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Konda

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(54) **FULLY CONNECTED GENERALIZED BUTTERFLY FAT TREE NETWORKS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 273 days.

This patent is subject to a terminal disclaimer.

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(51) **Int. Cl.**
H04L 12/28 (2006.01)

(52) **U.S. Cl.** **370/408**

(58) **Field of Classification Search** 370/351–357, 370/359–360, 369–370, 372, 375, 380, 386–390, 370/400, 408, 422, 427, 901, 902–903

See application file for complete search history.

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(57) **ABSTRACT**

A generalized butterfly fat tree network comprising $(\log_d N)$ stages is operated in strictly nonblocking manner for unicast and in rearrangeably nonblocking manner for arbitrary fan-out multicast when $s \geq 2$, and is operated in strictly nonblocking manner for arbitrary fan-out multicast when $s \geq 3$, includes a leaf stage consisting of an input stage having

$$\frac{N}{d}$$

switches with each of them having d inlet links and $s \times d$ outgoing links connecting to its immediate succeeding stage switches, and an output stage having

$$\frac{N}{d}$$

switches with each of them having d outlet links and $s \times d$ incoming links connecting from switches in its immediate preceding stage. The network also has $(\log_d N) - 1$ middle stages with each middle stage, excepting the root stage, having

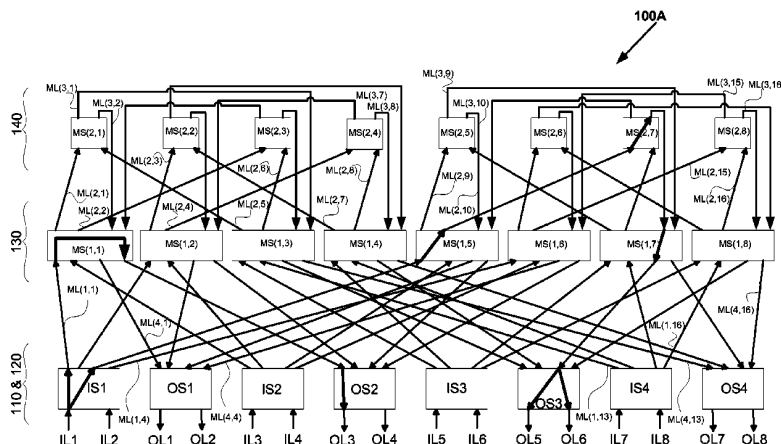
$$\frac{s \times N}{d}$$

switches, and each switch in the middle stage has d incoming links connecting from the switches in its immediate preceding stage, d incoming links connecting from the switches in its immediate succeeding stage, d outgoing links connecting to the switches in its immediate succeeding stage, d outgoing links connecting to the switches in its immediate preceding stage, and the root stage having

$$\frac{s \times N}{d}$$

switches, and each switch in the middle stage has d incoming links connecting from the switches in its immediate preceding stage and d outgoing links connecting to the switches in its immediate preceding stage.

