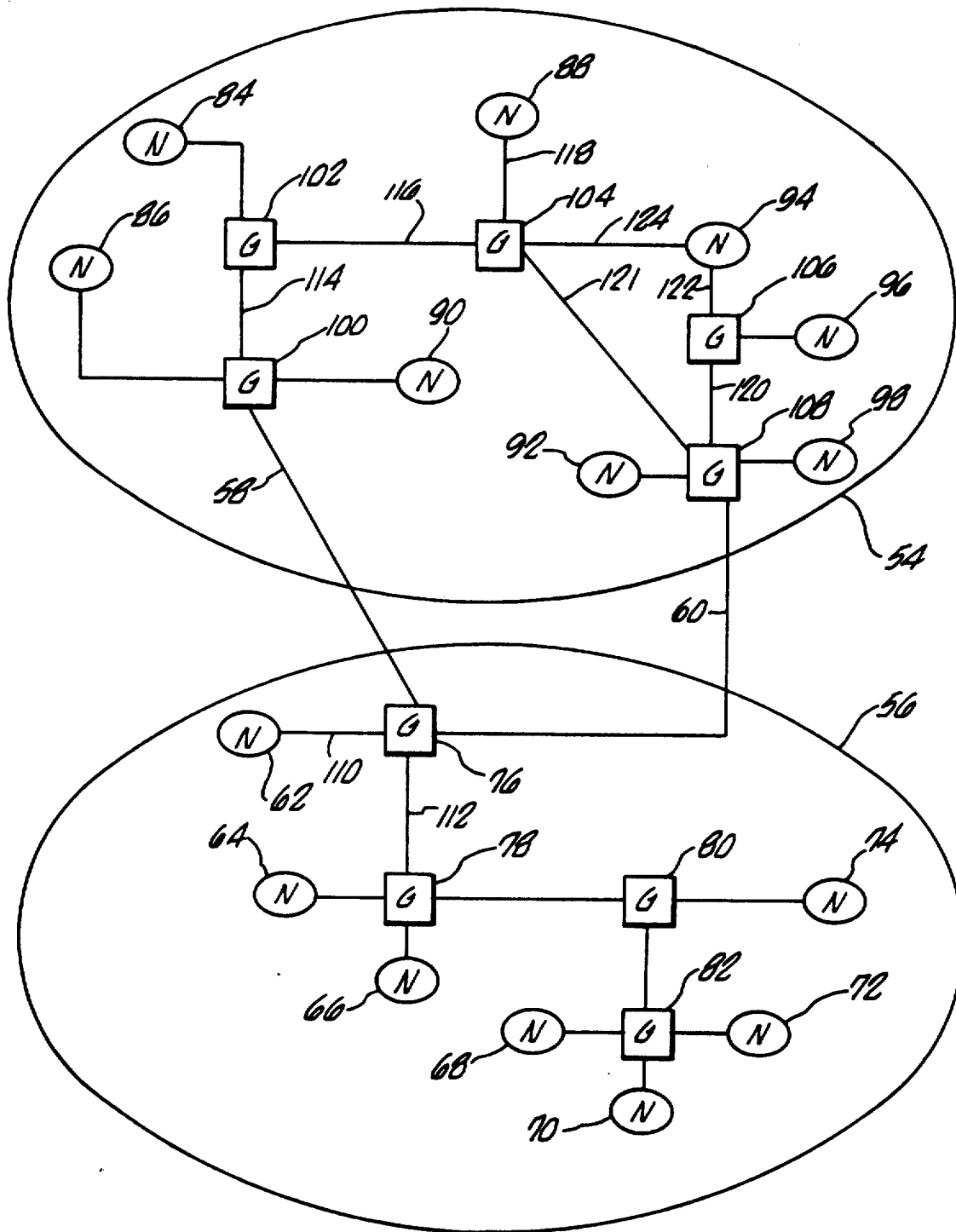


FIG. 2.

