provide instructions to a user or request placement confirmation from the user regarding contacting the first electrode to the patient's left arm and the second electrode to the patient's right arm, wherein the electrical signal measured between the left arm and right arm corresponds to Lead I in a 12-lead ECG, and (b) analyze the electrical signal corresponding to Lead I to calculate an average heartbeat representation for Lead I.

32. The system of claim 31, wherein the set of instructions, when executed by the one or more computing devices, further causes the one or more computing devices to (c) provide instructions to a user or request placement confirmation from the user regarding contacting the first electrode to the patient's left leg and the second electrode to the patient's right arm, wherein the electrical signal measured between the left arm and right arm corresponds to Lead II in a 12-lead ECG, and (d) analyze the electrical signal corresponding to Lead II to calculate an average heartbeat representation for Lead II.

33. The system of claim 32, wherein the set of instructions, when executed by the one or more computing devices, further causes the one or more computing devices to (e) provide instructions to a user or request placement confirmation from the user regarding contacting the first electrode to the patient's left leg and the second electrode to the patient's left arm, wherein the electrical signal measured between the left arm and right arm corresponds to Lead III in a 12-lead ECG, and (f) analyze the electrical signal corresponding to Lead III to calculate an average heartbeat representation for Lead III.

34. The system of claim 33, wherein the set of instructions, when executed by the one or more computing devices, further causes the one or more computing devices to time-align the average heartbeat representations for Lead I and Lead II and calculate aVR, aVL, and aVF from the time-aligned average heartbeat representations for Lead I and Lead II.

35. The system of claim 34, wherein the set of instructions, when executed by the one or more computing devices, further causes the one or more computing devices to (g) provide instructions to a user or request placement confirmation from the user regarding contacting the first electrode with each of the V1, V2, V3, V4, V5, and V6 chest locations while contacting the second electrode to one of the patient's left arm and the patients right arm, wherein the electrical signals measured between each of the V1, V2, V3, V4, V5, and V6 chest locations and the left arm or the right arm correspond to Leads V1, V2, V3, V4, V5, and V6 in a 12-lead ECG, and (h) analyze the electrical signals corresponding to Leads V1, V2, V3, V4, V5, and V6 to calculate average heartbeat representations for Leads V1, V2, V3, V4, V5, and V6.

36. The system of claim 35, wherein the left arm is used for Leads V1, V2, and V3 and the right arm is used for Leads V4, V5, and V6.

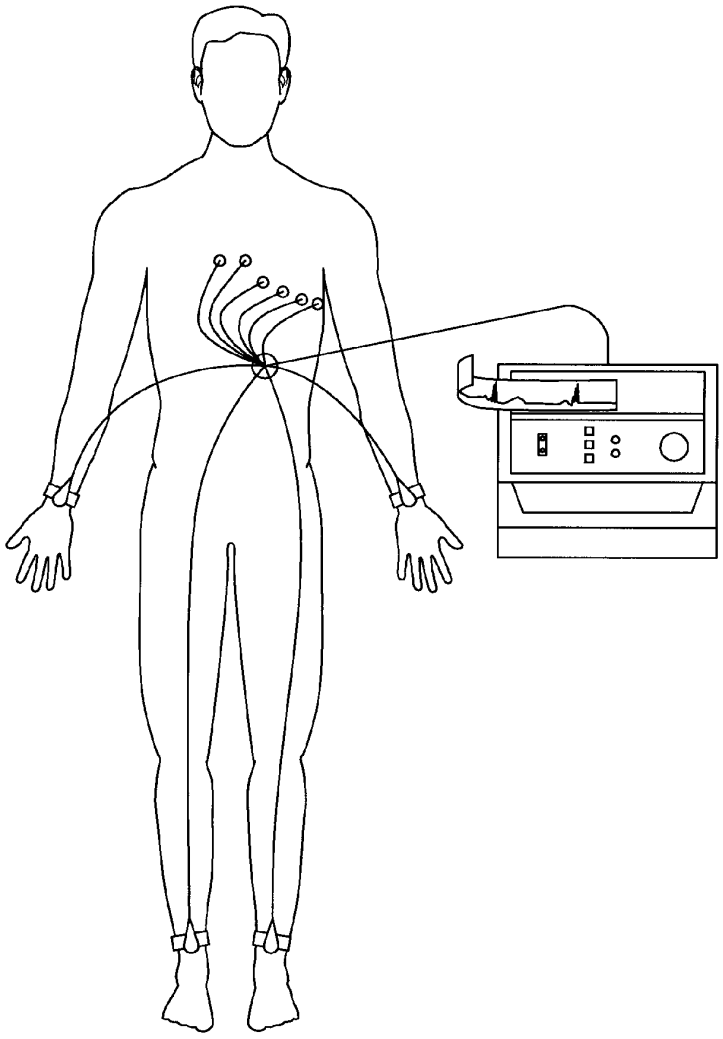

FIG. 1
(Prior Art)

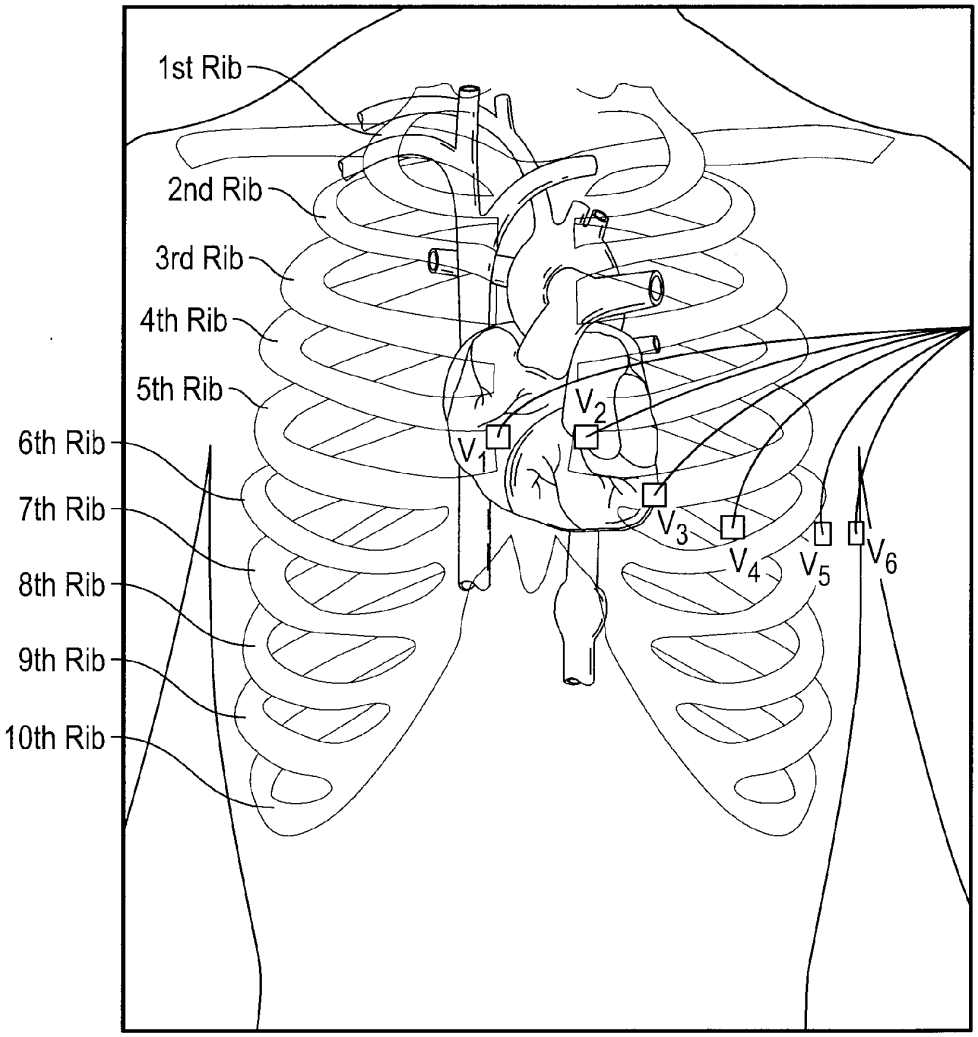

FIG. 2
(Prior Art)

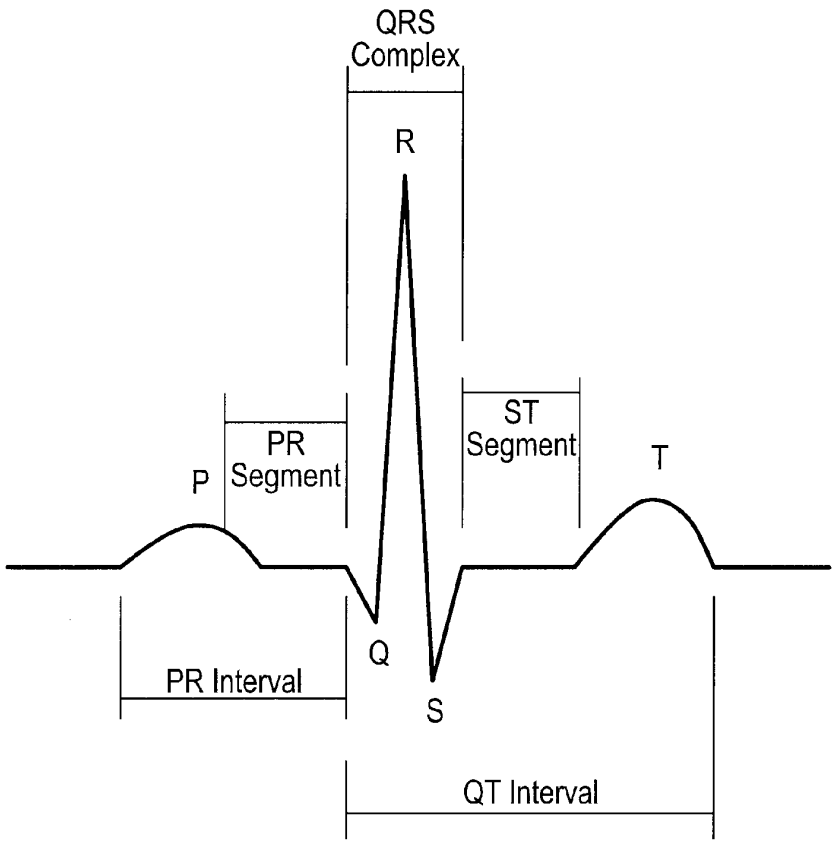

FIG. 3
(Prior Art)

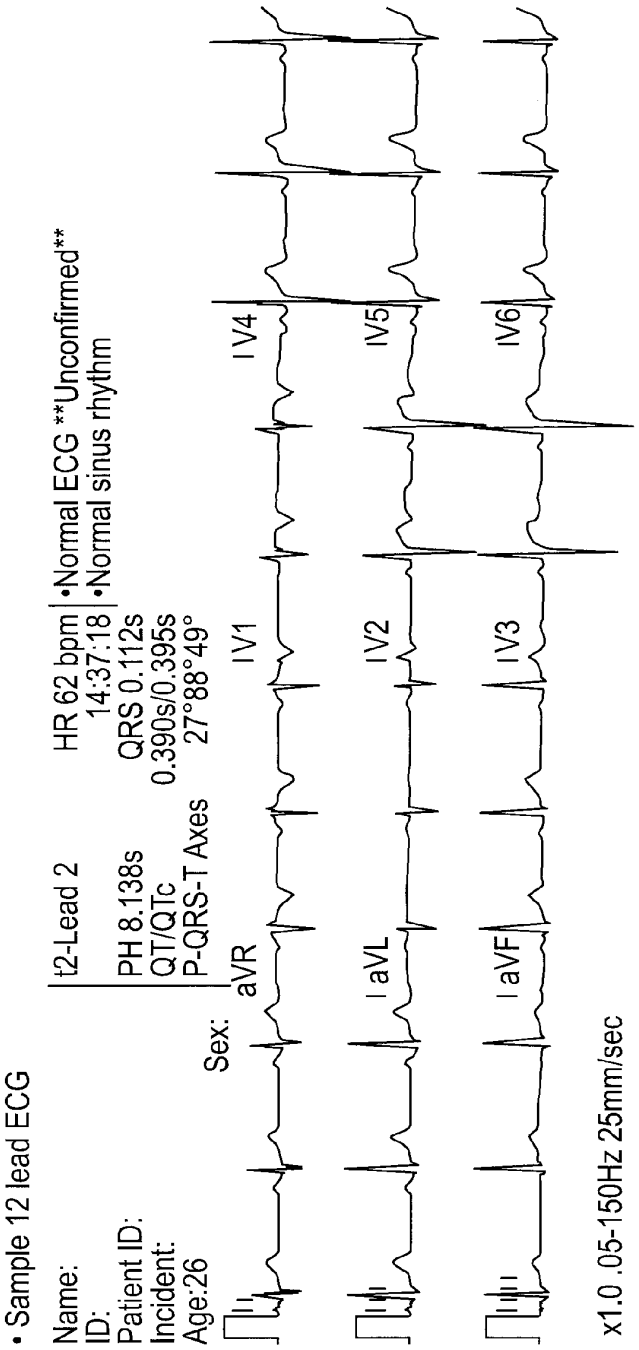

FIG. 4
(Prior Art)

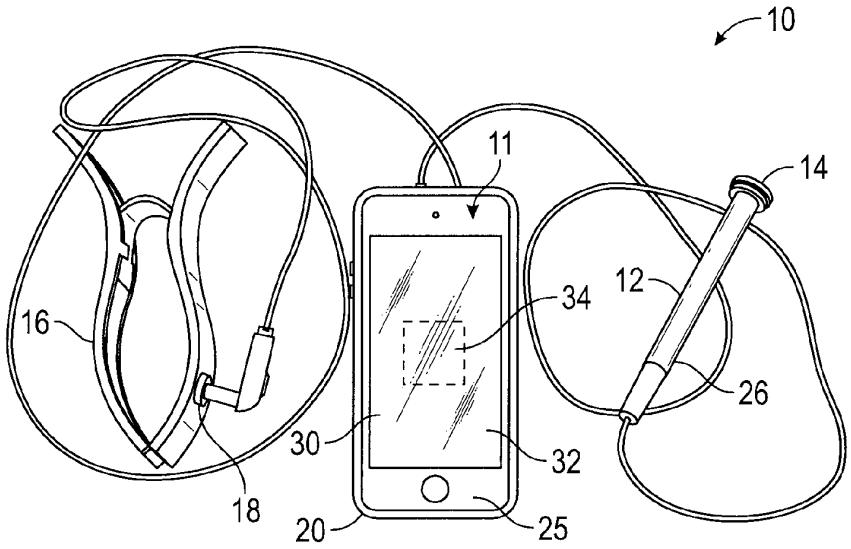

FIG. 5A

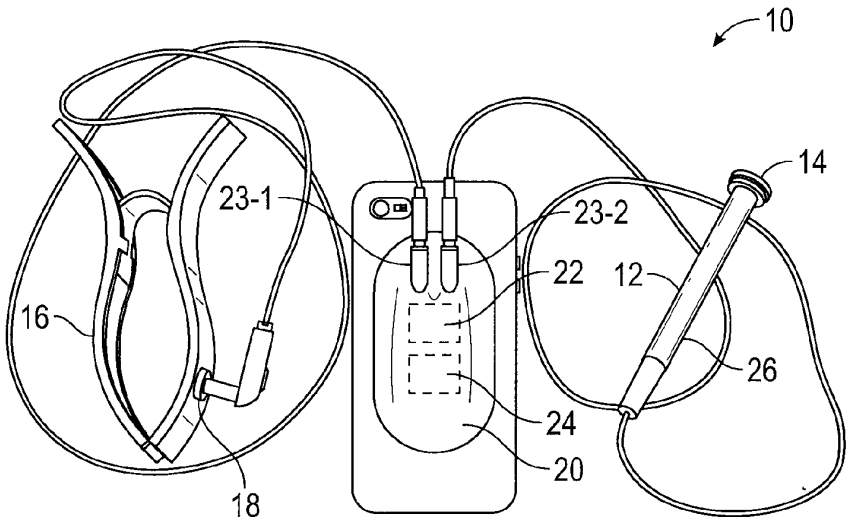

FIG. 5B

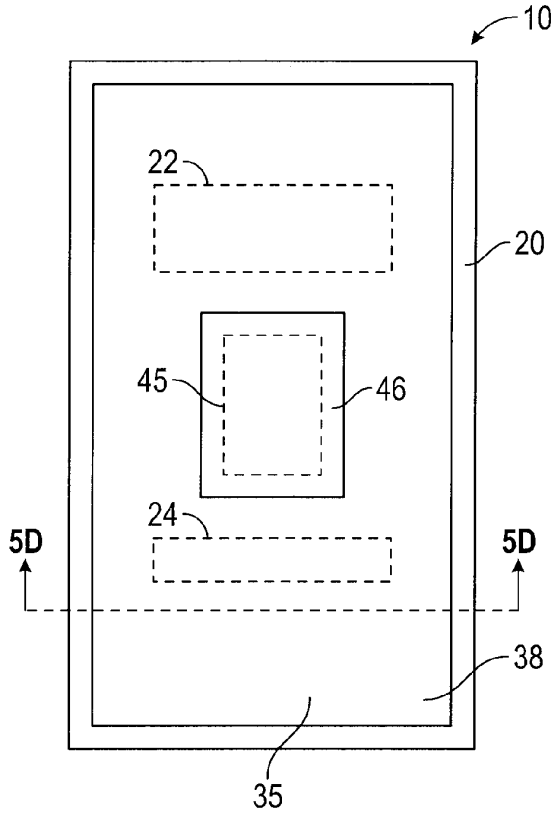

FIG. 5C

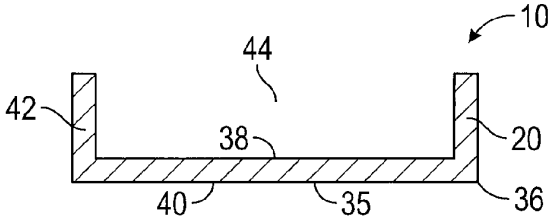

FIG. 5D

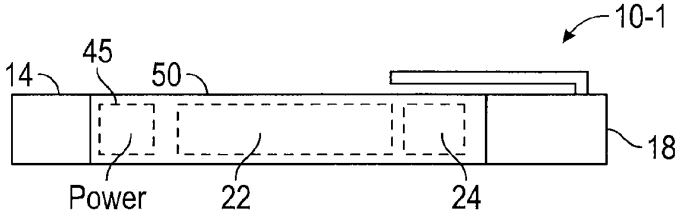

FIG. 6

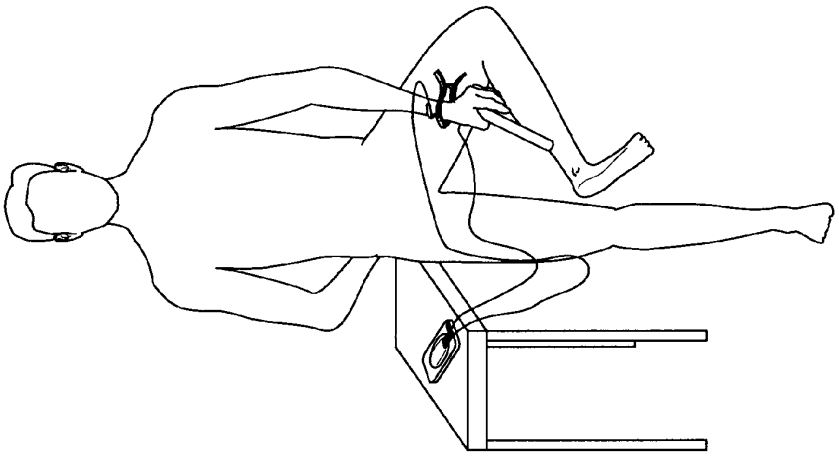

FIG. 7C

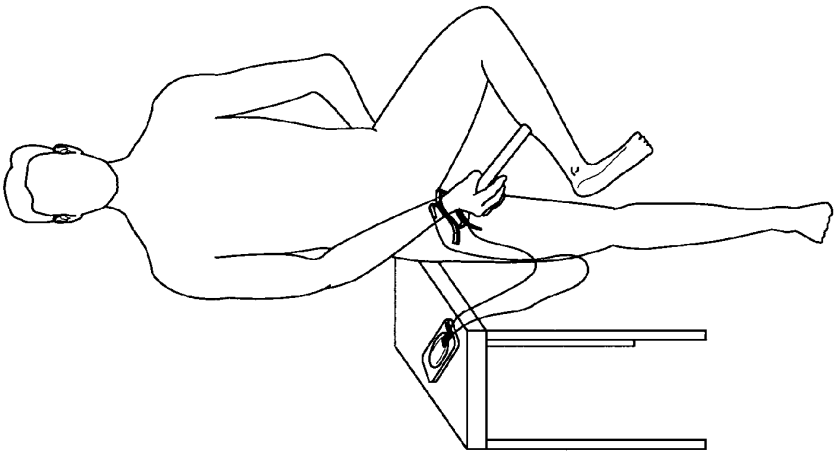

FIG. 7B

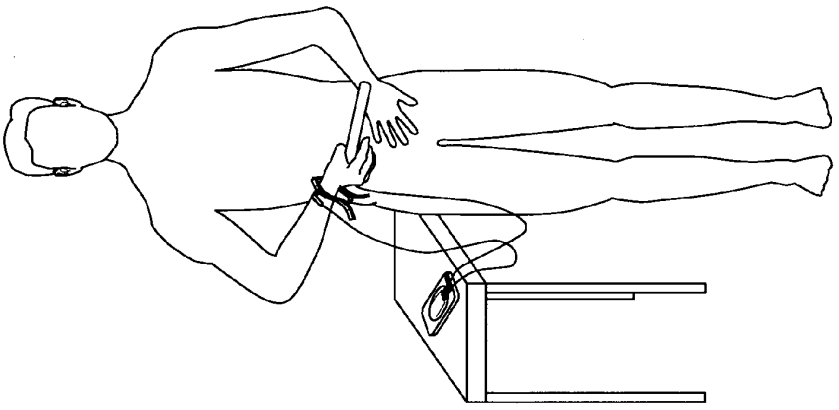

FIG. 7A

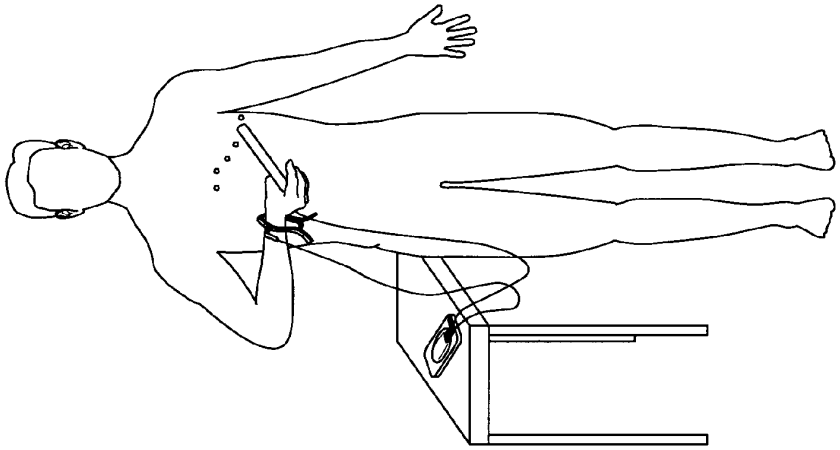

FIG. 7E

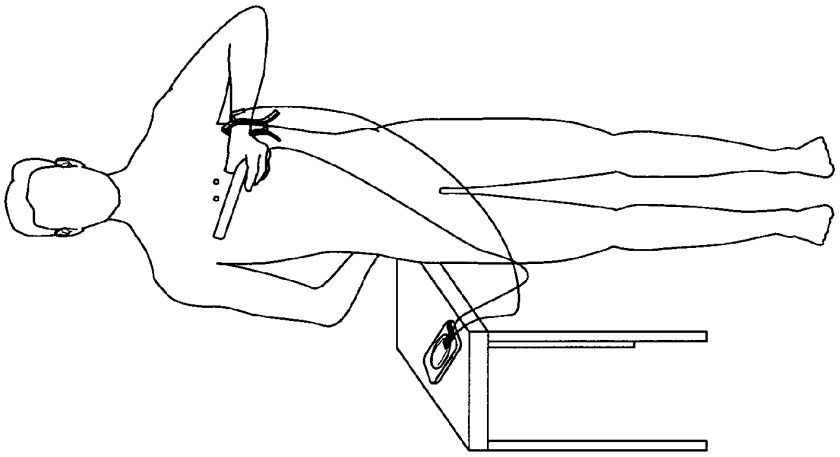

FIG. 7D

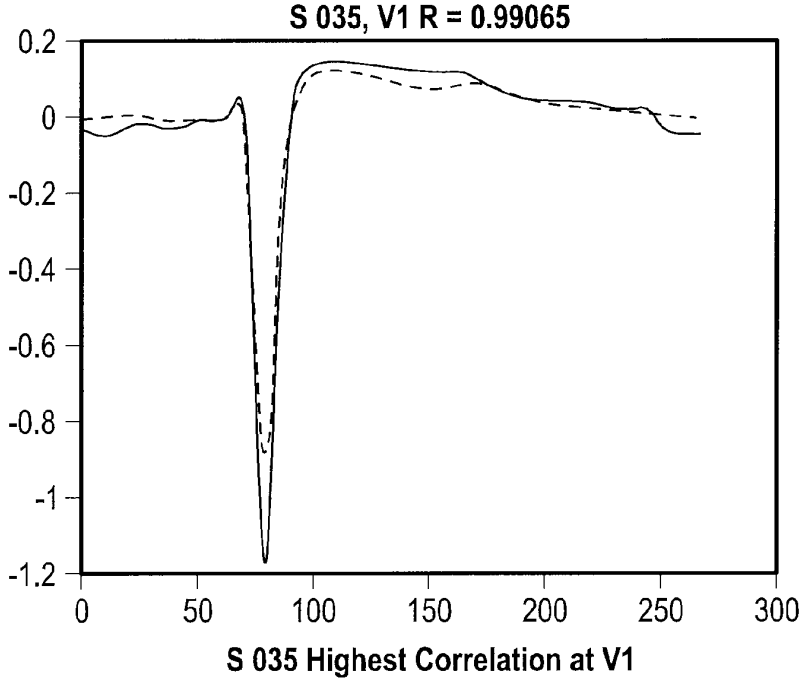
S 035, V1 R = 0.99065
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
0
50
100
150
200
250
300
S 035 Highest Correlation at V1

FIG. 8

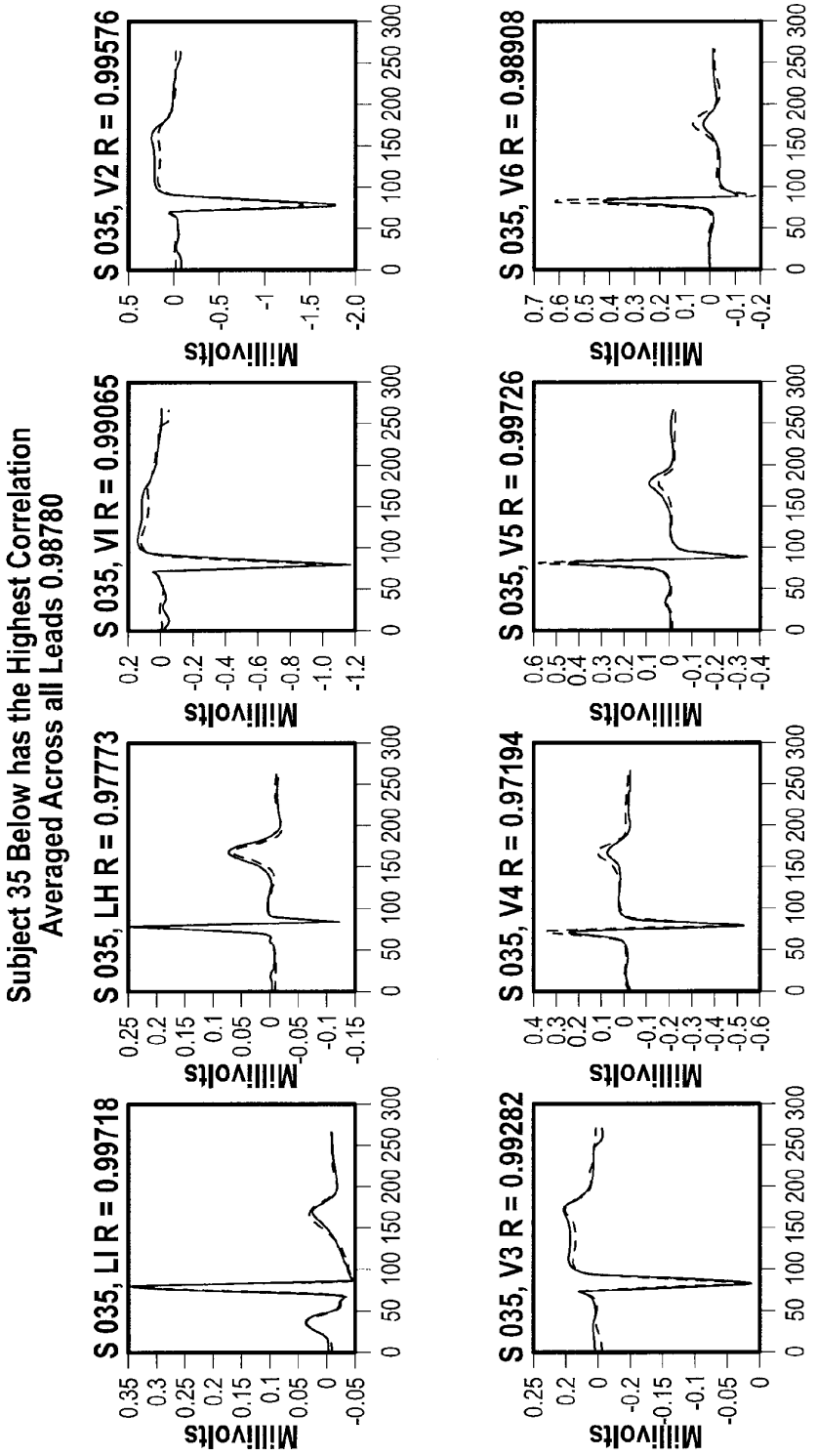
Subject 35 Below has the Highest Correlation
Averaged Across all Leads 0.98780
S 035, LI R = 0.99718
S 035, LH R = 0.97773
S 035, VI R = 0.99065
S 035, V2 R = 0.99576
S 035, V3 R = 0.99282
S 035, V4 R = 0.97194
S 035, V5 R = 0.99726
S 035, V6 R = 0.98908
Millivolts
0 50 100 150 200 250 300

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/034350

A. CLASSIFICATION OF SUBJECT MATTER

A61B 5/0402(2006.01)i, A61B 5/0408(2006.01)i, A61B 5/0432(2006.01)i, A61B 5/044(2006.01)i

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 5/0402; A61B 5/04; A61B 5/0452; A61B 5/00; A61B 5/0408; A61B 5/0432; A61B 5/044

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: electrocardiogram, electrode, sequentially, lead, reduce

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2011-0275950 A1 (JOEL Q. XUE et al.) 10 November 2011 See abstract, paragraphs [0035]-[0044], claim 17 and figure 7.	1-36
A	US 2011-0288425 A1 (DONALD-BANE STEWART) 24 November 2011 See abstract, paragraphs [0117]-[0250], claims 50-58 and figures 2,4,15.	1-36
A	US 2011-0301439 A1 (DAVID ALBERT et al.) 08 December 2011 See abstract, paragraphs [0052]-[0055] and claims 5-10.	1-36
A	US 2010-0234746 A1 (FREDRIK SEBELIUS) 16 September 2010 See abstract, paragraphs [0053]-[0073] and figures 1-6B.	1-36
A	KR 10-2010-0059198 A (SNU R&DB FOUNDATION) 04 June 2010 See abstract, paragraphs [0026]-[0032] and figures 1,2.	1-36

☐ 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
29 August 2014 (29.08.2014)	**01 September 2014 (01.09.2014)**

Name and mailing address of the ISA/KR
International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701,
Republic of Korea
Facsimile No. +82-42-472-7140

Authorized officer
KIM, Tae Hoon
Telephone No. +82-42-481-8407

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2014/034350

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011-0275950 A1	10/11/2011	CN 101152081 A	02/04/2008
		CN 101152081 B	05/09/2012
		DE 102007046259 A1	03/04/2008
		JP 2008-086754 A	17/04/2008
		JP 5078494 B2	21/11/2012
		US 2008-082013 A1	03/04/2008
		US 8005531 B2	23/08/2011
		US 8494621 B2	23/07/2013
US 2011-0288425 A1	24/11/2011	CN 101766482 A	07/07/2010
		CN 101766482 B	17/07/2013
		CN 1798522 A	05/07/2006
		CN 1798522 B	20/10/2010
		EP 1648296 A2	26/04/2006
		EP 1648296 B1	10/10/2012
		EP 2281505 A1	09/02/2011
		EP 2281505 B1	17/10/2012
		GB 0317947 D0	03/09/2003
		US 2006-0224071 A1	05/10/2006
		US 7974684 B2	05/07/2011
		US 8295919 B2	23/10/2012
		WO 2005-011492 A2	10/02/2005
		WO 2005-011492 A3	07/04/2005
		WO 2005-011492 B1	26/05/2005
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		CN 203153725 U	28/08/2013
		EP 2710546 A1	26/03/2014
		JP 2014-518713 A	07/08/2014
		TW 201247170 A	01/12/2012
		WO 2012-158190 A1	22/11/2012
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		CN 101384214 B	11/05/2011
		EP 1983895 A1	29/10/2008
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		SE 0600328 L	24/04/2007
		SE 529087 C2	24/04/2007
		US 2013-0102871 A1	25/04/2013
		US 8315695 B2	20/11/2012
		WO 2007-094729 A1	23/08/2007
KR 10-2010-0059198 A	04/06/2010	US 2010-0210921 A1	19/08/2010

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 12212-700.600	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2013/023370	International filing date *(day/month/year)* 28 January 2013 (28.01.2013)	Priority date *(day/month/year)* 26 January 2012 (26.01.2012)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant ALIVECOR, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 11 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☒	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 29 July 2014 (29.07.2014)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Simin Baharlou e-mail: pt09.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:
SHOOP RICHARD

SHAY GLENN LLP 2755 CAMPUS DRIVE, SUITE 210
SAN MATEO CA 94403 USA

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing *(day/month/year)*	**15 May 2013 (15.05.2013)**
Applicant's or agent's file reference 12212-700.600	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2013/023370	**28 January 2013 (28.01.2013)**	26 January 2012 (26.01.2012)

International Patent Classification (IPC) or both national classification and IPC

A61B 5/01(2006.01)i, A61B 5/145(2006.01)i, A61B 5/02(2006.01)i, H04B 7/24(2006.01)i, H04B 1/38(2006.01)i

Applicant

ALIVECOR, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.
For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/KR	Date of completion of this opinion	Authorized officer
Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea Facsimile No. 82-42-472-7140	15 May 2013 (15.05.2013)	KIM, Tae Hoon Telephone No.82-42-481-8407

Form PCT/ISA/237 (cover sheet) (July 2011)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2013/023370

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of :

   ☒ the international application in the language in which it was filed

   ☐ a translation of the international application into _____ , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of:

   a. a sequence listing filed or furnished
      ☐ on paper
      ☐ in electronic form

   b. time of filing or furnishing
      ☐ contained in the international application as filed.
      ☐ filed together with the international application in electronic form.
      ☐ furnished subsequently to this Authority for the purposes of search.

