



(51) International Patent Classification:

G01N 30/32 (2006.01) G01N 30/60 (2006.01)
BOIL 3/00 (2006.01) G01N 30/88 (2006.01)
B81C 1/00 (2006.01) G01N 30/08 (2006.01)

(21) International Application Number:

PCT/US20 14/038421

(22) International Filing Date:

16 May 2014 (16.05.2014)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/824,573 17 May 2013 (17.05.2013) US

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(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, BN, BR, BW, BY, BZ, CA, CH, CL, 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, IR, IS, JP, KE, KG, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM,

[Continued on nextpage]

(54) Title: INTEGRATED FLUIDIC SYSTEM FOR GAS CHROMATOGRAPHY

(57) Abstract: A method is presented for fabricating a fluidic system for a gas chromatograph. The method includes: microfabricating a portion of a fluidic system of a gas chromatograph on a substrate using a first mask; microfabricating a portion of the fluidic system of the gas chromatograph using a second mask; and microfabricating a portion of the fluidic system of the gas chromatograph using a third mask, such that the first mask, the second mask and the third mask are different from each other and the microfabricating of the fluidic system of the gas chromatograph is completed using only the first, second and third masks. A gas chromatograph wherein a microfabricated Knudsen pump is arranged to operate in a first direction to draw carrier gas into a preconcentrator and in a second direction to draw gas out of the preconcentrator.

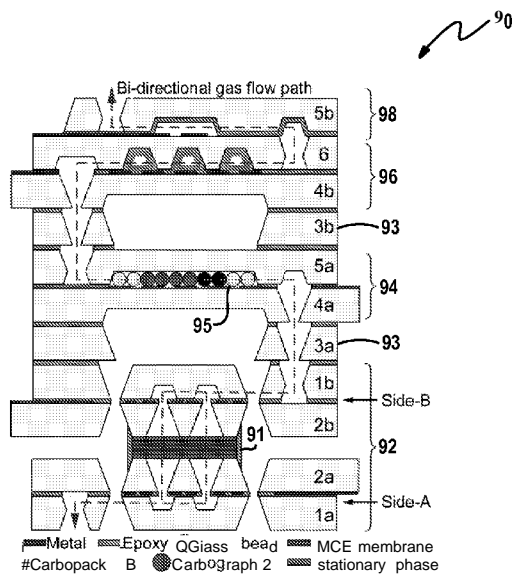


FIG. 10



TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.1 7(H))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(Hi))*
— *of inventorship (Rule 4.1 7(iv))*

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:

15 January 2015

INTERNATIONAL SEARCH REPORT

International application No PCT/US2Q14/Q38421
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A. CLASSIFICATION OF SUBJECT MATTER
INV. G01N30/32 B01L3/Q0 B81C1/00 G01N30/60 G01N30/88
ADD. G01N30/O8

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)
G01N BOIL 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 practicable, search terms used)
EPO-Internal , INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	US 5 888 390 A (CRAIG STEPHEN R [US]) 30 March 1999 (1999-03-30) col umn 1, line 5 - line 33 col umn 10, line 44 - line 62 col umn 11, line 33 - col umn 12, line 42 col umn 13, line 1 - line 6 col umn 13, line 46 - line 65 col umn 16, line 1 - line 32 -----	1-24,40, 41 25-39
Y A	Wo 2011/050285 AI (UNIV LOUISVILLE RES FOUND [US]; MCNAMARA SHAMUS [US]; PHARAS KUNAL [US] 28 April 2011 (2011-04-28) page 2, lines 3-10 page 29, line 11 - page 30, line 23 ----- -/ --	1-24, 40, 41 26

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 application or patent 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
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Date of the actual completion of the international search 27 October 2014	Date of mailing of the international search report 24/11/2014
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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 Miller, Thomas
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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2Q14/Q38421

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	wo 2008/067296 A2 (SCHLUMBERGER SERVICES PETROL [FR] ; SCHLUMBERGER CA LTD [CA] ; SCHLUMBER) 5 June 2008 (2008-06-05)	10-24
A	paragraphs [0023] , [0026] , [0029] , [0036] ; figure 2B -----	25-39
Y	US 7 530 257 B2 (BONNE ULRICH [US]) 12 May 2009 (2009-05-12)	10-24
A	col umn 3, l i nes 40-51 -----	25-39
A	JING LIU ET AL: "Demonstration of moti onless Knudsen pump based mi cro-gas chromatography featur ing mi cro-fabri cated col umns and on-col umn detectors" , LAB ON A CHI P, vol . 11, no. 20, 1 January 2011 (2011-01-01) , pages 3487-3492, XP055134659 , ISSN: 1473-0197 , DOI : 10. 1039/cll c20511k the whol e document -----	1-41
A	KLEMP M A ET AL: "CRYOFOCUSING INLET WITH REVERSE FLOW SAMPLE COLLECTION FOR GAS CHROMATOGRAPHY" , ANALYTICAL CHEMISTRY, AMERICAN CHEMICAL SOCI ETY, US, vol . 65, no. 18, 15 September 1993 (1993-09-15) , pages 2516-2521, XP000411484, ISSN: 0003-2700, DOI : 10. 1021/AC00066A020 page 2516 - page 2517; figure 1; table I -----	25-39

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US20 14/03842 1

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 64(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 all searchable 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 report covers only those claims for which fees were paid, specifically claims Nos. :
- A. 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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-24, 40, 41

A method for microfabricating a fluidic system for a gas chromatograph comprising the steps of microfabricating a portion of a fluidic system using only three masks.

2. claims: 25-39

A microfluidic gas chromatograph comprising pump, column, preconcentrator and detector, wherein the pump is arranged to operate in two directions.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2Q14/Q38421

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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