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# United States Patent [19]

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Patel et al.

[45] Date of Patent: **May 9, 1995**

[54] **FREQUENCY-SELECTIVE OPTICAL SWITCH EMPLOYING A FREQUENCY DISPERSIVE ELEMENT, POLARIZATION DISPERSIVE ELEMENT AND POLARIZATION MODULATING ELEMENTS**

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[73] Assignee: **Bell Communications Research, Inc.**, Livingston, N.J.

[21] Appl. No.: **125,607**

[22] Filed: **Sep. 22, 1993**

### Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 70,591, Jun. 1, 1993.

[51] Int. Cl.<sup>6</sup> ..... **G02F 1/137; G02F 1/13; H04J 14/06; H04J 14/02**

[52] U.S. Cl. .... **359/39; 354/94; 354/122; 354/128; 354/124; 385/37; 385/20; 385/17; 359/93; 359/245; 359/246**

[58] Field of Search ..... **359/94, 39, 122, 128, 359/124, 130, 245, 246, 494, 496, 615, 123, 139, 131, 127, 97; 385/17, 37, 20**

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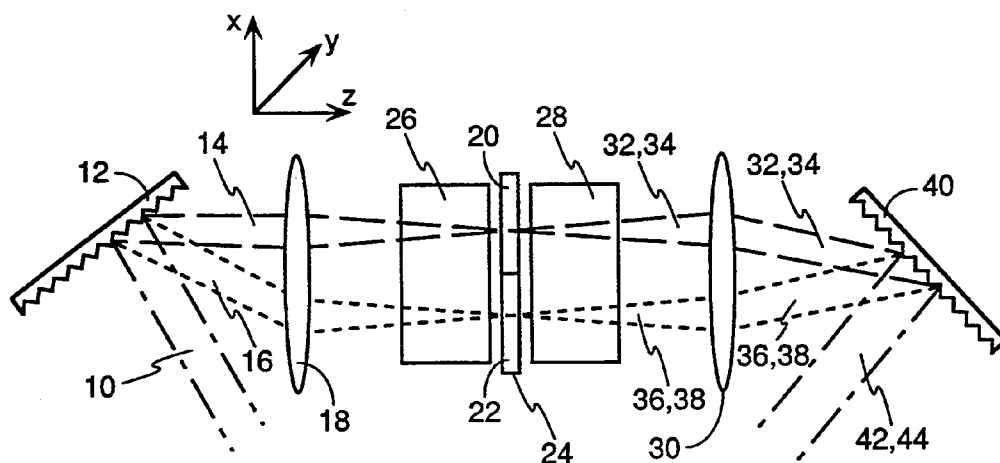
Attorney, Agent, or Firm—Leonard Charles Suchyta;

James W. Falk

### [57] ABSTRACT

A liquid-crystal optical switch capable of switching separate optical signals in a physical input channel to a selected output channel. A diffraction grating spatially divides the input channel into its frequency components, which pass through different segments of a liquid-crystal modulator. The liquid-crystal modulator segments are separately controlled to rotate the polarization of the frequency channel passing therethrough or to leave it intact. The channels then pass through a polarization-dispersive element, such as calcite, which spatially separates the beams in the transverse direction according to their polarization. A second diffraction grating recombines the frequency components of the same polarization into multiple output beams.

