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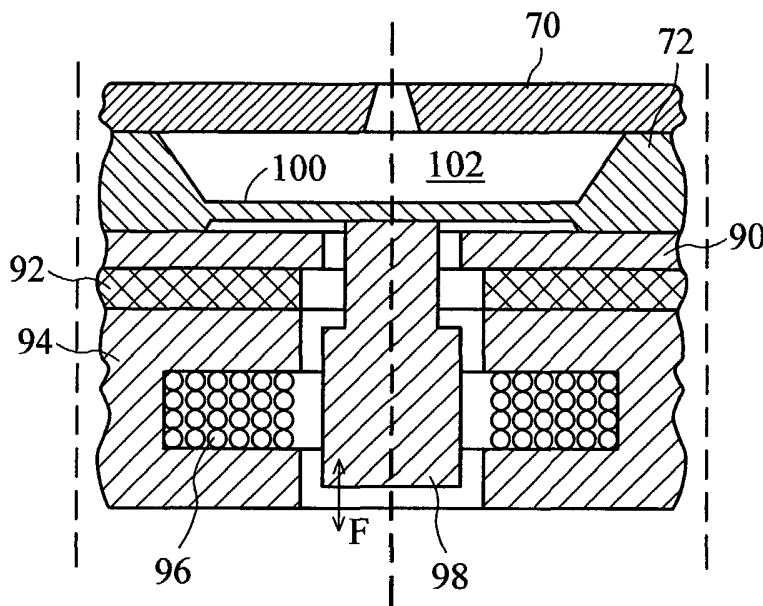
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(54) Title: FLUID PUMPING AND DROPLET DEPOSITION APPARATUS



(57) Abstract: In fluid pumping apparatus suitable for use in drop on demand ink jet printing, a resiliently deformable chamber wall is acted upon to create acoustic waves, which in turn cause a fluid flow in a chamber outlet. The resiliently deformable chamber wall preferably comprises both rigid and flexible portions. In an alternative arrangement a channel wall is provided with a region moveable in an actuation direction. An electromagnetic actuator operates under the principle of flux modulation. The invention is preferably of planar construction, manufactured using MEMS techniques.

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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.

INTERNATIONAL SEARCH REPORT

In Application No
PCT/GB 03/00739

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B41J2/14 B41J2/16

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)
IPC 7 B41J

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, PAJ, 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	US 5 225 854 A (STAENKELSTROEM ANDERS ET AL) 6 July 1993 (1993-07-06)	1-4, 18-24, 31, 46-48, 57-72 13-16
A	abstract column 1, line 52 - column 2, line 24 figure 2	
X	US 6 056 389 A (MOON JAE-HO ET AL) 2 May 2000 (2000-05-02)	1-5, 18-24, 46-48, 54-69
	abstract column 2, line 64 - column 3, line 37 figure 5	
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Further documents are listed in the continuation of box C.

Patent family members are listed in 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
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- "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

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- "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

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 International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 748 691 A (OCE NEDERLAND BV) 18 December 1996 (1996-12-18) the whole document -----	1,3,46, 57
X	US 5 170 177 A (SCHOENING SUSAN C ET AL) 8 December 1992 (1992-12-08) the whole document -----	1,3,46, 57
X	EP 0 931 654 A (OCE TECH BV) 28 July 1999 (1999-07-28) the whole document -----	1,3,46, 57
X	US 4 057 807 A (FISCHBECK KENNETH H ET AL) 8 November 1977 (1977-11-08) the whole document -----	1,3,46, 57
X	PATENT ABSTRACTS OF JAPAN vol. 004, no. 102 (M-022), 22 July 1980 (1980-07-22) & JP 55 059972 A (SEIKO EPSON CORP;OTHERS: 01), 6 May 1980 (1980-05-06) abstract -----	1,3,46, 57
X	PATENT ABSTRACTS OF JAPAN vol. 011, no. 014 (M-553), 14 January 1987 (1987-01-14) & JP 61 189947 A (NEC CORP), 23 August 1986 (1986-08-23) abstract -----	1,3,46, 57

INTERNATIONAL SEARCH REPORT

international application No.
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Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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, 46-78

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: 1-35,46-78

Droplet deposition apparatus where the fluid chamber comprises an elongate liquid channel and where the resiliently deformable chamber wall comprises an elongate channel wall.

2. claims: 36-45

a generally planar component comprising first and second planar layers, a plurality of actuators located between the two layers for deforming portions of the layers so as to cause a pressure change of a liquid in contact with the exterior of the first layer.

3. claims: 79-91

Droplet deposition apparatus comprising a push-rod supported by at least one flexural element at two locations spaced one from the other in the actuation direction.

4. claims: 92-102

method of manufacturing droplet deposition apparatus having a planar component defining channel walls comprising the step of forming a planar wafer and etching away material from one planar face of the wafer to define the channel walls.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 03/00739

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