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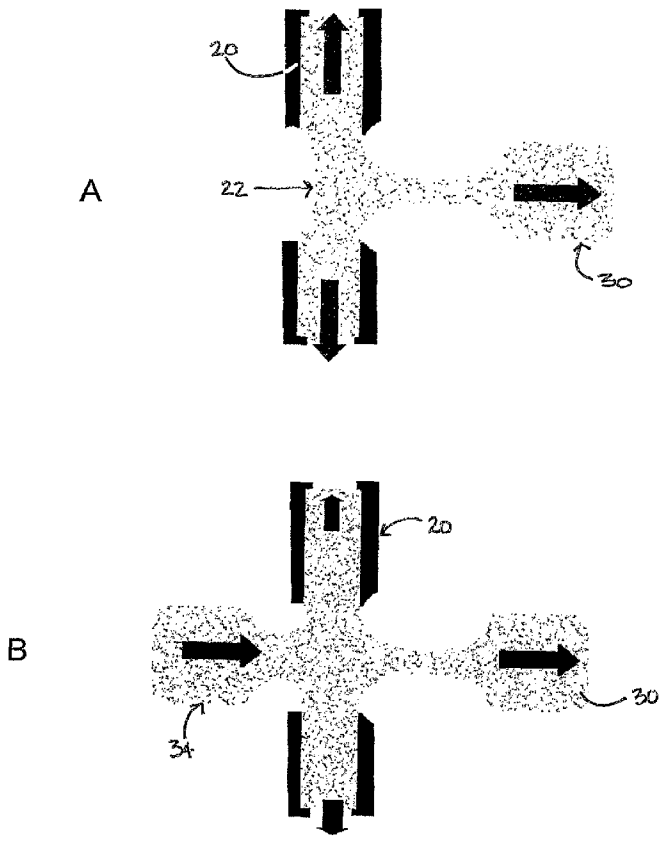
[Continued on next page]

(54) Title: DROPLET EXTRACTION FROM A LIQUID COLUMN FOR ON-CHIP MICROFLUIDICS



(57) Abstract: A refill droplet facilitates the extraction of a droplet laterally from a channel in a microfluidic apparatus. Such extraction allows a discrete band of separated particles or solute molecules to be excised from a fluid stream and processed and analyzed separately. An extraction point is located along the length of the channel and includes an EWOD surface or similar microfluidic technology to extract a droplet. An opening in the channel opposite the extraction means is equipped with microfluidic technology to transport a refill droplet to the opening. The refill droplet is moved into the channel or column to occupy the area previously occupied by the extracted droplet. This prevents distortion or mixing of the bands of particles or molecules within the channel and prevents the draining of any portion of the fluidic system.

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A. CLASSIFICATION OF SUBJECT MATTER
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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)
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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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A X	US 2004/058450 A1 (PAMULA VAMSEE K [US] ET AL) 25 March 2004 (2004-03-25) paragraphs [0014] - [0034]; figure 15b paragraphs [0114] - [0121]; claims	1,2 3,4
A	POLLACK MICHAEL G ET AL: "Electrowetting-based actuation of liquid droplets for microfluidic applications" APPLIED PHYSICS LETTERS, AIP, AMERICAN INSTITUTE OF PHYSICS, MELVILLE, NY, US, vol. 77, no. 11, 11 September 2000 (2000-09-11), pages 1725-1726, XP012026140 ISSN: 0003-6951 cited in the application the whole document	1-4

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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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	Smith-Hewitt, Laura

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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.
A	CHO S K ET AL: "Creating, Transporting, Cutting, and Merging Liquid Droplets by Electrowetting-Based Actuation for Digital Microfluidic Circuits" JOURNAL OF MICROELECTROMECHANICAL SYSTEMS, IEEE SERVICE CENTER, PISCATAWAY, NJ, US, vol. 12, no. 1, February 2003 (2003-02), pages 70-80, XP003006917 ISSN: 1057-7157 cited in the application the whole document	1-4
A	MASAO WASHIZU: "Electrostatic Actuation of Liquid Droplets for Microreactor Applications" IEEE TRANSACTIONS ON INDUSTRY APPLICATIONS, IEEE SERVICE CENTER, PISCATAWAY, NJ, US, vol. 34, no. 4, August 1998 (1998-08), XP011022429 ISSN: 0093-9994 the whole document	1-4
A	FAIR R B ET AL: "Electrowetting-based on-chip sample processing for integrated microfluidies" INTERNATIONAL ELECTRON DEVICES MEETING 2003. IEDM. TECHNICAL DIGEST. WASHINGTON, DC, DEC 8 - 10, 2003, NEW YORK, NY : IEEE, US, 8 December 2003 (2003-12-08), pages 779-782, XP010684124 ISBN: 0-7803-7872-5 the whole document	1-4
A	US 5 846 396 A1 (ZANZUCCHI PETER JOHN [US] ET AL) 8 December 1998 (1998-12-08) abstract; claims; figures	1-4

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004058450 A1	25-03-2004	AU 2003237100 A1	19-04-2004
		WO 2004029585 A1	08-04-2004
		US 2007037294 A1	15-02-2007
		US 2007045117 A1	01-03-2007
US 5846396 A1		NONE	