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(54) **METHOD FOR PROTECTING A TELECOMMUNICATIONS NETWORK**

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(52) **U.S. Cl.** **370/351; 370/258**

(58) **Field of Search** 370/252, 254, 370/255, 256, 257, 258, 404, 405, 452, 460; 359/341.1, 341.2; 398/58, 59, 66

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,956,835 A	9/1990	Grover	370/16
5,850,505 A	12/1998	Grover et al.	395/182.02
6,061,335 A *	5/2000	De Vito et al.	370/258

FOREIGN PATENT DOCUMENTS

GB	2299729 A	10/1996	H04Q/3/00
GB	2305811 A	4/1997	H04M/3/36
WO	97/11543	3/1997	H04L/12/24

OTHER PUBLICATIONS

Optimized design of ring-based survivable networks, W.D. Grover, J.B. Slevinsky and M.H. MacGregor, Can. J. Elect. & Comp. Eng., vol. 20, No. 3, 1995, pp. 139-149.

Fiber Network Survivability, Tom Flanagan, IEEE Communications Magazine, Jun. 1990, pp. 46-53.

Survivable Sonet Networks—Design Methodology, Ondria J. Wasem, Tsong-Ho Wu, and Richard H. Cardwell, IEEE Journal on Selected Areas in Communications, vol. 12, No. 1, Jan. 1994, pp. 205-212.

Broadband Network Infrastructure of the Future: Roles of Network Design Tools in Technology Deployment Strategies, Bharat Doshi and P. Harshavardhana, IEEE Communications Magazine, May 1998, 14 pages.

Net Solver: A Software Tool For the Design of Survivable Networks, Linda Morales Gardner, I. Hal Sudborough, and Ioannis G. Tollis, Globecom '95, pp. 926-930.

(List continued on next page.)

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(57) **ABSTRACT**

A method of connecting a telecommunications network, in which the network is formed of plural nodes connected by plural spans. Each node has a nodal switching device for making connections between adjacent spans meeting at the node. Method steps A-F are followed. A) Select a set of candidate rings, each candidate ring being formed of nodes connected by spans, the candidate rings each being capable of serving a number of demands and having a ring construction cost C. B) Assess the total transport utility U of each candidate ring, wherein the total transport utility is a measure of at least the number of demands served by the respective candidate ring. C) Assess the construction cost of each candidate ring. D) Calculate a ratio formed of U/C for each candidate ring. E) Choose, from the set of candidate rings, a best set of candidate rings, wherein candidate rings in the best set of candidate rings have a higher ratio of U/C than candidate rings not in the best set. F) Forming rings in the network that are selected from the best set of candidate simple rings.

40 Claims, 69 Drawing Sheets

