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(71) Applicant: **ORSUS MEDICAL LIMITED** [GB/GB];
Basepoint Business Centre, Riverside Court, Beaufort Park,
Chepstow Monmouthshire NP16 5UH (GB).

(72) Inventor: **CHAUDRY, Sabih**; Orsus Medical Ltd, Base-
point Business Centre, Riverside Court, Chepstow Mon-
mouthshire NP16 5UH (GB).

(74) Agent: **HUTCHINSON IP LTD**; 57 Hoghton Street,
Southport Merseyside PR9 0PG (GB).

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AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, 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, KH, KN, KP, KR,
KW, KZ, LA, LC, LK, LR, LS, 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, TN, TR,
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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 4.17(ii))

(54) Title: APPARATUS FOR MEASURING THE CONCENTRATION OF TARGET SUBSTANCES IN BLOOD

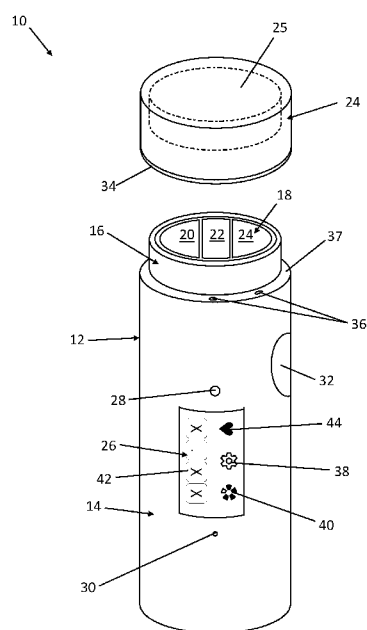


FIGURE 1

(57) Abstract: A non-invasive testing apparatus for determining a concentration of a target substance, such as blood sugar, blood alcohol, cholesterol, etc., in a patient's blood involves applying an output RF signal (102) to the skin of a patient via an antenna (20), and measuring the amplitude and phase of a response signal, which is a function of the output RF signal (102) modified by an interaction with the patient's blood. Measurements are taken at different output RF frequencies (310), and the response (300) is plotted as a function of frequency (310). Various parameters (552, 554, 556, 550, 408, 410) are derived from the shape of the resulting plots, namely any or more of: a resonance frequency shift; a Q factor of the resonance; a group delay; a phase shift; an amplitude variation; a shape factor of the plot; and a gradient of the plot at different frequencies. Models of the derived parameters as a function of concentration of the target substance in blood are used to arrive at a determination of the latter. Further elements are a circuit (1000) for obtaining the amplitude and phase measurements, a calibration device (5008), a system (3000) for attaching the apparatus to the patient's body using a pulley belt, and an inflatable bladder system (4000) for ensuring proper sensor contact.

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER INV. A61B5/00 A61B5/05 A61B5/145 A61B5/1495 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 A61N A44C		
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		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/275814 A1 (WATANABE SHINSUKE [JP] ET AL) 5 November 2009 (2009-11-05) figures 1,3A/B,5 paragraphs [0012], [0048] - [0053], [0057] - [0061], [0067] - [0073] ----- -/--	1,2,4,6, 8-14, 16-41, 43-45, 47-65
☒ 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		
Date of the actual completion of the international search		Date of mailing of the international search report
19 February 2018		05/03/2018
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 Albrecht, Ronald

INTERNATIONAL SEARCH REPORT

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	US 5 508 203 A (FULLER MILTON E [US] ET AL) 16 April 1996 (1996-04-16) figures 1,4C column 1, lines 1-12 column 2, lines 26-29 column 4, lines 1-6 column 4, lines 38-43 column 5, line 65 - column 6, line 14 column 6, line 57 - column 7, line 10 column 8, line 51 - column 9, line 11 -----	1-4,6, 8-14, 16-41, 43-45, 47-65
X	US 2008/319285 A1 (HANCOCK CHRISTOPHER PAUL [GB]) 25 December 2008 (2008-12-25) figures 1, 2, 3, 5, 6, 11, 12 44-46, 49, 53, 58, 89, 97-100 -----	1,5,6, 8-14, 16-41, 43-45, 47-65
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INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2017/050389

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 2015/112170 A1 (AMERSON III ROBERT LEE [US] ET AL) 23 April 2015 (2015-04-23) figures 1-5 paragraphs [0039] - [0043] -----	42
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X	US 2013/289375 A1 (FISCHER GEORG [DE]) 31 October 2013 (2013-10-31) figures 1,3,4 paragraphs [0063] - [0070], [0143], [0148] -----	46, 48-53, 57-62
X	WO 2014/207733 A1 (SENSIBLE MEDICAL INNOVATIONS LTD [IL]) 31 December 2014 (2014-12-31) figure 4ABC page 6, lines 17-18 page 7, lines 24-31 page 8, lines 6-9 page 8, lines 20-23 page 9, lines 1-7 page 10, line 17 - page 11, line 3 page 13, lines 1-27 -----	46, 48-53, 57-62
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2017/050389

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.:

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: 1-6(completely); 8-14, 16-41, 43-45, 47-65(partially)

improved analyte analysis using amplitude and phase
information of RF signals

2. claims: 7(completely); 8-14, 16-41, 43-45, 47-65(partially)

circuit for comparison of input and output signals

3. claims: 15(completely); 16-41, 43-45, 47-65(partially)

antenna calibration apparatus

4. claims: 42(completely); 44, 45, 57-62(partially)

attachment means for physiological testing apparatus

5. claims: 46(completely); 48-53, 57-62(partially)

controlling sensor contact pressure for physiological
testing apparatus

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2017/050389

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