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(12) **United States Patent**  
**Marom et al.**

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(54) **PROGRAMMABLE OPTICAL  
MULTIPLEXER/DEMULTIPLEXER**

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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 54 days.

(21) Appl. No.: **09/944,800**

(22) Filed: **Aug. 31, 2001**

(65) **Prior Publication Data**

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**Related U.S. Application Data**

(60) Provisional application No. 60/300,272, filed on Jun. 22, 2001.

(51) **Int. Cl.**<sup>7</sup> ..... **G02B 26/00**

(52) **U.S. Cl.** ..... **359/290; 359/115; 359/291**

(58) **Field of Search** ..... 359/115-119, 124,  
359/127-133, 298, 290-291, 558, 618,  
619, 652, 641-42, 644

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(57) **ABSTRACT**

A programmable optical demultiplexer can independently assign every input optical channel in a WDM optical communications signal to depart from any desired output port. The demultiplexer device can also be operated in the reverse direction, and thus achieve programmable optical multiplexer functionality, by accepting different wavelengths at each of multiple input ports and efficiently combining the wavelength channels at the multiplexer output port. The programmable multiplexer/demultiplexer device has an optical arrangement for spatially dispersing the optical wavelengths, and tunable micro-mirrors for beam steering each channel independently. Controlling the beam reflection direction determines the connectivity between the input and output ports at the wavelength level.

