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[54] **INTEGRATED BI-DIRECTIONAL AXIAL GRADIENT REFRACTIVE INDEX/DIFFRACTION GRATING WAVELENGTH DIVISION MULTIPLEXER**

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[51] **Int. Cl.**[7] **G02B 6/28**

[52] **U.S. Cl.** **385/24**; 385/33; 385/34; 385/37; 385/14; 385/49; 385/39; 359/130; 359/131; 372/50

[58] **Field of Search** 385/24, 33, 34, 385/37, 14, 49, 39; 359/130, 131; 372/50

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[57] **ABSTRACT**

A wavelength division multiplexer is provided that integrates an axial gradient refractive index element with a diffraction grating to provide efficient coupling from a plurality of input optical sources (each delivering a single wavelength to the device) which are multiplexed to a single polychromatic beam for output to a single output optical receiver. The device comprises: (a) means for accepting optical input from at least one optical source, the means including a planar surface; (b) a coupler element comprising (1) an axial gradient refractive index collimating lens having a planar entrance surface onto which the optical input is incident and (2) a homogeneous index boot lens affixed to the axial gradient refractive index collimating lens and having a planar but tilted exit surface; (c) a diffraction grating, such as a Littrow diffraction grating, on the tilted surface of the homogeneous index boot lens which combines a plurality of spatially separated wavelengths from the optical light; and (d) means to output at least one multiplexed, polychromatic output beam, the means including a planar surface. The device may be operated in the forward direction as a multiplexer or in the reverse direction as a demultiplexer.

32 Claims, 8 Drawing Sheets

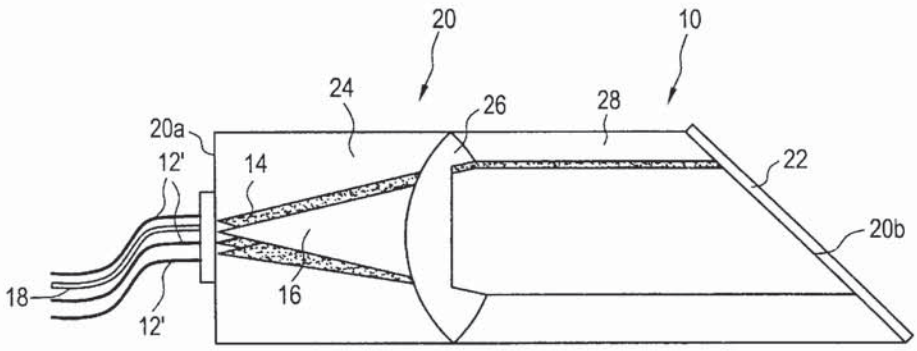

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FIG.1A

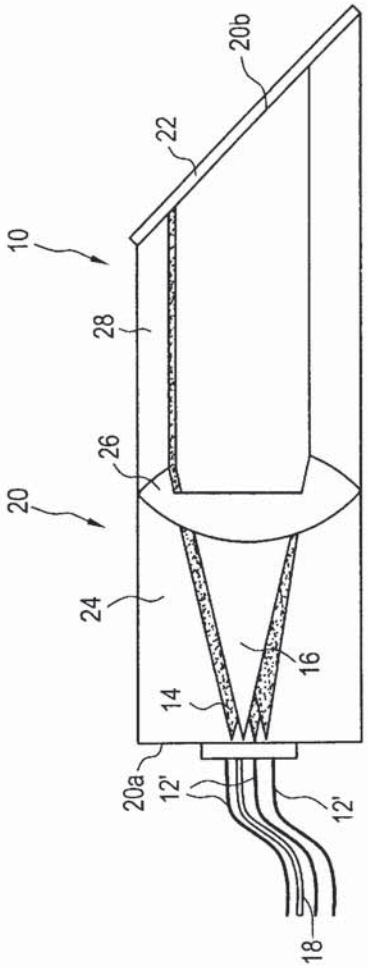


FIG.1B

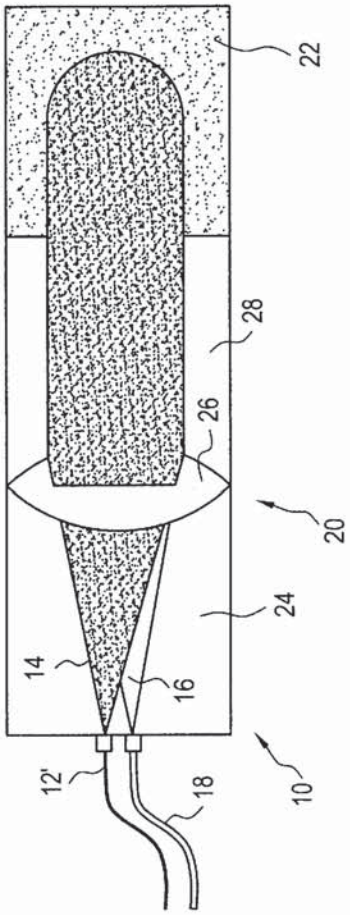


FIG.2B

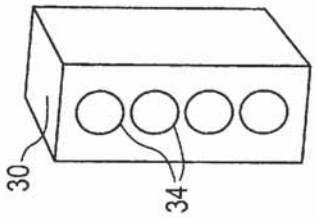


FIG.2C

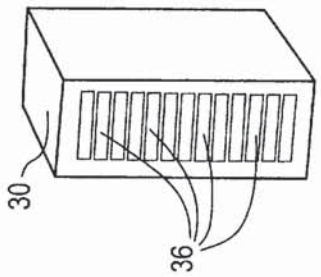
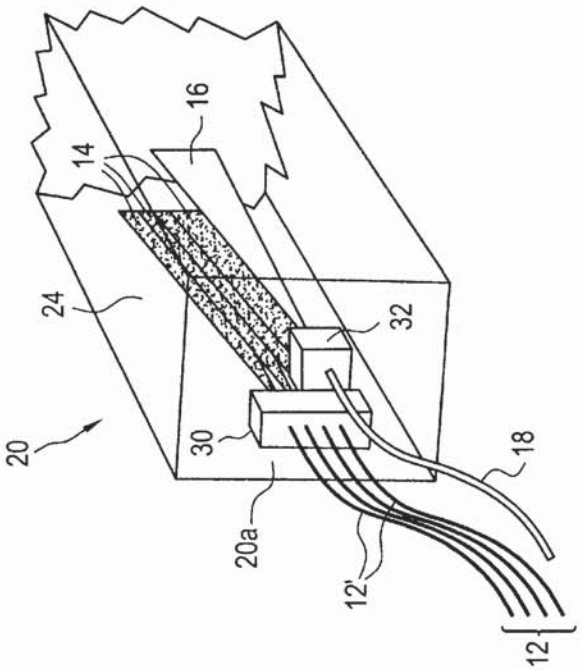


FIG.2A



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