16 Claims, 9 Drawing Sheets



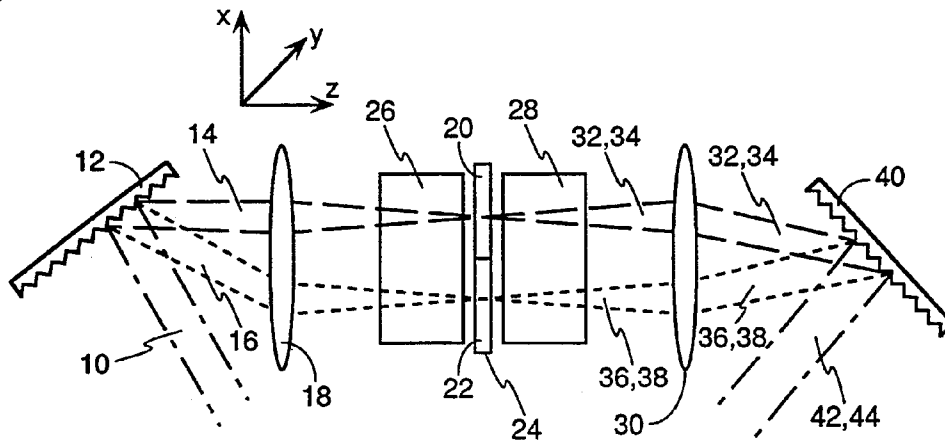


FIG. 1

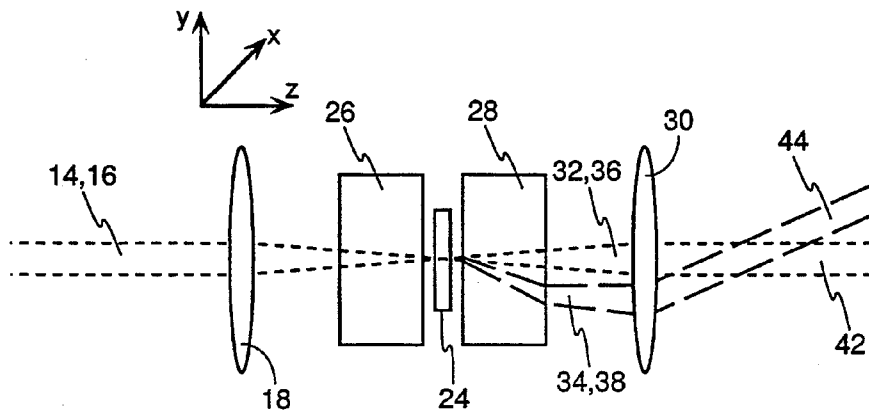


FIG. 2

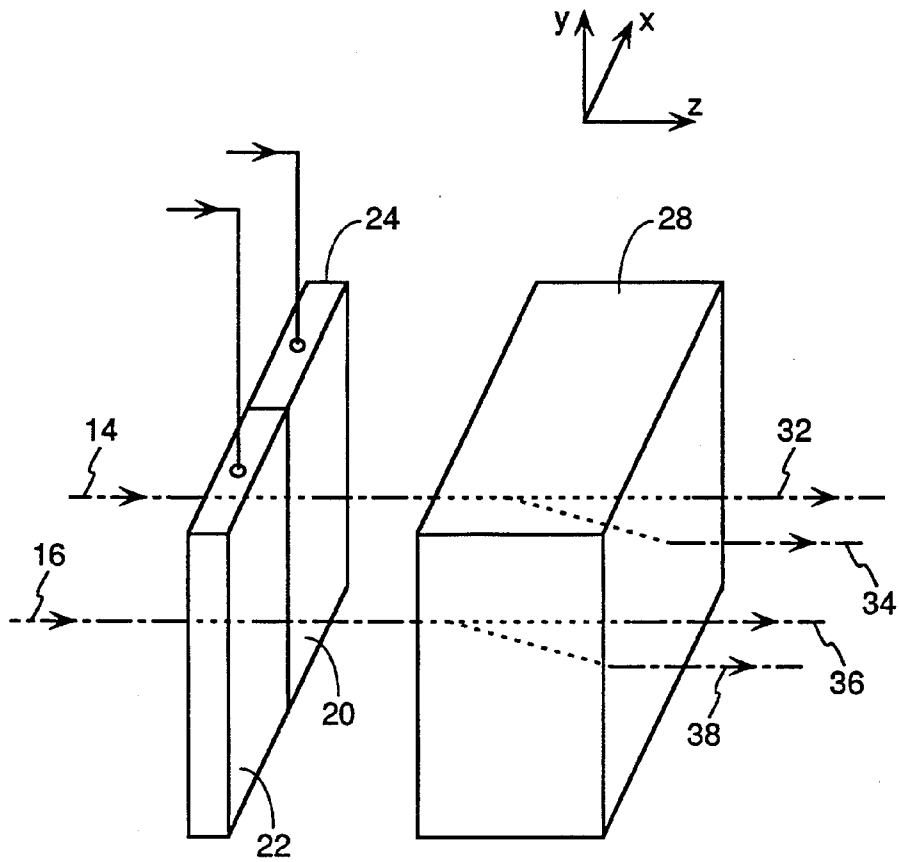


FIG. 3