**32 Claims, 6 Drawing Sheets**

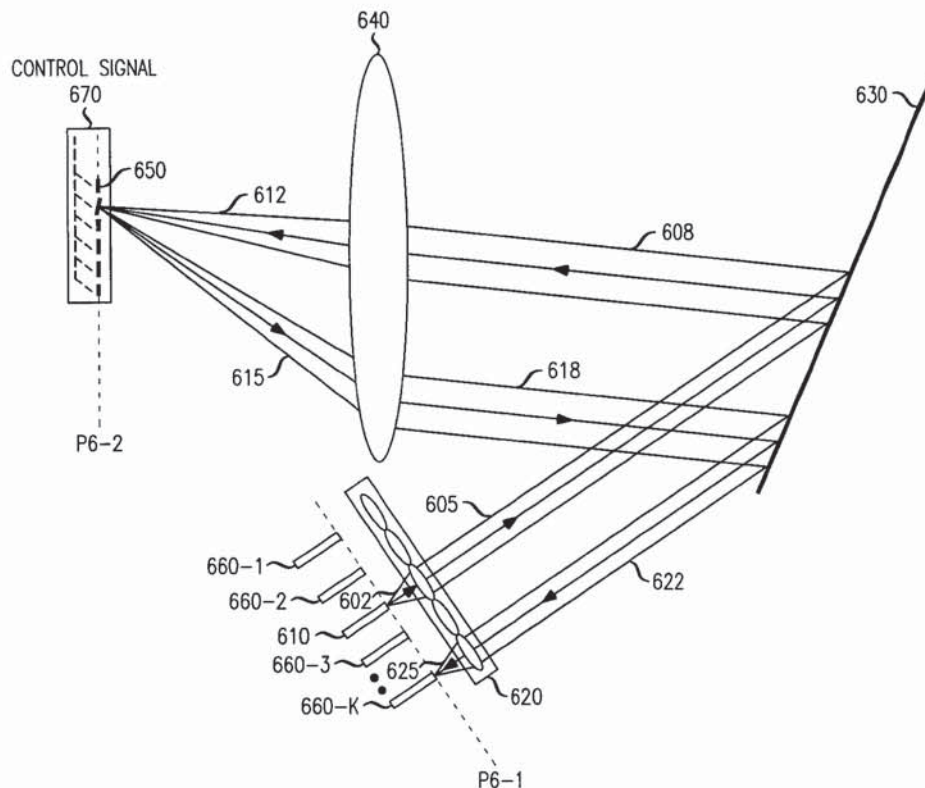


FIG. 1

PRIOR ART

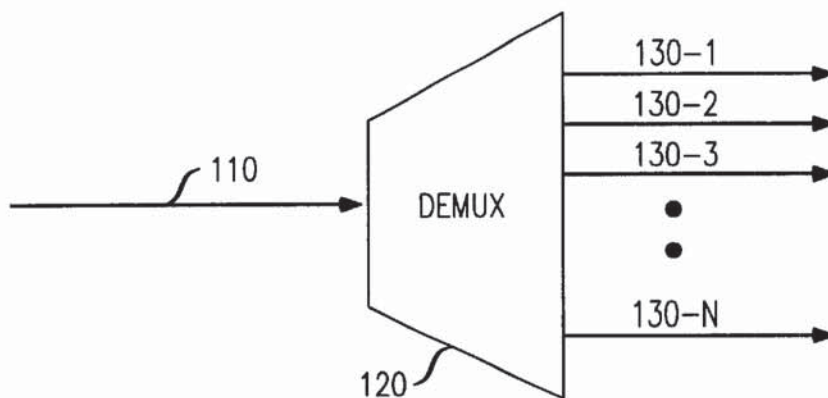


FIG. 2

PRIOR ART

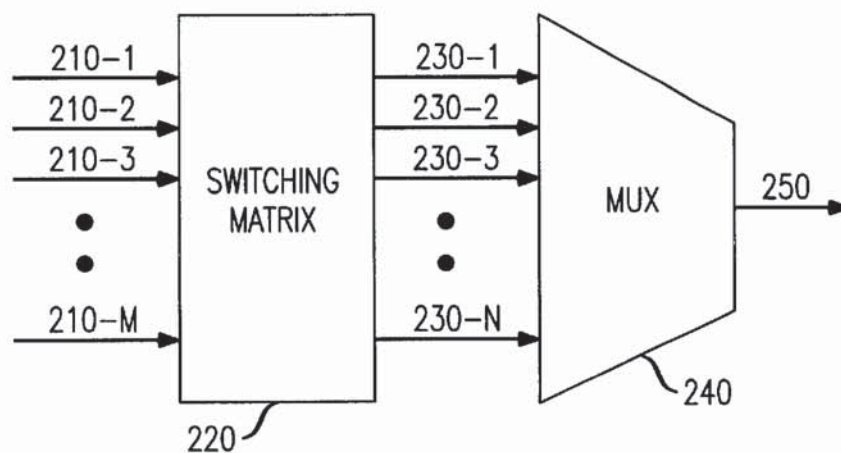


FIG. 3(A)

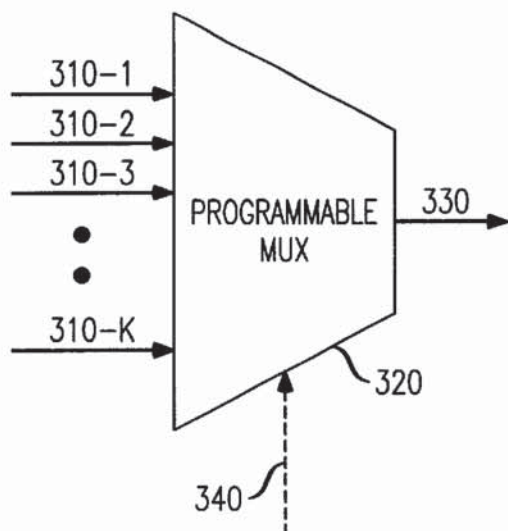


FIG. 3(B)

