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Ma et al.

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(54) **MODULAR THREE-DIMENSIONAL OPTICAL SWITCH**

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(51) **Int. Cl.**[7] **G02B 6/26**

(52) **U.S. Cl.** **385/16**; 385/18; 385/19

(58) **Field of Search** 385/16–20

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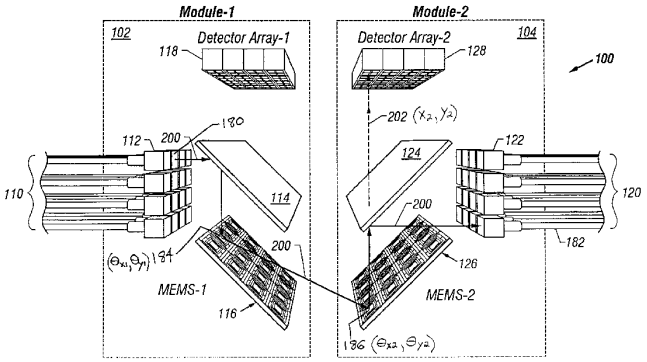
(57) **ABSTRACT**

A modular three-dimensional (3D) optical switch that is scalable and that provides monitor and control of MEMS mirror arrays. A first switch module includes an array of input channels. Light beams received from the input channels are directed toward a first wavelength selective mirror. The light beams are reflected off of the first wavelength selective mirror and onto a first array of moveable micromirrors. The moveable micromirrors are adjusted so that the light beams reflect therefrom and enter a second switch module where they impinge upon a second array of moveable micromirrors. The light beams reflect off of the second array of moveable micromirrors and impinge upon a second wavelength selective mirror. The light beams reflect off of the second wavelength selective mirror and into an array of output channels. The alignment or misalignment of a data path through the switch is detected by directing two monitor beams through the data path, one in the forward direction and one in the reverse direction. The position of each of the monitor beams is detected after its reflection from the second moveable micromirror that it hits. The position data is used to determine the angles of the moveable micromirrors in the data path.

71 Claims, 14 Drawing Sheets



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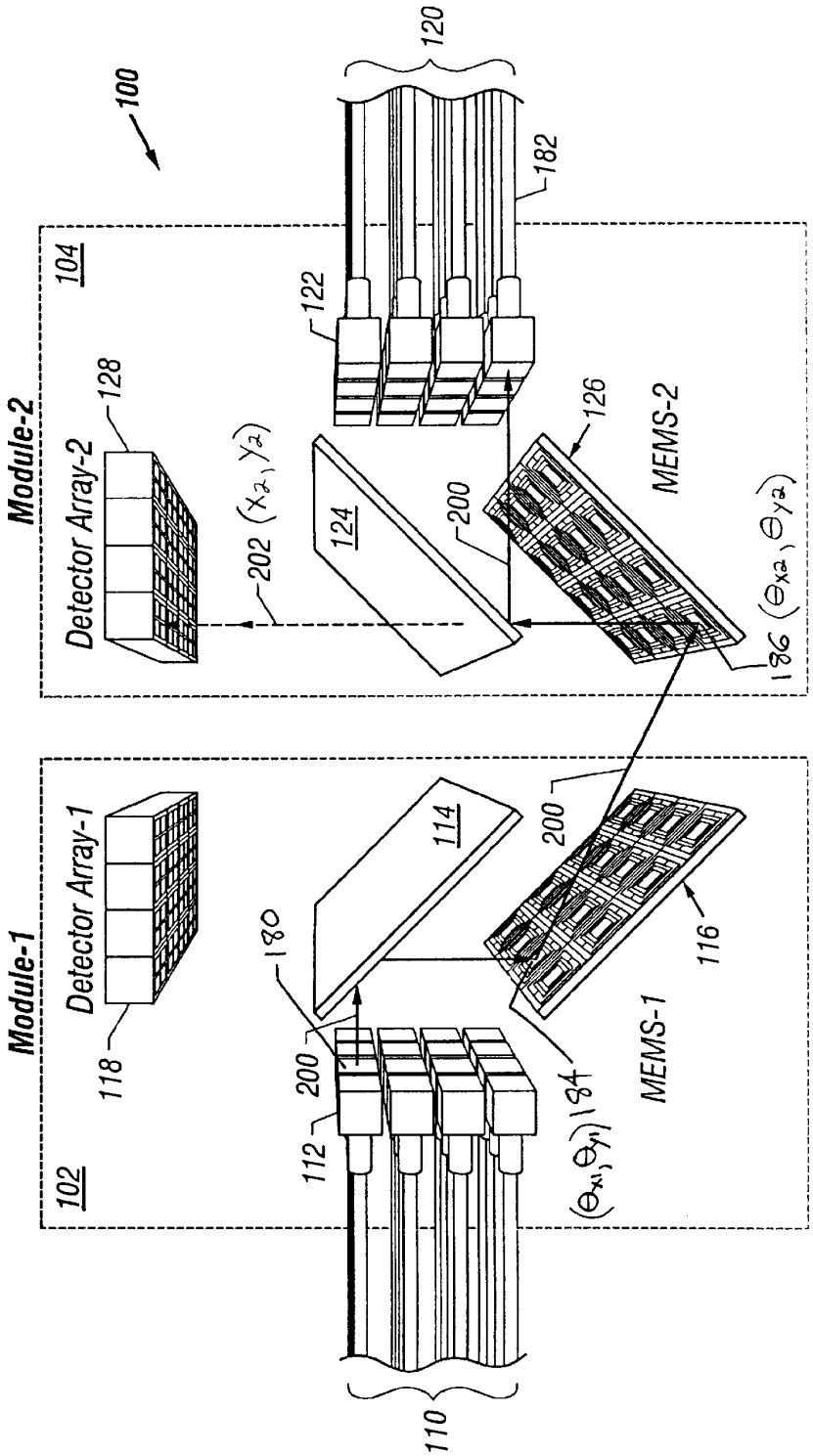

