

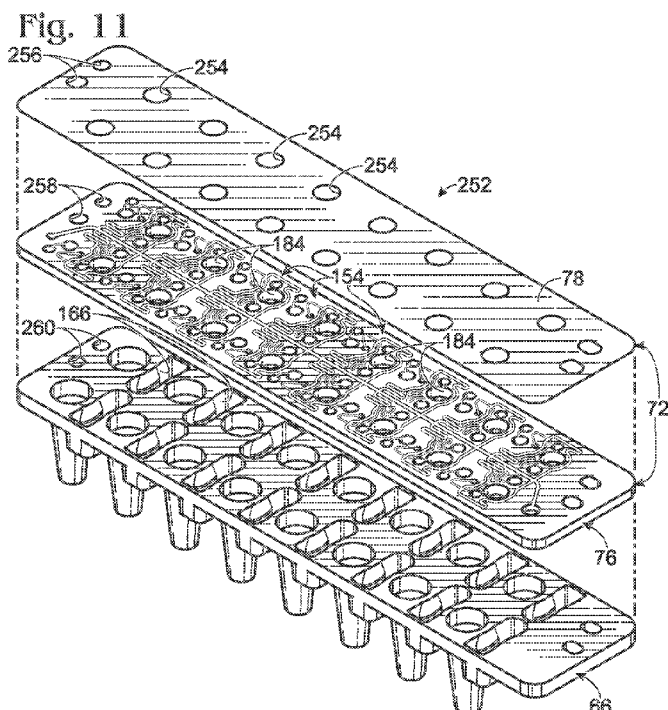


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[Continued on next page]

(54) Title: MICROFLUIDIC SYSTEM WITH FLUID PICKUPS



(57) Abstract: Microfluidic system, including methods and apparatus, for processing fluid, such as by droplet generation. In some embodiments, the system may include a well and a channel component attached to the well. The channel component may include (a) a body, (b) an input tube (a "fluid pickup") projecting from a bottom surface of the body and having an open bottom end disposed in the input well, (c) a microchannel, and (d) a passage extending through the input tube and the body and connecting the well to the microchannel. The system may be configured to receive a sample-containing fluid in the well and retain the sample-containing fluid below a top end of the passage, until a pressure differential is created that drives at least a portion of the sample-containing fluid from the well via the passage and through the microchannel.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/43715

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - G01N 1/00 (2014.01) CPC - C40B 60/14; B01J 19/0046; B01J 2219/00585 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) USPC- 436/174 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched IPC(8)- G01N 1/00 (2014.01) CPC- C40B 60/14; B01J 19/0046; B01J 2219/00585; USPC- 436/174;435/283.1 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatBase (PGPB, USPT, USOC, EPAB, JPAB, DWPI, TDBD), FreePatentsOnline (US Pat, PgPub, EPO, JPO, WIPO, NPL), GoogleScholar (PL, NPL); search terms: channel component microchannel tube gravity microfluidic system with fluid pickups																																			
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US 2002/0187557 A1 (Hobbs et al.) 12 December 2002 (12.12.2002) abstract, para [0090], [0093]</td> <td>1-4, 10, 25-27, 34, 39</td> </tr> <tr> <td>Y</td> <td></td> <td>5-9, 11-14, 28-33, 35-38</td> </tr> <tr> <td>Y</td> <td>WO 2011/002957 A2 (Pollack et al.) 06 January 2011 (06.01.2011) abstract, pg 7, para 2; pg 8, para 2; pg 20, Figure 91; pg 95 section 7.7; pg 101-12, Fig 88AB</td> <td>5-9, 11-14, 28-33, 35-38</td> </tr> <tr> <td>Y</td> <td>US 2013/0105319 A1 (Bhattacharya et al.) 02 May 2013 (02.05.2013) abstract, para [0006]-[0028], [0046], [0052], [0060]</td> <td>1-14, 25-39</td> </tr> <tr> <td>Y</td> <td>US 2013/090268 A1 (Hung et al.) 11 April 2013 (11.04.2013) abstract, para [0009]-[0011]</td> <td>1-14, 25-39</td> </tr> <tr> <td>Y</td> <td>US 2012/0190032 A1 (Ness et al.) 26 July 2012 (26.07.2012) abstract, para [0010], [0067]-[0071], [0074]-[0075], [0108]-[0130]</td> <td>1-14, 25-39</td> </tr> <tr> <td>Y</td> <td>US 2012/0261013 A1 (Gilbert et al.) 18 October 2012 (18.10.2012) abstract, para [0022], [0065]-[0068]</td> <td>1-14, 25-39</td> </tr> <tr> <td>Y</td> <td>US 2012/0241015 A1 (Hansen et al.) 27 September 2012 (27.09.2012) abstract, para [0007]-[0009], [0019]-[0063], [0098], [0102]-[0108],</td> <td>1-14, 25-39</td> </tr> <tr> <td>Y</td> <td>US 2012/0180884 A1 (Brunello et al.) 19 July 2012 (19.07.2012) abstract, para [0014]-[0044], [0050]-[0053]</td> <td>1-14, 25-39</td> </tr> <tr> <td>Y</td> <td>US 2010/0234674 A1 (Wheeler et al.) 16 September 2010 (16.09.2010) abstract, para [0010]-[0014], [0032]-[0033], [0037]-[0044]</td> <td>1-14, 25-39</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 2002/0187557 A1 (Hobbs et al.) 12 December 2002 (12.12.2002) abstract, para [0090], [0093]	1-4, 10, 25-27, 34, 39	Y		5-9, 11-14, 28-33, 35-38	Y	WO 2011/002957 A2 (Pollack et al.) 06 January 2011 (06.01.2011) abstract, pg 7, para 2; pg 8, para 2; pg 20, Figure 91; pg 95 section 7.7; pg 101-12, Fig 88AB	5-9, 11-14, 28-33, 35-38	Y	US 2013/0105319 A1 (Bhattacharya et al.) 02 May 2013 (02.05.2013) abstract, para [0006]-[0028], [0046], [0052], [0060]	1-14, 25-39	Y	US 2013/090268 A1 (Hung et al.) 11 April 2013 (11.04.2013) abstract, para [0009]-[0011]	1-14, 25-39	Y	US 2012/0190032 A1 (Ness et al.) 26 July 2012 (26.07.2012) abstract, para [0010], [0067]-[0071], [0074]-[0075], [0108]-[0130]	1-14, 25-39	Y	US 2012/0261013 A1 (Gilbert et al.) 18 October 2012 (18.10.2012) abstract, para [0022], [0065]-[0068]	1-14, 25-39	Y	US 2012/0241015 A1 (Hansen et al.) 27 September 2012 (27.09.2012) abstract, para [0007]-[0009], [0019]-[0063], [0098], [0102]-[0108],	1-14, 25-39	Y	US 2012/0180884 A1 (Brunello et al.) 19 July 2012 (19.07.2012) abstract, para [0014]-[0044], [0050]-[0053]	1-14, 25-39	Y	US 2010/0234674 A1 (Wheeler et al.) 16 September 2010 (16.09.2010) abstract, para [0010]-[0014], [0032]-[0033], [0037]-[0044]	1-14, 25-39
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Date of the actual completion of the international search 30 December 2014 (30.12.2014)		Date of mailing of the international search report 14 JAN 2015																																	
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774																																	

INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	US 2003/0215957 A1 (Lemmo et al.) 20 November 2003 (20.11.2003) abstract, para [0050]	1-14, 25-39

INTERNATIONAL SEARCH REPORT

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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:
This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.
Group I, claims 1-14, 25-39, directed to a microfluidic system
Group II, claims 15-24 and 40, directed to a method of processing fluid
The groups of inventions listed above do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:
Special Technical Features (Distinct Technical Features):
The special technical feature of Group II is the method of using the system of Group I, which is not required in Group I.
Common Technical Features (Features Do Not Make a Contribution Over the Prior Art):
Groups I-II are related as a system (Group I) and a method of using the system (Group II) and share the technical feature of the system, claim 1 and 25. However, these are not unifying features because they do not make a contribution over the prior art in view of anticipating US 2002/0187557 A1 to Hobbs et al. (hereinafter Hobbs).
-----Continued in the Supplemental Box-----

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 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 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.:
1-14, 25-39

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.

Continuation of Box No III Observations where unity of invention is lacking:

Hobbs anticipates claims 1 and 25, a system for fluid processing (abstract: microfluidic device), comprising: a well (para [0013]: includes a sample input adapted to provide a fluidic sample to the separation channel between the first end and the second end; para [0071]: well downstream of the upstream end 115A of the stationary phase material 115; para [0090]: well downstream of the trailing edge of particulate material in the channel 238); and a channel component (abstract: separation channel or column); including:

(a) a body including a bottom surface (para [0013]: channel having a first end and a second end) attached to the well and a top surface having a microchannel formed therein (para [0110]: one fluidic output at the downstream end of the column; claim 32: output port via a sample flow path . . . the plurality of separation channels; abstract: microfluidic device; Note: the channels in a micro-fluidic device must be micro-channels),

(b) an input tube projecting into the well from the bottom surface of the body (abstract: a sample input disposed between a first end and a second end of the separation channel or column), and

(c) a passage extending through the input tube and the body, wherein the system is configured to receive a sample-containing fluid in the well such that the sample-containing fluid is in contact with a bottom end of the passage and is retained, with assistance from gravity, below a top end of the passage and out of contact with the microchannel until a pressure differential is created that drives at least a portion of the sample-containing fluid from the well via the passage and through the microchannel (para [0067]: an input port, input channel, or other aperture; 1(c) a passage extending through the input tube and the body = 25 (c) a port, wherein the body and the input tube collectively define a passage extending upward from an open end of the input tube, through the input tube and the body, to the top surface; para [0072]: a pressure differential may be applied; para [0004]: the mobile phase is then forced e.g., by gravity, by applying pressure, or by applying an electric field).

Therefore, Groups I-II lack unity under PCT Rule 13 because they do not share a same or corresponding special technical feature providing a contribution over prior art.