



(51) International Patent Classification:
B81B 3/00 (2006.01)

(21) International Application Number:
PCT/US2008/068205

(22) International Filing Date:
25 June 2008 (25.06.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
11/773,357 3 July 2007 (03.07.2007) US
08153313.5 26 March 2008 (26.03.2008) EP

(71) Applicant (for all designated States except US): **QUALCOMM MEMS TECHNOLOGIES, INC.** [US/US];
5775 Morehouse Drive, San Diego, CA 92121 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **HEALD, David, L.** [US/US]; 976 Ballard Canyon Road, Solvang, CA 93463 (US). **ZHONG, Fan** [US/US]; 37497 Summer Holly Common, Fremont, CA 94536 (US). **FLOYD, Philip, Don** [US/US]; 3602 Midfield Way, Redwood City, CA 94062 (US).

(74) Agent: **ABUMERI, Mark, M.**; Knobbe Martens Olson & Bear, LLP, 2040 Main Street, Fourteenth Floor, Irvine, CA 92614 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

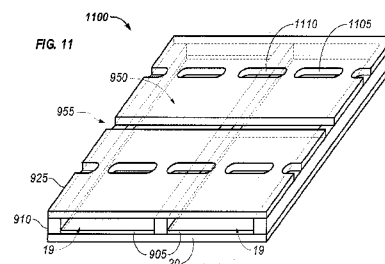
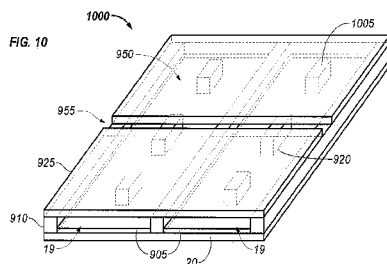
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:
29 October 2009

(54) Title: MEMS DEVICES HAVING IMPROVED UNIFORMITY AND METHODS FOR MAKING THEM



(57) Abstract: Disclosed is a microelectromechanical system (MEMS) device and method of manufacturing the same. In one aspect, MEMS such as an interferometric modulator include one or more elongated interior posts and support rails supporting a deformable reflective layer, where the elongated interior posts are entirely within an interferometric cavity and aligned parallel with the support rails. In another aspect, the interferometric modulator includes one or more elongated etch release holes formed in the deformable reflective layer and aligned parallel with channels formed in the deformable reflective layer defining parallel strips of the deformable reflective layer.



INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/068205

A. CLASSIFICATION OF SUBJECT MATTER
INV. B81B3/00

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 B81C

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/014022 A (QUALCOMM MEMS TECHNOLOGIES INC [US]; CHUI CLARENCE [US]; CHUNG WONSUK) 1 February 2007 (2007-02-01) paragraphs [0082], [0083], [0119], [0120] figures 8,13e	33-36
A		1-7, 10-22, 37
A	EP 0 758 080 A (SIEMENS AG [DE]) 12 February 1997 (1997-02-12)	

☐ 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.
- *Z* document member of the same patent family

Date of the actual completion of the international search

23 April 2009

Date of mailing of the international search report

04/09/2009

Name and mailing address of the ISA/
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Foussier, Philippe

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/068205

Box No. 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 No. 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 allsearchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search reportcovers 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.:

1-7, 10-22, 33-37

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ 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: 1-7,10-22,33-37

Electromechanical device with elongated post and its manufacturing method

2. claims: 8,9,23-32

Electromechanical device with elongated opening and its manufacturing method

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/068205

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 2007014022	A	01-02-2007	CA 2616268 A1	01-02-2007
			EP 1910218 A1	16-04-2008
			JP 2009503566 T	29-01-2009
			KR 20080040727 A	08-05-2008
EP 0758080	A	12-02-1997	JP 9049775 A	18-02-1997