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additioanl copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2013/023370

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-41	YES
	Claims	NONE	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	1-41	NO
Industrial applicability (IA)	Claims	1-41	YES
	Claims	NONE	NO

2. Citations and explanations :

Reference is made to the following documents:
D1: US 2010-0217099 A1 (STEVEN FRANCIS LEBOEUF et al.) 26 August 2010.
D2: US 2011-0301435 A1 (DAVID ALBERT et al.) 08 December 2011.
D3: JP 2002-191562 A (MATSUSHITA ELECTRIC IND. CO., LTD.) 09 July 2002.
D4: US 6319201 B1 (PETER J. WILK) 20 November 2001.
D5: US 2004-0220487 A1 (ANDREY VYSHEDSKIY et al.) 04 November 2004.

1. Novelty and Inventive Step

1.1 Claims 1-10

1.1.1 Independent claim 1

D1, which is considered to be the closest prior art to the subject matter of claim 1, discloses a medical device comprising: a physiological sensor; a signal processor configured to receive physical parameters, determine a representative value from the physical parameters, and digitally encode the representative value as a digital ultrasound signal; and a communication module comprising an ultrasound transmitter for transmitting the digital ultrasound signal, wherein the signal processor is configured to drive the communication module to transmit the digital ultrasound signal from the ultrasound transmitter (see paragraphs [0079]-[0085],[0092], figures 1,2 in D1). Claim 1 differs from D1 in the digital ultrasound signal which uses a first frequency and a second frequency and includes a header portion and a data portion. However, the digital ultrasound signal of claim 1 is merely a matter of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 1 would have been obvious over D1. Therefore, claim 1 lacks an inventive step under PCT Article 33(3).

1.1.2 Dependent claims 2-10

The additional feature of claim 2 is identical to the feature of D1 in blood pressure (see paragraph [0079] in D1). Accordingly, claim 2 would have been obvious over D1. Therefore, claim 2 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 3 is identical to the feature of D1 in a microprocessor (see paragraph [0055] in D1). Accordingly, claim 3 would have been obvious over D1. Therefore, claim 3 lacks an inventive step under PCT Article 33(3).

(Continued on Supplemental Box)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2013/023370

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The phrase "The device of claim 1" of claims 25-29 is considered to be a typo for "The device of claim 21" (PCT Article 6).

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of :

Box No. V

Claim 4 further specifies the first frequency which is 18.5 kHz and the second frequency which is 19.5 kHz. However, the additional features of claim 4 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 4 would have been obvious over D1. Therefore, claim 4 lacks an inventive step under PCT Article 33(3).

Claims 5 and 6 further specify digitally encoding the digital ultrasound signal. However, the additional features of claims 5 and 6 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claims 5 and 6 would have been obvious over D1. Therefore, claims 5 and 6 lack an inventive step under PCT Article 33(3).

Claim 7 further specifies a calibration tone. However, the additional feature of claim 7 is merely a matter of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 7 would have been obvious over D1. Therefore, claim 7 lacks an inventive step under PCT Article 33(3).

Claim 8 further specifies an error correction code portion. However, the additional feature of claim 8 is merely a matter of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 8 would have been obvious over D1. Therefore, claim 8 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 9 is identical to the feature of D1 in a speaker (see paragraph [0089] in D1). Accordingly, claim 9 would have been obvious over D1. Therefore, claim 9 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 10 is identical to the feature of D2 in piezoelectric buzzers (see paragraph [0033] in D2). Accordingly, claim 10 would have been obvious over D1 and D2. Therefore, claim 10 lacks an inventive step under PCT Article 33(3).

(Continued on Supplemental Box)

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of :

Box No. V

1.2 Claims 11-20
1.2.1 Independent claim 11
D1, which is considered to be the closest prior art to the subject matter of claim 11, discloses a system comprising: a monitoring device having a physiological sensor, a signal processor to receive physical parameters, determine a representative value from the physical parameters, and digitally encode the representative value as a digital ultrasound signal and a communication module for transmitting a digital ultrasound signal; and a specialized algorithm and software configured to be executed by a telecommunication device and to cause the telecommunication device to receive the digital ultrasound signal and extract the representative value of the physical parameter from the digital ultrasound signal (see paragraphs [0079]-[0085],[0092]-[0098],[0168], figures 1,2 in D1). Claim 11 differs from D1 in the digital ultrasound signal which uses a first frequency and a second frequency. However, the digital ultrasound signal of claim 11 is merely a matter of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 11 would have been obvious over D1. Therefore, claim 11 lacks an inventive step under PCT Article 33(3).

1.2.2 Dependent claims 12-20
The additional feature of claim 12 is identical to the feature of D1 in blood pressure (see paragraph [0079] in D1). Accordingly, claim 12 would have been obvious over D1. Therefore, claim 12 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 13 is identical to the feature of D1 in a microprocessor (see paragraph [0055] in D1). Accordingly, claim 13 would have been obvious over D1. Therefore, claim 13 lacks an inventive step under PCT Article 33(3).

Claim 14 further specifies the first frequency which is 18.5 kHz and the second frequency which is 19.5 kHz. However, the additional features of claim 14 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 14 would have been obvious over D1. Therefore, claim 14 lacks an inventive step under PCT Article 33(3).

Claims 15 and 16 further specify digitally encoding the digital ultrasound signal. However, the additional features of claims 15 and 16 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claims 15 and 16 would have been obvious over D1. Therefore, claims 15 and 16 lack an inventive step under PCT Article 33(3).

Claim 17 further specifies a calibration tone. However, the additional feature of claim 17 is merely a matter of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 17 would have been obvious over D1. Therefore, claim 17 lacks an inventive step under PCT Article 33(3).

(Continued on Supplemental Box)

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of :

Box No. V

Claim 18 further specifies a header portion, a data portion and an error correction code portion. However, the additional features of claim 18 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 18 would have been obvious over D1. Therefore, claim 18 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 19 is identical to the feature of D1 in a magnetic storage storing process executed by the telecommunication device (see paragraphs [0098]-[0108] in D1). Accordingly, claim 19 would have been obvious over D1. Therefore, claim 19 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 20 is identical to the feature of D2 in piezoelectric buzzers (see paragraph [0033] in D2). Accordingly, claim 20 would have been obvious over D1 and D2. Therefore, claim 20 lacks an inventive step under PCT Article 33(3).

1.3 Claims 21-29
1.3.1 Independent claim 21
D1, which is considered to be the closest prior art to the subject matter of claim 21, discloses a digital thermometer comprising: a temperature sensor for sensing a subject's temperature; a signal processor in communication with the temperature sensor and configured to generate a digital ultrasound signal of the subject's temperature; and a communication module comprising an ultrasound transmitter, wherein the signal processor is configured to drive the communication module to transmit the digital ultrasound signal from the ultrasound transmitter (see paragraphs [0012],[0079]-[0085],[0092], figures 1,2 in D1). Claim 21 differs from D1 in the digital ultrasound signal which uses a first frequency and a second frequency. However, the digital ultrasound signal of claim 21 is merely a matter of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 21 would have been obvious over D1. Therefore, claim 21 lacks an inventive step under PCT Article 33(3).

1.3.2 Dependent claims 22-29
The additional feature of claim 22 is identical to the feature of D1 in a microprocessor (see paragraph [0055] in D1). Accordingly, claim 22 would have been obvious over D1. Therefore, claim 22 lacks an inventive step under PCT Article 33(3).

Claim 23 further specifies the first frequency which is 18.5 kHz and the second frequency which is 19.5 kHz. However, the additional features of claim 23 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 23 would have been obvious over D1. Therefore, claim 23 lacks an inventive step under PCT Article 33(3).

(Continued on Supplemental Box)

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of :

Box No. V
Claims 25-29 are considered to be a dependent claims of claim 21(See Box VIII)
Claims 24 and 25 further specify digitally encoding the digital ultrasound signal. However, the additional features of claims 24 and 25 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claims 24 and 25 would have been obvious over D1. Therefore, claims 24 and 25 lack an inventive step under PCT Article 33(3).

Claim 26 further specifies a calibration tone. However, said feature is merely a matter of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 26 would have been obvious over D1. Therefore, claim 26 lacks an inventive step under PCT Article 33(3).

Claim 27 further specifies a header portion, a data portion and an error correction code portion. However, the additional features of claim 27 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 27 would have been obvious over D1. Therefore, claim 27 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 28 is identical to the feature of D1 in a speaker (see paragraph [0089] in D1). Accordingly, claim 28 would have been obvious over D1. Therefore, claim 28 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 29 is identical to the feature of D2 in piezoelectric buzzers (see paragraph [0033] in D2). Accordingly, claim 29 would have been obvious over D1 and D2. Therefore, claim 29 lacks an inventive step under PCT Article 33(3).

1.4 Claims 30-40
1.4.1 Independent claim 30
D1, which is considered to be the closest prior art to the subject matter of claim 30, discloses a method comprising: sensing a physical parameter from a subject; determining a representative value from the physical parameter; digitally encoding the representative value as a digital ultrasound signal; and driving a communication module near a subject to transmit the digital ultrasound signal (see paragraphs [0055],[0079]-[0085],[0092]-[0098], figures 1,2 in D1). Claim 30 differs from D1 in the digital ultrasound signal using a first frequency and a second frequency, and the frequencies comprising inaudible ultrasound. However, the digital ultrasound signal and the frequencies of claim 30 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 30 would have been obvious over D1. Therefore, claim 30 lacks an inventive step under PCT Article 33(3).

(Continued on Supplemental Box)

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of :

Box No. V

1.4.2 Dependent claims 31-40
The additional feature of claim 31 is identical to the feature of D1 in blood pressure (see paragraph [0079] in D1). Accordingly, claim 31 would have been obvious over D1. Therefore, claim 31 lacks an inventive step under PCT Article 33(3).

The additional feature of claim 32 is identical to the feature of D1 in a single average pulse-rate (see paragraph [0047] in D1). Accordingly, claim 32 would have been obvious over D1. Therefore, claim 32 lacks an inventive step under PCT Article 33(3).

Claims 33 and 34 further specify digitally encoding the representative value. However, the additional features of claims 33 and 34 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claims 33 and 34 would have been obvious over D1. Therefore, claims 33 and 34 lack an inventive step under PCT Article 33(3).

Claim 35 further specifies the first and second frequencies which are each greater than 17 kHz. However, the additional feature of claim 35 is merely a matter of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 35 would have been obvious over D1. Therefore, claim 35 lacks an inventive step under PCT Article 33(3).

Claims 36 and 37 further specify digitally encoding the digital ultrasound signal. However, the additional features of claims 36 and 37 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claims 36 and 37 would have been obvious over D1. Therefore, claims 36 and 37 lack an inventive step under PCT Article 33(3).

Claim 38 further specifies a calibration tone. However, the additional feature of claim 38 is merely a matter of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 38 would have been obvious over D1. Therefore, claim 38 lacks an inventive step under PCT Article 33(3).

Claims 39 and 40 further specify repeatedly driving an ultrasound transducer. However, the additional features of claims 39 and 40 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claims 39 and 40 would have been obvious over D1. Therefore, claims 39 and 40 lack an inventive step under PCT Article 33(3).

(Continued on Supplemental Box)

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of :

Box No. V

1.5 Claim 41
D1, which is considered to be the closest prior art to the subject matter of claim 41, discloses an integrated processor comprising: a magnetic storage storing process for receiving a value, digitally encoding the value as a digital ultrasound signal, wherein the digital ultrasound signal is encoded, and a telecommunication device comprising an ultrasound transmitter for transmitting the digital ultrasound signal (see paragraphs [0079]-[0085],[0092]-[0098],[0168], figures 1,2 in D1). Claim 41 differs from D1 in that the digital ultrasound signal uses a first frequency and a second frequency and includes a header portion and a data portion, and the frequencies comprising inaudible ultrasound. However, the digital ultrasound signal and the frequencies of claim 41 are merely matters of design option when the general knowledge in the relevant field of the art is used. Accordingly, claim 41 would have been obvious over D1. Therefore, claim 41 lacks an inventive step under PCT Article 33(3).

2. Industrial Applicability
Claims 1-41 are industrially applicable under PCT Article 33(4).

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 12212-702.600	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. **PCT/US2013/057576**	International filing date *(day/month/year)* **30 August 2013 (30.08.2013)**	(Earliest) Priority Date *(day/month/year)* 30 August 2012 (30.08.2012)
Applicant **ALIVECOR, INC.**		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of **3** sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language**, the international search was carried out on the basis of :
      ☒ the international application in the language in which it was filed
      ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.
2. ☐ **Certain claims were found unsearchable** (See Box No. II)
3. ☐ **Unity of invention is lacking** (See Box No. III)
4. With regard to the **title,**
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established by this Authority to read as follows:
5. With regard to the **abstract,**
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. With regard to the drawings,
   a. the figure of the **drawings** to be published with the abstract is Figure No. **7**
      ☐ as suggested by the applicant.
      ☒ as selected by this Authority, because the applicant failed to suggest a figure.
      ☐ as selected by this Authority, because this figure better characterizes the invention.
   b. ☐ none of the figure is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/057576

A. CLASSIFICATION OF SUBJECT MATTER

A61B 5/0402(2006.01)i, A61B 5/0404(2006.01)i, A61B 5/0432(2006.01)i

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 5/0402; A61B 5/02; A61B 5/053; A61N 1/368; A61B 5/00; A61B 5/0432; A61B 5/0404

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: heart activity, seismocardiogram, electrocardiogram, smart phone and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ANH DINH, `Heart Activity Monitoring on Smartphone`, International Conf. on Biomedical Engineering and Technology, vol. 11, 2011, pages 45 - 49 See abstract, page 45 - page 49, and figures 1 - 5(b).	1-2,4-6,9-12,16-18,22-26,29-30
A		3,7-8,13-15,19-21,27-28
A	US 2011-0301435 A1 (DAVID ALBERT et al.) 08 December 2011 See paragraphs [0009]-[0017], [0028]-[0032], [0038], claim 1, and figures 1-3.	1-30
A	US 2009-0024045 A1 (RAJAN PRAKASH et al.) 22 January 2009 See paragraphs [0046]-[0055], claim 1, and figures 3-5.	1-30
A	US 2006-0190045 A1 (FRANK I. MARCUS et al.) 24 August 2006 See paragraphs [0039]-[0070], claim 1, and figures 1, 3-4.	1-30
A	US 2008-0009759 A1 (SCOTT MATTHEW CHETHAM) 10 January 2008 See paragraphs [0075]-[0084], [0088]-[0091], [0124]-[0127], [0133]-[0137], claim 1, and figures 6A-6C, 11.	1-30

☐ 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 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
10 December 2013 (10.12.2013)	**10 December 2013 (10.12.2013)**

Name and mailing address of the ISA/KR
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea
Facsimile No. +82-42-472-7140

Authorized officer
KIM, Tae Hoon
Telephone No. +82-42-481-8407

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2013/057576

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011-0301435 A1	08/12/2011	EP 2579773 A2	17/04/2013
		JP 2013-531522 A	08/08/2013
		US 8509882 B2	13/08/2013
		WO 2011-156374 A2	15/12/2011
		WO 2011-156374 A3	12/04/2012
US 2009-0024045 A1	22/01/2009	US 8340750 B2	25/12/2012
		WO 2009-012030 A1	22/01/2009
US 2006-0190045 A1	24/08/2006	EP 1660174 A2	31/05/2006
		JP 2007-500550 A	18/01/2007
		US 2006-0095085 A1	04/05/2006
		US 6978184 B1	20/12/2005
		WO 2005-011475 A2	10/02/2005
		WO 2005-011475 A3	30/06/2005
US 2008-0009759 A1	10/01/2008	AU 2005-253651 A1	29/12/2005
		AU 2008-275068 A1	15/01/2009
		AU 2008-275068 B2	05/07/2012
		CA 2572206 A1	29/12/2005
		CA 2692795 A1	15/01/2009
		EP 1768552 A1	04/04/2007
		EP 2178434 A1	28/04/2010
		JP 2008-503277 A	07/02/2008
		JP 2010-533040 A	21/10/2010
		US 2009-0082679 A1	26/03/2009
		US 2012-0071772 A1	22/03/2012
		US 8068906 B2	29/11/2011
		US 8509886 B2	13/08/2013
		WO 2005-122881 A1	29/12/2005
		WO 2009-009616 A1	15/01/2009

PATENT COOPERATION TREATY

ADVANCE E-MAIL

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING TRANSMITTAL OF COPY OF INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (CHAPTER I OF THE PATENT COOPERATION TREATY)
(PCT Rule 44bis.1(c))

To:
AliveCor 41188-716.601
VN1; DJCH; UMG; LKIM; DG8; ANNA

GREENWALD, Uri, M.
Wilson Sonsini Goodrich & Rosati
650 Page Mill Road
Palo Alto, CA 94304
ETATS-UNIS D'AMERIQUE

Date of mailing *(day/month/year)* 17 March 2016 (17.03.2016)	
Applicant's or agent's file reference 41188-716601	**IMPORTANT NOTICE**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2014/054414	05 September 2014 (05.09.2014)	06 September 2013 (06.09.2013)

Applicant
ALIVECOR, INC.

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 82 70

Authorized officer
Yukari Nakamura

e-mail: pt07.pct@wipo.int

Form PCT/IB/326 (January 2004)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference 41188-716601	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2014/054414	International filing date *(day/month/year)* 05 September 2014 (05.09.2014)	Priority date *(day/month/year)* 06 September 2013 (06.09.2013)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant ALIVECOR, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☒	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 08 March 2016 (08.03.2016)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 338 82 70	Authorized officer Yukari Nakamura e-mail: pt07.pct@wipo.int

Form PCT/IB/373 (January 2004)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: URI M. GREENWALD
WILSON SONSINI GOODRICH & ROSATI
650 PAGE MILL ROAD
PALO ALTO, CA 94304

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)*	12 FEB 2015
Applicant's or agent's file reference 41188-716601	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2014/054414	05 September 2014	06 September 2013

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - A61B 5/00 (2014.01)
CPC - A61B5/0006 (2014.14)

Applicant ALIVECOR, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 *bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	20 January 2015	Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/237 (cover sheet) (July 2011)

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2014/054414

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
   - ☒ the international application in the language in which it was filed.
   - ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing filed or furnished:
   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 purposes of search

4. ☐ In addition, in the case that more than one version or copy of a sequence listing 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.

5. Additional comments:

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2014/054414

Box No. IV Lack of unity of invention

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:

   ☐ paid additional fees.

   ☐ paid additional fees under protest and, where applicable, the protest fee.

   ☐ paid additional fees under protest but the applicable protest fee was not paid.

   ☒ not paid additional fees.

2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

   ☐ complied with.

   ☒ not complied with for the following reasons:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-8, drawn to an electrocardiogram (ECG) sensing device.
Group II, claims 9-18, drawn to an ECG sensing system.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: said ECG sensing device comprising a base unit; a universal coupler; and an ECG module removably and universally couplable to said base unit via said universal coupler as claimed therein is not present in the invention of Group II. The special technical feature of the Group II invention: an ECG module comprising a conductive contact surface for contacting a skin surface of a subject; and an elevated portion having a height that projects above the height of said conductive contact surface as claimed therein is not present in the invention of Group I.

Groups I and II lack unity of invention because even though the inventions of these groups require the technical feature of an ECG sensing system comprising a mobile computing device and an ECG module, this technical feature is not a special technical feature as it does not make a contribution over the prior art.

Specifically, WO 2013/003852 A1 (COULT et al) 03 January 2013 (03.01.2013) teaches an ECG sensing system comprising a mobile computing device and an ECG module (systems of analyzing electrocardiograms to detect ventricular fibrillation, para. 0011. An electrocardiogram system 100 includes a cardiac monitor 110 coupled to a patient 150 by means of two or more electrodes 102 coupled to the monitor 110 with wires 104. The monitor 110 then may carry the signal to a processor 120, which can be part of any mobile computing device , para. 0013-0014).

Since none of the special technical features of the Group I or II inventions are found in more than one of the inventions, unity of invention is lacking.

4. Consequently, this opinion has been established in respect of the following parts of the international application:

   ☐ all parts.

   ☒ the parts relating to claims Nos. 1-8

Form PCT/ISA/237 (Box No. IV) (July 2011).

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2014/054414

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	6-8	YES
	Claims	1-5	NO
Inventive step (IS)	Claims	None	YES
	Claims	1-8	NO
Industrial applicability (IA)	Claims	1-8	YES
	Claims	None	NO

2. Citations and explanations:

Claims 1-5 lack novelty under PCT Article 33(2) as being anticipated by Solosko et al., hereinafter reffered to as Solosko.

Regarding claim 1, Solosko discloses an electrocardiogram (ECG) sensing device for use with a mobile computing device (ECG monitoring system with cellphone handset, abstract), said ECG sensing device comprising a base unit (base unit 100, [0060]); a universal coupler (cable 92 and plug 94 for connecting the handset 50. Base unit 100 couples with the monitor, [0060]); and an ECG module removably and universally couplable to said base unit via said universal coupler (ECG monitor removably couplable to the base unit 100 through electrical contacts 36, [0060]).

Regarding claim 2, Solosko discloses the device, wherein said ECG module comprises a conductive contact surface (electrode patch 20 suitable for use with a wireless ECG monitor, [0050]), wherein said ECG module generates a signal in response to said conductive contact surface contacting a skin surface of a subject (electrode patch 20 is worn on the skin of a subject. Electrical signals received at the three electrode pads s1, s2 and s3 are coupled to electrical contacts on the outward-facing side of the patch by a flex circuit layer as described in the parent application and the signals so provided are used to form three ECG lead vectors, Fig.1, Fig.2, [0050]), and a wireless transmitter for wirelessly transmitting said signal to said computing device (transmit/receive controller 218 and Bluetooth radio 220. Data is transmitted to the cellphone handset 50, [0063]).

Regarding claim 3, Solosko discloses the device, wherein said signal is one or more of a radio signal, a microwave signal, visible light signal, an infrared signal, a sonic signal, an ultrasonic signal, an electromagnetic induction signal, a WiFi signal, a ZigBee signal, a Bluetooth signal, a Bluetooth LE signal, or a wireless signal (ECG monitor 30 and the cellphone handset 50 communicate with each other via wireless Bluetooth radio, [0057]).

Regarding claim 4, Solosko discloses the device, wherein said universal coupler comprises an opening through the base unit sized such that said ECG module may extend partially therethrough, said opening having an edge region configured to engage a periphery of said ECG module (the monitor 30 is placed in its form-fitting space inside the base unit 100 as shown in FIG. 10 with its electrical contacts 36 facing downward. The space is keyed so that the monitor will only fit in the space when an LED 104 is positioned in the notch 34 of the monitor. With the lid 102 open as shown in the drawing, the monitor rests lightly on elastomeric charging contacts underneath the monitor. In other embodiments the contacts may be spring-loaded pins, [0060]).

Regarding claim 5, Solosko disloses the device, wherein said mobile computing device comprises a smartphone (the cellphone handset 50 includes a standard commercially available "smart phone" cellphone 52, [0053]).

Claim 6 lacks an inventive step under PCT Article 33(3) as being obvious over Solosko in view of Albert et al., hereinafter referred to as Albert.

Regarding claim 6, Solosko lacks in the teaching of the device, wherein said mobile computing device comprises a tablet computer. Albert is in the field of ECG devices (an ECG device, Col.2 ln.44-48) and discloses wherein said mobile computing device comprises a tablet computer (the ultrasonic signals can be received by, for example, a microphone 25 in a computing device 16 such as a smartphone 30, personal digital assistant (PDA), tablet personal computer, pocket personal computer, notebook computer, desktop computer, server computer, and the like, Col.6 ln.55-59). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Albert in the invention of Solosko. The motivation would have been to improve the versatility of the system by allowing the computing device to be a tablet computer.

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US2014/054414

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:

Claim 7 lacks an inventive step under PCT Article 33(3) as being obvious over Solosko in view of Kelley.

Regarding claim 7, Solosko lacks in the teaching of the device, wherein said mobile computing device comprises a smart watch. Kelley is in the field of heart monitoring sensors (abstract, [0030]) and discloses wherein said mobile computing device comprises a smart watch (in one embodiment of this device, the patient worn modules could be implemented with the Sony Ericsson SmartWatch, and the controller could be implemented with the Sony Ericsson Xperia mini pro smart phone., [0175-0176]). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Kelley in the invention of Solosko. The motivation would have been to improve the versatility of the system by allowing the computing device to be a smartwatch.

Claim 8 lacks an inventive step under PCT Article 33(3) as being obvious over Solosko in view of Bell.

Regarding claim 8, Solosko lacks in the teaching of the device, wherein said mobile computing device comprises a wearable computer. Bell is in the field of wearable electronic systems for medical sensors (abstract) and discloses wherein said mobile computing device comprises a wearable computer (FIG. 1 shows a wearable electronic health 1. This includes sensors, electrode modules, electronic control circuits, and control modules, [0038]). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Bell in the invention of Solosko. The motivation would have been to improve the versatility of the system by allowing the computing device to be a wearable computer.

Claims 1-8 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	Ravi GOPALAKRISHNAN et al.	Group Art Unit:	3762
Serial Number:	14/730,122	Examiner:	Nicole Lavert
Filing or 371 (c) Date:	2015-06-03	**CONFIRMATION NO:**	**2113**
Title:	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING		

FILED ELECTRONICALLY ON: May 3, 2016

Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR § 1.97

Commissioner for Patents:

An Information Disclosure Statement along with attached PTO/SB/08 is hereby submitted. A copy of each listed publication is submitted, if required, pursuant to 37 CFR §§1.97-1.98, as indicated below.

The Examiner is requested to review the information provided and to make the information of record in the above-identified application. The Examiner is further requested to initial and return the attached PTO/SB/08 in accordance with MPEP § 609.

The right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered, is hereby reserved.

This statement is not intended to represent that a search has been made or that the information cited in the statement is, or is considered to be, prior art or material to patentability as defined in § 1.56.

A. ☐ *37 CFR § 1.97 (b).* This Information Disclosure Statement should be considered by the Office because:

☐ (1) It is being filed within 3 months of the filing date of a national application and is other than a continued prosecution application under § 1.53 (d);

-- OR --

☐ (2) It is being filed within 3 months of entry of the national stage as set forth in § 1.491 in an international application;

-- OR --

☐ (3) It is being filed before the mailing of a first Office action on the merits;

-- OR --

☐ (4) It is being filed before the mailing of a first Office action after the filing of a request for continued examination under § 1.114.

B. ☒ *37 CFR § 1.97(c).* Although this Information Disclosure Statement is being filed after the period specified in *37 CFR § 1.97(b),* above, it is filed before the mailing date of the earlier of (1) a final office action under § 1.113, (2) a notice of allowance under § 1.311, or (3) an action that otherwise closes prosecution on the merits, this Information Disclosure Statement should be considered because it is accompanied by one of:

☐ a statement as specified in §1.97 (e) provided concurrently herewith;

-- OR --

☒ a fee of $180.00 as set forth in § 1.17 (p) authorized below, enclosed, or included with the payment of other papers filed together with this statement.

C. ☐ *37 CFR § 1.97 (d).* Although this Information Disclosure Statement is being filed after the mailing date of the earlier of (1) a final office action under § 1.113 or (2) a notice of allowance under § 1.311, it is being filed before payment of the issue fee and should be considered because it is accompanied by:

i. a statement as specified in § 1.97 (e);

-- AND --

ii. a fee of $180.00 as set forth in §1.17(p) is authorized below, enclosed, or included with the payment of other papers filed together with this Statement.

D. ☐ *37 CFR §1.97 (e).* Statement.

☐ A statement is provided herewith to satisfy the requirement under 37 CFR §§ 1.97 (c);

-- AND/OR --

☐ A statement is provided herewith to satisfy the requirement under 37 CFR §§ 1.97 (d);

-- AND/OR --

☐ A copy of a dated communication from a foreign patent office clearly showing that the information disclosure statement is being submitted within 3 months of the filing date on the communication is provided in lieu of a statement under 37 C.F.R. § 1.97(e) (1) as provided for under MPEP 609.04(b) V.

E. ☐ *Statement Under 37 C.F.R. §1.704(d).* Each item of information contained in the information disclosure statement was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office or is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office that was received by an individual designated in § 1.56(c) not more than thirty (30) days prior to the filing of this information disclosure statement. This statement is made pursuant to the requirements of 37 C.F.R. §1.704(d) to avoid reduction of the period of adjustment of the patent term for Applicant(s) delay.

F. ☒ *37 CFR §1.98 (a) (2).* The content of the Information Disclosure Statement is as follows:

☐ Copies of each of the references listed on the attached Form PTO/SB/08 are enclosed herewith.

-- OR --

☒ Copies of U.S. Patent Documents (issued patents and patent publications) listed on the attached Form PTO/SB/08 is NOT enclosed.

-- AND/OR --

☒ Copies of Foreign Patent Documents and/or Non Patent Literature Documents listed on the attached Form PTO/SB/08 are enclosed in accordance with 37 CFR §1.98 (a)(2).

-- AND/OR --

☐ Copies of pending unpublished U.S. patent applications are enclosed in accordance with 37 CFR §1.98 (a) (2) (iii).

G. ☐ *37 CFR §1.98(a)(3).* The Information Disclosure Statement includes non-English patents and/or references.

☐ Pursuant to 37 CFR §1.98(a)(3)(i), a concise explanation of the relevance of each patent, publication or other information provided that is not in English is provided herewith.

☐ Pursuant to MPEP 609(B), an English language copy of a foreign search report is submitted herewith to satisfy the requirement for a concise explanation where non-English language information is cited in the search report.

-- OR --

☐ A concise explanation of the relevance of each patent, publication or other information provided that is not in English is as follows: _____

☐ Pursuant to 37 CFR §1.98(a) (3) (ii), a copy of a translation, or a portion thereof, of the non-English language reference(s) is provided herewith.

H. ☐ *37 CFR §1.98(d).* Copies of patents, publications and pending U.S. patent applications, or other information specified in 37 C.F.R. § 1.98(a) are not provided herewith because:

☐ Pursuant to 37 CFR §1.98(d)(1) the information was previously submitted in an Information Disclosure Statement, or cited by examiner for another application under which this application claims priority for an earlier effective filing date under 35 U.S.C. 120.

Application in which the information was submitted: _____

Information Disclosure Statement(s) filed on: _____

AND

☐ The information disclosure statement submitted in the earlier application complied with paragraphs (a) through (c) of 37 CFR §1.98.

I. ☒ *Fee Authorization*. The Commissioner is hereby authorized to charge the above-referenced fees of $180.00 and charge any additional fees or credit any overpayment associated with this communication to Deposit Account No. 23-2415 (Docket No. 41188-720.301).

Respectfully submitted,

WILSON SONSINI GOODRICH & ROSATI

Dated: May 3, 2016

By: /Uri Greenwald/
Uri Greenwald, Reg. No. 72686

650 Page Mill Road
Palo Alto, CA 94304-1050
(650) 493-9300
Customer No. 21971

PTO/AIA/01 (08-12)
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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 14/569,513

filed on December 12, 2014

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Ravi GOPALAKRISHNAN Date (Optional): _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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LEGAL NAME OF INVENTOR

Inventor: Lev KORZINOV Date (Optional): 12/31/2015

Signature: [signature]

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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LEGAL NAME OF INVENTOR

Inventor: Fei WANG Date (Optional):

Signature:

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

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LEGAL NAME OF INVENTOR

Inventor: Euan THOMSON Date (Optional): _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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This declaration is directed to:

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☒ United States application or PCT international application number 14/569,513 filed on December 12, 2014.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

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LEGAL NAME OF INVENTOR

Inventor: Nupur SRIVASTAVA Date (Optional): _____

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

PTO/AIA/01 (06-12)
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING

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LEGAL NAME OF INVENTOR

Inventor: Iman ABUZEID Date (Optional): August 11, 2015

Signature:

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 14/569,513

filed on December 12, 2014

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

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LEGAL NAME OF INVENTOR

Inventor: David E. ALBERT Date (Optional): 6/8/2015

Signature: David Albert

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

Doc code: Oath
Document Description: Oath or declaration filed

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SUBSTITUTE STATEMENT IN LIEU OF AN OATH OR DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (35 U.S.C. 115(d) AND 37 CFR 1.64)

Title of Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING

This statement is directed to:

☐ The attached application,

OR

☒ United States application or PCT international application number 14/730,122 filed on June 3, 2015.

LEGAL NAME of inventor to whom this substitute statement applies:

(*E.g.*, Given Name (first and middle (if any)) and Family Name or Surname)

Omar DAWOOD

Residence (except for a deceased or legally incapacitated inventor):

City	State	Country
San Francisco	CA	USA

Mailing Address (except for a deceased or legally incapacitated inventor):

30 Maiden Lane

City	State	Zip	Country
San Francisco	CA	94108	USA

I believe the above-named inventor or joint inventor to be the original inventor or an original joint inventor of a claimed invention in the application.

The above-identified application was made or authorized to be made by me.

I hereby acknowledge that any willful false statement made in this statement is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

Relationship to the inventor to whom this substitute statement applies:

- ☐ Legal Representative (for deceased or legally incapacitated inventor only),
- ☒ Assignee,
- ☐ Person to whom the inventor is under an obligation to assign,
- ☐ Person who otherwise shows a sufficient proprietary interest in the matter (petition under 37 CFR 1.46 is required), or
- ☐ Joint Inventor.

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SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

- ☐ Inventor is deceased,
- ☐ Inventor is under legal incapacity,
- ■ Inventor cannot be found or reached after diligent effort, or
- ☐ Inventor has refused to execute the oath or declaration under 37 CFR 1.63.