22 Claims, 20 Drawing Sheets



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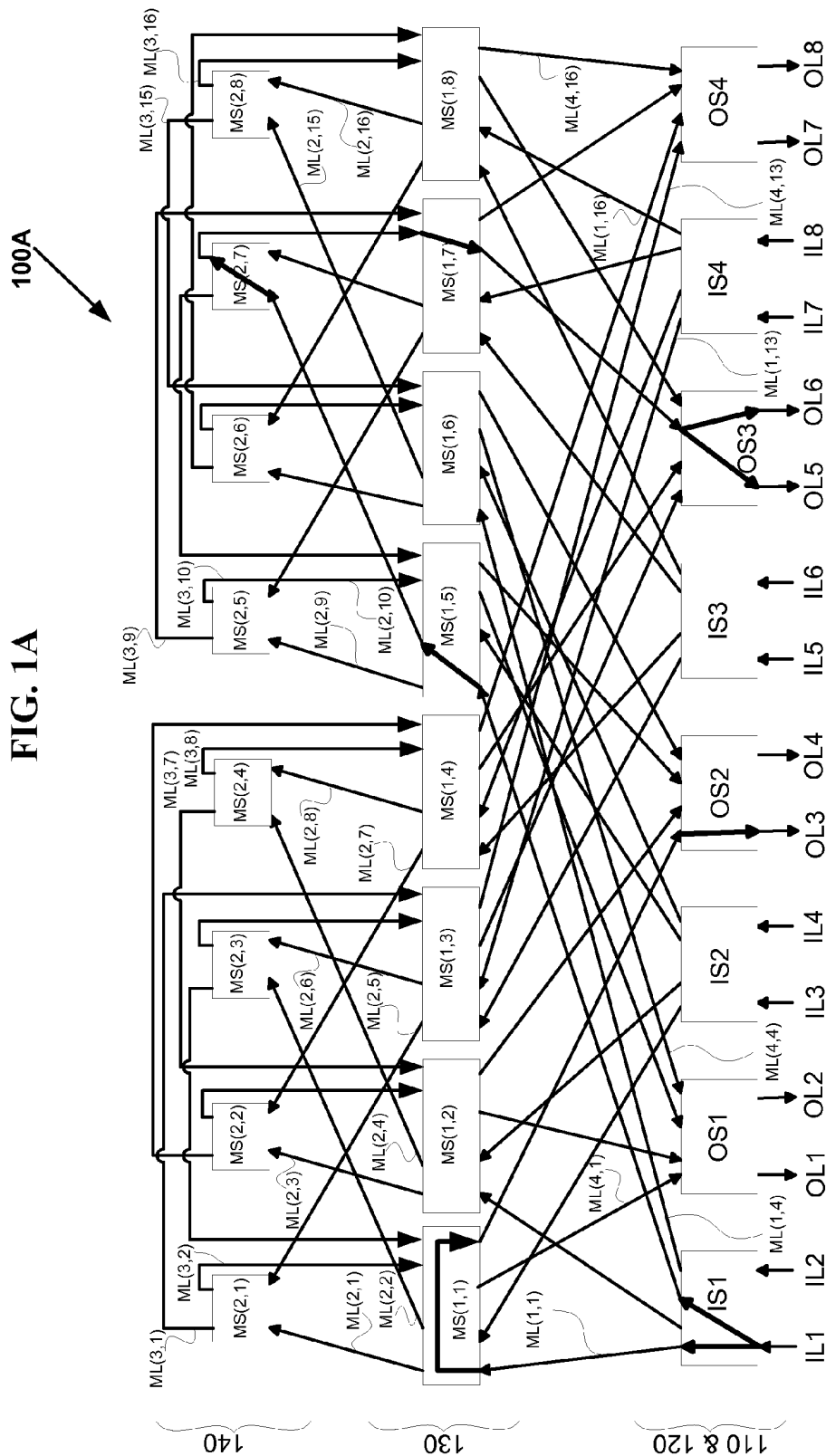