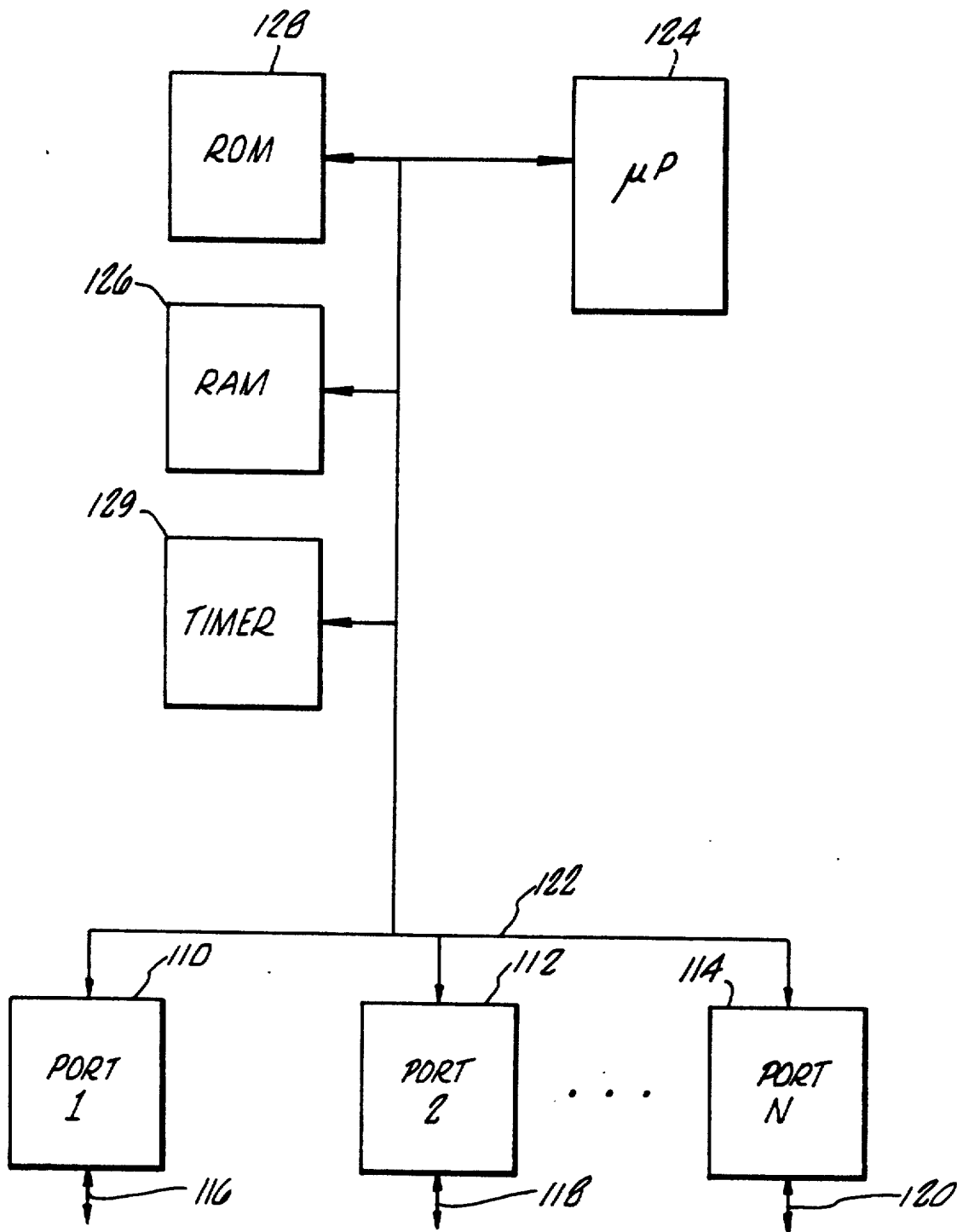


FIG. 3.