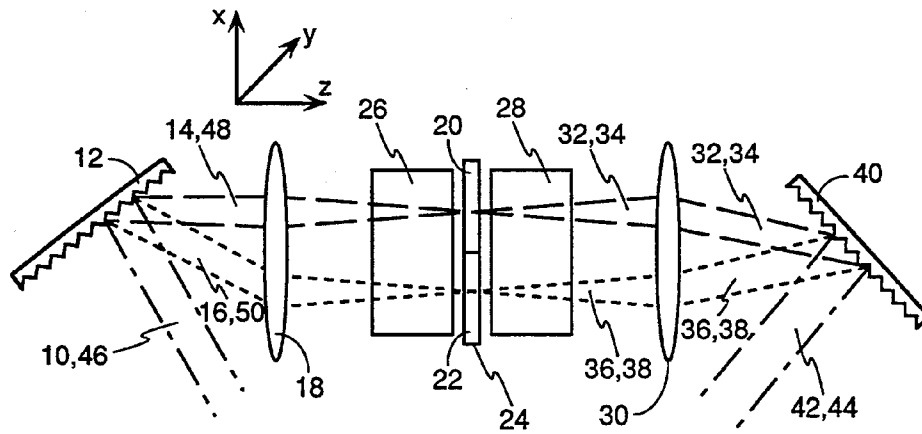


FIG. 4

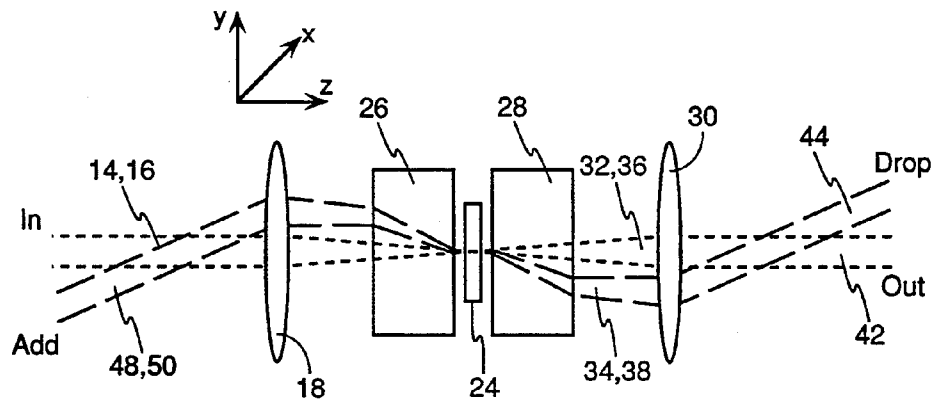


FIG. 5

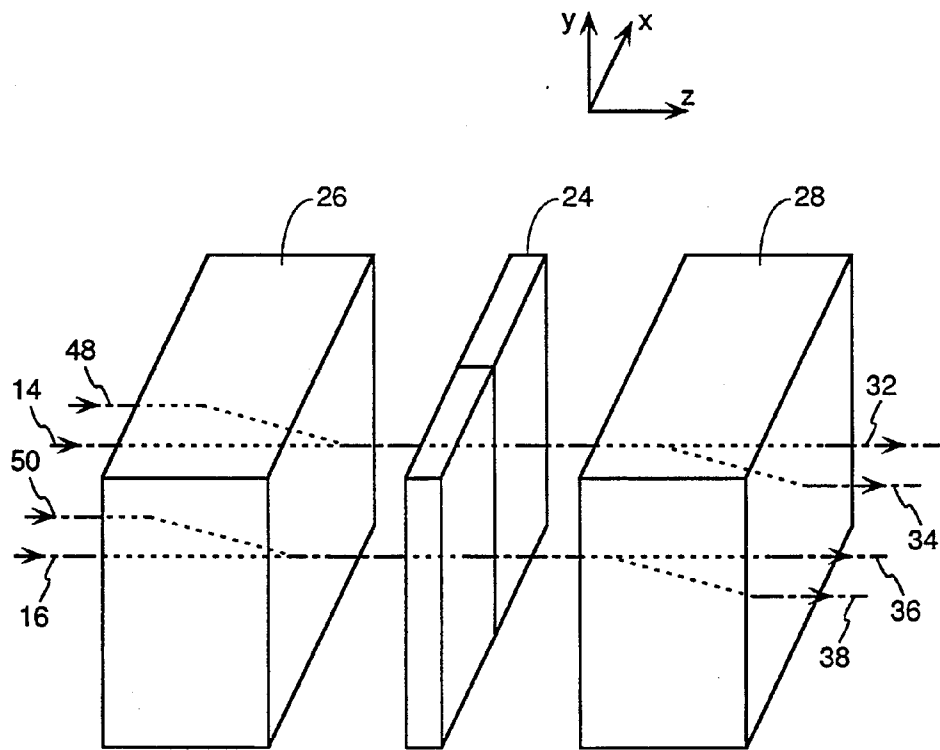


FIG. 6

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