If there are joint inventors, please check the appropriate box below:

- ■ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) naming the entire inventive entity has been or is currently submitted.

OR

- ☐ An application data sheet under 37 CFR 1.76 (PTO/AIA/14 or equivalent) has not been submitted. Thus, a Substitute Statement Supplemental Sheet (PTO/AIA/11 or equivalent) naming the entire inventive entity and providing inventor information is attached. See 37 CFR 1.64(b).

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: Dave Albert | Date (Optional): 3/23/2016

Signature: David Albert

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

If the applicant is a juristic entity, list the applicant name and the title of the signer:

Applicant Name: AliveCor, Inc.

Title of Person Executing This Substitute Statement: Chief Medical Officer

The signer, whose title is supplied above, is authorized to act on behalf of the applicant.

Residence of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent):

City San Francisco | State CA | Country USA

Mailing Address of the signer (unless provided in an application data sheet, PTO/AIA/14 or equivalent)

30 Maiden Lane

City San Francisco | State CA | Zip 94108 | Country USA

Note: Use an additional PTO/AIA/02 form for each inventor who is deceased, legally incapacitated, cannot be found or reached after diligent effort, or has refused to execute the oath or declaration under 37 CFR 1.63.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	14730122
Filing Date:	03-Jun-2015
Title of Invention:	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING
First Named Inventor/Applicant Name:	Ravi GOPALAKRISHNAN
Filer:	Uri M. Greenwald/Lora Kim
Attorney Docket Number:	41188-720.301

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Late Filing Fee for Oath or Declaration	1051	1	140	140
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**140**

Electronic Acknowledgement Receipt	
EFS ID:	25344994
Application Number:	14730122
International Application Number:	
Confirmation Number:	2113
Title of Invention:	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING
First Named Inventor/Applicant Name:	Ravi GOPALAKRISHNAN
Customer Number:	21971
Filer:	Uri M. Greenwald/Lora Kim
Filer Authorized By:	Uri M. Greenwald
Attorney Docket Number:	41188-720.301
Receipt Date:	30-MAR-2016
Filing Date:	03-JUN-2015
Time Stamp:	13:37:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$140
RAM confirmation Number	25653
Deposit Account	232415
Authorized User	KIM, LORA
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Oath or Declaration filed	41188_720301_Declaration_720201_signed.pdf	3671356 302ad8ecf5d90921925fdf29d74832bc8689962a	no	7
Warnings:					
Information:					
2	Oath or Declaration filed	41188_720301_SubstituteStatement_signed.pdf	255929 4cfc717a78a71109f215342f0f47a952ff1f8571	no	3
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30443 4f71b8418785b3bec57330e8cc89d6f606c202a9	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3957728		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/730,122	06/03/2015	Ravi GOPALAKRISHNAN	41188-720.301	2113

21971 7590 02/24/2016

WILSON, SONSINI, GOODRICH & ROSATI
650 PAGE MILL ROAD
PALO ALTO, CA 94304-1050

EXAMINER	
LAVERT, NICOLE F	

ART UNIT	PAPER NUMBER
3762	

NOTIFICATION DATE	DELIVERY MODE
02/24/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@wsgr.com

Office Action Summary	Application No. 14/730,122	Applicant(s) GOPALAKRISHNAN ET AL.	
	Examiner NICOLE F. LAVERT	Art Unit 3762	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *6/3/15*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-20* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

Oath/Declaration

The examiner notes that there is no executed oath/declaration within the application filed. Please correct.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the claims at issue are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the reference application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope

of a joint research agreement. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO internet Web site contains terminal disclaimer forms which may be used. Please visit http://www.uspto.gov/forms/. The filing date of the application will determine what form should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

3. Claims 1-20 are provisionally rejected on the ground of nonstatutory double patenting over claims 21-37 & 69-72 of copending Application No. 14,569513. This is a provisional double patenting rejection because the patentably indistinct claims have not in fact been patented.

The subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be covered by any patent granted on that copending application since the referenced copending application and the instant application are claiming common subject matter, as follows: a method comprising sensing a heart rate of a first user with a heart rate sensor and determining a heart rate variability of said first user based on said transmitted heart rate.

Furthermore, there is no apparent reason why applicant would be prevented from presenting claims corresponding to those of the instant application in the other copending application. See *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968). See also MPEP § 804.

Claim Rejections - 35 USC § 102

1. In the event the determination of the status of the application as subject to AIA 35 U.S.C. 102 and 103 (or as subject to pre-AIA 35 U.S.C. 102 and 103) is incorrect, any correction of the statutory basis for the rejection will not be considered a new ground of rejection if the prior art relied upon, and the rationale supporting the rejection, would be the same under either status.

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a)(2) the claimed invention was described in a patent issued under section 151, or in an application for patent published or deemed published under section 122(b), in which the patent or application, as the case may be, names another inventor and was effectively filed before the effective filing date of the claimed invention.

3. **Claims 1-20** are rejected under 35 U.S.C. 102(a)(2) as being anticipated by Levitan et al. (US 2012/0197148).

Levitan et al. discloses a method and a system of determining a presence of an arrhythmia of a first user, said method comprising (e.g., [0013]-[0019]) sensing a heart rate of said first user with a heart rate sensor, (e.g., via the disclosed means of 'data collection' 24); coupled to said first user; transmitting said heart rate of said first user to a mobile computing device, wherein said mobile computing device is configured to sense an electrocardiogram; determining, using said mobile computing device (e.g., via the disclosed external device), a heart rate variability of said first user based on said transmitted heart rate of said first user; and alerting said first user to sense an electrocardiogram of said first user, using said mobile computing device, in response to an irregularity in said heart rate variability [e.g., via the disclosed means of

calculating/generating a HRV relative density parameter (RD)] in response to said determined HRV value {e.g., [0056]-[0059] & (Figs 2-3)}.

Further comprising receiving biometric data of said first user from a biometric sensor coupled to said first user (e.g., via the disclosed 'data collection 24').

Further comprising determining a presence of said arrhythmia using a machine learning algorithm [e.g., 0067].

Wherein said heart rate sensor is in communication with a portable computing device (e.g., via the disclosed external device), i.e., a smartphone, smartwatch, and/or wearable computing device, further comprising a processor and display [e.g., 0091].

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NICOLE F. LAVERT whose telephone number is (571)270-5040. The examiner can normally be reached on M-F 7:30-5:00p.m. (alt. fridays).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christopher Koharski can be reached on 571-272-7230. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NICOLE F. LAVERT/
Primary Examiner, Art Unit 3762

Notice of References Cited	Application/Control No. 14/730,122	Applicant(s)/Patent Under Reexamination GOPALAKRISHNAN ET AL.	
	Examiner NICOLE F. LAVERT	Art Unit 3762	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2012/0197148 A1	08-2012	LEVITAN; JACOB	A61B5/02405	600/515
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 51

Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	001	US-UD341659	11-23-1993	HOMAYOUN, HABIB ; MEEHAN, HOWARD M. ; BEDIENT, ROBERT A. ; PIERCE, KENNETH H.	
	002	US-UD372785	08-13-1996	SABRI, MOHAMED ; PORTNUFF, COLIN M.	
	003	US-UD377983	02-11-1997	SABRI, MOHAMED ; PORTNUFF, COLIN M. ; RAE, JOHN R. ; HOMAYOUN, HABIB ; SEMLER, SHIRLEY L. ; SEMLER, HERBERT J.	
	004	US-UD414870	10-05-1999	SALTZSTEIN, WILLIAM E. ; SABRI, MOHAMED ; BURKHART, SCOTT M. ; SEMLER, GREGORY T.	
	005	US-D427315	06-27-2000	SALTZSTEIN, WILLIAM E. ; SABRI, MOHAMED ; BURKHART, SCOTT M. ; SEMLER, GREGORY T.	
	006	US-3717857	02-20-1973	EVANS J; Us	
	007	US-3731311	05-01-1973	WILLIAMS F; Us	
	008	US-3768014	10-23-1973	SMITH; Jus et al.	
	009	US-3776228	12-04-1973	SEMLER H; Us	
	010	US-3779237	12-18-1973	ROTH; Aus et al.	
	011	US-3779249	12-18-1973	SEMLER H; Us	

Examiner Signature	/Nicole Lavert/	Date Considered	02/17/2016

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.L./

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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 2 of 51

Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	012	US-3782367	01-01-1974	HOCHBERG; Hus et al.	
	013	US-3805227	04-16-1974	LESTER R; Us	
	014	US-3882277	05-06-1975	DEPEDRO; Donald et al.	
	015	US-3885552	05-27-1975	KENNEDY; James R.	
	016	US-3898984	08-12-1975	MANDEL; Louis et al.	
	017	US-3909599	09-30-1975	TROTT Jr.; Wayne B. et al.	
	018	US-4027146	05-31-1977	GILMORE; Charles Minot	
	019	US-4045767	08-30-1977	NISHIHARA; Motohisa et al.	
	020	US-4083366	04-11-1978	GOMBRICH; Peter P. et al.	
	021	US-4095050	06-13-1978	BEACHEM; Ronald et al.	
	022	US-4221223	09-09-1980	LINDEN; Rolf W.	
	023	US-4230127	10-28-1980	LARSON; Lary R.	
	024	US-4231031	10-28-1980	CROWTHER; Gerald O. et al.	
	025	US-4250888	02-17-1981	GROSSKOPF; Rudolf	
	026	US-4281664	08-04-1981	DUGGAN; Stephen R.	
	027	US-4295472	10-20-1981	ADAMS; John M.	
	028	US-4312358	01-26-1982	BARNEY; George M.	
	029	US-4318130	03-02-1982	HEUER; Daniel A.	
	030	US-4364397	12-21-1982	CITRON; Paul et al.	

Examiner Signature	/Nicole Lavert/	Date Considered	02/17/2016

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /N.L./

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Sheet 3 of 51

Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	031	US-4367752	01-11-1983	JIMENEZ; Oscar et al.	
	032	US-4409984	10-18-1983	DICK; Joseph B.	
	033	US-4531527	07-30-1985	REINHOLD Jr.; Herbert E. et al.	
	034	US-4567883	02-04-1986	LANGER; Alois A. et al.	
	035	US-4572182	02-25-1986	ROYSE; Suzanne M.	
	036	US-4580250	04-01-1986	KAGO; Yoshiyuki et al.	
	037	US-4583553	04-22-1986	SHAH; Atul P. et al.	
	038	US-4622979	11-18-1986	KATCHIS; Louis J. et al.	
	039	US-4625730	12-02-1986	FOUNTAIN; Glen H. et al.	
	040	US-4803625	02-07-1989	FU; Ping W. et al.	
	041	US-4889131	12-26-1989	SALEM; Robert J. et al.	
	042	US-4920489	04-24-1990	HUBELBANK; Mark et al.	
	043	US-4938228	07-03-1990	RIGHTER; William H. et al.	
	044	US-4938229	07-03-1990	BERGELSON; Michael N. et al.	
	045	US-4958641	09-25-1990	DIGBY; Dennis et al.	
	046	US-4977899	12-18-1990	DIGBY; Dennis et al.	
	047	US-4981141	01-01-1991	SEGALOWITZ; Jacob	
	048	US-5012814	05-07-1991	MILLS; Gary N. et al.	
	049	US-5023906	06-11-1991	NOVAS; Robert G.	

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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
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Attorney Docket Number	41188-720.301

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	050	US-5025794	06-25-1991	ALBERT; David E. et al.	
	051	US-5058597	10-22-1991	ONODA; Masahiro et al.	
	052	US-5090418	02-25-1992	SQUIRES; Wilber D. et al.	
	053	US-5111396	05-05-1992	MILLS; Gary N. et al.	
	054	US-5128552	07-07-1992	FANG; William et al.	
	055	US-5136555	08-04-1992	GARDOS , I; Van	
	056	US-5181552	01-26-1993	EIERMANN; Kenneth L.	
	057	US-5191891	03-09-1993	RIGHTER; William H.	
	058	US-5201321	04-13-1993	FULTON; Keith W.	
	059	US-5218969	06-15-1993	BREDESEN; Mark S. et al.	
	060	US-5226424	07-13-1993	BIBLE; Christopher T.	
	061	US-5238001	08-24-1993	GALLANT; Stuart L. et al.	
	062	US-5259387	11-09-1993	DEPINTO; Victor M.	
	063	US-5301679	04-12-1994	TAYLOR; Colin R.	
	064	US-5304186	04-19-1994	SEMLER; Herbert J. et al.	
	065	US-5313953	05-24-1994	YOMTOV; Barry M. et al.	
	066	US-5321618	06-14-1994	GESSMAN; Lawrence	
	067	US-5333616	08-02-1994	MILLS; Gary N. et al.	
	068	US-5336245	08-09-1994	ADAMS; Theodore P. et al.	
	069	US-5337752	08-16-1994	REEVES; William	

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Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	070	US-5339824	08-23-1994	ENGIRA; Ram M.	
	071	US-5343869	09-06-1994	PROSS; Gerhard et al.	
	072	US-5343870	09-06-1994	GALLANT; Stuart L. et al.	
	073	US-5348008	09-20-1994	BORNN; Robert et al.	
	074	US-5360005	11-01-1994	WILK; Peter J.	
	075	US-5365935	11-22-1994	RIGHTER; William H. et al.	
	076	US-5410587	04-25-1995	GRUNWELL; Randall L.	
	077	US-5417222	05-23-1995	DEMPSEY; Michael K. et al.	
	078	US-5433736	07-18-1995	NILSSON; Kenth-Ake-Sune	
	079	US-5452356	09-19-1995	ALBERT; David E.	
	080	US-5466246	11-14-1995	SILVIAN; Sergiu	
	081	US-5467773	11-21-1995	BERGELSON; Michael N. et al.	
	082	US-5481255	01-02-1996	ALBERT; David E. et al.	
	083	US-5503158	04-02-1996	COPPOCK; Richard A. et al.	
	084	US-5518001	05-21-1996	SNELL; Jeffery D.	
	085	US-5522396	06-04-1996	LANGER; Alois A. et al.	
	086	US-5539705	07-23-1996	AKERMAN; M. Alfred et al.	
	087	US-5544661	08-13-1996	DAVIS; Charles L. et al.	
	088	US-5551953	09-03-1996	LATTIN; Gary A. et al.	

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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	089	US-5561712	10-01-1996	NISHIHARA; Toshiyuki	
	090	US-5568448	10-22-1996	TANIGUSHI; Ryosuke et al.	
	091	US-5579284	11-26-1996	MAY; David F.	
	092	US-5608723	03-04-1997	FELSENSTEIN; Lee	
	093	US-5634468	06-03-1997	PLATT; Harry L. et al.	
	094	US-5652570	07-29-1997	LEPKOFKER; Robert	
	095	US-5661699	08-26-1997	SUTTON; Paul W.	
	096	US-5675325	10-07-1997	TANIGUCHI; Ryosuke et al.	
	097	US-5678562	10-21-1997	SELLERS; Craig S.	
	098	US-5701894	12-30-1997	CHERRY; Isaac R. et al.	
	099	US-5704364	01-06-1998	SALTZSTEIN; William E. et al.	
	100	US-5724025	03-03-1998	TAVORI , I; Tzchak	
	101	US-5730143	03-24-1998	SCHWARZBERG; Robert	
	102	US-5735285	04-07-1998	ALBERT; David E. et al.	
	103	US-5742251	04-21-1998	GERBER; Peter	
	104	US-5748103	05-05-1998	FLACH; Terry E. et al.	
	105	US-5764763	06-09-1998	JENSEN; James M. et al.	
	106	US-5772586	06-30-1998	HEINONEN; Pekka et al.	
	107	US-5818788	10-06-1998	KIMURA; Tohru et al.	

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Sheet 7 of 51

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Application Number	14730122
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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	108	US-5825718	10-20-1998	UEKI; Masataka et al.	
	109	US-5827179	10-27-1998	LICHTER; Patrick A. et al.	
	110	US-5840020	11-24-1998	HEINONEN; Pekka et al.	
	111	US-5844997	12-01-1998	MURPHY Jr.; ,Raymond L. H.	
	112	US-5861018	01-19-1999	FEIERBACH; Gary F.	
	113	US-5873369	02-23-1999	LANIADO; Shlomo et al.	
	114	US-5876351	03-02-1999	ROHDE; Mitchell M.	
	115	US-5877675	03-02-1999	REBSTOCK I; Janice et al.	
	116	US-5889730	03-30-1999	MAY; David F.	
	117	US-5929761	07-27-1999	VAN; Der Laan Robert Lambertus et al.	
	118	US-5970388	10-19-1999	WILL; Craig A.	
	119	US-5976083	11-02-1999	RICHARDSON; J. Jeffrey et al.	
	120	US-5982297	11-09-1999	WELLE; Richard P.	
	121	US-5983127	11-09-1999	DEPINTO; Victor M.	
	122	US-6008703	12-28-1999	PERROTT; Michael H. et al.	
	123	US-6024705	02-15-2000	SCHLAGER; Kenneth J. et al.	
	124	US-6037704	03-14-2000	WELLE; Richard P.	
	125	US-6047257	04-04-2000	DEWAELE; Piet	

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Art Unit	3766
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	126	US-6048319	04-11-2000	HUDGINS; Lonnie H. et al.	
	127	US-6072396	06-06-2000	GAUKEL; John J.	
	128	US-6083248	07-04-2000	THOMPSON; David L.	
	129	US-6084510	07-04-2000	LEMELSON; Jerome H. et al.	
	130	US-6102856	08-15-2000	GROFF; Clarence P. et al.	
	131	US-6153532	11-28-2000	DOW; Daniel B. et al.	
	132	US-6159147	12-12-2000	LICHTER; Patrick A. et al.	
	133	US-6198394	03-06-2001	JACOBSEN; Stephen C. et al.	
	134	US-6224548	05-01-2001	GOPINATHAN; Govindan et al.	
	135	US-6236889	05-22-2001	SOYKAN; Orhan et al.	
	136	US-6264614	07-24-2001	ALBERT; David E. et al.	
	137	US-6282440	08-28-2001	BRODNICK; Donald E. et al.	
	138	US-6282441	08-28-2001	RAYMOND; Stephen A. et al.	
	139	US-6289238	09-11-2001	BESSON; Marcus et al.	
	140	US-6319201	11-20-2001	WILK; Peter J.	
	141	US-6343049	01-29-2002	TODA; Kohji	
	142	US-6363139	03-26-2002	ZUREK; Robert A. et al.	
	143	US-6364834	04-02-2002	REUSS; James L. et al.	

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	144	US-6366871	04-02-2002	GEVA; Yakov	
	145	US-6377843	04-23-2002	NAYDENOV; Nartzis et al.	
	146	US-6418394	07-09-2002	PUOLAKANAHO; Pertti et al.	
	147	US-6433689	08-13-2002	HOVIND; Ole B. et al.	
	148	US-6453164	09-17-2002	FULLER; Robert M. et al.	
	149	US-6478736	11-12-2002	MAULT; James R.	
	150	US-6485416	11-26-2002	PLATT; Harry Louis et al.	
	151	US-6507734	01-14-2003	BERGER; Doug M. et al.	
	152	US-6513532	02-04-2003	MAULT; James R. et al.	
	153	US-6549756	04-15-2003	ENGSTROM; Eric	
	154	US-6558320	05-06-2003	CAUSEY III; James D. et al.	
	155	US-6579231	06-17-2003	PHIPPS; Eric T.	
	156	US-6595929	07-22-2003	STIVORIC; John M. et al.	
	157	US-6600471	07-29-2003	LEE; Hae-Seung et al.	
	158	US-6605038	08-12-2003	TELLER; Eric et al.	
	159	US-6612985	09-02-2003	EIFFERT; Michael E. et al.	
	160	US-6616613	09-09-2003	GOODMAN; Jesse B.	
	161	US-6636761	10-21-2003	BRODNICK; Donald Eugene	
	162	US-6685633	02-03-2004	ALBERT; David E. et al.	

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Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	163	US-6717983	04-06-2004	TODA; Kohji	
	164	US-6790178	09-14-2004	MAULT; James R. et al.	
	165	US-6804558	10-12-2004	HALLER; Markus et al.	
	166	US-6820057	11-16-2004	LOCH; Andrew et al.	
	167	US-6845263	01-18-2005	KAWAGUCHI; Keizoh	
	168	US-6893396	05-17-2005	SCHULZE; Arthur E. et al.	
	169	US-6928535	08-09-2005	YAMASHITA; Hirofumi et al.	
	170	US-6950681	09-27-2005	HOFMANN; Ludwig	
	171	US-6970737	11-29-2005	BRODNICK; Donald Eugene et al.	
	172	US-6987965	01-17-2006	NG; Richard et al.	
	173	US-7018339	03-28-2006	BIRNBAUM; Burton H. et al.	
	174	US-7020508	03-28-2006	STIVORIC; John M. et al.	
	175	US-7031745	04-18-2006	SHEN; Yuan-Yao	
	176	US-7061381	06-13-2006	FORCIER; Robert et al.	
	177	US-7103407	09-05-2006	HJELT; Kari et al.	
	178	US-7107095	09-12-2006	MANOLAS; Jan	
	179	US-7108659	09-19-2006	ROSS; Lynette et al.	
	180	US-7153262	12-26-2006	STIVORIC; John et al.	
	181	US-7162294	01-09-2007	ROWLANDSON I; G. et al.	

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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	182	US-7188151	03-06-2007	KUMAR; Kishore et al.	
	183	US-7222054	05-22-2007	GEVA; Jacob	
	184	US-7236818	06-26-2007	MCLEOD; Michael P. et al.	
	185	US-7257448	08-14-2007	CROWE; Louis Michael et al.	
	186	US-7260429	08-21-2007	SIEJKO; Krzysztof Z. et al.	
	187	US-7261690	08-28-2007	TELLER; Eric et al.	
	188	US-7285090	10-23-2007	STIVORIC; John et al.	
	189	US-7319425	01-15-2008	FIORENZA; John K. et al.	
	190	US-7324836	01-29-2008	STEENSTRA; Jack et al.	
	191	US-7349574	03-25-2008	SODINI; Charles G. et al.	
	192	US-7351207	04-01-2008	PRIEMER; Roland	
	193	US-7354400	04-08-2008	ASAFUSA; Katsunori et al.	
	194	US-7382247	06-03-2008	WELCH; James P. et al.	
	195	US-7383297	06-03-2008	ATSMON; Alon et al.	
	196	US-7398115	07-08-2008	LYNN; Lawrence A.	
	197	US-7415304	08-19-2008	ROWLANDSON I; G. et al.	
	198	US-7444116	10-28-2008	IVANOV; Valery Filippovich et al.	
	199	US-7460899	12-02-2008	ALMEN; Adam J.	

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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
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Attorney Docket Number	41188-720.301

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	200	US-7502643	03-10-2009	FARRINGDON; Jonathan et al.	
	201	US-7509159	03-24-2009	XUE; Joel Q. et al.	
	202	US-7515043	04-07-2009	WELCH; James P. et al.	
	203	US-7515044	04-07-2009	WELCH; James P. et al.	
	204	US-7520860	04-21-2009	GUION-JOHNSON MARIE A . et al.	
	205	US-7542878	06-02-2009	NANIKASHVILI; Reuven	
	206	US-7548623	06-16-2009	MANABE; Masao	
	207	US-7596405	09-29-2009	KURZWEIL; Raymond C. et al.	
	208	US-7603148	10-13-2009	MICHALAK; Gerald P.	
	209	US-7647185	01-12-2010	TARASSENKO; Lionel et al.	
	210	US-7654148	02-02-2010	TOMLINSON; Harold W.Jr et al.	
	211	US-7657479	02-02-2010	HENLEY; Julian L.	
	212	US-7668589	02-23-2010	BAUER; Peter T.	
	213	US-7689437	03-30-2010	TELLER; Eric et al.	
	214	US-7701895	04-20-2010	GEHASIE; Eyal et al.	
	215	US-7733224	06-08-2010	TRAN; Bao	
	216	US-7742808	06-22-2010	NISSILA; Seppo et al.	

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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
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Attorney Docket Number	41188-720.301

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	217	US-7806832	10-05-2010	GALLAGHER; Scott Patrick et al.	
	218	US-7819814	10-26-2010	GAVRIELY; Noam et al.	
	219	US-7846104	12-07-2010	MACQUARRIE; David et al.	
	220	US-7846106	12-07-2010	ANDREWS; Angela et al.	
	221	US-7904160	03-08-2011	BRODNICK; Donald E. et al.	
	222	US-7945064	05-17-2011	O'BRIEN; William D. et al.	
	223	US-7946959	05-24-2011	SHUM; Albert et al.	
	224	US-7955273	06-07-2011	RAHE-MEYER NIELS.	
	225	US-7983749	07-19-2011	WARREN; Jay A.	
	226	US-8019609	09-13-2011	TAMIR; Asaf et al.	
	227	US-8034006	10-11-2011	CELIK-BUTLER ZEYNEP . et al.	
	228	US-8062090	11-22-2011	ATSMON; Alon et al.	
	229	US-8078136	12-13-2011	ATSMON; Alon et al.	
	230	US-8078278	12-13-2011	PENNER; Abraham	
	231	US-8126526	02-28-2012	KITAJIMA; Kazumi et al.	
	232	US-8126566	02-28-2012	STAHMANN; Jeffrey E. et al.	
	233	US-8126728	02-28-2012	DICKS; Kent et al.	
	234	US-8130093	03-06-2012	MAZAR; Scott T. et al.	

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Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	235	US-8150750	04-03-2012	RAY; Subhransu K.	
	236	US-8160276	04-17-2012	LIAO; Tung-Tsai et al.	
	237	US-8165677	04-24-2012	VON; Arx Jeffrey A. et al.	
	238	US-8216136	07-10-2012	ADDISON; Paul Stanley et al.	
	239	US-8224429	07-17-2012	PRSTOJEVICH; Michael D. et al.	
	240	US-8265907	09-11-2012	NANIKASHVILI; Reuven et al.	
	241	US-8275553	09-25-2012	OCHS; James et al.	
	242	US-8275635	09-25-2012	STIVORIC; John M. et al.	
	243	US-8282550	10-09-2012	RASDAL; Andrew et al.	
	244	US-8285356	10-09-2012	BLY; Mark J. et al.	
	245	US-8301232	10-30-2012	ALBERT; David et al.	
	246	US-8301236	10-30-2012	BAUMANN; Eric et al.	
	247	US-8323188	12-04-2012	TRAN; Bao	
	248	US-8328718	12-11-2012	TRAN; Bao	
	249	US-8332233	12-11-2012	OTT; James E. et al.	
	250	US-8364250	01-29-2013	MOON; Jim et al.	
	251	US-8369936	02-05-2013	FARRINGDON; Jonathan et al.	
	252	US-8374688	02-12-2013	LIBBUS; Imad et al.	

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Sheet 15 of 51

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	253	US-8449471	05-28-2013	TRAN; Bao	
	254	US-8500636	08-06-2013	TRAN; Bao	
	255	US-8509882	08-13-2013	ALBERT; David et al.	
	256	US-8519835	08-27-2013	DUNKO; Gregory A.	
	257	US-8543185	09-24-2013	YUEN; Shelten Gee Jao et al.	
	258	US-8548770	10-01-2013	YUEN; Shelten Gee Jao et al.	
	259	US-8700137	04-15-2014	ALBERT; David E.	
	260	US-8755871	06-17-2014	WENG; Binwei et al.	
	261	US-8923958	12-30-2014	GUPTA; Sunny et al.	
	262	US-8951189	02-10-2015	OSORIO; Ivan	
	263	US-8951192	02-10-2015	OSORIO; Ivan	
	264	US-8974396	03-10-2015	BRADY; Donald et al.	
	265	US-8977347	03-10-2015	MESTHA; Lalit Keshav et al.	
	266	US-9026202	05-05-2015	ALBERT; David E.	
	267	US-20010027384	10-04-2001	SCHULZE; Arthur E. et al.	
	268	US-20010031998	10-18-2001	NELSON; Chester G. et al.	
	269	US-20010051766	12-13-2001	GAZDZINSKI; Robert F.	
	270	US-20020016541	02-07-2002	GLOSSOP; Neil David	
	271	US-20020032386	03-14-2002	SACKNER; Marvin A. et al.	

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	272	US-20020111556	08-15-2002	WEGNER; Stanley	
	273	US-20020143576	10-03-2002	NOLVAK; Rainer et al.	
	274	US-20030004425	01-02-2003	NARIMATSU; Kiyoyuki et al.	
	275	US-20030093002	05-15-2003	KUO; Terry B.J.	
	276	US-20030107487	06-12-2003	KORMAN; Ronen et al.	
	277	US-20030117987	06-26-2003	BREBNER; Gavin	
	278	US-20030149344	08-07-2003	NIZAN; Yaniv	
	279	US-20030193839	10-16-2003	SINGH; Manmohan L.	
	280	US-20040034284	02-19-2004	AVERSANO; Thomas R. et al.	
	281	US-20040044292	03-04-2004	YASUSHI; Mitsuo et al.	
	282	US-20040059205	03-25-2004	CARLSON; Sven-Erik et al.	
	283	US-20040117212	06-17-2004	KONG; Donggeon et al.	
	284	US-20040120356	06-24-2004	DAVENPORT; David et al.	
	285	US-20040143403	07-22-2004	BRANDON; Richard Bruce et al.	
	286	US-20040215088	10-28-2004	HUBELBANK; Mark	
	287	US-20040215094	10-28-2004	BAUMER; Martin et al.	
	288	US-20040220487	11-04-2004	VYSHEDSKIY; Andrey et al.	
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	290	US-20040225199	11-11-2004	EVANYK; Shane Walter et al.	
	291	US-20040228217	11-18-2004	SZETO; Chi Cheong	
	292	US-20040236819	11-25-2004	ANATI; Ram et al.	
	293	US-20040266407	12-30-2004	LEE; Sang-Man et al.	
	294	US-20040266480	12-30-2004	HJELT; Kari Tapani et al.	
	295	US-20050014531	01-20-2005	FINDIKLI; Nadi S.	
	296	US-20050027207	02-03-2005	WESTBROOK; Philip R. et al.	
	297	US-20050078533	04-14-2005	VYSHEDSKIY; Andrey et al.	
	298	US-20050124864	06-09-2005	MACK; David C. et al.	
	299	US-20050234353	10-20-2005	XUE; Joel Q. et al.	
	300	US-20060022833	02-02-2006	FERGUSON; Kevin et al.	
	301	US-20060047215	03-02-2006	NEWMAN; Richard W. et al.	
	302	US-20060173259	08-03-2006	FLAHERTY; J. C. et al.	
	303	US-20060190045	08-24-2006	MARCUS I; Frank et al.	
	304	US-20060193270	08-31-2006	GEHASIE; Eyal et al.	
	305	US-20060252999	11-09-2006	DEVAUL; Richard W. et al.	
	306	US-20070021677	01-25-2007	MARKEL; Gal	
	307	US-20070027386	02-01-2007	SUCH; Olaf et al.	
	308	US-20070032731	02-08-2007	LOVEJOY; Jeffrey L. et al.	

Examiner Signature	/Nicole Lavert/	Date Considered	02/17/2016

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Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	309	US-20070063850	03-22-2007	DEVAUL; Richard W. et al.	
	310	US-20070106179	05-10-2007	BAGHA; Merat et al.	
	311	US-20070156060	07-05-2007	CERVANTES; Miguel A. et al.	
	312	US-20070254604	11-01-2007	KIM; Joon Sik	
	313	US-20070265038	11-15-2007	KIM; Joon S.	
	314	US-20080009759	01-10-2008	CHETHAM; Scott M. et al.	
	315	US-20080058670	03-06-2008	MAININI; Christopher E.	
	316	US-20080112885	05-15-2008	OKUNEV; Yuri et al.	
	317	US-20080146890	06-19-2008	LEBOEUF; Steven Francis et al.	
	318	US-20080171945	07-17-2008	DOTTER; James E.	
	319	US-20080177162	07-24-2008	BAE; Sang Gon et al.	
	320	US-20080198872	08-21-2008	PIERCE; Michael	
	321	US-20080214903	09-04-2008	ORBACH; Tuvi	
	322	US-20080228045	09-18-2008	GAO; Tia et al.	
	323	US-20080293453	11-27-2008	ATLAS; Scott J. et al.	
	324	US-20090010461	01-08-2009	KLINGHULT; Gunnar et al.	
	325	US-20090024045	01-22-2009	PRAKASH; Rajan et al.	
	326	US-20090037575	02-05-2009	CRYSTAL; Jack C. et al.	
	327	US-20090117883	05-07-2009	COFFING; Dan et al.	

Examiner Signature	/Nicole Lavert/	Date Considered	02/17/2016

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Attorney Docket Number	41188-720.301

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	328	US-20090144080	06-04-2009	GRAY; Robert et al.	
	329	US-20090149767	06-11-2009	ROSSETTI; Walter	
	330	US-20090156908	06-18-2009	BELALCAZAR; Andres et al.	
	331	US-20090171170	07-02-2009	LI; Li et al.	
	332	US-20090209873	08-20-2009	PINTER; Robert et al.	
	333	US-20090273467	11-05-2009	ELIXMANN; Martin et al.	
	334	US-20090279389	11-12-2009	IRIE; Michio	
	335	US-20090287067	11-19-2009	DOROGUSKER; Jesse Lee et al.	
	336	US-20090306485	12-10-2009	BELL; Jonathan Arnold	
	337	US-20090312655	12-17-2009	LO; Thomas Ying-Ching	
	338	US-20100027379	02-04-2010	SAULNIER; Gary et al.	
	339	US-20100033303	02-11-2010	DUGAN; Brian M. et al.	
	340	US-20100035927	02-11-2010	OJIKA; Kosei et al.	
	341	US-20100042008	02-18-2010	AMITAI; David et al.	
	342	US-20100049006	02-25-2010	MAGAR; Surendar et al.	
	343	US-20100049037	02-25-2010	PINTER; Robert et al.	
	344	US-20100063381	03-11-2010	GREISER; Andreas	
	345	US-20100069735	03-18-2010	BERKNER; Lior	
	346	US-20100076276	03-25-2010	GILLAND; Bruce R.	