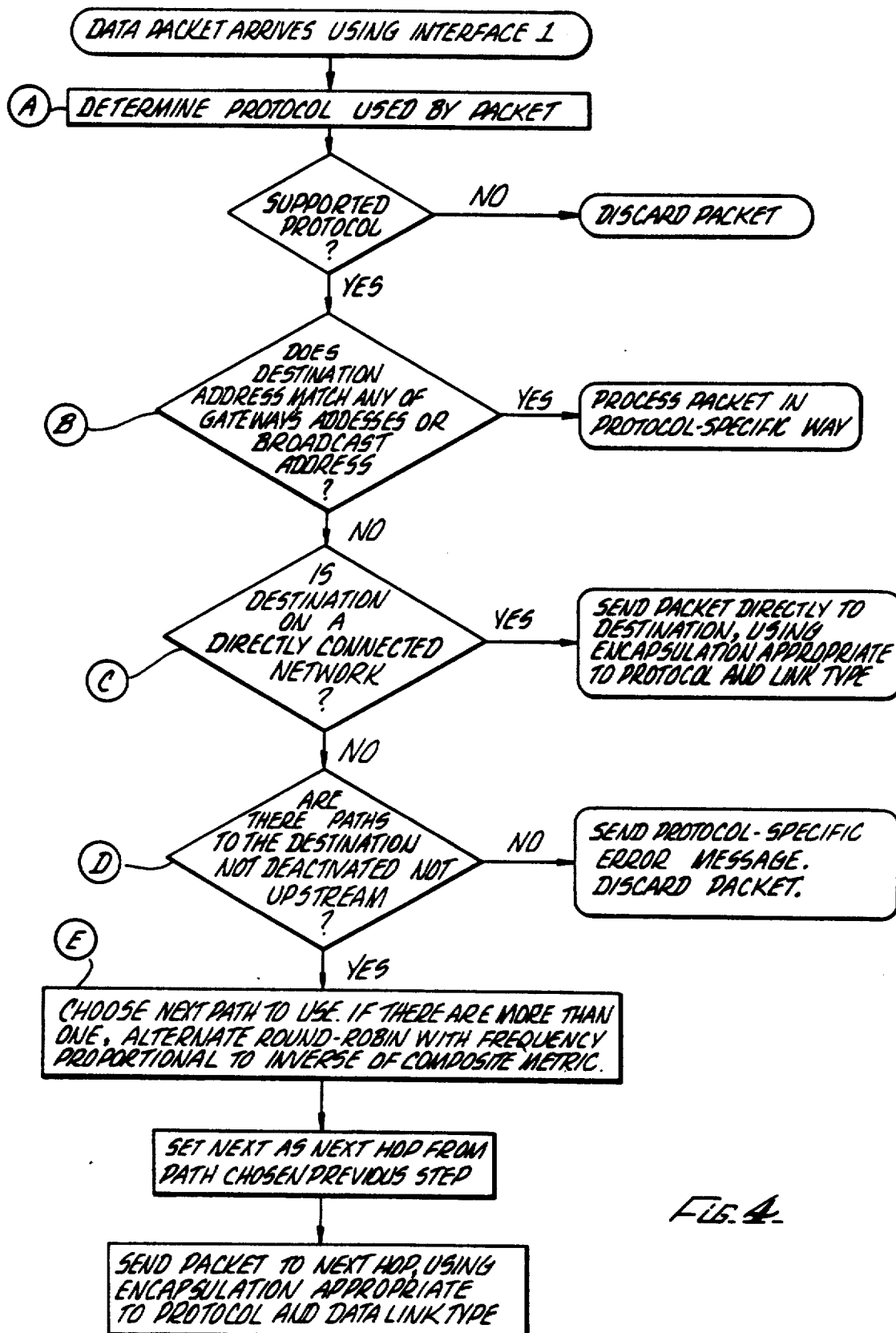


FIG. 4.

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