FIG. 1B

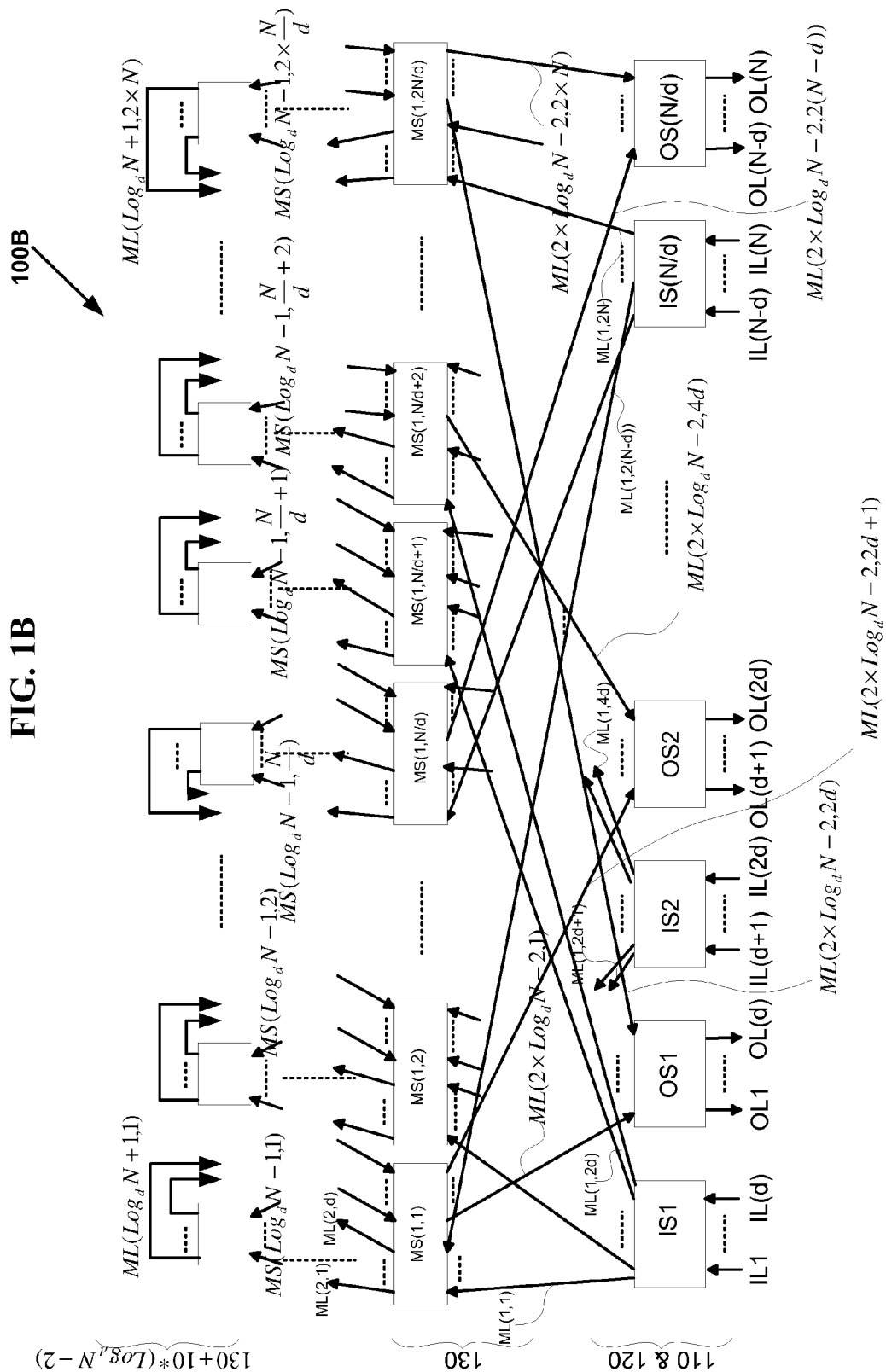
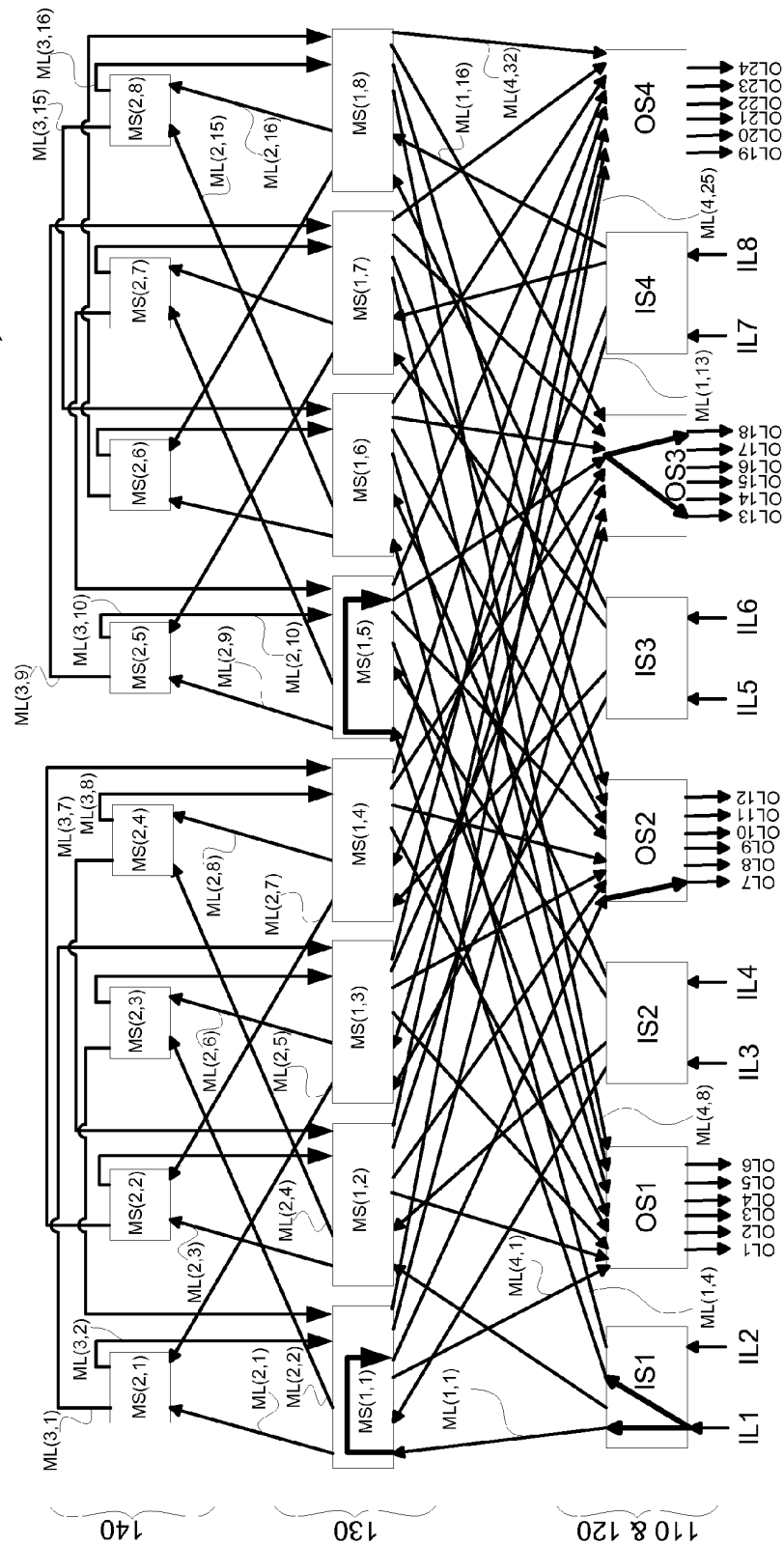


FIG. 1C

100C



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