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	347	US-20100094152	04-15-2010	SEMMLOW; John	
	348	US-20100113950	05-06-2010	LIN; Gloria et al.	
	349	US-20100148956	06-17-2010	SONG; Ge et al.	
	350	US-20100184479	07-22-2010	GRIFFIN Jr.; Paul P.	
	351	US-20100204758	08-12-2010	BOON; Scot C. et al.	
	352	US-20100208434	08-19-2010	KIM; Yu Guen et al.	
	353	US-20100217099	08-26-2010	LEBOEUF; Steven Francis et al.	
	354	US-20100217100	08-26-2010	LEBOEUF; Steven Francis et al.	
	355	US-20100217345	08-26-2010	WOLFE; Andrew et al.	
	356	US-20100234746	09-16-2010	SEBELIUS; Fredrik et al.	
	357	US-20100256509	10-07-2010	KUO; Bo-Jau et al.	
	358	US-20100256976	10-07-2010	ATSMON; Alon et al.	
	359	US-20100281261	11-04-2010	RAZZELL; Charles	
	360	US-20100298711	11-25-2010	PEDERSEN; Peder C. et al.	
	361	US-20100324378	12-23-2010	TRAN; Binh C. et al.	
	362	US-20100331631	12-30-2010	MACLAUGHLIN; Scott	
	363	US-20110015496	01-20-2011	SHERMAN; Lawrence M. et al.	
	364	US-20110035927	02-17-2011	GRIFFIN; Stephen et al.	

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Attorney Docket Number	41188-720.301

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	365	US-20110060251	03-10-2011	VERMA; Pramode et al.	
	366	US-20110066042	03-17-2011	PANDIA; Keya R. et al.	
	367	US-20110117529	05-19-2011	BARASH; David et al.	
	368	US-20110134725	06-09-2011	SU; Chung-Yi et al.	
	369	US-20110160601	06-30-2011	WANG; Yang et al.	
	370	US-20110182445	07-28-2011	ATSMON; Alon et al.	
	371	US-20110208076	08-25-2011	FONG; Shannon et al.	
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	373	US-20110275950	11-10-2011	XUE; Joel Q. et al.	
	374	US-20110288425	11-24-2011	STEWART; Donald-Bane	
	375	US-20110301435	12-08-2011	ALBERT; David et al.	
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	377	US-20120051187	03-01-2012	PAULSON; Brett L. et al.	
	378	US-20120053424	03-01-2012	KENALTY; Christopher et al.	
	379	US-20120071734	03-22-2012	SHIMUTA; Toru et al.	
	380	US-20120101396	04-26-2012	SOLOSKO; Thomas et al.	
	381	US-20120108916	05-03-2012	RIFTINE; Alexander	
	382	US-20120123891	05-17-2012	PATEL; Neilesh Shashikant	
	383	US-20120127833	05-24-2012	GHEN; Ronald David et al.	
	384	US-20120143018	06-07-2012	SKIDMORE; Frank M. et al.	

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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	385	US-20120147921	06-14-2012	CONTI; Richard F. et al.	
	386	US-20120157019	06-21-2012	LI; Pai-Chi	
	387	US-20120158090	06-21-2012	CHAVAN; Abhi et al.	
	388	US-20120171963	07-05-2012	TSFATY; Yossef	
	389	US-20120172689	07-05-2012	ALBERT; David et al.	
	390	US-20120179056	07-12-2012	MOULDER; J. Christopher et al.	
	391	US-20120285588	11-15-2012	SHEPPARD; James	
	392	US-20120316413	12-13-2012	LIU; Shuhai et al.	
	393	US-20130003852	01-03-2013	YAMAMOTO; Tomoyuki	
	394	US-20130030259	01-31-2013	THOMSEN; Erik et al.	
	395	US-20130085364	04-04-2013	LU; Ying Chiang et al.	
	396	US-20130122810	05-16-2013	KAUFMAN; Matthew	
	397	US-20130156194	06-20-2013	TANIOKA; Hideaki	
	398	US-20130159699	06-20-2013	TORKKEL; Juha	
	399	US-20130197320	08-01-2013	ALBERT; David E. et al.	
	400	US-20130236980	09-12-2013	MORETTI; Eugene W. et al.	
	401	US-20130261414	10-03-2013	TAL; Benny et al.	
	402	US-20130289366	10-31-2013	CHUA; Juliana et al.	
	403	US-20130331663	12-12-2013	ALBERT; David et al.	

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Sheet 23 of 51

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	404	US-20140050321	02-20-2014	ALBERT; David E. et al.	
	405	US-20140066798	03-06-2014	ALBERT; David E.	
	406	US-20140128758	05-08-2014	GALLOWAY; Conner Daniel Cross et al.	
	407	US-20140194760	07-10-2014	ALBERT; David E.	
	408	US-20140228665	08-14-2014	ALBERT; David E.	
	409	US-20140276162	09-18-2014	ALBERT; David E. et al.	
	410	US-20150018660	01-15-2015	THOMSON; Euan et al.	
	411	US-20150087952	03-26-2015	DAVID; E. Albert et al.	

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Examiner Initials*	Cite No1	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	001	CH-675675-A5	10-31-1990	ERGONOMICS AG.		☒
	002	CN-101828915-A	09-15-2010	WUXI YOUTEKE TECHNOLOGY CO LTD.		☒

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	003	CN-102347804-A	02-08-2012	HOT SPOT SHANGHAI NETWORK TECHNOLOGY CO LTD.		☒
	004	CN-201918016-U	08-03-2011	ZHIHAI FU.		☒
	005	DE-2506936-A1	09-02-1976	NORDMENDE.		☒
	006	DE-4212670-A1	01-13-1994	LAUSEN JOERG [DE]		☒
	007	EP-0631226-A1	12-28-1994	IBM [US]		☐
	008	EP-1181888-B1	09-26-2007	GE MED SYS INFORMATION TECH [US]		☐
	009	EP-1238633-B1	10-29-2008	YAMAN LTD [JP]		☐
	010	EP-2030565-A1	03-04-2009	MEDICALGORITHMICS SP Z O O [PL]		☐

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Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No1	Foreign Patent Document Country Code[3]–Number[4]–Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	011	EP-2116183-B1	02-01-2012	SUISSE ELECTRONIQUE MICROTECH [CH]		☐
	012	FR-2740426-A1	04-30-1997	DELATTRE BERTRAND [FR]		☒
	013	GB-2181554-A	04-23-1987	ATLANTIC MEDICAL SYSTEMS LIMIT.		☐
	014	GB-2408105-A	05-18-2005	DRAEGER SAFETY AG & CO KGAA [DE]		☐
	015	JP-2002191562-A	07-09-2002	MATSUSHITA ELECTRIC IND CO LTD.		☒
	016	JP-2002261731-A	09-13-2002	TODA KOJI.		☒
	017	JP-2003010177-A	01-14-2003	GE MED SYS GLOBAL TECH CO LLC.		☒
	018	JP-2005295378-A	10-20-2005	RCS KK.		☒
	019	JP-2012065073-A	03-29-2012	SEIKO EPSON CORP.		☒

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	020	JP-H01244328-A	09-28-1989	U II SYST INC.		☒
	021	JP-H05167540-A	07-02-1993	MORI MASAYA.		☒
	022	JP-H06326669-A	11-25-1994	MEITEC CORP.		☒
	023	JP-S59122032-A	07-14-1984	NIPPON SOKEN., et al.		☒
	024	JP-S59190742-A	10-29-1984	MATSUSHITA SEIKO KK.		☒
	025	JP-S63072231-A	04-01-1988	NIPPON SIGNAL CO LTD.		☒
	026	JP-S63294044-A	11-30-1988	TODA KOJI.		☒
	027	KR-20100059198-A	06-04-2010	SNU R&DB FOUNDATION [KR]		☒
	028	MX-2009011781-A	05-02-2011	OBREGON THOMAS SHAW [MX]		☒

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	029	WO-0041620-A1	07-20-2000	SCHNEIDER EDGAR [DE]		☐
	030	WO-0147597-A2	07-05-2001	MEDTRONIC INC [US]		☐
	031	WO-0157619-A2	08-09-2001	COMSENSE TECHNOLOGIES LTD [IL], et al.		☐
	032	WO-02080762-A1	10-17-2002	KORMAN RONEN [IL], et al.		☐
	033	WO-03075118-A2	09-12-2003	CARD GUARD SCIENT SURVIVAL LTD [IL], et al.		☐
	034	WO-03094720-A1	11-20-2003	BATKIN IZMAIL [CA], et al.		☐
	035	WO-2004037080-A1	05-06-2004	T MOBILE DEUTSCHLAND GMBH [DE], et al.		☐
	036	WO-2006001005-A2	01-05-2006	CARD GUARD SCIENT SURVIVAL LTD [IL], et al.		☐

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	037	WO-2006021956-A2	03-02-2006	CARD GUARD SCIENT SURVIVAL LTD [IL], et al.		☐
	038	WO-2007014545-A2	02-08-2007	RIEMENSCHNEIDER MARKUS [DE], et al.		☐
	039	WO-2007088315-A1	08-09-2007	ADVANCED RISC MACH LTD [GB], et al.		☐
	040	WO-2008005015-A1	01-10-2008	CARDIOVU INC [US]		☐
	041	WO-2008066682-A2	06-05-2008	PENRITH CORP [US], et al.		☐
	042	WO-2010025166-A1	03-04-2010	DELPHI TECH INC [US], et al.		☐
	043	WO-2010099066-A2	09-02-2010	VALENCELL INC [US], et al.		☐
	044	WO-2010108287-A1	09-30-2010	LUO HONGYUE [CA]		☐
	045	WO-2010113354-A1	10-07-2010	MURATA MANUFACTURING CO [JP], et al.		☒

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	046	WO-2010144626-A1	12-16-2010	WEISS KENNETH P [US]		☐
	047	WO-2011006356-A1	01-20-2011	CHOU CHANG-AN [CN]		☐
	048	WO-2011008838-A1	01-20-2011	SHERMAN LAWRENCE M [US], et al.		☐
	049	WO-2011014292-A1	02-03-2011	SHOPKICK INC [US], et al.		☐
	050	WO-2011022942-A1	03-03-2011	CHOU CHANG-AN [CN]		☐
	051	WO-2011040877-A1	04-07-2011	EPHONE INTERNAT PTE LTD [SG], et al.		☐
	052	WO-2011040878-A1	04-07-2011	EPHONE INTERNAT PTE LTD [SG], et al.		☐
	053	WO-2011113070-A1	09-15-2011	CENTAURI MEDICAL INC [US], et al.		☐
	054	WO-2011137375-A2	11-03-2011	UNIV OKLAHOMA [US], et al.		☐

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	055	WO-2011156374-A2	12-15-2011	ALIVEUSA LLC [US], et al.		☐
	056	WO-2012046158-A1	04-12-2012	KONINKL PHILIPS ELECTRONICS NV [NL], et al.		☐
	057	WO-2012108895-A1	08-16-2012	MASSACHUSETTS INST TECHNOLOGY [US], et al.		☐
	058	WO-2012129413-A1	09-27-2012	DRAEGER MEDICAL SYSTEMS INC [US], et al.		☐
	059	WO-2012160550-A1	11-29-2012	SHL TELEMEDICINE INTERNAT LTD [IL], et al.		☐
	060	WO-2013028960-A1	02-28-2013	INSOMNISOLV LLC [US], et al.		☐
	061	WO-2013036307-A1	03-14-2013	DRAEGER MEDICAL SYSTEMS INC [US], et al.		☐
	062	WO-2013066642-A1	05-10-2013	SCANADU INC [US]		☐

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	063	WO-2013093690-A1	06-27-2013	KONINKL PHILIPS ELECTRONICS NV [NL]		☐
	064	WO-2013122788-A1	08-22-2013	MOTOROLA MOBILITY LLC [US]		☐
	065	WO-2013138500-A1	09-19-2013	POPSOCKETS LLC [US], et al.		☐
	066	WO-2013155196-A2	10-17-2013	IMPAK HEALTH LLC [US]		☐
	067	WO-2013192166-A1	12-27-2013	MASSACHUSETTS INST TECHNOLOGY [US]		☐
	068	WO-8200910-A1	03-18-1982	ULTRAK INC [US]		☐
	069	WO-8805282-A1	07-28-1988	MICROMEDICAL IND PTY LTD [AU]		☐
	070	WO-9008361-A1	07-26-1990	SCOTT & FETZER CO [US]		☐
	071	WO-9206551-A1	04-16-1992	AUTOTROL CORP [US]		☐

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	072	WO-9731437-A1	08-28-1997	SONIC SYSTEMS [CA], et al.		☐
	073	WO-9838611-A1	09-03-1998	ERBEL RAIMUND [DE], et al.		☐
	074	WO-9944494-A1	09-10-1999	CARD GUARD SCIENT SURVIVAL LTD [IL], et al.		☐

NON-PATENT LITERATURE DOCUMENTS

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	001	Adidas miCoach Pacer Review: Like Nike+, Only Better"; printed from website http://gizmodo.com/5479456/adidas· printed on 03/04/2010· 5 pages.	☐
	002	AUSTRALIAN DESIGN AWARDS. Heartplus Micro"; printed from website http://www.designawards.com/au; printed on 04/12/2002 · 6 pages.	☐
	003	BAJAJ, M.D.; "Event Recording in Ambulatory Patients with Syncopal Events"; University of Kansas; Wichita, Kansas; (no date); Pages15-18; printed on or before 04/14/2010.	☐

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	004	BLUETOOTH. Headset Profile (HSP)", printed from website http://bluetooth.com/English/Techmology/Works/Pates/HSP.asgx, printed on May 12, 2010.	☐
	005	BRAMANTI et al., Multichannel telemetric system for biomedical signals via switched telephone lines", Medical and Biological Engineering and Computing, Sept. 1982, Vol. 20, No. 5, pp. 653-656.	☐
	006	BURKE, "A Micropower Dry-Electrode ECG Preamplifier", IEEE Transactions on Biomedical Engineering, Feb. 2000, Vol. 47, No.2, pp.155-162.	☐
	007	Card Guard CG-6108 ACT Ambulatory Cardiac Telemetry Brochure"; Card Guard; The Telemedicine Company: Switzerland; 2006; 2 pages.	☐
	008	CARDIOCOMM SOLUTIONS; GEMS AIR. (PC based ECG management) printed from website http://www.cardiocommsolutions/com; printed on 03/19/2010; 1 page.	☐
	009	CHARUVASTRA. Transtelephonic Cardiac Event Recording for Arrhythmia Surveillance"; printed from website http://tchin.org/resource room/c art· printed on 03/26/2010· 2 pages.	☐
	010	CHENG, Allen C.; "Real-Time Cardiovascular Diseases Detection on a Smartphone"; Departments of Electrical And Computer Engineering, Bioengineering, Neurological Surgery and Computer Science; University of Pittsburgh; Pittsburgh, PA; printed on or before 04/14/2010.	☐
	011	Co-pending US patent application No. US14/569,513, filed on 12-12-2014.	☐

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	012	Co-pending US patent application No. US14/692563, filed on 04-21-2015.	☐
	013	Co-pending US provisional application No. 61/800,879, filed on 03-15-2013.	☐
	014	Co-pending US provisional application No. 61/872,555, filed on 08-30-2013.	☐
	015	Co-pending US provisional application No. 61/874,806, filed on 09-06-2013.	☐
	016	Co-pending US provisional application No. 61/915,113, filed on 12-12-2013.	☐
	017	CREATIVE. PC-80B Portable ECG Monitor w/sd card extension slot"; printed from website www.amazon.com/Portable-Monitor-extension-leather-shipping/dp/B0010jWKUE; printed on 02/04/2010· 5 pages.	☐
	018	DEVEAU, "Health Care eyes smart phones to heal ills", printed from the website http://www.theQiobeandmail.com on 09/17/2009, 4 pages.	☐
	019	DINH. Heart activity monitoring on smartphone. IPCBEE-Int conf Biomedical Eng and Technol. June 17-19, 2011. 11:45-49.	☐
	020	DOBREV, et al., "Bootstrapped two-electrode biosignal amplifier, Med Bioi Eng Comput, 2008, 7 pages.	☐

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Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	021	DOLAN; Qualcomm launches ECG smartphone program in China; 9/8/2011; 11 pgs.; retrieved 3/19/14 from the internet (http://mobihealthnews.com/13092/qualcomm-launches-ecg-smartphone-program-in-china/).	☐
	022	ELERT, Glenn (Editor); Frequency Range of Human Hearing; The Physics Factbook; web version as of 3/29/2010; 2 pgs.; printed 6/6/2012 (http://web.archive.org/web/20100329141847/http:l/hypertextbook.com/facts/2003/ChrisDAmbrose.shtml).	☐
	023	European search report and opinion dated 11/21/2014 for EP Application No. 11865699.0.	☐
	024	FAVORITE PLUS. Handheld Easy ECG Monitor - Handheld Easy EKG Monitor"; printed from website www.favoriteplus.com/easy-ecg-handgeld-monitor-fp; printed on 02/04/2010; 2 pages.	☐
	025	FAVORITE PLUS. Handheld ECG Monitor - Handheld EKG Monitor at Favoriteplus.com"; printed from website www.favoriteplus.com/handheld-ecg-ekg-monitor; printed on 02/04/2010; 3 pages.	☐
	026	FAVORITE PLUS. Handheld ECG Monitor - Handheld EKG Monitor InstantCheck"; printed from website http://www. favoriteplus.com/instanchcheck-hand held-ecg-ekg-monitor; printed on 02/04/2010; 2 pages.	☐
	027	FERRICK, M.D.; "Holter Monitoring and cardiac Event Recording in Assessing Symptomatic Patients"; Albert Einstein College of Medicine; Bronx, New York; (no date)· Pages 11-14· printed on or before 04/14/2010.	☐

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	028	FREE2MOVE. Vitaphone 2300; www.free2move.us/News/NewsVitaghone 240105.htm printed 05/12/2010.	☐
	029	FULFORD-JONES, et al., "A Portable, Low-Power, Wireless Two-Lead EKG System", Division of Engineering and Applied Sciences, Harvard University, September, 2004, 4 pages.	☐
	030	GARABELLI et al. Accuracy and Novelty of an Inexpensive iPhone-based Event Recorder (Presentation Poster/Abstract) Heart Rhythm 2012, 33rd Annual Scientific Session. SP23. Innovation Poster Session II. No IA02-1; May 11,2012.	☐
	031	GBI PORTAL. Qualcomm's wireless reach mHealth project to improve cardiovascular disease in resource scarce China; 2/17/2012; 7 pgs. Retrieved 3/19/14 from www.intergrallc.com/2012/02/17/qualcooms-wireless-reach-mhealth-project-to-improve-cardiovascular-disease-in-resource-scarce-china/.	☐
	032	GE; Healthcare., "Marquette heart rate turbulence analysis program", 2005, DC-0160-12.05-EN-US. 4 pages.	☐
	033	GILLETTE, M.D.; "Diagnosis of Pediatric Arrhythmias with Event Recording"; Medical University of South Carolina; Charleston, South Carolina; (no date); Pages 25-32; printed on or before 04/14/2010.	☐
	034	GRIER, James W.; "How to use 1-lead ECG recorders to obtain 12-lead resting ECGs and exercise ("stress") ECGs"; Department of Biological Sciences: printed from website http://www.ndsu.edu/pubweb/rvgrier; printed on 06/07/21010; 13 pages.	☐

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	035	HANNAFORD, Kat; "How To Turn Your iPhone Into A Laser, Fan or Flashlight"; printed from website htto://m.qizmodo.com/5534904· printed on 02/03/2011.	☐
	036	HARTMANN, "ECG Front-End Design is Simplified with MicroConverter" AnalogDialogue, Nov. 2003, Vol. 37, pp. 1-5.	☐
	037	HAYES, M.D.; "Approaches to Diagnosing Transient Arhythmias" An Overview; Mayo Clinic; Rochester Minnesota; (no date); Pages 7-10; printed on or before 04/14/2010.	☐
	038	HEARING LOSS ASSOC. OF KENTUCKIANA; Decibal Ratings/Hazardous Time Exposures of Common Noise (excerpt from Survivor's Manual); web version as of 10/5/2008; 2 pgs.; printed 6/6/2012 (http://web.archive.org/web/20081005143856/http://www.hearinglossky.orglhlasurvival1.html).	☐
	039	HUANG, Tina; Age-related hearing loss; Minnesota Medicine; 90(10); pp. 48-50; Oct. 2007; printed 6/6/2012 from: http://www.minnesotamedicine.com/PastIssues/PastIssues2007/0ctober2007/Ciinca1Huang0ctober2007.aspx).	☐
	040	IMEC News; IMEC extends flexible ECG patch to enable arrhythmia detection"; printed from website http://www2.imec.be/imeC' printed on 08/18/2009 1 page.	☐
	041	INSTROMEDIX. Cardiac Event Recording FAQ's"; Instromedix A Card Guard Company, San Diego, CA.; printed from website www.instromedix.com/pdf/products/cardiac; printed on or before 04/14/2010.	☐

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	042	INSTROMEDIX. The Arrhythmia Monitoring System; King of Hearts Express AF Recorder" Brochure from Instromedix· A CardGuard Company; Rosemont IL; 2004· 3 pages.	☐
	043	"Internation search report and written opinion dated 04/30/2015 for PCT/US2014/070170.".	☐
	044	International search report and written opinion dated 02/12/2015 for PCT Application No. US2014/054414.	☐
	045	International search report and written opinion dated 02/17/2012 for PCT/US2011/039445.	☐
	046	International search report and written opinion dated 04/27/2012 for PCT/US2011/053708.	☐
	047	International search report and written opinion dated 05/15/2013 for PCT/US2013/023370.	☐
	048	International search report and written opinion dated 12/17/2013 for PCT/US2013/055458.	☐
	049	International search report dated 09/01/2014 for PCT/US2014/034350.	☐
	050	JENKINS II, W.; Time/Frequency Relationships for an FFT-Based Acoustic Modem; Naval Postgraduate School; pp. 1-1 02; Sep. 2010 (http://edocs.nps.edu/npspubs/scholarly/theses/201 0/Sep/1 OSep_Jenkins.pdf) printed 1 0/2/2013.	☐

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	051	KIM, et al., "Detection of Atrial Fibrillation Episodes using Multiple Heart Rate Variabili!Y_Features in Different Time Periods", 2008, 4 pages.	☐
	052	KOERNER. The Author's Metrics"; Wired Magazine Article; New York, NY; July 2009; page 93-126.	☐
	053	KUMAR, M.D., "Zio Patch", printed from website http://www.irhythmtech.com/zio-solution/zio-gach/, grinted on April 12, 2010.	☐
	054	KUMPARAK, Greg; "Visa officially announces their case that turns your iPhone into a credit card (and we've got pies!)"; May 17, 2010; printed from website www.mobilecrunch.com· printed on 02/03/2011.	☐
	055	LAU, et al. iPhone ECG application for community screening to detect silent atrial fibrillation: A novel technology to prevent stroke. Int J Cardiol. 2013 Apr 30;165(1):193-4.	☐
	056	LAU, et al. Performance of an Automated iPhone ECG Algorithm to Diagnose Atrial Fibrillation in a Community AF Screening Program (SEARCH-AF). Heart, Lung and Circulation. 2013; 22:S205.	☐
	057	LAU et al. Validation of an iPhone ECG application suitable for community screening for silent atrial fibrillation - A novel way to prevent stroke (Presentation Abstract 16810); American Heart Association 2012 Scientific Sessions and Resuscitation Science Symposium; 126(1); Nov. 20, 2012.	☐

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	058	LEIJDEKKERS et al., "Trial Results of a Novel Cardiac Rhythm Management System using Smart Phones and wireless ECG Sensors", Proceedings of the th International Conf. On Smart homes and health Telematics., July 1-3, 2009, Tours, France.	☐
	059	LEVKOV et al., "Removal of power-line interference from the ECG: a review of the subtraction procedure" BioMedical Engineering Online 2005, printed from website http://www.biomedical-engineeringonline.com/contenU4/1/50 pp. 1-18.	☐
	060	LIN; et al., "An intelligent telecardiology system using a wearable and wireless ECG to detect atrial fibrillation.", 2010 May, 14(3), 726-33.	☐
	061	LOWRES, et al. Screening Education And Recognition in Community pHarmacies of Atrial Fibrillation to prevent stroke in an ambulant population aged >=65 years (SEARCH-AF stroke prevention study): a cross-sectional study protocol. BMJ Open. 2012 Jun 25; 2(3); pii: e001355. doi: 10.1136/bmjopen-2012-001355.	☐
	062	M MED CHOICE. Handheld ECG Monitor" Brochure; M Med Choice, Beijing Choice Electronic Technology Co. LTD.· published on or before 04/14/2010.	☐
	063	M MED CHOICE. Handheld ECG Monitor MD100A1"; printed from website http://www.choicemmed.com/productshow.as_p; printed on 12/28/2009; 2 pages.	☐
	064	M MED CHOICE. Handheld ECG Monitor MD100B"; printed from website http://www.choicemmed.com/productshow.asp; printed on 12/28/2009· 2 pages.	☐

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	065	M Med Choice" printed from website http://www.choicemmed.con/1xwm .asp; printed on 12/28/2009· 1 page.	☐
	066	MACFARLANE, et al. Resting 12-lead ECG electrode placement and associated problems; SCST update 1995; 15pgs. Printed 02/18/2014 from www.scst.org.uk/resources/RESTING_12.pdf.	☐
	067	Mauvila ECG Tutorial"; Basic ECG Interpretation Tutorial; Sections 1-12; printed from website http://mauvila.com/ECG/ecg.htm· printed on 3/26/2010· 56 pages.	☐
	068	MEDGADGET. Zio Patch Wins Medical Design Award" MedGadget internet journal of emerging medical technologies, printed from website http://medaadaet.com/archives/2010/04/zio_patch_wins_medial_design_award_1.html.	☐
	069	MiCardioMobile: Remote Wireless Cardiac Rehabilitation Monitoring" printed from website htto://alivetec.cable.nu/cardiomobile· printed on or before 04/14/2010.	☐
	070	MOBILITY MIND. Use your Treo 650 as a portable ECG monitoring device", Mobility Mind Celebrating mobile Internet lifestyle and culture, Sept. 14, 2005, printed from website httg://www.treotoday.net/2005/09/14/use-your-treo-650-as-a-portab le-ecg-monitoring-device/.	☐
	071	MODEM PROTOCOLS EXPLAINED; ftp://kermit.columbia.edu/kermit/cu/protocol.html; 5 pgs.; printed 10/2/2013.	☐

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	072	MODEM TUTORIAL; http://www.lsu.edu/OCS/its/unix/tutoriai/ModemTutoriai/ModemTutorial.html; 2 pgs.; printed 10/2/2013.	☐
	073	MUENCH, Frederick, PhD; "HRV: The Manurfacturers and Vendors Speak; The portable StressEraser Heart Rate Variability Biofeedback Device: Background and Research"· Biofeedback Volume 36 Issue 1, Pages 35-39· published Spring 2008.	☐
	074	MURPH. RedEye mini converts iPhone, iPad or iPod touch into IR-beaming universal remote"; printed from website http://www.engadget.com/2010/03/02/redeye; printed on 03/02/2010; 3 pages.	☐
	075	NAM et al.; An Ultrasonic Sensor Based Low-Power Acoustic Modem for Underwater Communication in Underwater Wireless Sensor Networks; Computer Network Lab, Dept. of Elec. Eng., Korea Univ.; pp. 494-504; Dec. 2007 (http://nesl.ee.ucla.edu/fw/torres/home/Dropbox/good_paper_mico_controller.pdf; 11 pgs.; printed 10/2/2013).	☐
	076	NEUROREILLE; Audiometry; web version as of 10/14/2008; 1 pg.; printed 6/6/2012 (http://www.neuroreille.com/promenade/english/audiometry/audiometry.htm).	☐
	077	New Professional Quality ECGEKG Portable Heart Monitor"; printed from website http://cgibay.com/ws/eBayiSAPI.dll· printed on 02/04/2010· 3 pages.	☐
	078	Notice of allowance dated 01/08/2014 for US Application No. 14/015,303.	☐

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	079	Notice of allowance dated 01/27/2014 for US Application No. 14/015,303.	☐
	080	Notice of allowance dated 02/26/2014 for US Application No. 14/015,303.	☐
	081	Notice of allowance dated 05/23/2014 for US Application No. 13/108,738.	☐
	082	Notice of allowance dated 07/09/2013 for US Application No. 12/796,188.	☐
	083	Notice of allowance dated 08/28/2012 for US Application No. 13/420,520.	☐
	084	Notice of allowance dated 12/04/2013 for US Application No. 14/015,303.	☐
	085	Office action dated 01/02/2014 for US Application No. 13/108,738.	☐
	086	"Office action dated 05/18/2015 for US Application No. 13/752,048.".	☐
	087	Office action dated 06/18/2012 for US Application No. 13/420,520.	☐
	088	Office action dated 09/12/2014 for US Application No. 13/108,738.	☐
	089	Office action dated 10/06/2014 for US Application No. 14/252,044.	☐
	090	Office action dated 10/29/2012 for US Application No. 12/796,188.	☐

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EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND**

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IDS 41188-720.301 SB08 06/17/2015:7467460_1

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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 44 of 51

Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	091	Office action dated 11/19/2014 for US Application No. 13/969,446.	☐
	092	Omron Portable ECG EKG Handheld HCG-801 Monitor"; printed from website http://www.amazon.com/Omron-Portable-Handheld-HCG-801-Monitor/dp/B0019WH3EO· printed on 02/24/2010· 5 pages.	☐
	093	Omron Portable ECG Monitor"; printed from website http://www.target.com/gp/detail.html; printed on 03/26/2010· 1 page.	☐
	094	ORESKO, et al., "Detecting Cardiovascular Diseases via Real-Time Electrocardiogram Processing on a Smartphone", 2009 Workshop on Biomedicine in Computing: Systems, Architectures, and Circuits, pp 13-16.	☐
	095	PEREZ, Sarah; No NFC? No Problem; New Startup Zoosh Provides Workaround Technology (6/20/2011); printed on or before 6/27/2011 from website; 2 pgs.; (http://www.readwriteweb.com/archives).	☐
	096	PRYSTOWSKY, M.D.; "Chairmans Introduction"; Duke University Medical Center; Indianapolis, Indiana· (no date)· Pages 5-6· printed on or before 04/14/2010.	☐
	097	PRYSTOWSKY, M.D.; "Chairmans Summary"; Duke University Medical Center; Indianapolis Indiana; (no date); Pages 39-40· printed on or before 04/14/2010.	☐

Examiner Signature	/Nicole Lavert/	Date Considered	02/17/2016

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 45 of 51

Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
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Attorney Docket Number	41188-720.301

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	098	PRYSTOWSKY, M.D., "The Clinical Application, Diagnostic Yield and Cost Considerations of Cardiac Event Recorders", Indianapolis, Indiana (no date) pp. 19-23. printed on or before 04/14/2010.	☐
	099	PUURTINEN, et al., "Best Electrode Locations for a Small Bipolar ECG Device: Signal Strength Analysis of Clinical Data, Annals of Biomedical Engineering, Vol. 37, No.s 2, February 2009 (© 2008) pp. 331-336.	☐
	100	RAJU "Heart-Rate and EKG Monitor Using the MSP430FG439, SLAA280-October 2005-Revised September 2007, 11 pages.	☐
	101	READ-My-HEART. ECG Machine Handheld Read MyHeart"; (product item no.: HH-3413) printed from website http://www.helioliving.com/ECG-Machi ne-Handheld-ReadMyHea rt; printed on 2/04/2010; 1 page.	☐
	102	Readmyheart Personal Handheld ECG Monitor with Free Illustrator Book & Free Electrodes V2.2"; printed from website http://www .amazon.com/Readmyheart-Personai-Handheld-illustrator-Eiectrodes/dp/B0010AN63W; printed on 03/26/2010; 4 pages.	☐
	103	RICKER. Square payment dongle demoed for iPhone toting hippies and you (video)"; printed from website http://www.engadget.com/2010/01/18/square-payment; printed on 01/18/2010; 6 pages.	☐
	104	ROCKWOOD. The Networked Body" Magazine Article from FAST TALK Magazine; July/August 2009; pages 19-26.	☐

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 46 of 51

Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	105	SALAHUDDIN, et al., "Ultra Short Term Analysis of Heart Rate Variability using Normal Sinus Rhythm and Atrial Fibrillation ECG Data", Engineering in Medicine and Biology Society, August 2007, pp. 4656-4659.	☐
	106	SAXON, et al. iPhone rhythm strip - the implications of wireless and ubiquitous heart rate monitoring. JACC; 59(13): E726; March 2012.	☐
	107	SAXON. Ubiquitous Wireless ECG Recording: A Powerful Tool Physicians Should Embrace. J Cardiovasc Electrophysiol. 24(4): pp. 480-483; April 2013.	☐
	108	SEMLER, M.D.; "The Future of Cardiac Event Monitoring"; St. Vincent Hospital and Medical Center; Portland Oregon; (no date); Pages 33-37; printed on or before 04/14/2010.	☐
	109	SFO MEDICAL. Choice Portable Handheld ECG EKG Monitor"; printed from website http://www.amazon.com/Choice-Portable-Handheld-ECG-Monitor/dp/B001Q74VOM; printed on 03/26/2010; 1 page.	☐
	110	SHENZHEN NEW ELEMENT MED. EQUIPMENT. Wireless ECG Monitoring System", printed from website http://www.alibaba.com/product-gs/248168581/Wireless_ECG_Monitoring_system.html., printed on Mar. 26, 2010.	☐
	111	SHUMAKER, J.; Designing an Ultrasonic Modem for Robotic Communications; Army Research Laboratory; 26 pgs.; Mar. 2009 (http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA499556) printed 10/2/2013.	☐

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Sheet 47 of 51

Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
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Attorney Docket Number	41188-720.301

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	112	SMITH. Smartphone may keep the cardiologist away", The Independent, Health & Families, Mar. 5, 2010, printed from website http://www.independent.co.uk/life-style/health-and-families/healthnews/smartghone-may-keep-the-cardiologist-away-1916652. html, printed on Mar. 26, 2010.	☐
	113	STEVENS, "Apple's Seamlessly Embedded Heart Rate Monitor could turn the iPhone into a new-age mood ring", printed from the website http://www.enaadaet.com on 05/06/2010, 3 pages.	☐
	114	TALEB MEDICAL. Observer Hand-held ECG Monitor MD100B"; (no date); printed on or before 04/14/2010.	☐
	115	TEI, et al., New index of combined systolic and diastolic myocardial performance: a simple and reproducible measure of cardiac function--a study in normals and dilated cardiomyopathy; J Cardiol.; 26(6):357-366; Dec. 1995.	☐
	116	Texas Instruments. Information for Medical Applications, "Biophysical Monitoring-Electrocardiogram (ECG) Front End", April 2004, 2 pages.	☐
	117	TSCHIDA. Power A's New Case Turns Your iPhone Into A Universal Remote"; printed from website http://appadvice.com/appnn; printed on 03/01/2010· 2 pages.	☐
	118	US Application No. 13/752048, filed 1/28/2013.	☐
	119	US Application No. 13/964490, filed 8/12/2013.	☐

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Sheet 48 of 51

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	120	US Application No. 13/969446, filed 8/16/2013.	☐
	121	US Application No. 14/015303, filed 8/30/2013.	☐
	122	US Application No. 14/217032, filed 3/17/2014.	☐
	123	US Application No. 14/252044, filed 4/14/2014.	☐
	124	US Application No. 14/254310, filed 4/16/2014.	☐
	125	US Application No. 14/328962, filed 7/11/2014.	☐
	126	US Application No. 14/479105, filed 9/5/2014.	☐
	127	US Application No. 14/494191, filed 9/23/2014.	☐
	128	VANHEMERT, Kyle; "XWave Headset Lets You Control iPhone Apps With Your BRAIN"; September 8, 2010; printed from website http://gizmodo.com; printed on 09/08/2010.	☐
	129	VITAPHONE. Telemedicine since 1999: Modern health management is our special subject. 3 pgs. Retrieved 03/19/2014 from www.vitaphone.de/en/company/history-of-vitaphone/.	☐
	130	WIKIMEDIA LABORATORIES; Acoustics; web archive version dated 1/25/2009; 2 pgs.; printed 6/6/2012 (http://liveweb.archive.org/http://en.labs.wikimedia.org/wiki/Acoustics).	☐

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Sheet 49 of 51

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	131	WIKIPEDIA; Aliasing; web version as of 4/3/2011; S pgs.; printed 6/6/2012 (http://liveweb.archive.org/http://en.wikipedia.org/w/index.php?title=Aiiasing&oldid=422141882).	☐
	132	WIKIPEDIA; Hearing Range; web version as of 2/6/201 0; S pgs.; printed 6/6/2012 (http://web.archive.org/web/201 002062137 41/http://en.wikipedia.org/wiki/Hearing_range).	☐
	133	WIKIPEDIA ."Pulse oximetry", printed from website httg://en.wikigedia.orq on 05/10/2010, 4 pages.	☐
	134	WISNESKI, C.; Ultrasonic Local Area Communication; http://alumni.media.mit.edu/-wiz/ultracom.html; 2 pgs.; printed 10/2/2013.	☐
	135	WOODWARD ET AL; "Bio-Potentiai-To-Frequency Converter/Modulator"; Electronic Design· August 1999· Page 117.	☐
	136	ZIEGLER, Chris; "EPI Life phone sports ECG function, can let doctors know if you're gonna make it"; printed from website www.enoadoet.com/2010/06/; June 17 2010.	☐

Examiner Signature	/Nicole Lavert/	Date Considered	02/17/2016

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 50 of 51

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Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Uri Greenwald/	Date (YYYY-MM-DD)	2015-06-17
Name/Print	Uri Greenwald	Registration Number	72,686

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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EAST Search History

EAST Search History (Prior Art)

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S1	2755	600/508.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/30 02:05
S2	4833	600/509.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/30 02:07
S3	2551	(heart same "HRV")	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/30 02:14
S4	620	S3 and ((score or value) same 'HRV')	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/30 02:14
S5	269	S4 and arrhythmia	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/30 02:14
S6	3396	a61b5/02405.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/30 02:16
S7	161	S5 and @py<="2012"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/30 02:16
S8	2	"20120197148" and external	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/30 09:47
S9	2	"20120197148" and (display and algorithm)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/30 10:11
S10	2	"20120197148" and screen	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/30 10:13
S11	2846	600/508.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/17 09:59
S12	4940	600/509.ccls.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/17 09:59

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BIB DATA SHEET

CONFIRMATION NO. 2113

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
14/730,122	06/03/2015	600	3762	41188-720.301

APPLICANTS

AliveCor, Inc., San Francisco, CA;

INVENTORS

Ravi GOPALAKRISHNAN, San Francisco, CA;
Lev KORZINOV, San Francisco, CA;
Fei WANG, San Francisco, CA;
Euan THOMSON, San Francisco, CA;
Nupur SRIVASTAVA, San Francisco, CA;
Omar DAWOOD, San Francisco, CA;
Iman ABUZEID, San Francisco, CA;
David E ALBERT, San Francisco, CA;

**** CONTINUING DATA ***************************

This application is a CON of 14/569,513 12/12/2014
which claims benefit of 61/915,113 12/12/2013
and claims benefit of 61/953,616 03/14/2014
and claims benefit of 61/969,019 03/21/2014
and claims benefit of 61/970,551 03/26/2014
and claims benefit of 62/014,516 06/19/2014

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

06/12/2015

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /NICOLE F LAVERT/ Examiner's Signature	☐ Met after Allowance NFL Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		CA	16	20	2

ADDRESS

WILSON, SONSINI, GOODRICH & ROSATI
650 PAGE MILL ROAD
PALO ALTO, CA 94304-1050
UNITED STATES

TITLE

METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING

FILING FEE RECEIVED		
1740	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____

BIB (Rev. 05/07).