Fig. 1

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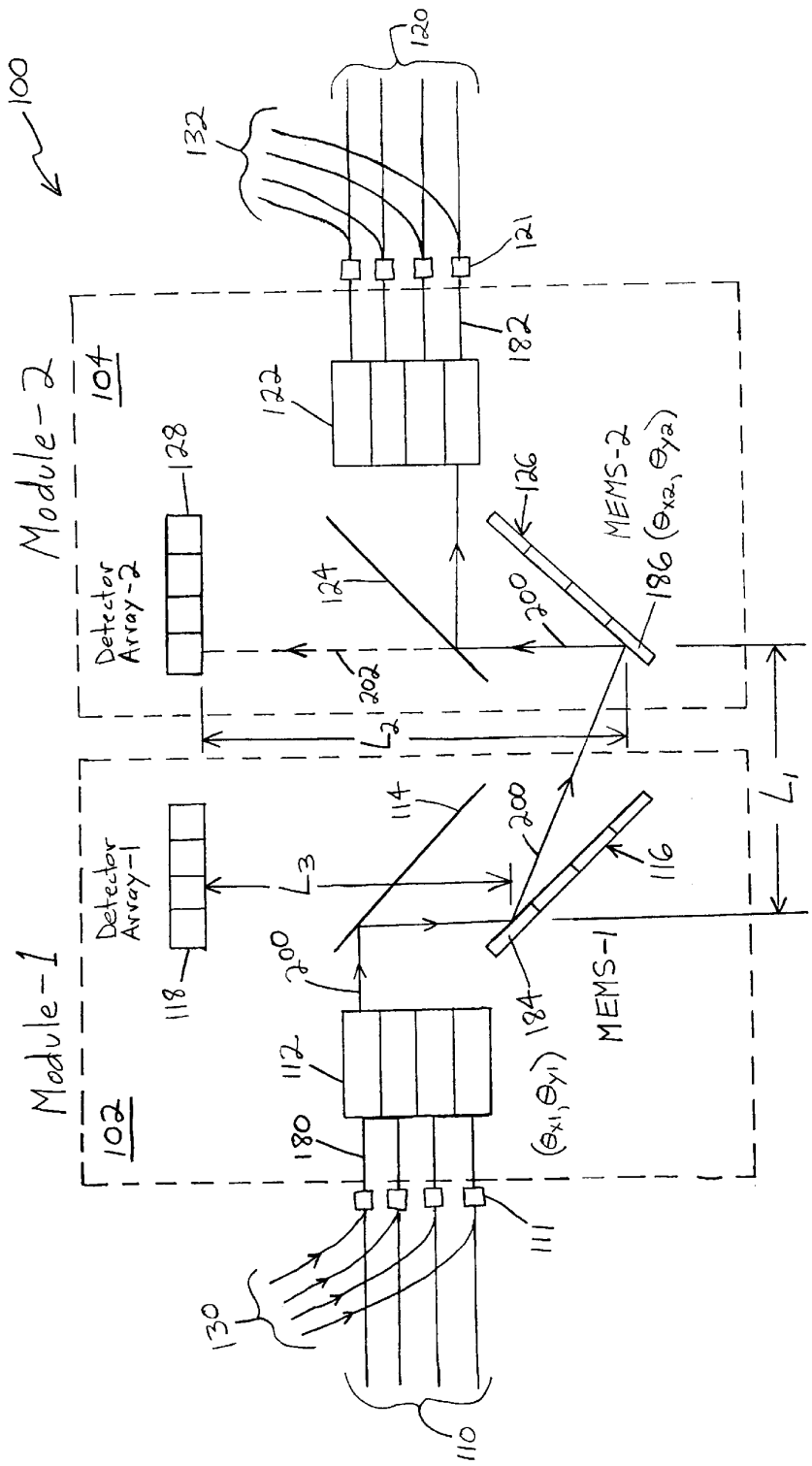

