

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
12 November 2009 (12.11.2009)

(10) International Publication Number  
**WO 2009/136341 A3**

(51) International Patent Classification:

A61B 5/00 (2006.01) A61B 5/113 (2006.01)  
A61B 5/024 (2006.01) A61B 5/08 (2006.01)  
A61B 5/0205 (2006.01) G01S 13/00 (2006.01)

(21) International Application Number:

PCT/IB2009/051806

(22) International Filing Date:

4 May 2009 (04.05.2009)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

08103895.2 9 May 2008 (09.05.2008) EP

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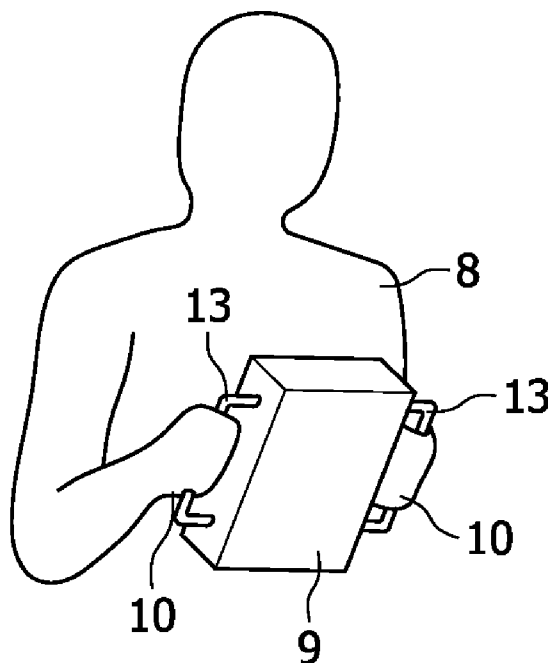
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

[Continued on next page]

(54) Title: CONTACTLESS RESPIRATION MONITORING OF A PATIENT AND OPTICAL SENSOR FOR A PHOTO-PLETHYSMOGRAPHY MEASUREMENT



**FIG. 2a**

(57) Abstract: The invention also relates to an optical sensor for a photoplethysmography measurement, comprising a light unit 1 with a light emitter 2 for emitting light into tissue of a patient 8 and/or a light detector 3 for detecting a part of the emitted light after interaction with the tissue, wherein the light unit is embedded in an elastic material 4. The invention further relates to a device for contactless respiration monitoring of a patient 8, comprising: a distance sensor for consecutively detecting the temporal distance variations relative to the patient's chest 12, preferably based on electromagnetic waves; and a calculating unit for determining the breathing activity based on the detected temporal distance variations. The invention is especially useful for providing a reliable and easy to use possibility for simultaneously monitoring respiration action, blood pressure and heart rate with a handheld device which can be used for spot-checking the vital parameters of patients in hospitals.



WO 2009/136341 A3



AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, 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, IS, JP, KE, KG, KM, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

**(84) Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (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, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**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:**

4 February 2010

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/IB2009/051806

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. A61B5/00 A61B5/024 A61B5/0205 A61B5/113 A61B5/08  
 G01S13/00

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 G01S

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, WPI Data

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005/234312 A1 (SUZUKI TAKUJI [JP] ET AL) 20 October 2005 (2005-10-20) paragraphs [0003], [0005], [0063], [0069], [0072] - [0076], [0101] figures 1-8,25	1-5
X	US 5 094 240 A (MUZ EDWIN [DE]) 10 March 1992 (1992-03-10) figures 1-3 column 1, lines 33-56 column 2, lines 59-68 column 3, line 63 - column 4, line 11	1-5
X	WO 98/17174 A (CARDIAC CRC NOMINEES PTY LIMIT [AU]; COOPER PHILIP GEORGE [AU]) 30 April 1998 (1998-04-30) figures 15,16 page 44, lines 1-7	1-5

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	"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
"E" earlier document but published on or after the international filing date	"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
"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)	"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.
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search  4 December 2009	Date of mailing of the international search report  16/12/2009
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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  Olapinski, Michael
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## INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2009/051806

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97/40741 A (OHMEDA INC [US]) 6 November 1997 (1997-11-06) figures 1-12 page 2, lines 23,24 page 4, lines 6-10 page 7, lines 16-23 page 14, line 17 - page 15, line 10 page 15, lines 18,19	1-5
X	US 6 525 386 B1 (MILLS MICHAEL A [US] ET AL) 25 February 2003 (2003-02-25) the whole document	1-3
X	EP 0 357 249 A (CRITIKON INC [US]) 7 March 1990 (1990-03-07) figures 1-4 column 4, lines 44-53 abstract	1
X	US 2008/077015 A1 (BORIC-LUBECKE OLGA [US] ET AL) 27 March 2008 (2008-03-27)	6-12
Y	paragraphs [0006], [0010], [0 75], [0092], [0182] - [0184] figure 19	13
X	WO 2008/027509 A2 (CALIFORNIA INST OF TECHN [US]; MCGRATH WILLIAM R) 6 March 2008 (2008-03-06)	6-8, 10-12
Y	paragraphs [0004], [0010], [0075], [0081], [0083], [0101] - [0103] figures 1,2,10-13	13
Y	US 2005/288601 A1 (WOOD MICHAEL [US] ET AL) 29 December 2005 (2005-12-29) figures 12,13,15 paragraphs [0009], [0014], [0030], [0066], [0082], [0170]	13
X	WO 2007/143535 A2 (BIANCAMED LTD [IE]; HENEGHAN CONOR [IE]; HANLEY CONOR [IE]; FOX NIAL) 13 December 2007 (2007-12-13)	6-12
Y	paragraphs [0015], [0024], [0038] - [0044], [0102]; figures	13

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IB2009/051806

## 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.:  
  
1-13
  
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: 1-5

directed to an optical sensor for photoplethysmography  
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2. claims: 6-13

directed to a contactless respiration monitor with a distance sensor  
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3. claims: 14-15

directed to a method for determining stress status and providing a stress status indicator signal  
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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2009/051806

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