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14730122	GOPALAKRISHNAN ET AL.
	Examiner	Art Unit
	NICOLE F LAVERT	3762

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner
A61B5/02405	2/17/2016	NFL

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
600	508-509	2/17/2016	NFL

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor Search (eDAN)	2/17/2016	NFL
EAST Search (see attachment)		
Consulted Search notes from 14/569513		

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/730,122	06/03/2015	Ravi GOPALAKRISHNAN	41188-720.301

CONFIRMATION NO. 2113

21971
WILSON, SONSINI, GOODRICH & ROSATI
650 PAGE MILL ROAD
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PUBLICATION NOTICE

Title:METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING

Publication No.US-2015-0265164-A1
Publication Date:09/24/2015

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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MAILED
JUN 18 2015
OFFICE OF PETITIONS

Doc Code: TRACK1.GRANT

Decision Granting Request for Prioritized Examination (Track I or After RCE)	Application No.: 14/730,122

1. THE REQUEST FILED June 3, 2015 IS **GRANTED.**

The above-identified application has met the requirements for prioritized examination

A. ☒ for an original nonprovisional application (Track I).
B. ☐ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination.** The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:

A. filing a **petition for extension of time** to extend the time period for filing a reply;
B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims**, or a multiple dependent claim;
C. filing a **request for continued examination**;
D. filing a notice of appeal;
E. filing a request for suspension of action;
F. mailing of a notice of allowance;
G. mailing of a final Office action;
H. completion of examination as defined in 37 CFR 41.102; or
I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to Brian W. Brown at 571-272-5338.

/Brian W. Brown/
[*Signature*]

Petitions Examiner, Office of Petitions
(Title)

U.S. Patent and Trademark Office
PTO-2298 (Rev. 02-2012)

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/730,122	06/03/2015	3766	1740	41188-720.301	20	2

CONFIRMATION NO. 2113

21971
WILSON, SONSINI, GOODRICH & ROSATI
650 PAGE MILL ROAD
PALO ALTO, CA 94304-1050

FILING RECEIPT

OC000000075719429

Date Mailed: 06/17/2015

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Ravi GOPALAKRISHNAN, San Francisco, CA;
Lev KORZINOV, San Francisco, CA;
Fei WANG, San Francisco, CA;
Euan THOMSON, San Francisco, CA;
Nupur SRIVASTAVA, San Francisco, CA;
Omar DAWOOD, San Francisco, CA;
Iman ABUZEID, San Francisco, CA;
David E ALBERT, San Francisco, CA;

Applicant(s)

AliveCor, Inc., San Francisco, CA;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 14/569,513 12/12/2014
which claims benefit of 61/915,113 12/12/2013
and claims benefit of 61/953,616 03/14/2014
and claims benefit of 61/969,019 03/21/2014
and claims benefit of 61/970,551 03/26/2014
and claims benefit of 62/014,516 06/19/2014

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 06/12/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/730,122**

Projected Publication Date: 09/24/2015

Non-Publication Request: No

Early Publication Request: No

Title

METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING

Preliminary Class

607

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: Yes

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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

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For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 14/730,122

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*			OR	x 80 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 420 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1600

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/730,122	06/03/2015	Ravi GOPALAKRISHNAN	41188-720.301

CONFIRMATION NO. 2113

21971
WILSON, SONSINI, GOODRICH & ROSATI
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INFORMAL NOTICE

OC000000075719430

Date Mailed: 06/17/2015

INFORMATIONAL NOTICE TO APPLICANT

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
  Ravi GOPALAKRISHNAN
  Lev KORZINOV
  Fei WANG
  Euan THOMSON
  Nupur SRIVASTAVA
  Omar DAWOOD
  Iman ABUZEID
  David E ALBERT

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sphouminh/

Based on Form PTO/SB/08a; SB/08b
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 51

Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	001	US-UD341659	11-23-1993	HOMAYOUN, HABIB ; MEEHAN, HOWARD M. ; BEDIENT, ROBERT A. ; PIERCE, KENNETH H.	
	002	US-UD372785	08-13-1996	SABRI, MOHAMED ; PORTNUFF, COLIN M.	
	003	US-UD377983	02-11-1997	SABRI, MOHAMED ; PORTNUFF, COLIN M. ; RAE, JOHN R. ; HOMAYOUN, HABIB ; SEMLER, SHIRLEY L. ; SEMLER, HERBERT J.	
	004	US-UD414870	10-05-1999	SALTZSTEIN, WILLIAM E. ; SABRI, MOHAMED ; BURKHART, SCOTT M. ; SEMLER, GREGORY T.	
	005	US-D427315	06-27-2000	SALTZSTEIN, WILLIAM E. ; SABRI, MOHAMED ; BURKHART, SCOTT M. ; SEMLER, GREGORY T.	
	006	US-3717857	02-20-1973	EVANS J; Us	
	007	US-3731311	05-01-1973	WILLIAMS F; Us	
	008	US-3768014	10-23-1973	SMITH; Jus et al.	
	009	US-3776228	12-04-1973	SEMLER H; Us	
	010	US-3779237	12-18-1973	ROTH; Aus et al.	
	011	US-3779249	12-18-1973	SEMLER H; Us	

Examiner Signature		Date Considered	

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND**

TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 2 of 51

Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	012	US-3782367	01-01-1974	HOCHBERG; Hus et al.	
	013	US-3805227	04-16-1974	LESTER R; Us	
	014	US-3882277	05-06-1975	DEPEDRO; Donald et al.	
	015	US-3885552	05-27-1975	KENNEDY; James R.	
	016	US-3898984	08-12-1975	MANDEL; Louis et al.	
	017	US-3909599	09-30-1975	TROTT Jr.; Wayne B. et al.	
	018	US-4027146	05-31-1977	GILMORE; Charles Minot	
	019	US-4045767	08-30-1977	NISHIHARA; Motohisa et al.	
	020	US-4083366	04-11-1978	GOMBRICH; Peter P. et al.	
	021	US-4095050	06-13-1978	BEACHEM; Ronald et al.	
	022	US-4221223	09-09-1980	LINDEN; Rolf W.	
	023	US-4230127	10-28-1980	LARSON; Lary R.	
	024	US-4231031	10-28-1980	CROWTHER; Gerald O. et al.	
	025	US-4250888	02-17-1981	GROSSKOPF; Rudolf	
	026	US-4281664	08-04-1981	DUGGAN; Stephen R.	
	027	US-4295472	10-20-1981	ADAMS; John M.	
	028	US-4312358	01-26-1982	BARNEY; George M.	
	029	US-4318130	03-02-1982	HEUER; Daniel A.	
	030	US-4364397	12-21-1982	CITRON; Paul et al.	

Examiner Signature		Date Considered	

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

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Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	031	US-4367752	01-11-1983	JIMENEZ; Oscar et al.	
	032	US-4409984	10-18-1983	DICK; Joseph B.	
	033	US-4531527	07-30-1985	REINHOLD Jr.; Herbert E. et al.	
	034	US-4567883	02-04-1986	LANGER; Alois A. et al.	
	035	US-4572182	02-25-1986	ROYSE; Suzanne M.	
	036	US-4580250	04-01-1986	KAGO; Yoshiyuki et al.	
	037	US-4583553	04-22-1986	SHAH; Atul P. et al.	
	038	US-4622979	11-18-1986	KATCHIS; Louis J. et al.	
	039	US-4625730	12-02-1986	FOUNTAIN; Glen H. et al.	
	040	US-4803625	02-07-1989	FU; Ping W. et al.	
	041	US-4889131	12-26-1989	SALEM; Robert J. et al.	
	042	US-4920489	04-24-1990	HUBELBANK; Mark et al.	
	043	US-4938228	07-03-1990	RIGHTER; William H. et al.	
	044	US-4938229	07-03-1990	BERGELSON; Michael N. et al.	
	045	US-4958641	09-25-1990	DIGBY; Dennis et al.	
	046	US-4977899	12-18-1990	DIGBY; Dennis et al.	
	047	US-4981141	01-01-1991	SEGALOWITZ; Jacob	
	048	US-5012814	05-07-1991	MILLS; Gary N. et al.	
	049	US-5023906	06-11-1991	NOVAS; Robert G.	

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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	050	US-5025794	06-25-1991	ALBERT; David E. et al.	
	051	US-5058597	10-22-1991	ONODA; Masahiro et al.	
	052	US-5090418	02-25-1992	SQUIRES; Wilber D. et al.	
	053	US-5111396	05-05-1992	MILLS; Gary N. et al.	
	054	US-5128552	07-07-1992	FANG; William et al.	
	055	US-5136555	08-04-1992	GARDOS , I; Van	
	056	US-5181552	01-26-1993	EIERMANN; Kenneth L.	
	057	US-5191891	03-09-1993	RIGHTER; William H.	
	058	US-5201321	04-13-1993	FULTON; Keith W.	
	059	US-5218969	06-15-1993	BREDESEN; Mark S. et al.	
	060	US-5226424	07-13-1993	BIBLE; Christopher T.	
	061	US-5238001	08-24-1993	GALLANT; Stuart L. et al.	
	062	US-5259387	11-09-1993	DEPINTO; Victor M.	
	063	US-5301679	04-12-1994	TAYLOR; Colin R.	
	064	US-5304186	04-19-1994	SEMLER; Herbert J. et al.	
	065	US-5313953	05-24-1994	YOMTOV; Barry M. et al.	
	066	US-5321618	06-14-1994	GESSMAN; Lawrence	
	067	US-5333616	08-02-1994	MILLS; Gary N. et al.	
	068	US-5336245	08-09-1994	ADAMS; Theodore P. et al.	
	069	US-5337752	08-16-1994	REEVES; William	

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Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

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	070	US-5339824	08-23-1994	ENGIRA; Ram M.	
	071	US-5343869	09-06-1994	PROSS; Gerhard et al.	
	072	US-5343870	09-06-1994	GALLANT; Stuart L. et al.	
	073	US-5348008	09-20-1994	BORNN; Robert et al.	
	074	US-5360005	11-01-1994	WILK; Peter J.	
	075	US-5365935	11-22-1994	RIGHTER; William H. et al.	
	076	US-5410587	04-25-1995	GRUNWELL; Randall L.	
	077	US-5417222	05-23-1995	DEMPSEY; Michael K. et al.	
	078	US-5433736	07-18-1995	NILSSON; Kenth-Ake-Sune	
	079	US-5452356	09-19-1995	ALBERT; David E.	
	080	US-5466246	11-14-1995	SILVIAN; Sergiu	
	081	US-5467773	11-21-1995	BERGELSON; Michael N. et al.	
	082	US-5481255	01-02-1996	ALBERT; David E. et al.	
	083	US-5503158	04-02-1996	COPPOCK; Richard A. et al.	
	084	US-5518001	05-21-1996	SNELL; Jeffery D.	
	085	US-5522396	06-04-1996	LANGER; Alois A. et al.	
	086	US-5539705	07-23-1996	AKERMAN; M. Alfred et al.	
	087	US-5544661	08-13-1996	DAVIS; Charles L. et al.	
	088	US-5551953	09-03-1996	LATTIN; Gary A. et al.	

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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

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	089	US-5561712	10-01-1996	NISHIHARA; Toshiyuki	
	090	US-5568448	10-22-1996	TANIGUSHI; Ryosuke et al.	
	091	US-5579284	11-26-1996	MAY; David F.	
	092	US-5608723	03-04-1997	FELSENSTEIN; Lee	
	093	US-5634468	06-03-1997	PLATT; Harry L. et al.	
	094	US-5652570	07-29-1997	LEPKOFKER; Robert	
	095	US-5661699	08-26-1997	SUTTON; Paul W.	
	096	US-5675325	10-07-1997	TANIGUCHI; Ryosuke et al.	
	097	US-5678562	10-21-1997	SELLERS; Craig S.	
	098	US-5701894	12-30-1997	CHERRY; Isaac R. et al.	
	099	US-5704364	01-06-1998	SALTZSTEIN; William E. et al.	
	100	US-5724025	03-03-1998	TAVORI , I; Tzchak	
	101	US-5730143	03-24-1998	SCHWARZBERG; Robert	
	102	US-5735285	04-07-1998	ALBERT; David E. et al.	
	103	US-5742251	04-21-1998	GERBER; Peter	
	104	US-5748103	05-05-1998	FLACH; Terry E. et al.	
	105	US-5764763	06-09-1998	JENSEN; James M. et al.	
	106	US-5772586	06-30-1998	HEINONEN; Pekka et al.	
	107	US-5818788	10-06-1998	KIMURA; Tohru et al.	

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Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	108	US-5825718	10-20-1998	UEKI; Masataka et al.	
	109	US-5827179	10-27-1998	LICHTER; Patrick A. et al.	
	110	US-5840020	11-24-1998	HEINONEN; Pekka et al.	
	111	US-5844997	12-01-1998	MURPHY Jr.; ,Raymond L. H.	
	112	US-5861018	01-19-1999	FEIERBACH; Gary F.	
	113	US-5873369	02-23-1999	LANIADO; Shlomo et al.	
	114	US-5876351	03-02-1999	ROHDE; Mitchell M.	
	115	US-5877675	03-02-1999	REBSTOCK I; Janice et al.	
	116	US-5889730	03-30-1999	MAY; David F.	
	117	US-5929761	07-27-1999	VAN; Der Laan Robert Lambertus et al.	
	118	US-5970388	10-19-1999	WILL; Craig A.	
	119	US-5976083	11-02-1999	RICHARDSON; J. Jeffrey et al.	
	120	US-5982297	11-09-1999	WELLE; Richard P.	
	121	US-5983127	11-09-1999	DEPINTO; Victor M.	
	122	US-6008703	12-28-1999	PERROTT; Michael H. et al.	
	123	US-6024705	02-15-2000	SCHLAGER; Kenneth J. et al.	
	124	US-6037704	03-14-2000	WELLE; Richard P.	
	125	US-6047257	04-04-2000	DEWAELE; Piet	

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Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	126	US-6048319	04-11-2000	HUDGINS; Lonnie H. et al.	
	127	US-6072396	06-06-2000	GAUKEL; John J.	
	128	US-6083248	07-04-2000	THOMPSON; David L.	
	129	US-6084510	07-04-2000	LEMELSON; Jerome H. et al.	
	130	US-6102856	08-15-2000	GROFF; Clarence P. et al.	
	131	US-6153532	11-28-2000	DOW; Daniel B. et al.	
	132	US-6159147	12-12-2000	LICHTER; Patrick A. et al.	
	133	US-6198394	03-06-2001	JACOBSEN; Stephen C. et al.	
	134	US-6224548	05-01-2001	GOPINATHAN; Govindan et al.	
	135	US-6236889	05-22-2001	SOYKAN; Orhan et al.	
	136	US-6264614	07-24-2001	ALBERT; David E. et al.	
	137	US-6282440	08-28-2001	BRODNICK; Donald E. et al.	
	138	US-6282441	08-28-2001	RAYMOND; Stephen A. et al.	
	139	US-6289238	09-11-2001	BESSON; Marcus et al.	
	140	US-6319201	11-20-2001	WILK; Peter J.	
	141	US-6343049	01-29-2002	TODA; Kohji	
	142	US-6363139	03-26-2002	ZUREK; Robert A. et al.	
	143	US-6364834	04-02-2002	REUSS; James L. et al.	

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Attorney Docket Number	41188-720.301

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	144	US-6366871	04-02-2002	GEVA; Yakov	
	145	US-6377843	04-23-2002	NAYDENOV; Nartzis et al.	
	146	US-6418394	07-09-2002	PUOLAKANAHO; Pertti et al.	
	147	US-6433689	08-13-2002	HOVIND; Ole B. et al.	
	148	US-6453164	09-17-2002	FULLER; Robert M. et al.	
	149	US-6478736	11-12-2002	MAULT; James R.	
	150	US-6485416	11-26-2002	PLATT; Harry Louis et al.	
	151	US-6507734	01-14-2003	BERGER; Doug M. et al.	
	152	US-6513532	02-04-2003	MAULT; James R. et al.	
	153	US-6549756	04-15-2003	ENGSTROM; Eric	
	154	US-6558320	05-06-2003	CAUSEY III; James D. et al.	
	155	US-6579231	06-17-2003	PHIPPS; Eric T.	
	156	US-6595929	07-22-2003	STIVORIC; John M. et al.	
	157	US-6600471	07-29-2003	LEE; Hae-Seung et al.	
	158	US-6605038	08-12-2003	TELLER; Eric et al.	
	159	US-6612985	09-02-2003	EIFFERT; Michael E. et al.	
	160	US-6616613	09-09-2003	GOODMAN; Jesse B.	
	161	US-6636761	10-21-2003	BRODNICK; Donald Eugene	
	162	US-6685633	02-03-2004	ALBERT; David E. et al.	

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Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	163	US-6717983	04-06-2004	TODA; Kohji	
	164	US-6790178	09-14-2004	MAULT; James R. et al.	
	165	US-6804558	10-12-2004	HALLER; Markus et al.	
	166	US-6820057	11-16-2004	LOCH; Andrew et al.	
	167	US-6845263	01-18-2005	KAWAGUCHI; Keizoh	
	168	US-6893396	05-17-2005	SCHULZE; Arthur E. et al.	
	169	US-6928535	08-09-2005	YAMASHITA; Hirofumi et al.	
	170	US-6950681	09-27-2005	HOFMANN; Ludwig	
	171	US-6970737	11-29-2005	BRODNICK; Donald Eugene et al.	
	172	US-6987965	01-17-2006	NG; Richard et al.	
	173	US-7018339	03-28-2006	BIRNBAUM; Burton H. et al.	
	174	US-7020508	03-28-2006	STIVORIC; John M. et al.	
	175	US-7031745	04-18-2006	SHEN; Yuan-Yao	
	176	US-7061381	06-13-2006	FORCIER; Robert et al.	
	177	US-7103407	09-05-2006	HJELT; Kari et al.	
	178	US-7107095	09-12-2006	MANOLAS; Jan	
	179	US-7108659	09-19-2006	ROSS; Lynette et al.	
	180	US-7153262	12-26-2006	STIVORIC; John et al.	
	181	US-7162294	01-09-2007	ROWLANDSON I; G. et al.	

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Attorney Docket Number	41188-720.301

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	182	US-7188151	03-06-2007	KUMAR; Kishore et al.	
	183	US-7222054	05-22-2007	GEVA; Jacob	
	184	US-7236818	06-26-2007	MCLEOD; Michael P. et al.	
	185	US-7257448	08-14-2007	CROWE; Louis Michael et al.	
	186	US-7260429	08-21-2007	SIEJKO; Krzysztof Z. et al.	
	187	US-7261690	08-28-2007	TELLER; Eric et al.	
	188	US-7285090	10-23-2007	STIVORIC; John et al.	
	189	US-7319425	01-15-2008	FIORENZA; John K. et al.	
	190	US-7324836	01-29-2008	STEENSTRA; Jack et al.	
	191	US-7349574	03-25-2008	SODINI; Charles G. et al.	
	192	US-7351207	04-01-2008	PRIEMER; Roland	
	193	US-7354400	04-08-2008	ASAFUSA; Katsunori et al.	
	194	US-7382247	06-03-2008	WELCH; James P. et al.	
	195	US-7383297	06-03-2008	ATSMON; Alon et al.	
	196	US-7398115	07-08-2008	LYNN; Lawrence A.	
	197	US-7415304	08-19-2008	ROWLANDSON I; G. et al.	
	198	US-7444116	10-28-2008	IVANOV; Valery Filippovich et al.	
	199	US-7460899	12-02-2008	ALMEN; Adam J.	

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	200	US-7502643	03-10-2009	FARRINGDON; Jonathan et al.	
	201	US-7509159	03-24-2009	XUE; Joel Q. et al.	
	202	US-7515043	04-07-2009	WELCH; James P. et al.	
	203	US-7515044	04-07-2009	WELCH; James P. et al.	
	204	US-7520860	04-21-2009	GUION-JOHNSON MARIE A . et al.	
	205	US-7542878	06-02-2009	NANIKASHVILI; Reuven	
	206	US-7548623	06-16-2009	MANABE; Masao	
	207	US-7596405	09-29-2009	KURZWEIL; Raymond C. et al.	
	208	US-7603148	10-13-2009	MICHALAK; Gerald P.	
	209	US-7647185	01-12-2010	TARASSENKO; Lionel et al.	
	210	US-7654148	02-02-2010	TOMLINSON; Harold W.Jr et al.	
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	212	US-7668589	02-23-2010	BAUER; Peter T.	
	213	US-7689437	03-30-2010	TELLER; Eric et al.	
	214	US-7701895	04-20-2010	GEHASIE; Eyal et al.	
	215	US-7733224	06-08-2010	TRAN; Bao	
	216	US-7742808	06-22-2010	NISSILA; Seppo et al.	

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	217	US-7806832	10-05-2010	GALLAGHER; Scott Patrick et al.	
	218	US-7819814	10-26-2010	GAVRIELY; Noam et al.	
	219	US-7846104	12-07-2010	MACQUARRIE; David et al.	
	220	US-7846106	12-07-2010	ANDREWS; Angela et al.	
	221	US-7904160	03-08-2011	BRODNICK; Donald E. et al.	
	222	US-7945064	05-17-2011	O'BRIEN; William D. et al.	
	223	US-7946959	05-24-2011	SHUM; Albert et al.	
	224	US-7955273	06-07-2011	RAHE-MEYER NIELS.	
	225	US-7983749	07-19-2011	WARREN; Jay A.	
	226	US-8019609	09-13-2011	TAMIR; Asaf et al.	
	227	US-8034006	10-11-2011	CELIK-BUTLER ZEYNEP . et al.	
	228	US-8062090	11-22-2011	ATSMON; Alon et al.	
	229	US-8078136	12-13-2011	ATSMON; Alon et al.	
	230	US-8078278	12-13-2011	PENNER; Abraham	
	231	US-8126526	02-28-2012	KITAJIMA; Kazumi et al.	
	232	US-8126566	02-28-2012	STAHMANN; Jeffrey E. et al.	
	233	US-8126728	02-28-2012	DICKS; Kent et al.	
	234	US-8130093	03-06-2012	MAZAR; Scott T. et al.	

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	235	US-8150750	04-03-2012	RAY; Subhransu K.	
	236	US-8160276	04-17-2012	LIAO; Tung-Tsai et al.	
	237	US-8165677	04-24-2012	VON; Arx Jeffrey A. et al.	
	238	US-8216136	07-10-2012	ADDISON; Paul Stanley et al.	
	239	US-8224429	07-17-2012	PRSTOJEVICH; Michael D. et al.	
	240	US-8265907	09-11-2012	NANIKASHVILI; Reuven et al.	
	241	US-8275553	09-25-2012	OCHS; James et al.	
	242	US-8275635	09-25-2012	STIVORIC; John M. et al.	
	243	US-8282550	10-09-2012	RASDAL; Andrew et al.	
	244	US-8285356	10-09-2012	BLY; Mark J. et al.	
	245	US-8301232	10-30-2012	ALBERT; David et al.	
	246	US-8301236	10-30-2012	BAUMANN; Eric et al.	
	247	US-8323188	12-04-2012	TRAN; Bao	
	248	US-8328718	12-11-2012	TRAN; Bao	
	249	US-8332233	12-11-2012	OTT; James E. et al.	
	250	US-8364250	01-29-2013	MOON; Jim et al.	
	251	US-8369936	02-05-2013	FARRINGDON; Jonathan et al.	
	252	US-8374688	02-12-2013	LIBBUS; Imad et al.	

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Attorney Docket Number	41188-720.301

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	253	US-8449471	05-28-2013	TRAN; Bao	
	254	US-8500636	08-06-2013	TRAN; Bao	
	255	US-8509882	08-13-2013	ALBERT; David et al.	
	256	US-8519835	08-27-2013	DUNKO; Gregory A.	
	257	US-8543185	09-24-2013	YUEN; Shelten Gee Jao et al.	
	258	US-8548770	10-01-2013	YUEN; Shelten Gee Jao et al.	
	259	US-8700137	04-15-2014	ALBERT; David E.	
	260	US-8755871	06-17-2014	WENG; Binwei et al.	
	261	US-8923958	12-30-2014	GUPTA; Sunny et al.	
	262	US-8951189	02-10-2015	OSORIO; Ivan	
	263	US-8951192	02-10-2015	OSORIO; Ivan	
	264	US-8974396	03-10-2015	BRADY; Donald et al.	
	265	US-8977347	03-10-2015	MESTHA; Lalit Keshav et al.	
	266	US-9026202	05-05-2015	ALBERT; David E.	
	267	US-20010027384	10-04-2001	SCHULZE; Arthur E. et al.	
	268	US-20010031998	10-18-2001	NELSON; Chester G. et al.	
	269	US-20010051766	12-13-2001	GAZDZINSKI; Robert F.	
	270	US-20020016541	02-07-2002	GLOSSOP; Neil David	
	271	US-20020032386	03-14-2002	SACKNER; Marvin A. et al.	

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	272	US-20020111556	08-15-2002	WEGNER; Stanley	
	273	US-20020143576	10-03-2002	NOLVAK; Rainer et al.	
	274	US-20030004425	01-02-2003	NARIMATSU; Kiyoyuki et al.	
	275	US-20030093002	05-15-2003	KUO; Terry B.J.	
	276	US-20030107487	06-12-2003	KORMAN; Ronen et al.	
	277	US-20030117987	06-26-2003	BREBNER; Gavin	
	278	US-20030149344	08-07-2003	NIZAN; Yaniv	
	279	US-20030193839	10-16-2003	SINGH; Manmohan L.	
	280	US-20040034284	02-19-2004	AVERSANO; Thomas R. et al.	
	281	US-20040044292	03-04-2004	YASUSHI; Mitsuo et al.	
	282	US-20040059205	03-25-2004	CARLSON; Sven-Erik et al.	
	283	US-20040117212	06-17-2004	KONG; Donggeon et al.	
	284	US-20040120356	06-24-2004	DAVENPORT; David et al.	
	285	US-20040143403	07-22-2004	BRANDON; Richard Bruce et al.	
	286	US-20040215088	10-28-2004	HUBELBANK; Mark	
	287	US-20040215094	10-28-2004	BAUMER; Martin et al.	
	288	US-20040220487	11-04-2004	VYSHEDSKIY; Andrey et al.	
	289	US-20040220488	11-04-2004	VYSHEDSKIY; Andrey et al.	

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	290	US-20040225199	11-11-2004	EVANYK; Shane Walter et al.	
	291	US-20040228217	11-18-2004	SZETO; Chi Cheong	
	292	US-20040236819	11-25-2004	ANATI; Ram et al.	
	293	US-20040266407	12-30-2004	LEE; Sang-Man et al.	
	294	US-20040266480	12-30-2004	HJELT; Kari Tapani et al.	
	295	US-20050014531	01-20-2005	FINDIKLI; Nadi S.	
	296	US-20050027207	02-03-2005	WESTBROOK; Philip R. et al.	
	297	US-20050078533	04-14-2005	VYSHEDSKIY; Andrey et al.	
	298	US-20050124864	06-09-2005	MACK; David C. et al.	
	299	US-20050234353	10-20-2005	XUE; Joel Q. et al.	
	300	US-20060022833	02-02-2006	FERGUSON; Kevin et al.	
	301	US-20060047215	03-02-2006	NEWMAN; Richard W. et al.	
	302	US-20060173259	08-03-2006	FLAHERTY; J. C. et al.	
	303	US-20060190045	08-24-2006	MARCUS I; Frank et al.	
	304	US-20060193270	08-31-2006	GEHASIE; Eyal et al.	
	305	US-20060252999	11-09-2006	DEVAUL; Richard W. et al.	
	306	US-20070021677	01-25-2007	MARKEL; Gal	
	307	US-20070027386	02-01-2007	SUCH; Olaf et al.	
	308	US-20070032731	02-08-2007	LOVEJOY; Jeffrey L. et al.	

Examiner Signature		Date Considered	

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Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	309	US-20070063850	03-22-2007	DEVAUL; Richard W. et al.	
	310	US-20070106179	05-10-2007	BAGHA; Merat et al.	
	311	US-20070156060	07-05-2007	CERVANTES; Miguel A. et al.	
	312	US-20070254604	11-01-2007	KIM; Joon Sik	
	313	US-20070265038	11-15-2007	KIM; Joon S.	
	314	US-20080009759	01-10-2008	CHETHAM; Scott M. et al.	
	315	US-20080058670	03-06-2008	MAININI; Christopher E.	
	316	US-20080112885	05-15-2008	OKUNEV; Yuri et al.	
	317	US-20080146890	06-19-2008	LEBOEUF; Steven Francis et al.	
	318	US-20080171945	07-17-2008	DOTTER; James E.	
	319	US-20080177162	07-24-2008	BAE; Sang Gon et al.	
	320	US-20080198872	08-21-2008	PIERCE; Michael	
	321	US-20080214903	09-04-2008	ORBACH; Tuvi	
	322	US-20080228045	09-18-2008	GAO; Tia et al.	
	323	US-20080293453	11-27-2008	ATLAS; Scott J. et al.	
	324	US-20090010461	01-08-2009	KLINGHULT; Gunnar et al.	
	325	US-20090024045	01-22-2009	PRAKASH; Rajan et al.	
	326	US-20090037575	02-05-2009	CRYSTAL; Jack C. et al.	
	327	US-20090117883	05-07-2009	COFFING; Dan et al.	

