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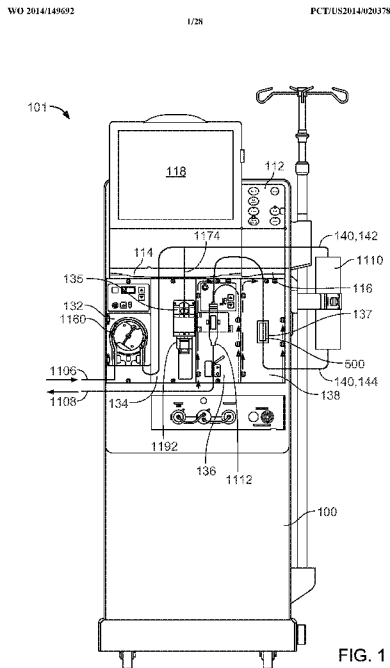
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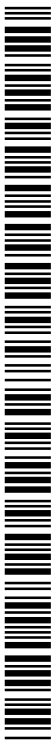
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[Continued on next page]

(54) Title: MEDICAL FLUID SENSORS AND RELATED SYSTEMS AND METHODS



(57) Abstract: This disclosure relates to medical fluid sensors and related systems and methods. In certain aspects, a method includes reading an indicia of a medical fluid cartridge to determine a volume of a fluid passageway of the medical fluid cartridge indicated by the indicia, receiving radio frequency energy generated by excited atoms in medical fluid in the fluid passageway of the medical fluid cartridge, and determining a concentration of a substance in the medical fluid based on the determined volume of the fluid passageway of the medical fluid cartridge indicated by the indicia and the received radio frequency energy generated by the excited atoms in the medical fluid in the fluid passageway of the medical fluid cartridge.





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).

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- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

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INTERNATIONAL SEARCH REPORT

International application No PCT/US2014/020378

A. CLASSIFICATION OF SUBJECT MATTER INV. A61B5/055 G01N24/08 G01R33/46 A61M1/16 A61M1/36 ADD.				
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) A61B G01N G01R A61M				
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, WPI Data				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
A	US 2003/040700 A1 (HICKLE RANDALL S [US] ET AL) 27 February 2003 (2003-02-27) page 4, paragraph 51 page 6, line 29, paragraph 66 - line 35 page 8, line 3, paragraph 89 - line 8 figures 1,4,5,9,10	1		
A	US 2011/199097 A1 (HARTSOUGH LARRY DOWD [US]) 18 August 2011 (2011-08-18) page 1, paragraph 1 page 3, paragraph 43 page 5, paragraph 60 page 5, paragraph 62 - page 6, paragraph 62 figures 4,5,15	1		
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.</td> <td style="width: 50%; border: none;"><input checked="" type="checkbox"/> See patent family annex.</td> </tr> </table>			<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.	<input checked="" type="checkbox"/> See patent family annex.
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.	<input checked="" type="checkbox"/> 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		
Date of the actual completion of the international search	Date of mailing of the international search report			
25 June 2014	27/10/2014			
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 Kempeneers, Johanna			

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2014/020378

Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, the international search was carried out on the basis of:
 - a. (means)
 - on paper
 - in electronic form
 - b. (time)
 - in the international application as filed
 - together with the international application in electronic form
 - subsequently to this Authority for the purpose of search
2. In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
3. Additional comments:

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/020378

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 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.:
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.:

1-17

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.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/020378

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2008/077074 A1 (KEENAN RICHARD [US] ET AL) 27 March 2008 (2008-03-27) page 6, paragraph 110 - page 7, paragraph 111 page 7, paragraph 116 page 12, paragraph 150 - page 13, paragraph 162 page 15, paragraph 177 - paragraph 178 page 24, paragraph 268 figures 1,1A,1B,8,9,10,17 -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2014/020378

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2003040700	A1	27-02-2003	AT 378080 T 15-11-2007
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			WO 2010047749 A2 29-04-2010

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			WO 2008022047 A2 21-02-2008

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-17

a method comprising reading an indicia of a medical fluid cartridge indicating a volume of a fluid passageway of the cartridge, receiving radio frequency energy generated by excited atoms in a medical fluid in said fluid passageway, and determining a concentration of a substance in the medical fluid based on said volume of said fluid passageway and the received radio frequency energy

2. claim: 18

a method comprising determining a volume of a fluid passageway of a medical fluid cartridge and applying a machine readable indicia to the cartridge, the indicia being indicative of the determined volume

3. claims: 19-37

a method comprising measuring a quantity of a first substance and a second substance in a reference fluid cartridge, measuring a quantity of said first and second substance in a medical fluid in a medical fluid cartridge, and determining a concentration of the second substance in the medical fluid based on the measured quantities of the first and second substances in both the reference fluid and the medical fluid
