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# (12) United States Patent Holmes

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#### (54) OPTICAL PROCESSING

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G03H 1/12 (2006.01) G02B 6/26 (2006.01) B23K 26/06 (2006.01)

219/121.73; 219/121.75

See application file for complete search history.

#### (56) References Cited

#### U.S. PATENT DOCUMENTS

4050010			0/4000	TT 1 . 1 250/11
4,952,010	Α	**	8/1990	Healey et al 359/11
5,107,359	Α		4/1992	Ohuchida
5,428,466	Α	ağe	6/1995	Rejman-Greene et al 359/15
5,539,543	Α		7/1996	Liu et al.
5,589,955	Α	aķt	12/1996	Amako et al 359/9
5,959,747	Α	*	9/1999	Psaltis et al 359/22
5,995,251	Α	alic	11/1999	Hesselink et al 359/30
6,072,608	Α	*	6/2000	Psaltis et al 359/22

#### (Continued)

#### FOREIGN PATENT DOCUMENTS

EP 1 050 775 A1 11/2000

#### (Continued)

#### OTHER PUBLICATIONS

Marom, D.M., et al., "Wavelength-Selective 1×4 Switch for 128 WDM Channels at 50 Ghz Spacing," *OFC Postdeadline Paper*, pp. FB7-1-FB7-3 (2002).

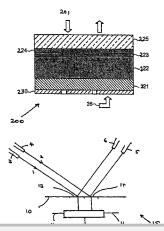
#### (Continued)

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#### (57) ABSTRACT

To operate an optical device comprising an SLM with a two-dimensional array of controllable phase-modulating elements groups of individual phase-modulating elements are delineated, and control data selected from a store for each delineated group of phase-modulating elements. The selected control data are used to generate holograms at each group and one or both of the delineation of the groups and the selection of control data is/are varied. In this way upon illumination of the groups by light beams, light beams emergent from the groups are controllable independently of each other.

#### 14 Claims, 36 Drawing Sheets





#### U.S. PATENT DOCUMENTS

6,115,123 A	* 9/20	00 Stappaerts et a	1 356/457
6,710,292 B1	* 3/20	04 Fukuchi et al.	219/121.73
6,975,786 B1	* 12/20	05 Warr et al	385/17

#### FOREIGN PATENT DOCUMENTS

EP	1 053 501 B1	7/2003
WO	WO 01 25840 A1	4/2001
WO	WO 01 25848 A2	4/2001
WO	WO 01 90823 A1	11/2001
WO	WO 02 079870 A2	10/2002
WO	WO 02 101451 A1	12/2002

#### OTHER PUBLICATIONS

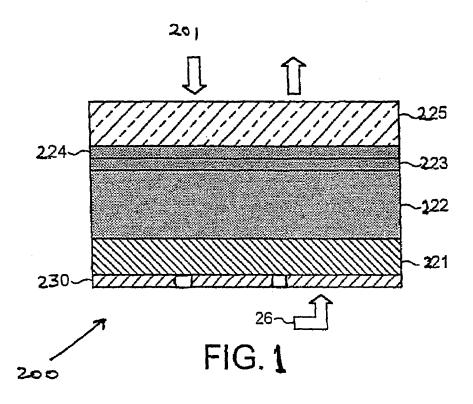
Mears, R. J., et al., "Telecommunications Applications of Ferroelectric Liquid-Crystal Smart Pixels," IEEE Journal of Selected Topics in Quantum Electronics, vol. 2, No. 1, Apr. 1996, pp. 35-46. Mears, R. J., et al., "WDM Channel Management Using Programmable Holographic Elements," IEE Colloquim on Multiwavelength Optical Networks: Devices, Systems and Network Implementations, IEE, London, GB, Jun. 18, 1998, pp. 11-1-11-6.

Pan, Ci-Ling, et al., "Tunable Semiconductor Laser with Liquid Crystal Pixel Mirror in Grating-Loaded External Cavity," Electronics Letters, IEE Stevenage, GB, vol. 35, No. 17, Aug. 19, 1999, pp. 1472-1473.

\* cited by examiner



Dec. 5, 2006



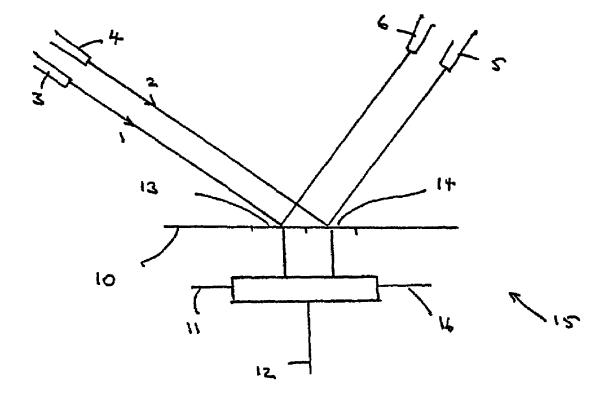
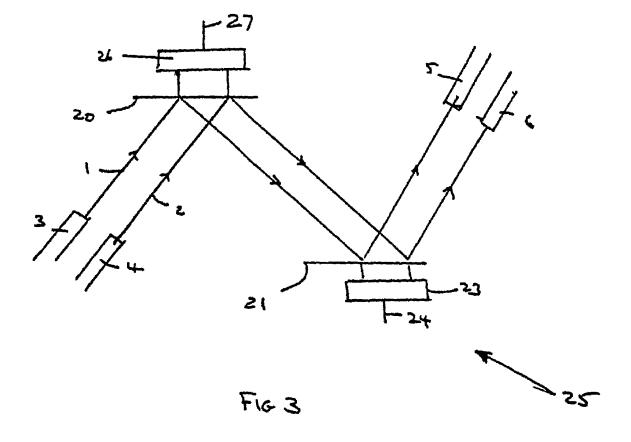


Fig 2



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