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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
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Attorney Docket Number	41188-720.301

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	328	US-20090144080	06-04-2009	GRAY; Robert et al.	
	329	US-20090149767	06-11-2009	ROSSETTI; Walter	
	330	US-20090156908	06-18-2009	BELALCAZAR; Andres et al.	
	331	US-20090171170	07-02-2009	LI; Li et al.	
	332	US-20090209873	08-20-2009	PINTER; Robert et al.	
	333	US-20090273467	11-05-2009	ELIXMANN; Martin et al.	
	334	US-20090279389	11-12-2009	IRIE; Michio	
	335	US-20090287067	11-19-2009	DOROGUSKER; Jesse Lee et al.	
	336	US-20090306485	12-10-2009	BELL; Jonathan Arnold	
	337	US-20090312655	12-17-2009	LO; Thomas Ying-Ching	
	338	US-20100027379	02-04-2010	SAULNIER; Gary et al.	
	339	US-20100033303	02-11-2010	DUGAN; Brian M. et al.	
	340	US-20100035927	02-11-2010	OJIKA; Kosei et al.	
	341	US-20100042008	02-18-2010	AMITAI; David et al.	
	342	US-20100049006	02-25-2010	MAGAR; Surendar et al.	
	343	US-20100049037	02-25-2010	PINTER; Robert et al.	
	344	US-20100063381	03-11-2010	GREISER; Andreas	
	345	US-20100069735	03-18-2010	BERKNER; Lior	
	346	US-20100076276	03-25-2010	GILLAND; Bruce R.	

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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

U. S. PATENT DOCUMENTS

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	347	US-20100094152	04-15-2010	SEMMLOW; John	
	348	US-20100113950	05-06-2010	LIN; Gloria et al.	
	349	US-20100148956	06-17-2010	SONG; Ge et al.	
	350	US-20100184479	07-22-2010	GRIFFIN Jr.; Paul P.	
	351	US-20100204758	08-12-2010	BOON; Scot C. et al.	
	352	US-20100208434	08-19-2010	KIM; Yu Guen et al.	
	353	US-20100217099	08-26-2010	LEBOEUF; Steven Francis et al.	
	354	US-20100217100	08-26-2010	LEBOEUF; Steven Francis et al.	
	355	US-20100217345	08-26-2010	WOLFE; Andrew et al.	
	356	US-20100234746	09-16-2010	SEBELIUS; Fredrik et al.	
	357	US-20100256509	10-07-2010	KUO; Bo-Jau et al.	
	358	US-20100256976	10-07-2010	ATSMON; Alon et al.	
	359	US-20100281261	11-04-2010	RAZZELL; Charles	
	360	US-20100298711	11-25-2010	PEDERSEN; Peder C. et al.	
	361	US-20100324378	12-23-2010	TRAN; Binh C. et al.	
	362	US-20100331631	12-30-2010	MACLAUGHLIN; Scott	
	363	US-20110015496	01-20-2011	SHERMAN; Lawrence M. et al.	
	364	US-20110035927	02-17-2011	GRIFFIN; Stephen et al.	

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First Named Inventor	RAVI; Gopalakrishnan
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Attorney Docket Number	41188-720.301

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	365	US-20110060251	03-10-2011	VERMA; Pramode et al.	
	366	US-20110066042	03-17-2011	PANDIA; Keya R. et al.	
	367	US-20110117529	05-19-2011	BARASH; David et al.	
	368	US-20110134725	06-09-2011	SU; Chung-Yi et al.	
	369	US-20110160601	06-30-2011	WANG; Yang et al.	
	370	US-20110182445	07-28-2011	ATSMON; Alon et al.	
	371	US-20110208076	08-25-2011	FONG; Shannon et al.	
	372	US-20110235466	09-29-2011	BOOIJ; Wilfred Edwin et al.	
	373	US-20110275950	11-10-2011	XUE; Joel Q. et al.	
	374	US-20110288425	11-24-2011	STEWART; Donald-Bane	
	375	US-20110301435	12-08-2011	ALBERT; David et al.	
	376	US-20110301439	12-08-2011	ALBERT; David et al.	
	377	US-20120051187	03-01-2012	PAULSON; Brett L. et al.	
	378	US-20120053424	03-01-2012	KENALTY; Christopher et al.	
	379	US-20120071734	03-22-2012	SHIMUTA; Toru et al.	
	380	US-20120101396	04-26-2012	SOLOSKO; Thomas et al.	
	381	US-20120108916	05-03-2012	RIFTINE; Alexander	
	382	US-20120123891	05-17-2012	PATEL; Neilesh Shashikant	
	383	US-20120127833	05-24-2012	GHEN; Ronald David et al.	
	384	US-20120143018	06-07-2012	SKIDMORE; Frank M. et al.	

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Application Number	14730122
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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	385	US-20120147921	06-14-2012	CONTI; Richard F. et al.	
	386	US-20120157019	06-21-2012	LI; Pai-Chi	
	387	US-20120158090	06-21-2012	CHAVAN; Abhi et al.	
	388	US-20120171963	07-05-2012	TSFATY; Yossef	
	389	US-20120172689	07-05-2012	ALBERT; David et al.	
	390	US-20120179056	07-12-2012	MOULDER; J. Christopher et al.	
	391	US-20120285588	11-15-2012	SHEPPARD; James	
	392	US-20120316413	12-13-2012	LIU; Shuhai et al.	
	393	US-20130003852	01-03-2013	YAMAMOTO; Tomoyuki	
	394	US-20130030259	01-31-2013	THOMSEN; Erik et al.	
	395	US-20130085364	04-04-2013	LU; Ying Chiang et al.	
	396	US-20130122810	05-16-2013	KAUFMAN; Matthew	
	397	US-20130156194	06-20-2013	TANIOKA; Hideaki	
	398	US-20130159699	06-20-2013	TORKKEL; Juha	
	399	US-20130197320	08-01-2013	ALBERT; David E. et al.	
	400	US-20130236980	09-12-2013	MORETTI; Eugene W. et al.	
	401	US-20130261414	10-03-2013	TAL; Benny et al.	
	402	US-20130289366	10-31-2013	CHUA; Juliana et al.	
	403	US-20130331663	12-12-2013	ALBERT; David et al.	

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Application Number	14730122
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First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	404	US-20140050321	02-20-2014	ALBERT; David E. et al.	
	405	US-20140066798	03-06-2014	ALBERT; David E.	
	406	US-20140128758	05-08-2014	GALLOWAY; Conner Daniel Cross et al.	
	407	US-20140194760	07-10-2014	ALBERT; David E.	
	408	US-20140228665	08-14-2014	ALBERT; David E.	
	409	US-20140276162	09-18-2014	ALBERT; David E. et al.	
	410	US-20150018660	01-15-2015	THOMSON; Euan et al.	
	411	US-20150087952	03-26-2015	DAVID; E. Albert et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No1	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	001	CH-675675-A5	10-31-1990	ERGONOMICS AG.		☒
	002	CN-101828915-A	09-15-2010	WUXI YOUTEKE TECHNOLOGY CO LTD.		☒

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Application Number	14730122
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Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

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	003	CN-102347804-A	02-08-2012	HOT SPOT SHANGHAI NETWORK TECHNOLOGY CO LTD.		☒
	004	CN-201918016-U	08-03-2011	ZHIHAI FU.		☒
	005	DE-2506936-A1	09-02-1976	NORDMENDE.		☒
	006	DE-4212670-A1	01-13-1994	LAUSEN JOERG [DE]		☒
	007	EP-0631226-A1	12-28-1994	IBM [US]		☐
	008	EP-1181888-B1	09-26-2007	GE MED SYS INFORMATION TECH [US]		☐
	009	EP-1238633-B1	10-29-2008	YAMAN LTD [JP]		☐
	010	EP-2030565-A1	03-04-2009	MEDICALGORITHMICS SP Z O O [PL]		☐

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Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No1	Foreign Patent Document Country Code[3]–Number[4]–Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	011	EP-2116183-B1	02-01-2012	SUISSE ELECTRONIQUE MICROTECH [CH]		☐
	012	FR-2740426-A1	04-30-1997	DELATTRE BERTRAND [FR]		☒
	013	GB-2181554-A	04-23-1987	ATLANTIC MEDICAL SYSTEMS LIMIT.		☐
	014	GB-2408105-A	05-18-2005	DRAEGER SAFETY AG & CO KGAA [DE]		☐
	015	JP-2002191562-A	07-09-2002	MATSUSHITA ELECTRIC IND CO LTD.		☒
	016	JP-2002261731-A	09-13-2002	TODA KOJI.		☒
	017	JP-2003010177-A	01-14-2003	GE MED SYS GLOBAL TECH CO LLC.		☒
	018	JP-2005295378-A	10-20-2005	RCS KK.		☒
	019	JP-2012065073-A	03-29-2012	SEIKO EPSON CORP.		☒

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	020	JP-H01244328-A	09-28-1989	U II SYST INC.		☒
	021	JP-H05167540-A	07-02-1993	MORI MASAYA.		☒
	022	JP-H06326669-A	11-25-1994	MEITEC CORP.		☒
	023	JP-S59122032-A	07-14-1984	NIPPON SOKEN., et al.		☒
	024	JP-S59190742-A	10-29-1984	MATSUSHITA SEIKO KK.		☒
	025	JP-S63072231-A	04-01-1988	NIPPON SIGNAL CO LTD.		☒
	026	JP-S63294044-A	11-30-1988	TODA KOJI.		☒
	027	KR-20100059198-A	06-04-2010	SNU R&DB FOUNDATION [KR]		☒
	028	MX-2009011781-A	05-02-2011	OBREGON THOMAS SHAW [MX]		☒

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Attorney Docket Number	41188-720.301

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	029	WO-0041620-A1	07-20-2000	SCHNEIDER EDGAR [DE]		☐
	030	WO-0147597-A2	07-05-2001	MEDTRONIC INC [US]		☐
	031	WO-0157619-A2	08-09-2001	COMSENSE TECHNOLOGIES LTD [IL], et al.		☐
	032	WO-02080762-A1	10-17-2002	KORMAN RONEN [IL], et al.		☐
	033	WO-03075118-A2	09-12-2003	CARD GUARD SCIENT SURVIVAL LTD [IL], et al.		☐
	034	WO-03094720-A1	11-20-2003	BATKIN IZMAIL [CA], et al.		☐
	035	WO-2004037080-A1	05-06-2004	T MOBILE DEUTSCHLAND GMBH [DE], et al.		☐
	036	WO-2006001005-A2	01-05-2006	CARD GUARD SCIENT SURVIVAL LTD [IL], et al.		☐

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	037	WO-2006021956-A2	03-02-2006	CARD GUARD SCIENT SURVIVAL LTD [IL], et al.		☐
	038	WO-2007014545-A2	02-08-2007	RIEMENSCHNEIDER MARKUS [DE], et al.		☐
	039	WO-2007088315-A1	08-09-2007	ADVANCED RISC MACH LTD [GB], et al.		☐
	040	WO-2008005015-A1	01-10-2008	CARDIOVU INC [US]		☐
	041	WO-2008066682-A2	06-05-2008	PENRITH CORP [US], et al.		☐
	042	WO-2010025166-A1	03-04-2010	DELPHI TECH INC [US], et al.		☐
	043	WO-2010099066-A2	09-02-2010	VALENCELL INC [US], et al.		☐
	044	WO-2010108287-A1	09-30-2010	LUO HONGYUE [CA]		☐
	045	WO-2010113354-A1	10-07-2010	MURATA MANUFACTURING CO [JP], et al.		☒

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	046	WO-2010144626-A1	12-16-2010	WEISS KENNETH P [US]		☐
	047	WO-2011006356-A1	01-20-2011	CHOU CHANG-AN [CN]		☐
	048	WO-2011008838-A1	01-20-2011	SHERMAN LAWRENCE M [US], et al.		☐
	049	WO-2011014292-A1	02-03-2011	SHOPKICK INC [US], et al.		☐
	050	WO-2011022942-A1	03-03-2011	CHOU CHANG-AN [CN]		☐
	051	WO-2011040877-A1	04-07-2011	EPHONE INTERNAT PTE LTD [SG], et al.		☐
	052	WO-2011040878-A1	04-07-2011	EPHONE INTERNAT PTE LTD [SG], et al.		☐
	053	WO-2011113070-A1	09-15-2011	CENTAURI MEDICAL INC [US], et al.		☐
	054	WO-2011137375-A2	11-03-2011	UNIV OKLAHOMA [US], et al.		☐

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	055	WO-2011156374-A2	12-15-2011	ALIVEUSA LLC [US], et al.		☐
	056	WO-2012046158-A1	04-12-2012	KONINKL PHILIPS ELECTRONICS NV [NL], et al.		☐
	057	WO-2012108895-A1	08-16-2012	MASSACHUSETTS INST TECHNOLOGY [US], et al.		☐
	058	WO-2012129413-A1	09-27-2012	DRAEGER MEDICAL SYSTEMS INC [US], et al.		☐
	059	WO-2012160550-A1	11-29-2012	SHL TELEMEDICINE INTERNAT LTD [IL], et al.		☐
	060	WO-2013028960-A1	02-28-2013	INSOMNISOLV LLC [US], et al.		☐
	061	WO-2013036307-A1	03-14-2013	DRAEGER MEDICAL SYSTEMS INC [US], et al.		☐
	062	WO-2013066642-A1	05-10-2013	SCANADU INC [US]		☐

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	063	WO-2013093690-A1	06-27-2013	KONINKL PHILIPS ELECTRONICS NV [NL]		☐
	064	WO-2013122788-A1	08-22-2013	MOTOROLA MOBILITY LLC [US]		☐
	065	WO-2013138500-A1	09-19-2013	POPSOCKETS LLC [US], et al.		☐
	066	WO-2013155196-A2	10-17-2013	IMPAK HEALTH LLC [US]		☐
	067	WO-2013192166-A1	12-27-2013	MASSACHUSETTS INST TECHNOLOGY [US]		☐
	068	WO-8200910-A1	03-18-1982	ULTRAK INC [US]		☐
	069	WO-8805282-A1	07-28-1988	MICROMEDICAL IND PTY LTD [AU]		☐
	070	WO-9008361-A1	07-26-1990	SCOTT & FETZER CO [US]		☐
	071	WO-9206551-A1	04-16-1992	AUTOTROL CORP [US]		☐

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	072	WO-9731437-A1	08-28-1997	SONIC SYSTEMS [CA], et al.		☐
	073	WO-9838611-A1	09-03-1998	ERBEL RAIMUND [DE], et al.		☐
	074	WO-9944494-A1	09-10-1999	CARD GUARD SCIENT SURVIVAL LTD [IL], et al.		☐

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	001	Adidas miCoach Pacer Review: Like Nike+, Only Better"; printed from website http://gizmodo.com/5479456/adidas· printed on 03/04/2010· 5 pages.	☐
	002	AUSTRALIAN DESIGN AWARDS. Heartplus Micro"; printed from website http://www.designawards.com/au; printed on 04/12/2002 · 6 pages.	☐
	003	BAJAJ, M.D.; "Event Recording in Ambulatory Patients with Syncopal Events"; University of Kansas; Wichita, Kansas; (no date); Pages15-18; printed on or before 04/14/2010.	☐

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	004	BLUETOOTH. Headset Profile (HSP)", printed from website http://bluetooth.com/English/Techmology/Works/Pates/HSP.asgx, printed on May 12, 2010.	☐
	005	BRAMANTI et al., Multichannel telemetric system for biomedical signals via switched telephone lines", Medical and Biological Engineering and Computing, Sept. 1982, Vol. 20, No. 5, pp. 653-656.	☐
	006	BURKE, "A Micropower Dry-Electrode ECG Preamplifier", IEEE Transactions on Biomedical Engineering, Feb. 2000, Vol. 47, No.2, pp.155-162.	☐
	007	Card Guard CG-6108 ACT Ambulatory Cardiac Telemetry Brochure"; Card Guard; The Telemedicine Company: Switzerland; 2006; 2 pages.	☐
	008	CARDIOCOMM SOLUTIONS; GEMS AIR. (PC based ECG management) printed from website http://www.cardiocommsolutions/com; printed on 03/19/2010; 1 page.	☐
	009	CHARUVASTRA. Transtelephonic Cardiac Event Recording for Arrhythmia Surveillance"; printed from website http://tchin.org/resource room/c art· printed on 03/26/2010· 2 pages.	☐
	010	CHENG, Allen C.; "Real-Time Cardiovascular Diseases Detection on a Smartphone"; Departments of Electrical And Computer Engineering, Bioengineering, Neurological Surgery and Computer Science; University of Pittsburgh; Pittsburgh, PA; printed on or before 04/14/2010.	☐
	011	Co-pending US patent application No. US14/569,513, filed on 12-12-2014.	☐

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	012	Co-pending US patent application No. US14/692563, filed on 04-21-2015.	☐
	013	Co-pending US provisional application No. 61/800,879, filed on 03-15-2013.	☐
	014	Co-pending US provisional application No. 61/872,555, filed on 08-30-2013.	☐
	015	Co-pending US provisional application No. 61/874,806, filed on 09-06-2013.	☐
	016	Co-pending US provisional application No. 61/915,113, filed on 12-12-2013.	☐
	017	CREATIVE. PC-80B Portable ECG Monitor w/sd card extension slot"; printed from website www.amazon.com/Portable-Monitor-extension-leather-shipping/dp/B0010jWKUE; printed on 02/04/2010· 5 pages.	☐
	018	DEVEAU, "Health Care eyes smart phones to heal ills", printed from the website http://www.theQiobeandmail.com on 09/17/2009, 4 pages.	☐
	019	DINH. Heart activity monitoring on smartphone. IPCBEE-Int conf Biomedical Eng and Technol. June 17-19, 2011. 11:45-49.	☐
	020	DOBREV, et al., "Bootstrapped two-electrode biosignal amplifier, Med Bioi Eng Comput, 2008, 7 pages.	☐

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Sheet 35 of 51

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Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

NON-PATENT LITERATURE DOCUMENTS

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	021	DOLAN; Qualcomm launches ECG smartphone program in China; 9/8/2011; 11 pgs.; retrieved 3/19/14 from the internet (http://mobihealthnews.com/13092/qualcomm-launches-ecg-smartphone-program-in-china/).	☐
	022	ELERT, Glenn (Editor); Frequency Range of Human Hearing; The Physics Factbook; web version as of 3/29/2010; 2 pgs.; printed 6/6/2012 (http://web.archive.org/web/20100329141847/http:l/hypertextbook.com/facts/2003/ChrisDAmbrose.shtml).	☐
	023	European search report and opinion dated 11/21/2014 for EP Application No. 11865699.0.	☐
	024	FAVORITE PLUS. Handheld Easy ECG Monitor - Handheld Easy EKG Monitor"; printed from website www.favoriteplus.com/easy-ecg-handgeld-monitor-fp; printed on 02/04/2010; 2 pages.	☐
	025	FAVORITE PLUS. Handheld ECG Monitor - Handheld EKG Monitor at Favoriteplus.com"; printed from website www.favoriteplus.com/handheld-ecg-ekg-monitor; printed on 02/04/2010; 3 pages.	☐
	026	FAVORITE PLUS. Handheld ECG Monitor - Handheld EKG Monitor InstantCheck"; printed from website http://www. favoriteplus.com/instanchcheck-hand held-ecg-ekg-monitor; printed on 02/04/2010; 2 pages.	☐
	027	FERRICK, M.D.; "Holter Monitoring and cardiac Event Recording in Assessing Symptomatic Patients"; Albert Einstein College of Medicine; Bronx, New York; (no date)· Pages 11-14· printed on or before 04/14/2010.	☐

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	028	FREE2MOVE. Vitaphone 2300; www.free2move.us/News/NewsVitaghone 240105.htm printed 05/12/2010.	☐
	029	FULFORD-JONES, et al., "A Portable, Low-Power, Wireless Two-Lead EKG System", Division of Engineering and Applied Sciences, Harvard University, September, 2004, 4 pages.	☐
	030	GARABELLI et al. Accuracy and Novelty of an Inexpensive iPhone-based Event Recorder (Presentation Poster/Abstract) Heart Rhythm 2012, 33rd Annual Scientific Session. SP23. Innovation Poster Session II. No IA02-1; May 11,2012.	☐
	031	GBI PORTAL. Qualcomm's wireless reach mHealth project to improve cardiovascular disease in resource scarce China; 2/17/2012; 7 pgs. Retrieved 3/19/14 from www.intergrallc.com/2012/02/17/qualcooms-wireless-reach-mhealth-project-to-improve-cardiovascular-disease-in-resource-scarce-china/.	☐
	032	GE; Healthcare., "Marquette heart rate turbulence analysis program", 2005, DC-0160-12.05-EN-US. 4 pages.	☐
	033	GILLETTE, M.D.; "Diagnosis of Pediatric Arrhythmias with Event Recording"; Medical University of South Carolina; Charleston, South Carolina; (no date); Pages 25-32; printed on or before 04/14/2010.	☐
	034	GRIER, James W.; "How to use 1-lead ECG recorders to obtain 12-lead resting ECGs and exercise ("stress") ECGs"; Department of Biological Sciences: printed from website http://www.ndsu.edu/pubweb/rvgrier; printed on 06/07/21010; 13 pages.	☐

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	035	HANNAFORD, Kat; "How To Turn Your iPhone Into A Laser, Fan or Flashlight"; printed from website htto://m.qizmodo.com/5534904· printed on 02/03/2011.	☐
	036	HARTMANN, "ECG Front-End Design is Simplified with MicroConverter" AnalogDialogue, Nov. 2003, Vol. 37, pp. 1-5.	☐
	037	HAYES, M.D.; "Approaches to Diagnosing Transient Arhythmias" An Overview; Mayo Clinic; Rochester Minnesota; (no date); Pages 7-10; printed on or before 04/14/2010.	☐
	038	HEARING LOSS ASSOC. OF KENTUCKIANA; Decibal Ratings/Hazardous Time Exposures of Common Noise (excerpt from Survivor's Manual); web version as of 10/5/2008; 2 pgs.; printed 6/6/2012 (http://web.archive.org/web/20081005143856/http://www.hearinglossky.orglhlasurvival1.html).	☐
	039	HUANG, Tina; Age-related hearing loss; Minnesota Medicine; 90(10); pp. 48-50; Oct. 2007; printed 6/6/2012 from: http://www.minnesotamedicine.com/PastIssues/PastIssues2007/0ctober2007/Ciinca1Huang0ctober2007.aspx).	☐
	040	IMEC News; IMEC extends flexible ECG patch to enable arrhythmia detection"; printed from website http://www2.imec.be/imeC' printed on 08/18/2009 1 page.	☐
	041	INSTROMEDIX. Cardiac Event Recording FAQ's"; Instromedix A Card Guard Company, San Diego, CA.; printed from website www.instromedix.com/pdf/products/cardiac; printed on or before 04/14/2010.	☐

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	042	INSTROMEDIX. The Arrhythmia Monitoring System; King of Hearts Express AF Recorder" Brochure from Instromedix· A CardGuard Company; Rosemont IL; 2004· 3 pages.	☐
	043	"Internation search report and written opinion dated 04/30/2015 for PCT/US2014/070170.".	☐
	044	International search report and written opinion dated 02/12/2015 for PCT Application No. US2014/054414.	☐
	045	International search report and written opinion dated 02/17/2012 for PCT/US2011/039445.	☐
	046	International search report and written opinion dated 04/27/2012 for PCT/US2011/053708.	☐
	047	International search report and written opinion dated 05/15/2013 for PCT/US2013/023370.	☐
	048	International search report and written opinion dated 12/17/2013 for PCT/US2013/055458.	☐
	049	International search report dated 09/01/2014 for PCT/US2014/034350.	☐
	050	JENKINS II, W.; Time/Frequency Relationships for an FFT-Based Acoustic Modem; Naval Postgraduate School; pp. 1-1 02; Sep. 2010 (http://edocs.nps.edu/npspubs/scholarly/theses/201 0/Sep/1 OSep_Jenkins.pdf) printed 1 0/2/2013.	☐

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	051	KIM, et al., "Detection of Atrial Fibrillation Episodes using Multiple Heart Rate Variabili!Y_Features in Different Time Periods", 2008, 4 pages.	☐
	052	KOERNER. The Author's Metrics"; Wired Magazine Article; New York, NY; July 2009; page 93-126.	☐
	053	KUMAR, M.D., "Zio Patch", printed from website http://www.irhythmtech.com/zio-solution/zio-gach/, grinted on April 12, 2010.	☐
	054	KUMPARAK, Greg; "Visa officially announces their case that turns your iPhone into a credit card (and we've got pies!)"; May 17, 2010; printed from website www.mobilecrunch.com· printed on 02/03/2011.	☐
	055	LAU, et al. iPhone ECG application for community screening to detect silent atrial fibrillation: A novel technology to prevent stroke. Int J Cardiol. 2013 Apr 30;165(1):193-4.	☐
	056	LAU, et al. Performance of an Automated iPhone ECG Algorithm to Diagnose Atrial Fibrillation in a Community AF Screening Program (SEARCH-AF). Heart, Lung and Circulation. 2013; 22:S205.	☐
	057	LAU et al. Validation of an iPhone ECG application suitable for community screening for silent atrial fibrillation - A novel way to prevent stroke (Presentation Abstract 16810); American Heart Association 2012 Scientific Sessions and Resuscitation Science Symposium; 126(1); Nov. 20, 2012.	☐

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	058	LEIJDEKKERS et al., "Trial Results of a Novel Cardiac Rhythm Management System using Smart Phones and wireless ECG Sensors", Proceedings of the th International Conf. On Smart homes and health Telematics., July 1-3, 2009, Tours, France.	☐
	059	LEVKOV et al., "Removal of power-line interference from the ECG: a review of the subtraction procedure" BioMedical Engineering Online 2005, printed from website httg://www.biomedical-engineeringonline.com/contenU4/1/50 pp. 1-18.	☐
	060	LIN; et al., "An intelligent telecardiology system using a wearable and wireless ECG to detect atrial fibrillation.", 2010 May, 14(3), 726-33.	☐
	061	LOWRES, et al. Screening Education And Recognition in Community pHarmacies of Atrial Fibrillation to prevent stroke in an ambulant population aged >=65 years (SEARCH-AF stroke prevention study): a cross-sectional study protocol. BMJ Open. 2012 Jun 25; 2(3); pii: e001355. doi: 10.1136/bmjopen-2012-001355.	☐
	062	M MED CHOICE. Handheld ECG Monitor" Brochure; M Med Choice, Beijing Choice Electronic Technology Co. LTD.· published on or before 04/14/2010.	☐
	063	M MED CHOICE. Handheld ECG Monitor MD100A1"; printed from website http://www.choicemmed.com/productshow.as_p; printed on 12/28/2009; 2 pages.	☐
	064	M MED CHOICE. Handheld ECG Monitor MD100B"; printed from website http://www.choicemmed.com/productshow.asp; printed on 12/28/2009· 2 pages.	☐

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	065	M Med Choice" printed from website http://www.choicemmed.con/1xwm .asp; printed on 12/28/2009· 1 page.	☐
	066	MACFARLANE, et al. Resting 12-lead ECG electrode placement and associated problems; SCST update 1995; 15pgs. Printed 02/18/2014 from www.scst.org.uk/resources/RESTING_12.pdf.	☐
	067	Mauvila ECG Tutorial"; Basic ECG Interpretation Tutorial; Sections 1-12; printed from website http://mauvila.com/ECG/ecg.htm· printed on 3/26/2010· 56 pages.	☐
	068	MEDGADGET. Zio Patch Wins Medical Design Award" MedGadget internet journal of emerging medical technologies, printed from website http://medaadaet.com/archives/2010/04/zio_patch_wins_medial_design_award_1.html.	☐
	069	MiCardioMobile: Remote Wireless Cardiac Rehabilitation Monitoring" printed from website htto://alivetec.cable.nu/cardiomobile· printed on or before 04/14/2010.	☐
	070	MOBILITY MIND. Use your Treo 650 as a portable ECG monitoring device", Mobility Mind Celebrating mobile Internet lifestyle and culture, Sept. 14, 2005, printed from website httg://www.treotoday.net/2005/09/14/use-your-treo-650-as-a-portab le-ecg-monitoring-device/.	☐
	071	MODEM PROTOCOLS EXPLAINED; ftp://kermit.columbia.edu/kermit/cu/protocol.html; 5 pgs.; printed 10/2/2013.	☐

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	072	MODEM TUTORIAL; http://www.lsu.edu/OCS/its/unix/tutoriai/ModemTutoriai/ModemTutorial.html; 2 pgs.; printed 10/2/2013.	☐
	073	MUENCH, Frederick, PhD; "HRV: The Manurfacturers and Vendors Speak; The portable StressEraser Heart Rate Variability Biofeedback Device: Background and Research"· Biofeedback Volume 36 Issue 1, Pages 35-39· published Spring 2008.	☐
	074	MURPH. RedEye mini converts iPhone, iPad or iPod touch into IR-beaming universal remote"; printed from website http://www.engadget.com/2010/03/02/redeye; printed on 03/02/2010; 3 pages.	☐
	075	NAM et al.; An Ultrasonic Sensor Based Low-Power Acoustic Modem for Underwater Communication in Underwater Wireless Sensor Networks; Computer Network Lab, Dept. of Elec. Eng., Korea Univ.; pp. 494-504; Dec. 2007 (http://nesl.ee.ucla.edu/fw/torres/home/Dropbox/good_paper_mico_controller.pdf; 11 pgs.; printed 10/2/2013).	☐
	076	NEUROREILLE; Audiometry; web version as of 10/14/2008; 1 pg.; printed 6/6/2012 (http://www.neuroreille.com/promenade/english/audiometry/audiometry.htm).	☐
	077	New Professional Quality ECGEKG Portable Heart Monitor"; printed from website http://cgibay.com/ws/eBayiSAPI.dll· printed on 02/04/2010· 3 pages.	☐
	078	Notice of allowance dated 01/08/2014 for US Application No. 14/015,303.	☐

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	084	Notice of allowance dated 12/04/2013 for US Application No. 14/015,303.	☐
	085	Office action dated 01/02/2014 for US Application No. 13/108,738.	☐
	086	"Office action dated 05/18/2015 for US Application No. 13/752,048.".	☐
	087	Office action dated 06/18/2012 for US Application No. 13/420,520.	☐
	088	Office action dated 09/12/2014 for US Application No. 13/108,738.	☐
	089	Office action dated 10/06/2014 for US Application No. 14/252,044.	☐
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Attorney Docket Number	41188-720.301

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Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	091	Office action dated 11/19/2014 for US Application No. 13/969,446.	☐
	092	Omron Portable ECG EKG Handheld HCG-801 Monitor"; printed from website http://www.amazon.com/Omron-Portable-Handheld-HCG-801-Monitor/dp/B0019WH3EO· printed on 02/24/2010· 5 pages.	☐
	093	Omron Portable ECG Monitor"; printed from website http://www.target.com/gp/detail.html; printed on 03/26/2010· 1 page.	☐
	094	ORESKO, et al., "Detecting Cardiovascular Diseases via Real-Time Electrocardiogram Processing on a Smartphone", 2009 Workshop on Biomedicine in Computing: Systems, Architectures, and Circuits, pp 13-16.	☐
	095	PEREZ, Sarah; No NFC? No Problem; New Startup Zoosh Provides Workaround Technology (6/20/2011); printed on or before 6/27/2011 from website; 2 pgs.; (http://www.readwriteweb.com/archives).	☐
	096	PRYSTOWSKY, M.D.; "Chairmans Introduction"; Duke University Medical Center; Indianapolis, Indiana· (no date)· Pages 5-6· printed on or before 04/14/2010.	☐
	097	PRYSTOWSKY, M.D.; "Chairmans Summary"; Duke University Medical Center; Indianapolis Indiana; (no date); Pages 39-40· printed on or before 04/14/2010.	☐

Examiner Signature		Date Considered	

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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 45 of 51

Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	098	PRYSTOWSKY, M.D., "The Clinical Application, Diagnostic Yield and Cost Considerations of Cardiac Event Recorders", Indianapolis, Indiana (no date) pp. 19-23. printed on or before 04/14/2010.	☐
	099	PUURTINEN, et al., "Best Electrode Locations for a Small Bipolar ECG Device: Signal Strength Analysis of Clinical Data, Annals of Biomedical Engineering, Vol. 37, No.s 2, February 2009 (© 2008) pp. 331-336.	☐
	100	RAJU "Heart-Rate and EKG Monitor Using the MSP430FG439, SLAA280-October 2005-Revised September 2007, 11 pages.	☐
	101	READ-My-HEART. ECG Machine Handheld Read MyHeart"; (product item no.: HH-3413) printed from website http://www.helioliving.com/ECG-Machi ne-Handheld-ReadMyHea rt; printed on 2/04/2010; 1 page.	☐
	102	Readmyheart Personal Handheld ECG Monitor with Free Illustrator Book & Free Electrodes V2.2"; printed from website http://www .amazon.com/Readmyheart-Personai-Handheld-illustrator-Eiectrodes/dp/B0010AN63W; printed on 03/26/2010; 4 pages.	☐
	103	RICKER. Square payment dongle demoed for iPhone toting hippies and you (video)"; printed from website http://www.engadget.com/2010/01/18/square-payment; printed on 01/18/2010; 6 pages.	☐
	104	ROCKWOOD. The Networked Body" Magazine Article from FAST TALK Magazine; July/August 2009; pages 19-26.	☐

Examiner Signature		Date Considered	

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This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND**

TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 46 of 51

Complete if Known	
Application Number	14730122
Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	105	SALAHUDDIN, et al., "Ultra Short Term Analysis of Heart Rate Variability using Normal Sinus Rhythm and Atrial Fibrillation ECG Data", Engineering in Medicine and Biology Society, August 2007, pp. 4656-4659.	☐
	106	SAXON, et al. iPhone rhythm strip - the implications of wireless and ubiquitous heart rate monitoring. JACC; 59(13): E726; March 2012.	☐
	107	SAXON. Ubiquitous Wireless ECG Recording: A Powerful Tool Physicians Should Embrace. J Cardiovasc Electrophysiol. 24(4): pp. 480-483; April 2013.	☐
	108	SEMLER, M.D.; "The Future of Cardiac Event Monitoring"; St. Vincent Hospital and Medical Center; Portland Oregon; (no date); Pages 33-37; printed on or before 04/14/2010.	☐
	109	SFO MEDICAL. Choice Portable Handheld ECG EKG Monitor"; printed from website http://www.amazon.com/Choice-Portable-Handheld-ECG-Monitor/dp/B001Q74VOM; printed on 03/26/2010; 1 page.	☐
	110	SHENZHEN NEW ELEMENT MED. EQUIPMENT. Wireless ECG Monitoring System", printed from website http://www.alibaba.com/product-gs/248168581/Wireless_ECG_Monitoring_system.html., printed on Mar. 26, 2010.	☐
	111	SHUMAKER, J.; Designing an Ultrasonic Modem for Robotic Communications; Army Research Laboratory; 26 pgs.; Mar. 2009 (http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA499556) printed 10/2/2013.	☐

Examiner Signature		Date Considered	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 47 of 51

