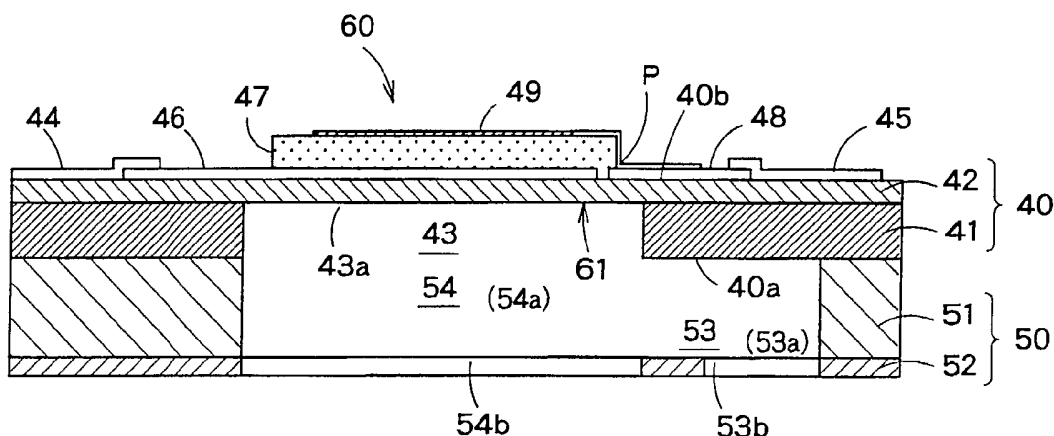




(10) International Publication Number
WO 2005/102711 A3

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: LIQUID CONTAINER WITH LIQUID SENSOR



(S7) Abstract: The invention relates to a liquid sensor which can certainly judge the existence of liquid, and a liquid container including the sensor. A liquid sensor 60 in which a piezoelectric element having a piezoelectric layer 47 on both surfaces of which electrodes 46 and 49 are formed is used, and a bottom 43a of a cavity 43 for receiving liquid as a detection object is vibrated. The sensor 60 includes a vibration cavity forming base portion 40 in which the cavity 43 having the vibratable bottom 43a is formed, and a flow path forming base portion 50 laminated on the vibration cavity forming base portion 40. A liquid supply path 53 for supplying the liquid as the detection object to the cavity 43 and a liquid discharge path 54 for discharging the liquid as the detection object from the cavity 43 are formed in the flow path forming base portion 50.

INTERNATIONAL SEARCH REPORT

Inter. application No
PC 1, JP2005/007754

A. CLASSIFICATION OF SUBJECT MATTER

B41J2/175

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)

B41J G01F

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)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2004/056910 A1 (USUI MINORU ET AL) 25 March 2004 (2004-03-25) pages 4-5; figure 1 -----	1-19, 34-47
A	EP 1 314 565 A (SEIKO EPSON CORPORATION) 28 May 2003 (2003-05-28) column 5, line 10 - column 6, line 10; figure 4 -----	20-30
A	US 2002/170353 A1 (USUI MINORU ET AL) 21 November 2002 (2002-11-21) page 11, paragraph 160 - page 12, paragraph 162; figure 20 -----	31-33
A	EP 1 285 764 A (SEIKO EPSON CORPORATION) 26 February 2003 (2003-02-26) page 16, line 32 - line 47; figure 20 -----	48-70

☐ 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

19 January 2006

Date of mailing of the international search report

22.02.06

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

Achermann, D

INTERNATIONAL SEARCH REPORT

ational application No.
PCT/JP2005/007754

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.:

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.

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

1. claims: 1-19, 34-47

Liquid sensor with a cavity having two liquid paths.
Problem: how to prevent air bubbles from entering the cavity.

2. claims: 20-30

Liquid container having a liquid sensor with a liquid flow restricting portion. Problem: how to cause the flow of the liquid to be directed toward the cavity.

3. claims: 31-33

Liquid container with liquid sensor and a container body having two openings which communicate with the cavity of the liquid sensor. Problem: how to regulate the liquid flow into and from the cavity.

4. claims: 48-70

Liquid container with a liquid chamber, a liquid outlet in fluid communication with the liquid chamber, a cavity, a first flow path through which the liquid outlet is in fluid communication with the cavity, and a second flow path through which the liquid outlet is in fluid communication with the cavity. Problem: fluid communication between liquid chamber, liquid outlet and cavity.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT, JP2005/007754

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004056910	A1	25-03-2004	NONE
EP 1314565	A	28-05-2003	CN 1421319 A 04-06-2003 CN 2587643 Y 26-11-2003 US 2003103119 A1 05-06-2003
US 2002170353	A1	21-11-2002	NONE
EP 1285764	A	26-02-2003	CN 1380852 A 20-11-2002 CN 1663800 A 07-09-2005 HK 1051017 A1 07-10-2005 WO 0187626 A1 22-11-2001 TW 503187 B 21-09-2002 US 2003071862 A1 17-04-2003