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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, 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, 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, PE, PG, PH, PL, PT, QA, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
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[Continued on next page]

(54) **Title:** SYSTEM AND METHOD FOR NON-INVASIVE DETERMINATION OF HEMOGLOBIN CONCENTRATION IN BLOOD

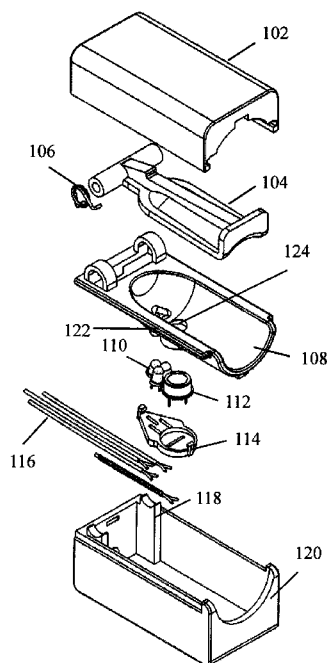


FIG. 1A

(57) **Abstract:** A system and method for measurement of absolute value of hemoglobin concentration non-invasively is provided. The system comprises a probe device comprising a sliding top structurally configured to be manually slid forward and backward onto the finger seat which is positioned on top of the housing for placing a fingertip. The finger seat houses two cavities for housing a set of three light emitting diodes and a photodetector respectively. Multiple distinct wavelengths of light transmitted through the fingertip is detected by the photodetector. Further, electronic signals generated by the photodetector are processed to obtain alternating and direct components of light corresponding to each wavelength. A system of three equations are obtained including unknown values of two primary constituent absorbers and known consolidated values of one or more secondary constituent absorbers corresponding to each wavelength of light. The system of equations are then solved simultaneously to derive absolute value of hemoglobin concentration.



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))

Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

— 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))

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

(88) Date of publication of the international search report:

23 August 2012

— of inventorship (Rule 4.17(iv))

INTERNATIONAL SEARCH REPORT

International application No

PCT/IN2011/000595

A. CLASSIFICATION OF SUBJECT MATTER

INV. G01N33/72 A61B5/1455
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)

G01N A61B

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 6 151 518 A (HAYASHI KATSUMI [JP]) 21 November 2000 (2000-11-21)	1-3,5,6, 8,9
Y	column 3, line 19 - column 11, line 67; claims 1-11; figures 1-11	4,7, 10-12
Y	US 4 407 290 A (WILBER SCOTT A [US]) 4 October 1983 (1983-10-04) abstract; claims 1-36; figures 1-14	4,7
Y	US 2004/107065 A1 (AL-ALI AMMAR [US]) 3 June 2004 (2004-06-03) paragraphs [0009] - [0049]; claims 1-28; figures 1-11	4,7
Y	US 5 149 503 A (KOHNO HIROMASA [JP] ET AL) 22 September 1992 (1992-09-22) claims 1-12; figures 1-22	4,7
	-/--	



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

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"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

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IN2011/000595

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2004/176670 A1 (TAKAMURA YOSHIKI [JP] ET AL) 9 September 2004 (2004-09-09) paragraphs [0004], [111443]; claims 1-13; figure 6 -----	10-12
Y	WO 00/25112 A1 (ROLFE PETER [GB]) 4 May 2000 (2000-05-04) page 2, line 4 - page 9, line 23; claims 1-17; figures 1-2 page 10, line 19 - page 13, line 25 -----	10-12
Y	US 5 720 284 A (AOYAGI TAKUO [JP] ET AL) 24 February 1998 (1998-02-24) column 3, line 50 - column 11, line 45; claim 1; figures 1-7 -----	10-12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2011/000595

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.:

1-12

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

Information on patent family members

International application No

PCT/IN2011/000595

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
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			US	5720284 A		24-02-1998

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-12

Method for determining absolute value of hemoglobin concentration in blood using specific optical arrangement and calculation algorithm

2. claims: 13-18

Method of processing waveform signal for obtaining alternating and direct components used for determining absolute value of hemoglobin concentration.

3. claims: 19, 20

Device for measuring optical signal transmitted through a finger following near-infrared irradiation, comprising a housing with a finger sea having sliding top and pressure inducing flap.