FIG. 2

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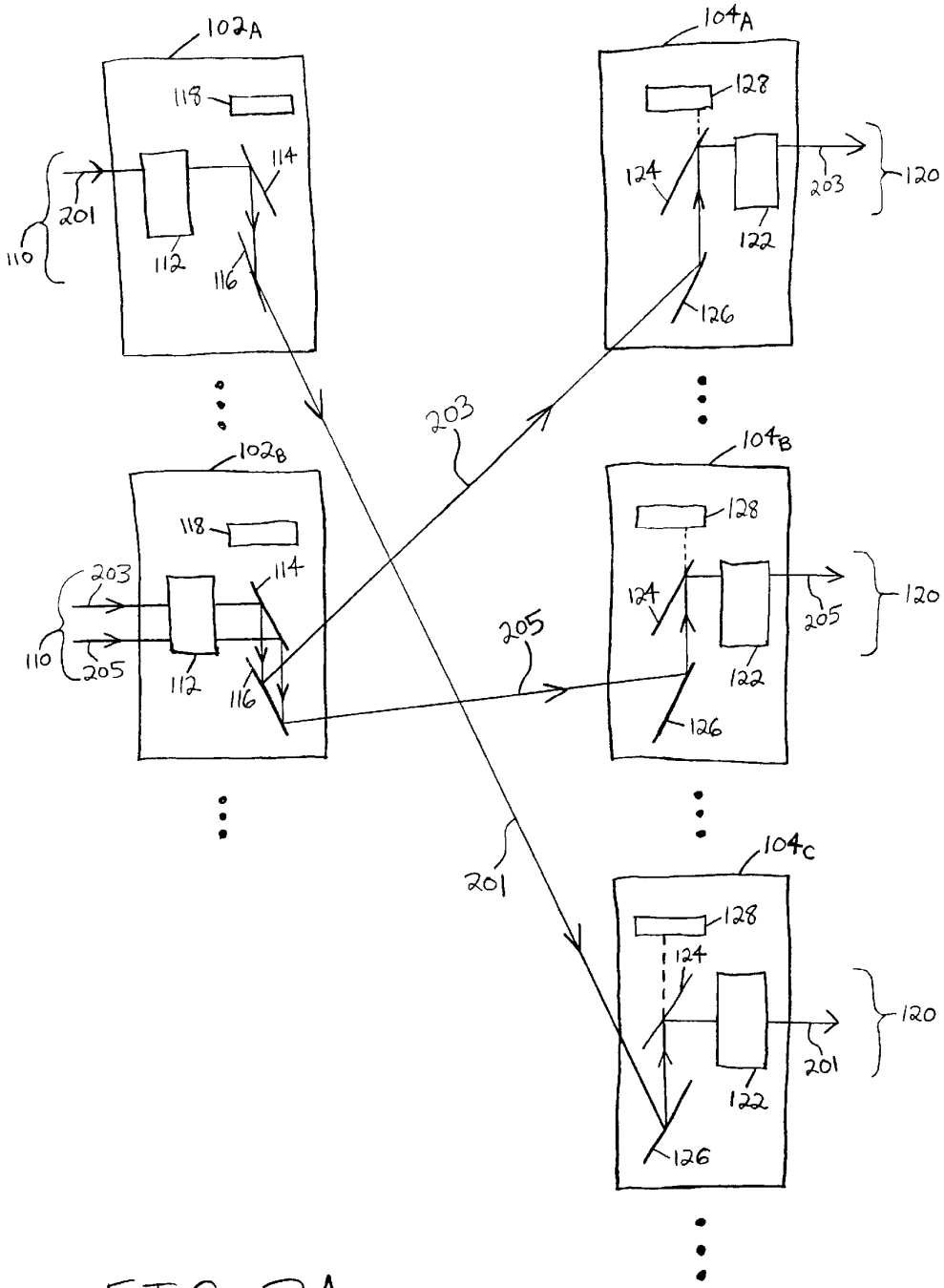

FIG. 3A

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