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Application Number	14730122
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Art Unit	3766
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	112	SMITH. Smartphone may keep the cardiologist away", The Independent, Health & Families, Mar. 5, 2010, printed from website http://www.independent.co.uk/life-style/health-and-families/healthnews/smartghone-may-keep-the-cardiologist-away-1916652. html, printed on Mar. 26, 2010.	☐
	113	STEVENS, "Apple's Seamlessly Embedded Heart Rate Monitor could turn the iPhone into a new-age mood ring", printed from the website http://www.enaadaet.com on 05/06/2010, 3 pages.	☐
	114	TALEB MEDICAL. Observer Hand-held ECG Monitor MD100B"; (no date); printed on or before 04/14/2010.	☐
	115	TEI, et al., New index of combined systolic and diastolic myocardial performance: a simple and reproducible measure of cardiac function--a study in normals and dilated cardiomyopathy; J Cardiol.; 26(6):357-366; Dec. 1995.	☐
	116	Texas Instruments. Information for Medical Applications, "Biophysical Monitoring-Electrocardiogram (ECG) Front End", April 2004, 2 pages.	☐
	117	TSCHIDA. Power A's New Case Turns Your iPhone Into A Universal Remote"; printed from website http://appadvice.com/appnn; printed on 03/01/2010· 2 pages.	☐
	118	US Application No. 13/752048, filed 1/28/2013.	☐
	119	US Application No. 13/964490, filed 8/12/2013.	☐

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Sheet 48 of 51

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	120	US Application No. 13/969446, filed 8/16/2013.	☐
	121	US Application No. 14/015303, filed 8/30/2013.	☐
	122	US Application No. 14/217032, filed 3/17/2014.	☐
	123	US Application No. 14/252044, filed 4/14/2014.	☐
	124	US Application No. 14/254310, filed 4/16/2014.	☐
	125	US Application No. 14/328962, filed 7/11/2014.	☐
	126	US Application No. 14/479105, filed 9/5/2014.	☐
	127	US Application No. 14/494191, filed 9/23/2014.	☐
	128	VANHEMERT, Kyle; "XWave Headset Lets You Control iPhone Apps With Your BRAIN"; September 8, 2010; printed from website http://gizmodo.com; printed on 09/08/2010.	☐
	129	VITAPHONE. Telemedicine since 1999: Modern health management is our special subject. 3 pgs. Retrieved 03/19/2014 from www.vitaphone.de/en/company/history-of-vitaphone/.	☐
	130	WIKIMEDIA LABORATORIES; Acoustics; web archive version dated 1/25/2009; 2 pgs.; printed 6/6/2012 (http://liveweb.archive.org/http://en.labs.wikimedia.org/wiki/Acoustics).	☐

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IDS 41188-720.301 SB08 06/17/2015:7467460_1

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Sheet 49 of 51

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	131	WIKIPEDIA; Aliasing; web version as of 4/3/2011; S pgs.; printed 6/6/2012 (http://liveweb.archive.org/http://en.wikipedia.org/w/index.php?title=Aiiasing&oldid=422141882).	☐
	132	WIKIPEDIA; Hearing Range; web version as of 2/6/201 0; S pgs.; printed 6/6/2012 (http://web.archive.org/web/201 002062137 41/http://en.wikipedia.org/wiki/Hearing_range).	☐
	133	WIKIPEDIA ."Pulse oximetry", printed from website httg://en.wikigedia.orq on 05/10/2010, 4 pages.	☐
	134	WISNESKI, C.; Ultrasonic Local Area Communication; http://alumni.media.mit.edu/-wiz/ultracom.html; 2 pgs.; printed 10/2/2013.	☐
	135	WOODWARD ET AL; "Bio-Potentiai-To-Frequency Converter/Modulator"; Electronic Design· August 1999· Page 117.	☐
	136	ZIEGLER, Chris; "EPI Life phone sports ECG function, can let doctors know if you're gonna make it"; printed from website www.enoadoet.com/2010/06/; June 17 2010.	☐

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Based on Form PTO/SB/08a; SB/08b
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 50 of 51

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Filing Date	06-03-2015
First Named Inventor	RAVI; Gopalakrishnan
Art Unit	3766
Examiner Name	Unassigned
Attorney Docket Number	41188-720.301

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Uri Greenwald/	Date (YYYY-MM-DD)	2015-06-17
Name/Print	Uri Greenwald	Registration Number	72,686

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	22660271
Application Number:	14730122
International Application Number:	
Confirmation Number:	2113
Title of Invention:	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING
First Named Inventor/Applicant Name:	Ravi GOPALAKRISHNAN
Customer Number:	21971
Filer:	Uri M. Greenwald/Collin Szeto (FC3)
Filer Authorized By:	Uri M. Greenwald
Attorney Docket Number:	41188-720.301
Receipt Date:	17-JUN-2015
Filing Date:	03-JUN-2015
Time Stamp:	15:34:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		IDS41188-720-301-6-17-2015.pdf	847685 2af66141fec9d6b0669543b807b6da2adfd09bd7	yes	55

	Multipart Description/PDF files in .zip description		
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	Transmittal Letter	1	4
	Information Disclosure Statement (IDS) Form (SB08)	5	55

Warnings:					
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Ravi GOPALAKRISHNAN, et al.	Group Art Unit: 3766
Serial Number: 14/730,122	Examiner: Unassigned
Filing Date: June 3, 2015	**CONFIRMATION NO: 2113**
Title: METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING	

FILED ELECTRONICALLY ON: June 17, 2015

Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.97

Madam:

An Information Disclosure Statement along with attached PTO/SB/08 is hereby submitted. A copy of each listed publication is submitted, if required, pursuant to 37 CFR §§1.97-1.98, as indicated below.

The Examiner is requested to review the information provided and to make the information of record in the above-identified application. The Examiner is further requested to initial and return the attached PTO/SB/08 in accordance with MPEP §609.

The right to establish the patentability of the claimed invention over any of the information provided herewith, and/or to prove that this information may not be prior art, and/or to prove that this information may not be enabling for the teachings purportedly offered, is hereby reserved.

This statement is not intended to represent that a search has been made or that the information cited in the statement is, or is considered to be, prior art or material to patentability as defined in §1.56.

A. ☒ *37 CFR §1.97(b).* This Information Disclosure Statement should be considered by the Office because:

☐ (1) It is being filed within 3 months of the filing date of a national application and is other than a continued prosecution application under §1.53(d);

-- OR --

☐ (2) It is being filed within 3 months of entry of the national stage as set forth in §1.491 in an international application;

-- OR --

☒ (3) It is being filed before the mailing of a first Office action on the merits;

-- OR --

☐ (4) It is being filed before the mailing of a first Office action after the filing of a request for continued examination under §1.114.

B. ☐ *37 CFR §1.97(c).* Although this Information Disclosure Statement is being filed after the period specified in *37 CFR §1.97(b),* above, it is filed before the mailing date of the earlier of (1) a final office action under §1.113, (2) a notice of allowance under §1.311, or (3) an action that otherwise closes prosecution on the merits, this Information Disclosure Statement should be considered because it is accompanied by one of:

☐ a statement as specified in §1.97(e) provided concurrently herewith;

-- OR --

☐ a fee of $180.00 as set forth in §1.17(p) authorized below, enclosed, or included with the payment of other papers filed together with this statement.

C. ☐ *37 CFR §1.97(d).* Although this Information Disclosure Statement is being filed after the mailing date of the earlier of (1) a final office action under §1.113 or (2) a notice of allowance under §1.311, it is being filed before payment of the issue fee and should be considered because it is accompanied by:

i. a statement as specified in §1.97(e);

-- AND --

ii. a fee of $180.00 as set forth in §1.17(p) is authorized below, enclosed, or included with the payment of other papers filed together with this Statement.

D. ☐ *37 CFR §1.97(e).* Statement.

☐ A statement is provided herewith to satisfy the requirement under 37 CFR §§1.97(c);

-- AND/OR --

☐ A statement is provided herewith to satisfy the requirement under 37 CFR §§1.97(d);

-- AND/OR --

☐ A copy of a dated communication from a foreign patent office clearly showing that the information disclosure statement is being submitted within 3 months of the filing date on the communication is provided in lieu of a statement under 37 C.F.R. § 1.97(e)(1) as provided for under MPEP 609.04(b) V.

E. ☐ *Statement Under 37 C.F.R. §1.704(d).* Each item of information contained in the information disclosure statement was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office or is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office that was received by an individual designated in § 1.56(c) not more than thirty (30) days prior to the filing of this

information disclosure statement. This statement is made pursuant to the requirements of 37 C.F.R. §1.704(d) to avoid reduction of the period of adjustment of the patent term for Applicant(s) delay.

F. ☒ *37 CFR §1.98(a)(2).* The content of the Information Disclosure Statement is as follows:

☐ Copies of each of the references listed on the attached Form PTO/SB/08 are enclosed herewith.

-- OR --

☒ Copies of U.S. Patent Documents (issued patents and patent publications) listed on the attached Form PTO/SB/08 are NOT enclosed.

-- AND/OR --

☒ Copies of Non Patent Literature Documents **as item No. 011** listed on the attached Form PTO/SB/08 are enclosed in accordance with 37 CFR §1.98 (a)(2).

-- AND/OR --

☐ Copies of pending unpublished U.S. patent applications are enclosed in accordance with 37 CFR §1.98(a)(2)(iii).

G. ☐ *37 CFR §1.98(a)(3).* The Information Disclosure Statement includes non-English patents and/or references.

☐ Pursuant to 37 CFR §1.98(a)(3)(i), a concise explanation of the relevance of each patent, publication or other information provided that is not in English is provided herewith.

☐ Pursuant to MPEP 609(B), an English language copy of a foreign search report is submitted herewith to satisfy the requirement for a concise explanation where non-English language information is cited in the search report.

-- OR --

☐ A concise explanation of the relevance of each patent, publication or other information provided that is not in English is as follows: _____

☐ Pursuant to 37 CFR §1.98(a)(3)(ii), a copy of a translation, or a portion thereof, of the non-English language reference(s) is provided herewith.

H. ☒ *37 CFR §1.98(d).* Copies of patents, publications and pending U.S. patent applications, or other information specified in 37 C.F.R. § 1.98(a) are not provided herewith because:

☒ Pursuant to 37 CFR §1.98(d)(1) the information **as items FOREIGN PATENT DOCUMENTS No. 001 through 74 and NON-PATENT LITERATURE DOCUMENTS No. 001 through 010 and 012 through 136** were previously submitted in an Information Disclosure Statement for another application under which this application claims priority for an earlier effective filing date under 35 U.S.C. 120.

Application in which the information was submitted: 14/569,513

Information Disclosure Statement(s) filed on: 06/17/2015

AND

☒ The information disclosure statement submitted in the earlier application complied with paragraphs (a) through (c) of 37 CFR §1.98.

I. ☒ *Fee Authorization*. The Commissioner is hereby authorized to charge the above-referenced fees of $0.00 and charge any additional fees or credit any overpayment associated with this communication to Deposit Account No. 23-2415 (Docket No. 41188-720.301).

Respectfully submitted,

WILSON SONSINI GOODRICH & ROSATI

Dated: June 17, 2015

By: /Uri Greenwald/
Uri Greenwald, MD
Reg. No. 72,686

650 Page Mill Road
Palo Alto, CA 94304-1050
(650) 493-9300
Customer No. 021971

PTO/AIA/15 (03-13)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	41188-720.301
First Named Inventor	Ravi GOPALAKRISHNAN
Title	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☐ **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. ☐ **Applicant asserts small entity status.** See 37 CFR 1.27
3. ☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. ☑ **Specification** [*Total Pages* 38] Both the claims and abstract must start on a new page. *(See MPEP § 608.01(a) for information on the preferred arrangement)*
5. ☑ **Drawing(s)** (35 U.S.C. 113) [*Total Sheets* 14]
6. **Inventor's Oath or Declaration** [*Total Pages* ____] *(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))*
   a. ☐ Newly executed (original or copy)
   b. ☐ A copy from a prior application (37 CFR 1.63(d))
7. ☑ **Application Data Sheet** ** See note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R** in duplicate, large table, or Computer Program (*Appendix*)
   ☐ Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission** (*if applicable, items a. – c. are required*)
   a. ☐ Computer Readable Form (CRF)
   b. ☐ Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ Paper
   c. ☐ Statements verifying identity of above copies

ADDRESS TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**

ACCOMPANYING APPLICATION PAPERS

10. ☐ **Assignment Papers** (cover sheet & document(s)) Name of Assignee ____
11. ☐ **37 CFR 3.73(c) Statement** ☐ **Power of Attorney** (*when there is an assignee*)
12. ☐ **English Translation Document** (*if applicable*)
13. ☐ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
14. ☐ **Preliminary Amendment**
15. ☐ **Return Receipt Postcard** (*MPEP § 503*) (*Should be specifically itemized*)
16. ☐ **Certified Copy of Priority Document(s)** (*if foreign priority is claimed*)
17. ☐ **Nonpublication Request** Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. ☑ **Other:** Request for Prioritized Examination

***Note**: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS

☐ The address associated with Customer Number: 021971 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature	/Uri Greenwald/	Date	06/03/2015
Name (Print/Type)	Uri Greenwald, MD	Registration No. (Attorney/Agent)	72686

This collection of information is required by 37 CFR 1.53(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/14 (12-13)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	41188-720.301
	Application Number	
Title of Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ravi		GOPALAKRISHNAN	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	San Francisco	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	30 Maiden Ln.
Address 2	

City	San Francisco	State/Province	CA
Postal Code	94108	Country i	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Lev		KORZINOV	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	San Francisco	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	30 Maiden Ln.
Address 2	

City	San Francisco	State/Province	CA
Postal Code	94108	Country i	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Fei		WANG	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	41188-720.301
	Application Number	
Title of Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING	

City	San Francisco	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	30 Maiden Ln.		
Address 2			
City	San Francisco	State/Province	CA
Postal Code	94108	Country i	US

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Euan		THOMSON	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	San Francisco	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	30 Maiden Ln.		
Address 2			
City	San Francisco	State/Province	CA
Postal Code	94108	Country i	US

Inventor 5 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Nupur		SRIVASTAVA	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	San Francisco	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	30 Maiden Ln.		
Address 2			
City	San Francisco	State/Province	CA
Postal Code	94108	Country i	US

Inventor 6 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Omar		DAWOOD	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	San Francisco	State/Province	CA	Country of Residence i	US

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	41188-720.301
	Application Number	
Title of Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING	

Mailing Address of Inventor:			
Address 1	30 Maiden Ln.		
Address 2			
City	San Francisco	State/Province	CA
Postal Code	94108	Country i	US

Inventor 7 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Iman		ABUZEID	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	San Francisco	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:			
Address 1	30 Maiden Ln.		
Address 2			
City	San Francisco	State/Province	CA
Postal Code	94108	Country i	US

Inventor 8 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	David	E	ALBERT	

Residence Information (Select One) (•) US Residency ( ) Non US Residency ( ) Active US Military Service

City	San Francisco	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:			
Address 1	30 Maiden Ln.		
Address 2			
City	San Francisco	State/Province	CA
Postal Code	94108	Country i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. — Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	021971

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	41188-720.301
	Application Number	
Title of Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING	

Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING		
Attorney Docket Number	41188-720.301	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	14	Suggested Figure for Publication (if any)	

Filing By Reference :

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	021971		

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	41188-720.301
	Application Number	
Title of Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the application number blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	14569513	2014-12-12
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14569513	Claims benefit of provisional	61915113	2013-12-12
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14569513	Claims benefit of provisional	61953616	2014-03-14
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14569513	Claims benefit of provisional	61969019	2014-03-21
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14569513	Claims benefit of provisional	61970551	2014-03-26
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
14569513	Claims benefit of provisional	62014516	2014-06-19

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) [i]the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country [i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	41188-720.301
	Application Number	
Title of Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING	

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☒ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date o f filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (12-13)
Approved for use through 04/30/2017. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	41188-720.301
	Application Number	
Title of Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING	

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◉ Assignee	○ Legal Representative under 35 U.S.C. 117	○ Joint Inventor
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. ☒

Organization Name	AliveCor, Inc.		
Mailing Address Information For Applicant:			
Address 1	30 Maiden Ln.		
Address 2			
City	San Francisco	**State/Province**	CA
Country [i]	US	Postal Code	94108
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not subsitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	41188-720.301
	Application Number	
Title of Invention	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING	

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PATENT APPLICATION

METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING

Inventor(s): Ravi GOPALAKRISHNAN
Citizen of The United States, Residing at
30 Maiden Ln.
San Francisco, CA 94108

Lev KORZINOV,
Citizen of Russia, Residing at
30 Maiden Ln.
San Francisco, CA 94108

Fei WANG,
Citizen of The United States, Residing at
30 Maiden Ln.
San Francisco, CA 94108

Euan THOMSON,
Citizen of The United States, Residing at
30 Maiden Ln.
San Francisco, CA 94108

Nupur SRIVASTAVA,
Citizen of The United States, Residing at
30 Maiden Ln.
San Francisco, CA 94108

Omar DAWOOD,
Citizen of The United States, Residing at
30 Maiden Ln.
San Francisco, CA 94108

Iman ABUZEID,
Citizen of Saudi Arabia, Residing at
30 Maiden Ln.
San Francisco, CA 94108

David E. ALBERT
Citizen of The United States, Residing at
30 Maiden Ln.
San Francisco, CA 94108

Assignee: AliveCor, Inc.
30 Maiden Ln.
San Francisco, CA 94108
a Delaware Corporation

Entity: Large business concern

WSGR

Wilson Sonsini Goodrich & Rosati
PROFESSIONAL CORPORATION

650 Page Mill Road
Palo Alto, CA 94304
(650) 493-9300 (Main)
(650) 493-6811 (Facsimile)

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METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING

CROSS-REFERENCE

[0001] This application is a continuation of U.S. Application Serial No. 14/569,513 filed December 12, 2014, which claims the benefit of U.S. Provisional Application No. 61/915,113, filed December 12, 2013, which application is incorporated herein by reference, U.S. Provisional Application No. 61/953,616 filed March 14, 2014, U.S. Provisional Application No. 61/969,019, filed March 21, 2014, U.S. Provisional Application No. 61/970,551 filed March 26, 2014 which application is incorporated herein by reference, and U.S. Provisional Application No. 62/014,516, filed June 19, 2014, which application is incorporated herein by reference.

BACKGROUND

[0002] The present disclosure relates to medical devices, systems, and methods. In particular, the present disclosure relates to methods and systems for managing health and disease such as cardiac diseases including arrhythmia and atrial fibrillation.

[0003] Cardiovascular diseases are the leading cause of death in the world. In 2008, 30% of all global death can be attributed to cardiovascular diseases. It is also estimated that by 2030, over 23 million people will die from cardiovascular diseases annually. Cardiovascular diseases are prevalent in the populations of high-income and low-income countries alike.

[0004] Arrhythmia is a cardiac condition in which the electrical activity of the heart is irregular or is faster (tachycardia) or slower (bradycardia) than normal. Although many arrhythmias are not life-threatening, some can cause cardiac arrest and even sudden cardiac death. Atrial fibrillation is the most common cardiac arrhythmia. In atrial fibrillation, electrical conduction through the ventricles of heart is irregular and disorganized. While atrial fibrillation may cause no symptoms, it is often associated with palpitations, shortness of breath, fainting, chest, pain or congestive heart failure. Atrial fibrillation is also associated with atrial clot formation, which is associated with clot migration and stroke.

[0005] Atrial fibrillation is typically diagnosed by taking an electrocardiogram (ECG) of a subject, which shows a characteristic atrial fibrillation waveform

[0006] To treat atrial fibrillation, a patient may take medications to slow heart rate or modify the rhythm of the heart. Patients may also take anticoagulants to prevent atrial clot formation and stroke. Patients may even undergo surgical intervention including cardiac ablation to treat atrial fibrillation.

[0007] Often, a patient with arrhythmia or atrial fibrillation is monitored for extended periods of time to manage the disease. For example, a patient may be provided with a Holter monitor or other

ambulatory electrocardiography device to continuously monitor a patient's heart rate and rhythm for at least 24 hours.

[0008] Current ambulatory electrocardiography devices such as Holter monitors, however, are typically bulky and difficult for subjects to administer without the aid of a medical professional. For example, the use of Holter monitors requires a patient to wear a bulky device on their chest and precisely place a plurality of electrode leads on precise locations on their chest. These requirements can impede the activities of the subject, including their natural movement, bathing, and showering. Once an ECG is generated, the ECG is sent to the patient's physician who may analyze the ECG and provide a diagnosis and other recommendations. Currently, this process often must be performed through hospital administrators and health management organizations and many patients do not receive feedback in an expedient manner.

SUMMARY

[0009] Disclosed herein are devices, systems, and methods for managing health and disease such as cardiac diseases, including arrhythmia and atrial fibrillation. In particular, a cardiac disease and/or rhythm management system, according to aspects of the present disclosure, allows a user to conveniently document their electrocardiograms (ECG) and other biometric data and receive recommendation(s) and/or goal(s) generated by the system or by a physician in response to the documented data. The cardiac disease and/or rhythm management system can be loaded onto a local computing device of the user, where biometric data can be conveniently entered onto the system while the user may continue to use the local computing device for other purposes. A local computing device may comprise, for example, a computing device worn on the body (e.g. a head-worn computing device such as a Google Glass, a wrist-worn computing device such as a Samsung Galaxy Gear Smart Watch, etc.), a tablet computer (e.g. an Apple iPad, an Apple iPod, a Google Nexus tablet, a Samsung Galaxy Tab, a Microsoft Surface, etc.), a smartphone (e.g. an Apple iPhone, a Google Nexus phone, a Samsung Galaxy phone, etc.)

[0010] A portable computing device or an accessory thereof may be configured to continuously measure one or more physiological signals of a user. The heart rate of the user may be continuously measured. The continuously measurement may be made with a wrist or arm band or a patch in communication with the portable computing device. The portable computing device may have loaded onto (e.g. onto a non-transitory computer readable medium of the computing device) and executing thereon (e.g. by a processor of the computing device) an application for one or more of receiving the continuously measured physiological signal(s), analyzing the physiological signal(s), sending the physiological signal(s) to a remote computer for further analysis and storage, and

displaying to the user analysis of the physiological signal(s). The heart rate may be measured by one or more electrodes provided on the computing device or accessory, a motion sensor provided on the computing device or accessory, or by imaging and lighting sources provided on the computing device or accessory. In response to the continuous measurement and recordation of the heart rate of the user, parameters such as heart rate (HR), heart rate variability (R-R variability or HRV), and heart rate turbulence (HRT) may be determined. These parameters and further parameters may be analyzed to detect and/or predict one or more of atrial fibrillation, tachycardia, bradycardia, bigeminy, trigeminy, or other cardiac conditions. A quantitative heart health score may also be generated from the determined parameters. One or more of the heart health score, detected heart conditions, or recommended user action items based on the heart health score may be displayed to the user through a display of the portable computing device.

[0011] The biometric data may be uploaded onto a remote server where one or more cardiac technicians or cardiac specialists may analyze the biometric data and provide ECG interpretations, diagnoses, recommendations such as lifestyle recommendations, and/or goals such as lifestyle goals for subject. These interpretations, diagnoses, recommendations, and/or goals may be provided to the subject through the cardiac disease and/or rhythm management system on their local computing device. The cardiac disease and/or rhythm management system may also include tools for the subject to track their biometric data and the associated interpretations, diagnoses, recommendations, and/or goals from the cardiac technicians or specialists.

[0012] An aspect of the present disclosure includes a dashboard centered around arrhythmia or atrial fibrillation tracking. The dashboard includes a heart score that can be calculated in response to data from the user such as their ECG and other personal information such as age, gender, height, weight, body fat, disease risks, etc. The main driver of this heart score will often be the incidence of the user's atrial fibrillation. Other drivers and influencing factors include the aforementioned personal information. The heart score will be frequently related to output from a machine learning algorithm that combines and weights many if not all of influencing factors.

[0013] The dashboard will often display and track many if not all of the influencing factors. Some of these influencing factors may be entered directly by the user or may be input by the use of other mobile health monitoring or sensor devices. The user may also use the dashboard as an atrial fibrillation or arrhythmia management tool to set goals to improve their heart score.

[0014] The dashboard may also be accessed by the user's physician (e.g. the physician prescribing the system to the user, another regular physician, or other physician) to allow the physician to view

the ECG and biometric data of the user, view the influencing factors of the user, and/or provide additional ECG interpretations, diagnoses, recommendations, and/or goals.

[0015] Another aspect of the present disclosure provides a method for managing cardiac health. Biometric data of a user may be received. A cardiac health score may be generated in response to the received biometric data. One or more recommendations or goals for improving the generated cardiac health score may be displayed to the user. The biometric data may comprise one or more of an electrocardiogram (ECG), dietary information, stress level, activity level, gender, height, weight, age, body fat percentage, blood pressure, results from imaging scans, blood chemistry values, or genotype data. The recommendations or goals may be updated in response to the user meeting the displayed recommendations or goals. The user may be alerted if one or more recommendations or goals have not been completed by the user, for example if the user has not completed one or more recommendations or goals for the day.

[0016] The analysis applied may be through one or more of the generation of a heart health score or the application of one or more machine learning algorithms. The machine learning algorithms may be trained using population data of heart rate. The population data may be collected from a plurality of the heart rate monitoring enabled portable computing devices or accessories provided to a plurality of users. The training population of users may have been previously identified as either having atrial fibrillation or not having atrial fibrillation prior to the generation of data for continuously measured heart rate. The data may be used to train the machine learning algorithm to extract one or more features from any continuously measured heart rate data and identify atrial fibrillation or other conditions therefrom. After the machine learning algorithm has been trained, the machine learning algorithm may recognize atrial fibrillation from the continuously measured heart rate data of a new user who has not yet been identified as having atrial fibrillation or other heart conditions. One or more of training population data or the trained machine learning algorithm may be provided on a central computing device (e.g. be stored on a non-transitory computer readable medium of a server) which is in communication with the local computing devices of the users and the application executed thereon (e.g. through an Internet or an intranet connection.)

[0017] A set of instructions for managing cardiac health may be downloaded from the Internet. These set of instructions may be configured to automatically generate the cardiac health score. The cardiac health score may be generated using a machine learning algorithm. The machine learning algorithm may generate the cardiac health score of the user and/or the recommendations and/or goals in response to biometric data from a plurality of users. The set of instructions may be configured to

allow a medical professional to access the received biometric data. The cardiac health score and/or the recommendations and/or goals may be generated by the medical professional.

[0018] The set of instructions may be stored on a non-transitory computer readable storage medium of one or more of a body-worn computer, a tablet computer, a smartphone, or other computing device. These set of instructions may be capable of being executed by the computing device. When executed, the set of instructions may cause the computing device to perform any of the methods described herein, including the method for managing cardiac health described above.

[0019] Another aspect of the present disclosure provides a system for managing cardiac health. The system may comprise a sensor for recording biometric data of a user and a local computing device receiving the biometric data from the sensor. The local computing device may be configured to display a cardiac health score and one or more recommendations or goals for the user to improve the cardiac health score in response to the received biometric data.

[0020] The system may further comprise a remote server receiving the biometric data from the local computing device. One or more of the local computing device or the remote server may comprise a machine learning algorithm which generates one or more of the cardiac health score or the one or more recommendations or goals for the user. The remote server may be configured for access by a medical professional. Alternatively or in combination, one or more of the cardiac health score or one or more recommendations or goals may be generated by the medical professional and provided to the local computing device through the remote server.

[0021] The sensor may comprise one or more of a hand-held electrocardiogram (ECG) sensor, a wrist-worn activity sensor, a blood pressure monitor, a personal weighing scale, a body fat percentage sensor, a personal thermometer, a pulse oximeter sensor, or any mobile health monitor or sensor. Often, the sensor is configured to be in wireless communication with the local computing device. The local computing device comprises one or more of a personal computer, a laptop computer, a palmtop computer, a tablet computer, a smartphone, a body-worn computer, or the like. The biometric data may comprise one or more of an electrocardiogram (ECG), dietary information, stress level, activity level, gender, height, weight, age, body fat percentage, or blood pressure.

[0022] Other physiological signals or parameters such as physical activity, heart sounds, blood pressure, blood oxygenation, blood glucose, temperature, activity, breath composition, weight, hydration levels, an electroencephalograph (EEG), an electromyography (EMG), a mechanomyogram (MMG), an electrooculogram (EOG), etc. may also be monitored. The user may also input user-related health data such as age, height, weight, body mass index (BMI), diet, sleep levels, rest levels, or stress levels. One or more of these physiological signals and/or parameters

may be combined with the heart rate data to detect atrial fibrillation or other conditions. The machine learning algorithm may be configured to identify atrial fibrillation or other conditions in response to heart rate data in combination with one or more of the other physiological signals and/or parameters for instance. Triggers or alerts may be provided to the user in response to the measured physiological signals and/or parameters. Such triggers or alerts may notify the user to take corrective steps to improve their health or monitor other vital signs or physiological parameters. The application loaded onto and executed on the portable computing device may provide a health dash board integrating and displaying heart rate information, heart health parameters determined in response to the heart rate information, other physiological parameters and trends thereof, and recommended user action items or steps to improve health.

INCORPORATION BY REFERENCE

[0023] All publications, patents, and patent applications mentioned in this specification are herein incorporated by reference to the same extent as if each individual publication, patent, or patent application was specifically and individually indicated to be incorporated by reference.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The novel features of the subject matter disclosed herein are set forth with particularity in the appended claims. A better understanding of the features and advantages of the present disclosure will be obtained by reference to the following detailed description that sets forth illustrative embodiments, in which the principles of the disclosure are utilized, and the accompanying drawings of which:

[0025] FIG. 1 shows a system for cardiac disease and rhythm management;

[0026] FIG. 2 shows a flow chart of a method 200 for predicting and/or detecting atrial fibrillation from R-R interval measurements;

[0027] FIG. 3 shows a flow chart of a method for predicting and/or detecting atrial fibrillation from R-R interval measurements and for predicting and/or detecting atrial fibrillation from raw heart rate signals;

[0028] FIG. 4 shows an embodiment of the system and method of the ECG monitoring described herein;

[0029] FIG. 5 shows a flow chart of an exemplary method to generate a heart health score in accordance with many embodiments;

[0030] FIG. 6 shows an exemplary method of generating a heart score;

[0031] FIG. 7 shows a schematic diagram of the executed application described herein;

[0032] FIG. 8 shows exemplary screenshots of the executed application;

[0033] FIG. 9 shows an exemplary method for cardiac disease and rhythm management;

[0034] FIG. 10 shows an exemplary method for monitoring a subject to determine when to record an electrocardiogram (ECG);

[0035] FIG. 11 shows an exemplary screenshot of a first aspect of a dashboard application;

[0036] FIG. 11A shows an exemplary screenshot of a second aspect of a dashboard application;

[0037] FIG. 12 shows an exemplary screenshot of a first aspect of a goals and recommendations page of the cardiac disease and rhythm management system interface or mobile app;

[0038] FIG. 12A shows an exemplary screenshot of a second aspect of a goals and recommendations page of the cardiac disease and rhythm management system interface or mobile app;

[0039] FIG. 13 shows an exemplary screenshot of a user's local computing device notifying the user with a pop-up notice to meet their daily recommendations and goals; and

[0040] FIG. 14 shows an embodiment comprising a smart watch which includes at least one heart rate monitor and at least one activity monitor.

DETAILED DESCRIPTION

[0041] Devices, systems, and methods for managing health and disease such as cardiac diseases, including arrhythmia and atrial fibrillation, are disclosed. In particular, a cardiac disease and/or rhythm management system, according to aspects of the present disclosure, allows a user to conveniently document their electrocardiograms (ECG) and other biometric data and receive recommendation(s) and/or goal(s) generated by the system or by a physician in response to the documented data.

[0042] The term "atrial fibrillation," denoting a type of cardiac arrhythmia, may also be abbreviated in either the figures or description herein as "AFIB."

[0043] FIG. 1 shows a system 100 for cardiac disease and rhythm management. The system 100 may be prescribed for use by a user or subject such as being prescribed by the user or subject's regular or other physician or doctor. The system 100 may comprise a local computing device 101 of the user or subject. The local computing device 101 may be loaded with a user interface, dashboard, or other sub-system of the cardiac disease and rhythm management system 100. For example, the local computing device 101 may be loaded with a mobile software application ("mobile app") 101a for interfacing with the system 100. The local computing device may comprise a computing device worn on the body (e.g. a head-worn computing device such as a Google Glass, a wrist-worn computing device such as a Samsung Galaxy Gear Smart Watch, etc.), a tablet computer (e.g. an

Apple iPad, an Apple iPod, a Google Nexus tablet, a Samsung Galaxy Tab, a Microsoft Surface, etc.), a smartphone (e.g. an Apple iPhone, a Google Nexus phone, a Samsung Galaxy phone, etc.).

[0044] The local computing device 101 may be coupled to one or more biometric sensors. For example, the local computing device 101 may be coupled to a handheld ECG monitor 103. The handheld ECG monitor 103 may be in the form of a smartphone case as described in co-owned U.S. Patent Applications Nos. 12/796,188 (now U.S. Patent No. 8,509,882), 13/107,738, 13/420,520 (now U.S. Patent No. 8,301,232), 13/752,048, 13/964,490, 13/969,446, 14/015,303, and 14/076,076, the contents of which are incorporated herein by reference.

[0045] In some embodiments, the handheld ECG monitor 103 may be a handheld sensor coupled to the local computing device 101 with an intermediate protective case/adapter as described in U.S. Provisional Application No. 61/874,806, filed Sep. 6, 2013, the contents of which are incorporated herein by reference. The handheld ECG monitor 103 may be used by the user to take an ECG measurement which the handheld ECG monitor 103 may send to the local computing device by connection 103a. The connection 103a may comprise a wired or wireless connection (e.g. a WiFi connection, a Bluetooth connection, a NFC connection, an ultrasound signal transmission connection, etc.). The mobile software application 101a may be configured to interface with the one or more biometric sensors including the handheld ECG monitor 103.

[0046] The local computing device 101 may be coupled to a wrist-worn biometric sensor 105 through a wired or wireless connection 105a (e.g. a WiFi connection, a Bluetooth connection, a NFC connection, an ultrasound signal transmission connection, etc.). The wrist-worn biometric sensor 105 may comprise an activity monitor such as those available from Fitbit Inc. of San Francisco, CA or a Nike FuelBand available from Nike, Inc. of Oregon. The wrist-worn biometric sensor 105 may also comprise an ECG sensor such as that described in co-owned U.S. Provisional Application No. 61/872,555, the contents of which is incorporated herein by reference.

