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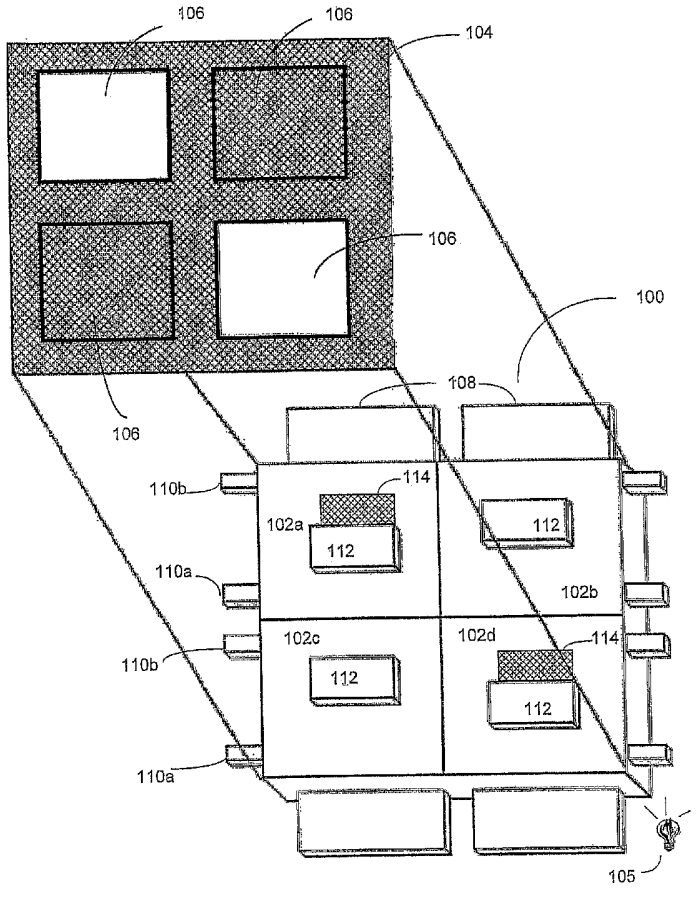
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[Continued on next page]

(54) Title: METHODS AND APPARATUS FOR ACTUATING DISPLAYS



(57) Abstract: The invention relates to MEMS-based display devices. In particular, the display devices may include actuators having two mechanically compliant electrodes. In addition, bi-stable shutter assemblies and means for supporting shutters in shutter assemblies are disclosed inclusion in the display devices.

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SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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Published:

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2006/006552

A. CLASSIFICATION OF SUBJECT MATTER
INV. B81B3/00 G02B26/04 G09G3/22 B81B7/04 G02B26/08

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)
B81B G02B G09G

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/171327 A1 (MILLER SAMUEL LEE ET AL) 21 November 2002 (2002-11-21) paragraph [0011] - paragraph [0122]	1-35
X	US 2002/196522 A1 (LITTLE MICHAEL J ET AL) 26 December 2002 (2002-12-26) paragraph [0008] - paragraph [0050]	1-35
X	US 6 738 177 B1 (GUTIERREZ ROMAN C ET AL) 18 May 2004 (2004-05-18) column 2, line 65 - column 17, line 31	1-35
X	US 6 639 572 B1 (LITTLE MICHAEL L ET AL) 28 October 2003 (2003-10-28) column 4, line 24 - column 11, line 26	1-35
X	US 6 507 138 B1 (RODGERS M. STEVEN ET AL) 14 January 2003 (2003-01-14) column 2, line 34 - column 21, line 32	1-35

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"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

"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 combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 June 2006	14. 09. 2006

Name and mailing address of the ISA/	Authorized officer
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	Kurze, Volker

INTERNATIONAL SEARCH REPORT

International application No.
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Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-35

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-35

   Display apparatus comprising an modulator and an actuator inlcuding two compliant electrodes, respeonsive to a voltage which draws the electrodes together; corresponding method of forming an image on a display apparatus

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2. claims: 36-73

   Display apparatus comprising a shutter, a volatge input and an actuator for moving the shutter; correpsonding method of forming an image

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3. claims: 74-98

   A display apparatus comprising a modulator, an actuator and a mechanical support

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4. claims: 99-101

   Method of manufacturing a display apparatus by etching surfaces.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2006/006552

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002171327 A1	21-11-2002	US 2001048265 A1	06-12-2001
US 2002196522 A1	26-12-2002	NONE	
US 6738177 B1	18-05-2004	NONE	
US 6639572 B1	28-10-2003	NONE	
US 6507138 B1	14-01-2003	US 6133670 A	17-10-2000