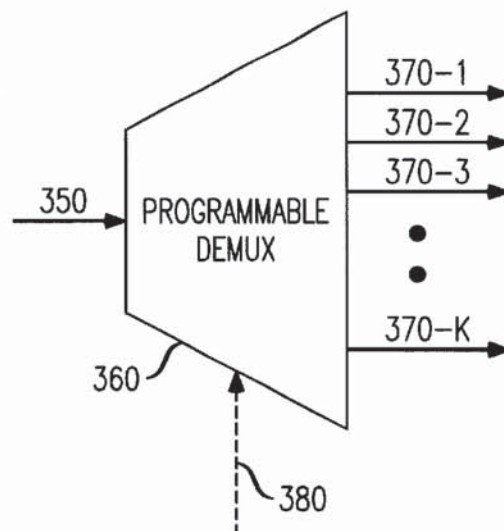


FIG. 4

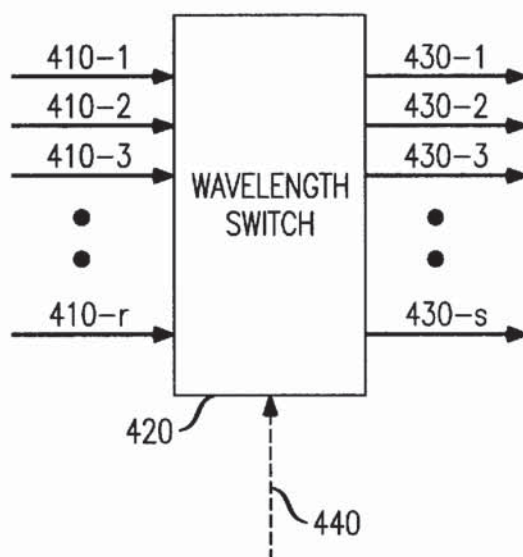
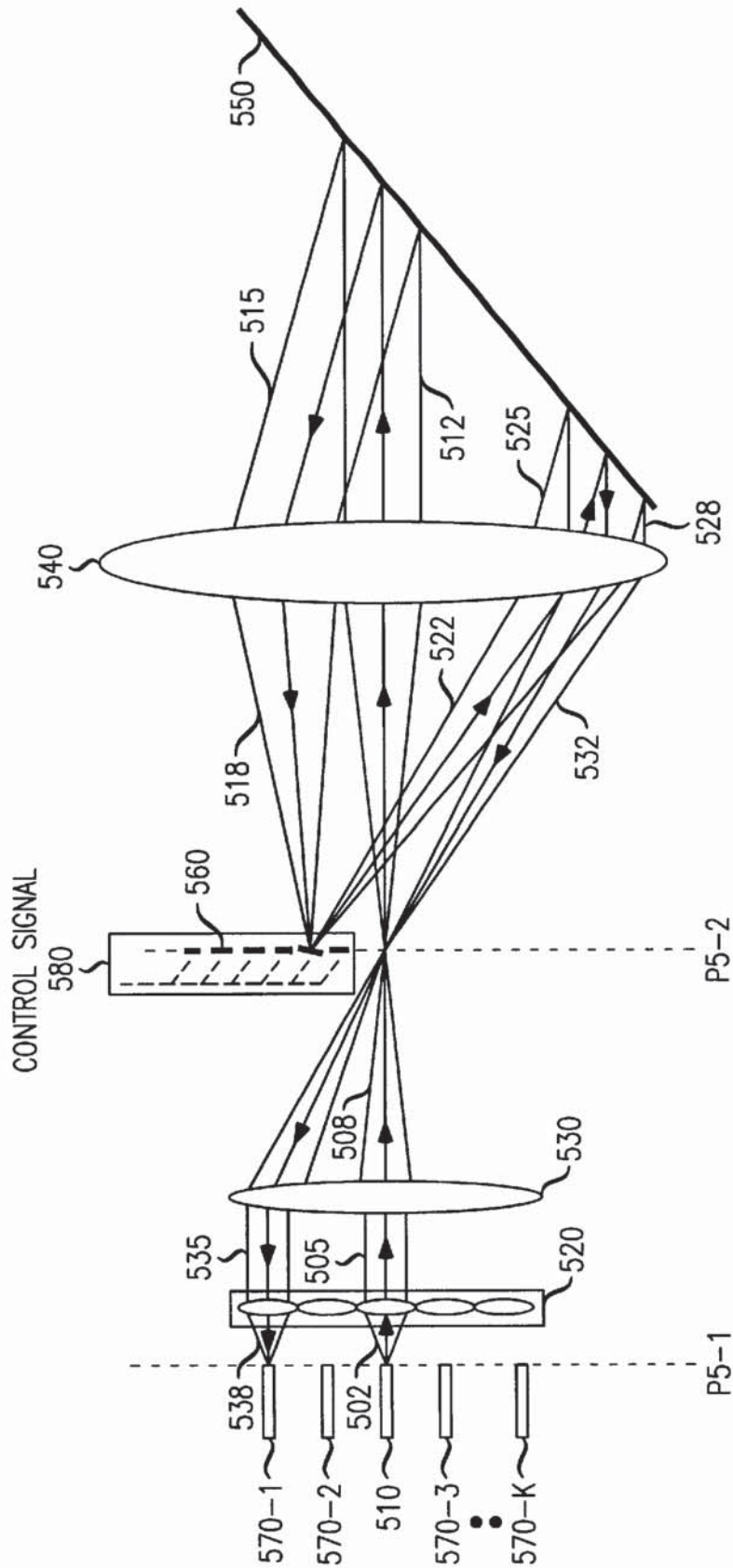
