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- (71) Applicant: SILICON LIGHT MACHINES [US/US]; 385 Moffett Park Drive, Suite 115, Sunnyvale, CA 94089 (US).
- (72) Inventors: PAYNE, Alexander; 9467 Sunnyside Avenue, Ben Lomond, CA 95005 (US). GUDEMAN, Christopher; 19148 Old Vineyard Road, Los Gatos, CA 95033 (US). HUNTER, James; 3655 Pruneridge Ave. #51, Santa Clara, CA 95057 (US). BRUNER, Michael; 14072 Okanogan Drive, Saratoga, CA 95070 (US). CARROLL, Clinton; 2032 Country Drive, Fremont, CA 94536 (US).

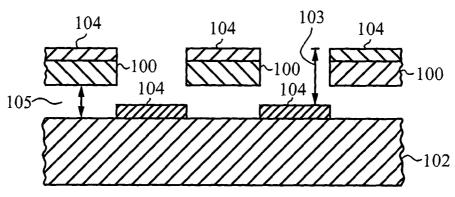
- (74) Agents: HAVERSTOCK, Thomas, B. et al.; Haverstock & Owens LLP, 162 N. Wolfe Road, Sunnyvale, CA 94086 (US).
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(54) Title: SILICON-BASED MEMS AND TREATMENT OF SILICON-BASED SURFACES TO REDUCE SURFACE CHARGING



(57) Abstract: A method of treating silicon-based surfaces for reducing charge migration is disclosed. In accordance with the method, a silicon-based surface is treated with Nitrogenrich pacifying gas environment, after the surface is actuated. The surface is actuated in a drying step, wherein residual water or moisture is removed from the surfaces at an elevated temperature and a reduced pressure. The method of the instant invention is particularly useful for the treatment of ribbon surfaces in grating light valve device, wherein after the ribbon surfaces are treated according to the current invention, surface charging remains low for several days, even in open conditions.



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#### INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER IPC 7 H01L21/00

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#### **B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  $IPC\ 7\ H01L$ 

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 practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX, IBM-TDB

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 694 740 A (MARTIN JOHN R ET AL) 9 December 1997 (1997-12-09) abstract; claims 1,3,11,12,17,18,21-23,29; figure 4 column 1, line 49 - line 62 column 2, line 4 - line 9 column 4, line 56 - line 67	1-45
A	WO 00 07225 A (SILICON LIGHT MACHINES INC) 10 February 2000 (2000-02-10) page 6, line 11 - line 19; claim 7	1-45
A	US 5 239 806 A (MASLAKOW WILLIAM H) 31 August 1993 (1993-08-31) abstract; claims 1-3	1-45
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Further documents are listed in the continuation of box C.	χ Patent family members are listed in annex.
<ul> <li>Special categories of cited documents:</li> <li>"A" document defining the general state of the art which is not considered to be of particular relevance</li> <li>"E" earlier document but published on or after the international filing date</li> <li>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</li> <li>"O" document referring to an oral disclosure, use, exhibition or other means</li> <li>"P" document published prior to the international filing date but later than the priority date claimed</li> </ul>	<ul> <li>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</li> <li>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</li> <li>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combined with one or more other such documents, such combination being obvious to a person skilled in the art.</li> <li>"&amp;" document member of the same patent family</li> </ul>
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Name and mailing address of the ISA  European Patent Office, P.B. 5818 Patentlaan 2  NL – 2280 HV Rijswijk  Tel. (+31–70) 340–2040, Tx. 31 651 epo nl,  Fax: (+31–70) 340–3016	Authorized officer Michel, A

### INTERNATIONAL SEARCH REPORT

Intermonal Application No
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C (Continue	ation) DOCUMENTS CONSIDERED TO BE RELEVANT	FC1/03 02/01543		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
	appropriate, or the following passages	Tooyetti to olani 140.		
A	US 5 770 473 A (BARTHOLOMEW ROGER F ET AL) 23 June 1998 (1998-06-23) abstract; claims 3,4,8,10-12,15-17,20	1-45		
A	US 6 090 717 A (GUERRA ROBERT ET AL) 18 July 2000 (2000-07-18) the whole document	1–45		
А	US 5 868 854 A (HUNABASHI MICHIMASA ET AL) 9 February 1999 (1999-02-09) the whole document	1-45		
MARKET,				
,				

### INTERNATIONAL SEARCH REPORT

Inte—onal Application No
PCT/US 02/01543

	atent document d in search report		Publication date		Patent family member(s)		Publication date
US	5694740	Α	09-12-1997	WO	9734151 A	41	18-09-1997
WO	0007225	Α	10-02-2000	US	6303986 E		16-10-2001
				AU CN	5134899 <i>F</i> 1320101 T		21-02-2000 31-10-2001
				EP	1113982 A		11-07-2001
				WO	0007225 A		10-02-2001
				US	2001022382 A		20-09-2001
US	5239806	Α	31-08-1993	US	5194695 A	Α	16-03-1993
US	5770473	<b>–</b> –––– А	23-06-1998	US	5513198 A		30-04-1996
				US	5392305 A	A	21-02-1995
				ΑU	672705 B	32	10-10-1996
				ΑU	6744094 A	4	27-01-1995
				CA	2128068 A		15-01-1995
				CN	1103373 A		07-06-1995
				DE	69409586 D		20-05-1998
				DE	69409586 T		15-10-1998
				EP	0634822 <i>P</i>		18-01-1995
				JP	7147457 <i>P</i>		06-06-1995
				US 	5629952 A	<i></i>	13-05-1997
US	6090717	A	18-07-2000	WO	9736322 A	<b>A1</b>	02-10-1997
US	5868854	Α	09-02-1999	JP	2224233 A		06-09-1990
				JP	2528962 B		28-08-1996
				JP	5217966 A		27-08-1993
				US	5200017 A		06-04-1993
				US	5320707 A		14-06-1994
				US	6077788 A		20-06-2000
				US	6036816 A		14-03-2000
				US	6254721 B		03-07-2001
				US	5952245 A		14-09-1999
				US	2002043340 A		18-04-2002
	*			US	2002043339 A		18-04-2002
				DE	69030596 D		05-06-1997
				DE	69030596 T		04-12-1997
				EP	0385590 A		05-09-1990
				EP	0751552 A		02-01-1997
				KR	9407062 B		04-08-1994
				US	5007981 A 2002013063 A		16-04-1991
				US US	2002013063 A 2002023720 A		31-01-2002 28-02-2002
					/ UU/ U/ 5//U #	4 1	/