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(54) Title: A MICROMIRROR HAVING REDUCED SPACE BETWEEN HINGE AND MIRROR PLATE OF THE MICROMIRROR

(57) Abstract: A spatial light modulator is disclosed, along with a method for making such a modulator that comprises an array of micromirror devices. The center-to-center distance and the gap between adjacent micromirror devices are determined corresponding to the light source being used so as to optimize optical efficiency and performance quality. The micromirror device comprises a hinge support formed on a substrate and a hinge that is held by the hinge support. A mirror plate is connected to the hinge via a contact, and the distance between the mirror plate and the hinge is determined according to desired maximum rotation angle of the mirror plate, the optimum gap and pitch between the adjacent micromirrors. In a method of fabricating such spatial light modulator, one sacrificial layer is deposited on a substrate followed by forming the mirror plates, and another sacrificial layer is deposited on the mirror plates followed by forming the hinge supports. The two sacrificial layers are removed via the small gap between adjacent mirror devices with spontaneous vapor phase chemical etchant. Also disclosed is a projection system that comprises such a spatial light modulator, as well as a light source, condensing optics, wherein light from the light source is focused onto the array of micromirrors, projection optics for projecting light selectively reflected from the array of micromirrors onto a target, and a controller for selectively actuating the micromirrors in the array.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/23139

A. CLASSIFICATION OF SUBJECT MATTER

IPC: G02B 26/00(2007.01),26/08(2007.01);G02F 1/29(2007.01)

US CL : 359/290, 291, 292, 293, 294, 295, 298

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 359/290, 291, 292, 293, 294, 295, 298

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
USPAT, JPO, EPO, Derwent, USPGPUB; search terms: spatial light modulator, mirror plate array, substrate, hinge

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,835,256 (HUIBERS) 10 November 1998 (10.11.1998), column 3, lines 21-33 and 47-60; column 5, lines 1-65, column 6, lines 1-65	1-60
A	US 6,529,310 (HUIBERS et al.) 04 March 2003 (04.03.2003), column 3, lines 28-67; column 4, lines 1-67; column 6, lines 32-67; column 7, 8, 9, 10, and 11, lines 1-67	1-60
	US 6,396,619 (HUIBERS et al.) 28 May 2002 (28.05.2002), column 3, lines 26-67, columns 4 and 5, lines 1-67, column 6, lines 1-58, column 7, lines 51-67, columns 8-12, lines 1-67	1-60
A	US 6,523,961 (ILKOV et al.) 02 February 2003 (02.02.2003), columns 3-12, lines 1-67 and column 13, lines 1-60	1-60



Further documents are listed in the continuation of Box C.



See patent family annex.

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