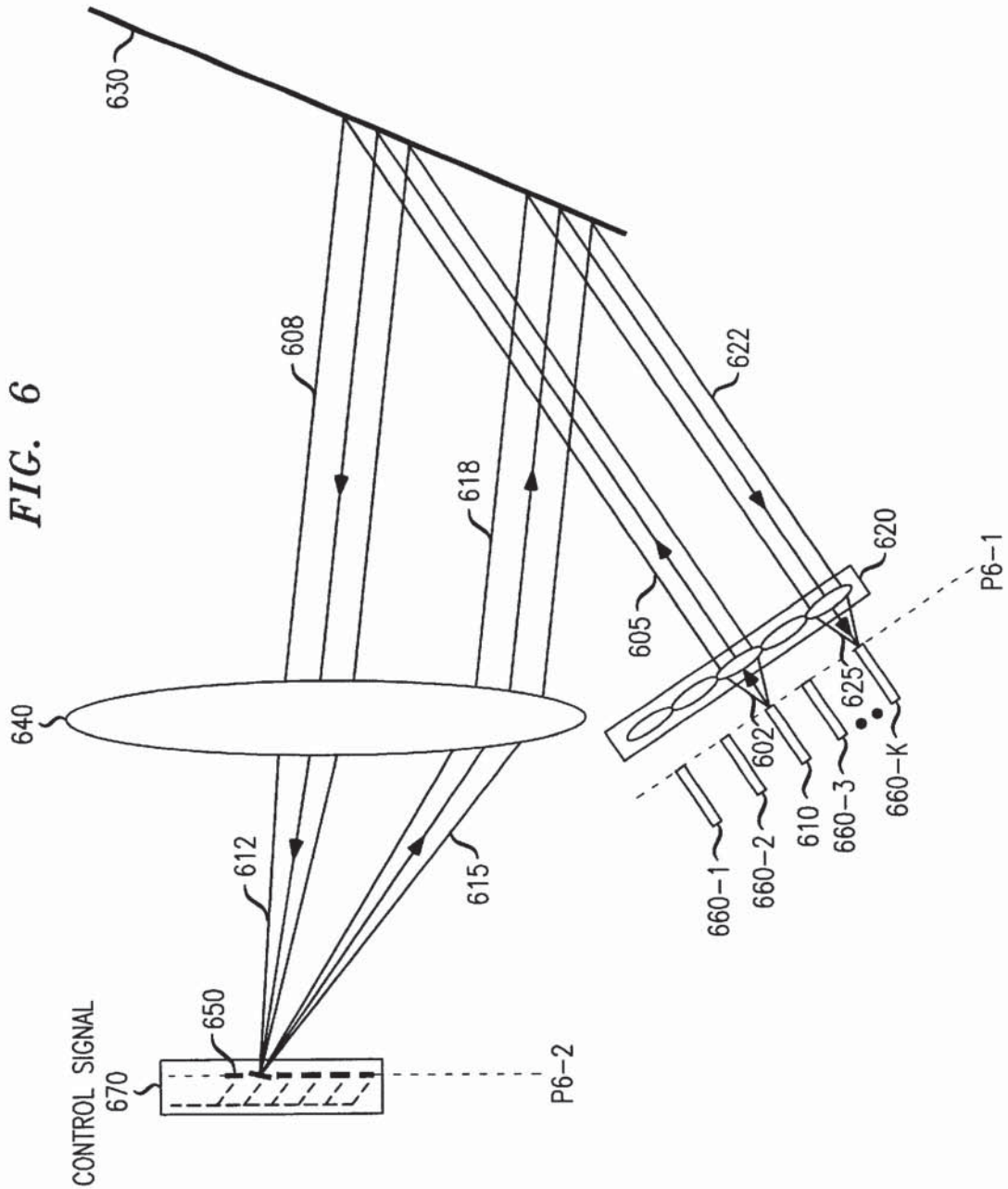


FIG. 5







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