[0047] The local computing device 101 may be coupled to other biometric devices as well such as a personal scale or a blood pressure monitor 107. The blood pressure monitor 107 may communicate with the local device 101 through a wired or wireless connection 107a (e.g. a WiFi connection, a Bluetooth connection, a NFC connection, an ultrasound signal transmission connection, etc.).

[0048] The local computing device 101 may directly communicate with a remote server or cloud-based service 113 through the Internet 111 via a wired or wireless connection 111a (e.g. a WiFi connection, a cellular network connection, a DSL Internet connection, a cable Internet connection, a fiber optic Internet connection, a T1 Internet connection, a T3 Internet connection, etc.). Alternatively or in combination, the local computing device 101 may first couple with another local

computing device 109 of the user, such as a personal computer of the user, which then communicates with the remote server or cloud-based service 113 via a wired or wireless connection 109a (e.g. a WiFi connection, a cellular network connection, a DSL Internet connection, a cable Internet connection, a fiber optic Internet connection, a T1 Internet connection, a T3 Internet connection, etc.) The local computing device 109 may comprise software or other interface for managing biometric data collected by the local computing device 101 or the biometric data dashboard loaded on the local computing device 101.

[0049] Other users may access the patient data through the remote server or cloud-based service 113. These other users may include the user's regular physician, the user's prescribing physician who prescribed the system 100 for use by the user, other cardiac technicians, other cardiac specialists, and system administrators and managers. For example, a first non-subject user may access the remote server or cloud-based service 113 with a personal computer or other computing device 115 through an Internet connection 115a (e.g. a WiFi connection, a cellular network connection, a DSL Internet connection, a cable Internet connection, a fiber optic Internet connection, a T1 Internet connection, a T3 Internet connection, etc.). Alternatively or in combination, the first non-subject user may access the remote server or cloud-based service 113 with a local computing device such as a tablet computer or smartphone 117 through an Internet connection 117a. The tablet computer or smartphone 117 of the first non-subject user may interface with the personal computer 115 through a wired or wireless connection 117b (e.g. a WiFi connection, a Bluetooth connection, a NFC connection, an ultrasound signal transmission connection, etc.). Further, a second non-subject user may access the remote server or cloud-based service 113 with a personal computer or other computing device 119 through an Internet connection 119a (e.g. a WiFi connection, a cellular network connection, a DSL Internet connection, a cable Internet connection, a fiber optic Internet connection, a T1 Internet connection, a T3 Internet connection, etc.). Further, a third non-subject user may access the remote server or cloud-based service 113 with a tablet computer or smartphone 121 through an Internet connection 121a (e.g. a WiFi connection, a cellular network connection, a DSL Internet connection, a cable Internet connection, a fiber optic Internet connection, a T1 Internet connection, a T3 Internet connection, etc.). Further, a fourth non-subject user may access the remote server or cloud-based service 113 with a personal computer or other computing device 123 through an Internet connection 123a (e.g. a WiFi connection, a cellular network connection, a DSL Internet connection, a cable Internet connection, a fiber optic Internet connection, a T1 Internet connection, a T3 Internet connection, etc.). The first non-subject user may comprise an administrator or manager of the system 100. The second non-subject user may comprise a cardiac technician. The third non-

subject user may comprise a regular or prescribing physician of the user or subject. And, the fourth non-subject user may comprise a cardiac specialist who is not the user or subject's regular or prescribing physician. Generally, many if not all of the communication between various devices, computers, servers, and cloud-based services will be secure and HIPAA-compliant.

[0050] Aspects of the present disclosure provide systems and methods for detecting and/or predicting atrial fibrillation or other arrhythmias of a user by applying one or more machine learning-based algorithms. A portable computing device (or an accessory usable with the portable computing device) may provide R-R intervals and/or raw heart rate signals as input to an application loaded and executed on the portable computing device. The raw heart rate signals may be provided using an electrocardiogram (ECG) in communication with the portable computing device or accessory such as described in U.S. Ser. Nos. 13/964,490 filed August 12, 2013, 13/420,520 filed March 14, 2013, 13/108,738 filed May 16, 2011, and 12/796,188 filed June 8, 2010. Alternatively or in combination, the raw heart rate signals may be provided using an on-board heart rate sensor of the portable computing device or by using photoplethysmography implemented by an imaging source and a light source of the portable computing device. Alternatively or in combination, the raw heart rate signals may be from an accessory device worn by the user or attached to the user (e.g. a patch) and which is in communication with the portable computing device. Such wearable accessory devices may include Garmin's Vivofit Fitness Band, Fitbit, Polar Heart Rate Monitors, New Balance's Balance Watch, Basis B1 Band, MIO Alpha, Withings Pulse, LifeCORE Heart Rate Monitor strap, and the like.

[0051] R-R intervals may be extracted from the raw heart rate signals. The R-R intervals may be used to calculate heart rate variability (HRV) which may be analyzed in many ways such as using time-domain methods, geometric methods, frequency-domain methods, non-linear methods, long term correlations, or the like as known in the art. Alternatively or in combination, the R-R intervals may be used for non-traditional measurements such as (i) determining the interval between every other or every three R-waves to evaluate for bigeminy or trigeminy or (ii) the generation of a periodic autoregressive moving average (PARMA).

[0052] The machine learning based algorithm(s) may allow software application(s) to identify patterns and/or features of the R-R interval data and/or the raw heart rate signals or data to predict and/or detect atrial fibrillation or other arrhythmias. These extracted and labelled features may be features of HRV as analyzed in the time domain such as SDNN (the standard deviation of NN intervals calculated over a 24 hour period), SDANN (the standard deviation of the average NN intervals calculated over short periods), RMSSD (the square root of the mean of the sum of the

squares of the successive differences between adjacent NNs), SDSD (the standard deviation of the successive differences between adjacent NNs), NN50 (the number of pairs of successive NNs that differ by more than 50 ms), pNN50 (the proportion of NN50 divided by total number of NNs), NN20 (the number of pairs of successive NNs that differ by more than 20 ms), pNN20 (the proportion of NN20 divided by the total number of NNs), EBC (estimated breath cycle), NNx (the number of pairs of successive NNs that differ by more than x ms), pNNx (the proportion of NNx divided by the number of NNs), or other features known in the art. Alternatively or in combination, the extracted and labelled features may comprise a nonlinear transform of R-R ratio or R-R ratio statistics with an adaptive weighting factor. Alternatively or in combination, the extracted and labelled features may be features of HRV as analyzed geometrically such as the sample density distribution of NN interval durations, the sample density distribution of differences between adjacent NN intervals, a Lorenz plot of NN or RR intervals, degree of skew of the density distribution, kurtosis of the density distribution, or other features known in the art. Alternatively or in combination, the extracted and labelled features may be features of HRV in the frequency domain such as the power spectral density of different frequency bands including a high frequency band (HF, from 0.15 to 0.4 Hz), low frequency band (LF, from 0.04 to 0.15 Hz), and the very low frequency band (VLF, from 0.0033 to 0.04 Hz), or other frequency domain features as known in the art. Alternatively or in combination, the extracted and labelled features may be non-linear features such as the geometric shapes of a Poincaré plot, the correlation dimension, the nonlinear predictability, the pointwise correlation dimension, the approximate entropy, and other features as known in the art. Other features from the raw heart rate signals and data may also be analyzed. These features include for example a generated autoregressive (AR) model, a ratio of consecutive RR intervals, a normalized ratio of consecutive RR intervals, a standard deviation of every 2, 3, or 4 RR intervals, or a recurrence plot of the raw HR signals, among others.

[0053] The features of the analysis and/or measurement may be selected, extracted, and labelled to predict atrial fibrillation or other arrhythmias in real time, e.g. by performing one or more machine learning operation. Such operations can be selected from among an operation of ranking the feature(s), classifying the feature(s), labelling the feature(s), predicting the feature(s), and clustering the feature(s). Alternatively or in combination, the extracted features may be labelled and saved for offline training of a machine learning algorithm or set of machine learning operations. For example, the operations may be selected from any of those above. Any number of machine learning algorithms or methods may be trained to identify atrial fibrillation or other conditions such as arrhythmias. These may include the use of decision tree learning such as with a random forest,

association rule learning, artificial neural network, inductive logic programming, support vector machines, clustering, Bayesian networks, reinforcement learning, representation learning, similarity and metric learning, sparse dictionary learning, or the like.

[0054] The systems and methods for detecting and/or predicting atrial fibrillation or other conditions such as arrhythmias described herein may be implemented as software provided as a set of instructions on a non-transitory computer readable medium. A processor of a computing device (e.g. a tablet computer, a smartphone, a smart watch, a smart band, a wearable computing device, or the like) may execute this set of instructions to receive the input data and detect and/or predict atrial fibrillation therefrom. The software may be downloaded from an online application distribution platform such as the Apple iTunes or App Store, Google Play, Amazon App Store, and the like. A display of the computing device may notify the user whether atrial fibrillation or other arrhythmias has been detected and/or if further measurements are required (e.g. to perform a more accurate analysis). The software may be loaded on and executed by the portable computing device of the user such as with the processor of the computing device.

[0055] The machine learning-based algorithms or operations for predicting and/or detecting atrial fibrillation or other arrhythmias may be provided as a service from a remote server which may interact or communicate with a client program provided on the computing device of the user, e.g. as a mobile app. The interaction or communication may be through an Application Program Interface (API). The API may provide access to machine learning operations for ranking, clustering, classifying, and predicting from the R-R interval and/or raw heart rate data, for example.

[0056] The machine learning-based algorithms or operations, provided through a remote server and/or on a local application on a local computing device, may operate on, learn from, and make analytical predictions from R-R interval data or raw heart rate data, e.g. from a population of users. The R-R interval or raw heart rate data may be provided by the local computing device itself or an associated accessory, such as described in U.S. Ser. Nos. 13/964,490 filed August 12, 2013, 13/420,520 filed March 14, 2013, 13/108,738 filed May 16, 2011, and 12/796,188 filed June 8, 2010. Thus, atrial fibrillation and other arrhythmias or other heart conditions can be in a convenient, user-accessible way.

[0057] FIG. 2 shows a flow chart of a method 200 for predicting and/or detecting atrial fibrillation from R-R interval measurements. In a step 202, an R-R interval of a user is obtained. In a step 204, the obtained R-R interval is analyzed using one or more traditional heart rate variability measurements such as, for example, time domain measures, frequency domain measures, and non-linear heart rate variability. In a step 206, the obtained R-R interval is analyzed using one or more

non-traditional heart rate variability measurements such as, for example, RR (n-i) for Bigeminy and Trigeminy detection, and the generation of a periodic autoregressive moving average (PARMA). In a step 208, a feature selection occurs. In a step 210, a real time prediction or detection of atrial fibrillation, and/or in a step 212, the heart rate variability measurements may be labelled and saved for offline training of a machine learning algorithm or set of machine learning operations, and then may be subsequently used to make a real time prediction and/or detection of atrial fibrillation.

[0058] FIG. 3 shows a flow chart of a method 300 for predicting and/or detecting atrial fibrillation from R-R interval measurements and for predicting and/or detecting atrial fibrillation from raw heart rate signals. In a step 302, raw heart rate signals are obtained from, for example, an ECG of a user. In a step 304, R-R intervals are obtained from the obtained raw hearth signals. In a step 306, the obtained R-R interval is analyzed using one or more traditional heart rate variability measurements such as, for example, time domain measures, frequency domain measures, and non-linear heart rate variability. In a step 308, the obtained R-R interval is analyzed using one or more non-traditional heart rate variability measurements such as, for example, RR (n-i) for bigeminy and trigeminy detection, and the generation of a periodic autoregressive moving average (PARMA). In a step 310, features from the obtained heart rate features are analyzed using one or more of wavelet features and shape based features from a Hilbert transform. In a step 312, a feature selection occurs. In a step 314, a real time prediction or detection of atrial fibrillation, and/or in a step 316, the heart rate variability measurements may be labelled and saved for offline training of a machine learning algorithm or set of machine learning operations, and then may be subsequently used to make a real time prediction and/or detection of atrial fibrillation.

[0059] Although the above steps show methods 200 and 300 in accordance with many embodiments, a person of ordinary skill in the art will recognize many variations based on the teaching described herein. The steps may be completed in a different order. Steps may be added or deleted. Some of the steps may comprise sub-steps. Many of the steps may be repeated as often as beneficial to the user or subject.

[0060] One or more of the steps of method 200 and 300 may be performed with circuitry, for example, one or more of a processor or a logic circuitry such as a programmable array logic for a field programmable gate array. The circuitry may be programmed to provide one or more of the steps of methods 200 and 300, and the program may comprise program instructions stored on a non-transitory computer readable medium or memory or programmed steps of the logic circuitry such as the programmable array logic or the field programmable gate array, for example.

[0061] Aspects of the present disclosure provide systems and methods for monitoring one or more physiological parameters and providing a trigger message to the user if the one or more physiological parameter meets a pre-determined or learned threshold(s). Two or more of the physiological parameters may be combined to provide a trigger message. That is, a particular trigger message may be provided to the user if two or more pre-determined threshold(s) for the physiological parameter(s) are met.

[0062] Table 1 below shows an exemplary table of physiological parameters that may be measured (left column), features of interest to be measured or threshold types to be met (middle column), and exemplary trigger messages (right column).

TABLE 1

Physiological Parameter	Measurements/Threshold	Sample Trigger Messages
Heart Rate	Heart Rate Variability (HRV), Non-linear Transformation of RR Intervals	Measure ECG; See Your Doctor
Heart Sound	Sound Features	Abnormal Heart Sound; Measure ECG; See Your Doctor
Blood Pressure	Upper and Lower Thresholds	High/Low Blood Pressure; Take BP Medication; Exercise; See Your Doctor
Blood Oxygenation	O2 Saturation, O2 Saturation Variability	High Risk of Hypoventilation; High Risk of Sleep Disorder such as Apnea; See Your Doctor
Blood Glucose	Upper and Lower Thresholds	High Risk of Hypoglycemia; See Your Doctor
Temperature	Temperature, Temperature Changes	Fever; Take OTC Fever Medication; See Your Doctor
Physical Activity (accelerometer data)	Gait, Chest Compressions, Speed, Distance	Monitor Senior or Infant Posture, e.g. if senior/infant has fallen
Electrocardiogram (ECG)	ECG Features (E.g. QT, QRS, PR intervals, HRV ,etc.	High Risk of Certain Cardiac Diseases; Sleep apnea; See Your Doctor
Breath Content (Breathalyzer data)	Percentage of the Certain Chemicals	High Risk of Certain Dental Disease, Diabetes, etc.; See Your Doctor

[0063] The machine learning based algorithms or operations as described herein may be used to determine the appropriate trigger thresholds in response to the raw physiological data input and/or user-input physiological parameters (e.g. age, height, weight, gender, etc.). Features of the raw physiological data input may be selected, extracted, labelled, clustered, and/or analyzed. These processed features may then be analyzed using one or more machine learning operation such as ranking the feature(s), classifying the feature(s), predicting the feature(s), and clustering the feature(s). The various machine learning algorithms described herein may be used to analyze the

features to detect and predict health conditions and generate recommendations or user action items to improve the health of the user. For instance, the machine learning algorithms may be trained to identify atrial fibrillation or other conditions in response to the non-heart rate physiological parameter(s) such as age, gender, body mass index (BMI), activity level, diet, and others in combination with the raw heart rate data and HRV that can be extracted therefrom.

[0064] The systems and methods for monitoring one or more physiological parameters and providing a trigger message to the user if the one or more physiological parameter meets a pre-determined threshold(s) described herein may be implemented as software provided as a set of instructions on a non-transitory computer readable medium. A processor of a computing device (e.g. a tablet computer, a smartphone, a smart watch, a smart band, a wearable computing device, or the like) may execute this set of instructions to receive the input data and detect and/or predict atrial fibrillation therefrom. The software may be downloaded from an online application distribution platform such as the Apple iTunes or App Store, Google Play, Amazon App Store, and the like. The software may be loaded on and executed by the portable computing device of the user such as with the processor of the computing device. The software may also provide both the triggering application described herein and the heart rate monitoring and analysis for detecting atrial fibrillation or other heart conditions described herein.

[0065] In an embodiment, a method and system for longitudinal monitoring of a patient's or any consumer's (after referred to as "patient") health using various ECG monitoring devices is described herein. The ECG monitoring devices generate ECG signal data which can be stored in a database for further analysis. The ECG data, which can be stored in a database along with other patient information, can be analyzed by a processing device, such as a computer or server, using various algorithms.

[0066] Various ECG monitoring or recording devices, hereinafter referred to as ECG monitoring devices, can be used to record the ECG data. For example, the ECG monitoring device can be a handheld, portable, or wearable smartphone based device, as described in U.S. Patent No. 8,301,232, which is herein incorporated by reference in its entirety for all purposes. A smartphone based device, or a device having wireless or cellular telecommunication capabilities, can transmit the ECG data to a database or server directly through the internet. These types of ECG monitoring devices as well as other ECG monitoring devices include portable devices, wearable recording devices, event recorders, and Holter monitors. Clinical or hospital based ECG recording devices can also be used and integrated into the system. Such devices may be able to transmit stored ECG data through a phone line or wirelessly through the internet or cellular network, or may need to be sent to a data

collection center for data collection and processing. The ECG data can be tagged with the type of ECG monitoring device used to record the data by, for example, including it in metadata for indexing and searching purposes.

[0067] The ECG monitoring devices can be single lead devices or multiple lead devices, where each lead generally terminates with an electrode. Some embodiments may even be leadless and have electrodes that are integrated with the body or housing of the device, and therefore have a predetermined relationship with each other, such as a fixed spacing apart from each other. The orientation and positioning of the single lead in a single lead device or of each lead of the multiple lead device or of the electrodes of the leadless device can be transmitted with the ECG data. The lead and/or electrode placement may be predetermined and specified to the patient in instructions for using the device. For example, the patient may be instructed to position the leads and/or electrodes with references to one or more anatomical landmarks on the patient's torso. Any deviation from the predetermined lead and/or electrode placement can be notated by the patient or user when transmitting the ECG data. The lead and electrode placement may be imaged using a digital camera, which may be integrated with a smart phone, and transmitted with the ECG data and stored in the database. The lead and electrode placement may be marked on the patient's skin for imaging and for assisting subsequent placement of the leads and electrodes. The electrodes can be attached to the skin using conventional methods which may include adhesives and conducting gels, or the electrodes may simply be pressed into contact with the patient's skin. The lead and electrode placement may be changed after taking one recording or after recording for a predetermined or variable amount of time. The ECG data can be tagged with the numbers of leads and/or electrodes and the lead and/or electrode placement, including whether adhesives and/or conducting gels were used. Again, this information can be including in metadata for indexing and searching purposes.

[0068] The ECG signal data can be continuously recorded over a predetermined or variable length of time. Continuous ECG recording devices can record for up to 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, or 14 days. Alternatively or additionally, the ECG data can be recorded on demand by the patient at various discrete times, such as when the patient feels chest pains or experiences other unusual or abnormal feelings. The on demand ECG recorder can have a memory buffer that can record a predetermined amount of ECG data on a rolling basis, and when activated by the patient to record a potential event, a predetermined amount of ECG data can be saved and/or transmitted. The predetermined amount of ECG data can include a predetermined amount of ECG data before activation and a predetermined amount of ECG data after activation such that a window of ECG data is captured that encompasses the potential event. The time period between ECG recordings may be

regular or irregular. For example, the time period may be once a day, once a week, once a month, or at some other predetermined interval. The ECG recordings may be taken at the same or different times of days, under similar or different circumstances, as described herein. One or more baseline ECGs can be recorded while the patient is free of symptoms. The baseline ECGs can be periodically recorded and predetermined intervals and/or on-demand. The same ECG recording device or different ECG recording devices may be used to record the various ECG of a particular patient. All this information may be tagged to or associated with the ECG data by, for example, including it in the metadata for indexing and searching purposes.

[0069] The ECG data can be time stamped and can be annotated by the patient or health care provider to describe the circumstances during which the ECG was recorded, preceding the ECG recording, and/or following the ECG recording. For example, the system and device can have an user interface for data entry that allows the patient to enter in notes regarding the conditions and circumstances surrounding the ECG recording. This additional data can be also included as metadata for indexing and searching purposes. For example, location, food, drink, medication and/or drug consumption, exercise, rest, sleep, feelings of stress, anxiety, pain or other unusual or abnormal feelings, or any other circumstance that may affect the patient's ECG signal can all be inputted into the device, smart phone, computer or other computing device to be transmitted to the server or database along with the ECG data. The annotated data can also include the patient's identity or unique identifier as well as various patient characteristics including age, sex, race, ethnicity, and relevant medical history. The annotated data can also be time stamped or tagged so that the ECG data can be matched or correlated with the activity or circumstance of interest. This also allows comparison of the ECG before, after and during the activity or circumstance so that the effect on the ECG can be determined.

[0070] The ECG data and the associated metadata can be transmitted from the device to a server and database for storage and analysis. The transmission can be real-time, at regular intervals such as hourly, daily, weekly and any interval in between, or can be on demand. The metadata facilitates the searching, organizing, analyzing and retrieving of ECG data. Comparison and analysis of a single patient's ECG data can be performed, and/or comparison of ECG data between patients can be performed. For example, the metadata can be used to identify and select a subset of ECG data where an activity or circumstance, such as the taking of medication, occurred within a predetermined amount of time to the ECG data. The components of the ECG signal data, such as the P wave, T wave, and QRS complex and the like, the amplitudes of the components, the ratios between the components, the width of the components, and the delay or time separation between the components,

can be extracted, compared, analyzed, and stored as ECG features. For example, the P wave and heart rate can be extracted and analyzed to identify atrial fibrillation, where the absence of P waves and/or an irregular heart rate may indicate atrial fibrillation. The extracted ECG features can also be included in the metadata for indexing and searching.

[0071] The changes in the ECG signal over time in view of the activities and circumstances can be compared with changes over time and circumstances observed within a database of ECG's. Comparisons may include any comparison of data derived from any other ECG signal or any database of ECG's or any subset of ECG data, or with data derived from any database of ECG's. Changes in any feature of the ECG signal over time may be used for a relative comparison with similar changes in any ECG database or with data derived from an ECG database. The ECG data from the baseline ECG and the ECG data from a potential adverse event can be compared to determine the changes or deviations from baseline values. In addition, both the baseline ECG and the ECG data recorded from the patient can be compared to one or more predetermined template ECGs which can represent a normal healthy condition as well as various diseased conditions, such as myocardial infarction and arrhythmias.

[0072] The comparisons and analysis described herein can be used to draw conclusions and insights into the patient's health status, which includes potential health issues that the patient may be experiencing at the time of measurement or at future times. Conclusions and determinations may be predictive of future health conditions or diagnostic of conditions that the patient already has. The conclusions and determinations may also include insights into the effectiveness or risks associated with drugs or medications that the patient may be taking, have taken or may be contemplating taking in the future. In addition, the comparisons and analysis can be used to determine behaviors and activities that may reduce or increase risk of an adverse event. Based on the comparisons and analysis described herein, the ECG data can be classified according to a level of risk of being an adverse event. For example, the ECG data can be classified as normal, low risk, moderate risk, high risk, and/or abnormal. The normal and abnormal designation may require health care professional evaluation, diagnosis, and/or confirmation.

[0073] Diagnosis and determination of an abnormality, an adverse event, or a disease state by physicians and other health care professionals can be transmitted to the servers and database to be tagged with and associated with the corresponding ECG data. The diagnosis and determination may be based on analysis of ECG data or may be determined using other tests or examination procedures. Professional diagnosis and determinations can be extracted from the patient's electronic health records, can be entered into the system by the patient, or can be entered into the system by the

medical professional. The conclusions and determinations of the system can be compared with actual diagnosis and determinations from medical professions to validate and/or refine the machine learning algorithms used by the system. The time of occurrence and duration of the abnormality, adverse event or disease state can also be included in the database, such that the ECG data corresponding with the occurrence and/or the ECG data preceding and/or following the abnormality, adverse event or disease state can be associated together and analyzed. The length of time preceding or following the abnormality may be predetermined and be up to 1 to 30 days, or greater than 1 to 12 months. Analysis of the time before the abnormality, adverse event or disease state may allow the system to identify patterns or correlations of various ECG features that precede the occurrence of the abnormality, adverse event or disease state, thereby providing advance detection or warning of the abnormality, adverse event or disease state. Analysis of the time following the abnormality, adverse event or disease state can provide information regarding the efficacy of treatments and/or provide the patient or physician information regarding disease progression, such as whether the patient's condition in improving, worsening or staying the same. The diagnosis and determination can also be used for indexing by, for example, including it in the metadata associated with the corresponding ECG data.

[0074] As described herein, various parameters may be included in the database along with the ECG data. These may include the patient's age, gender, weight, blood pressure, medications, behaviors, habits, activities, food consumption, drink consumption, drugs, medical history and other factors that may influence a patient's ECG signal. The additional parameters may or may not be used in the comparison of the changes in ECG signal over time and circumstances.

[0075] The conclusions, determinations, and/or insights into the patient's health generated by the system may be communicated to the patient directly or via the patient's caregiver (doctor or other healthcare professional). For example, the patient can be sent an email or text message that is automatically generated by the system. The email or text message can be a notification which directs the patient to log onto a secure site to retrieve the full conclusion, determination or insight, or the email or text message can include the conclusion, determination or insight. Alternatively or additionally, the email or text message can be sent to the patient's caregiver. The notification may also be provided via an application on a smartphone, tablet, laptop, desktop or other computing device.

[0076] As described herein, the system can identify behaviors, habits, activities, foods, drinks, medications, drugs, and the like which are associated with the patient's abnormal ECG readings. In addition to informing the patient of these associations, the system can provide instructions or

recommendations to the patient to avoid these behaviors, habits, activities, foods, drinks, medications, drugs, and the like which are associated with the patient's abnormal ECG readings. Similarly, the system can identify behaviors, habits, activities, foods, drinks, medications, drugs, and the like which are associated with normal or improving ECG readings, and can instruct or recommend that the patient perform these behaviors, habits, and activities and/or consume these foods, drinks, medications, and drugs. The patient may avoid a future healthcare issue, as instructed or recommended by the system, by modifying their behavior, habits or by taking any course of action, including but not limited to taking a medication, drug or adhering to a diet or exercise program, which may be a predetermined course of action recommended by the system independent of any analysis of the ECG data, and/or may also result from insights learned through this system and method as described herein. In addition, the insights of the system may relate to general fitness and or mental wellbeing.

[0077] The ECG data and the associated metadata and other related data as described herein can be stored in a central database, a cloud database, or a combination of the two. The data can be indexed, searched, and/or sorted according to any of the features, parameters, or criteria described herein. The system can analyze the ECG data of a single patient, and it can also analyze the ECG data of a group of patients, which can be selected according to any of the features, parameters or criteria described herein. When analyzing data from a single patient, it may be desirable to reduce and/or correct for the intra-individual variability of the ECG data, so that comparison of one set of ECG data taken at one particular time with another set of ECG data taken at another time reveals differences resulting from changes in health status and not from changes in the type of ECG recording device used, changes in lead and electrode placement, changes in the condition of the skin (i.e. dry, sweaty, conductive gel applied or not applied), and the like. As described above, consistent lead and electrode placement can help reduce variability in the ECG readings. The system can also retrieve the patient's ECG data that were taken under similar circumstances and can analyze this subset of ECG data.

[0078] FIG. 4 illustrates an embodiment of the system and method 400 of ECG monitoring described herein. The system can be implemented on a server or computer having a processor for executing the instructions described herein, which can be stored in memory. In step 402, ECG data can be recorded using any of the devices described herein for one or more patients. In step 404, the ECG data is transmitted along with associated metadata to a server and database that stores the ECG data. In step 406, a subset of the ECG data can be selected based on criteria in the metadata, such as user identity, time, device used to record the ECG data, and the like. In step 408, the subset of ECG

data can be analyzed using a machine learning algorithm, which can assign a risk level to the ECG data in step 410. The system can then determine whether the risk level is high, as shown in step 412. If the risk level is low, the user can be notified that the ECG is normal or low risk, as shown in step 414. If the risk level is high, a high risk level alert can be sent to the patient with the option of sending the ECG to the medical professional for interpretation, as shown in step 416. The system then waits for the user's response to determine whether the patient elects to send the ECG to the medical professional for interpretation, as shown in step 418. If the patient does not wish to send the ECG to the medical professional for interpretation, the system can end the routine at this point, as shown in 420. If the patient does elect to send the ECG to the medical professional for interpretation, the request can be transmitted to the medical professional in step 422. The request to the medical professional can be sent to a workflow auction system as described in U.S. Provisional Application No. 61/800,879, filed March 15, 2013, which is herein incorporated by reference in its entirety for all purposes. Once the medical professional has interpreted the ECG, the system can receive and store the ECG interpretation from the medical professional in the database, as shown in step 424. The system can then notify the user of the professional ECG interpretation, which can be sent to or accessed by the user, as shown in step 426. Additionally, the system can compare the assigned risk level with the medical diagnosis in step 428 and can determine whether the risk level determined by the system agrees with the medical diagnosis in step 430. If the risk level does not agree with the medical diagnosis, the machine learning algorithm can be adjusted until the risk level matches the medical diagnosis, as shown in step 432. If the risk level does agree with the medical diagnosis, the routine can be ended as shown in step 434.

[0079] Although the above steps show a method 400 in accordance with many embodiments, a person of ordinary skill in the art will recognize many variations based on the teaching described herein. The steps may be completed in a different order. Steps may be added or deleted. Some of the steps may comprise sub-steps. Many of the steps may be repeated as often as beneficial to the user or subject.

[0080] One or more of the steps of a method 400 may be performed with circuitry, for example, one or more of a processor or a logic circuitry such as a programmable array logic for a field programmable gate array. The circuitry may be programmed to provide one or more of the steps of a method 400, and the program may comprise program instructions stored on a non-transitory computer readable medium or memory or programmed steps of the logic circuitry such as the programmable array logic or the field programmable gate array, for example.

[0081] Aspects of the present disclosure provide systems and methods for generating a heart health score in response to continuously measured or monitored physiological parameter(s). The score may be given a quantitative value such as be graded from A to F or 0 to 100 for example (e.g. a great score may be an A or 100, a good score may be a B or 75, a moderate score may be a C or 50, a poor score may be a D or 25, and a failing score may be an F or 0.) If an arrhythmia is detected, the score may be below 50 for example. Other scoring ranges such as A to Z, 1 to 5, 1 to 10, 1 to 1000, etc. may also be used. Arrhythmia may be detecting using the machine learning based operations or algorithms described herein.

[0082] FIG. 5 shows a flow chart of an exemplary method 500 to generate a heart health score in accordance with many embodiments.

[0083] In a step 502, an arrhythmia is detected. If an arrhythmia is detected (e.g. using the methods and/or algorithms disclosed herein), then the heart health score generated will be below 50. Depending on the severity of the arrhythmia detected, the heart score may be calculated or assigned within the ranges according to the table below in Table 2.

TABLE 2

Arrhythmia	Heart Health score
ATRIAL FIBRILLATION, HR below 100	30-45
ATRIAL FIBRILLATION, HR above 100	15-30
Sinus Tachycardia	20-40
Supraventricular Tachycardia	20-40
Bradycardia	20-40
Bigeminy, Trigeminy	30-50
Short runs of High Heart Rate (VTACH suspect)	10-30

[0084] In a step 504 a Heart Rate Variability (HRV) is calculated. HRV can be an indicator of heart health. The value for HRV value for a healthy heart is typically higher than HRV for an unhealthy heart. Also, HRV typically declines with age and may be affected by other factors, like stress, lack of physical activity, etc. HRV may be measured and analyzed using the methods described above. HRV may be calculated in the absence of arrhythmia, which may improve the accuracy of the HRV measurement. HRV may be determined and further analyzed as described above.

[0085] In a step 506, premature beats are counted and Heart Rate Turbulence (HRT) is calculated. Premature beats in the sequence of R-R intervals may be detected. Also, R-R intervals typically tend to recover at a certain pace after a premature beat. Using these two parameters (prematurity and

pace of R-R recovery), HRT parameters may be calculated. There may be known deviations of HRT parameters associated with patients with risk of Congestive Heart Failure (CHF). These deviations, however, may be used to estimate an inverse measure. The number of premature beats per day (or per hour) may also be used as a measure of heart health. A low number of premature beats may indicate better heart health. In summary, the heart health score may be generated by combining at least heart rate variability (HRV), the number of premature beats, and heart rate turbulence (HRT). This combination (in the absence of arrhythmia) may provide an accurate estimate of how healthy the heart of the user is.

[0086] In a step 508, a heart health score is generated, and in a step 510, a hearth health score is generated based on an arrhythmia. To initially generate the score, a few hours (e.g. 2-5 hours) of measured R-R intervals may be required. A more accurate score may be generated after a week of continuous R-R interval measurements. Longer data sets may be required to detect significant arrhythmias as they may usually be detected within the first 7-8 days of monitoring.

[0087] Although the above steps show a method 500 in accordance with many embodiments, a person of ordinary skill in the art will recognize many variations based on the teaching described herein. The steps may be completed in a different order. Steps may be added or deleted. Some of the steps may comprise sub-steps. Many of the steps may be repeated as often as beneficial to the user or subject.

[0088] One or more of the steps of a method 500 may be performed with circuitry, for example, one or more of a processor or a logic circuitry such as a programmable array logic for a field programmable gate array. The circuitry may be programmed to provide one or more of the steps of a method 500, and the program may comprise program instructions stored on a non-transitory computer readable medium or memory or programmed steps of the logic circuitry such as the programmable array logic or the field programmable gate array, for example.

[0089] FIG. 6 shows a further method 600 of generating a heart score. In addition to the parameters which may be derived from the heart rate data described above, the heart health score may also be generated in response to further physiological parameters as shown in FIG. 6.

[0090] In a step 602, a raw ECG waveform is obtained. In a step 608, ECG parameters are extracted from the raw ECG waveform data and arrhythmia prediction and/or detection algorithms are run to analyze the obtained raw ECG waveform data.

[0091] In a step 604, physiological parameters may be measured using a sensor of the user's local computing device or an accessory thereof. Such measured physiological parameters may include blood pressure, user activity and exercise level, blood oxygenation levels, blood sugar levels, an

electrocardiogram, skin hydration or the like of the user. These physiological parameters may be measured over time such as over substantially the same time scale or length as the measurement of heart rate. In a step 610, an R-R interval is extracted and both traditional and non-traditional heart rate measures are used to analyze the measured heart rate and physiological parameters.

[0092] In a step 606, additional physiological parameters for determining the heart health score may be input by the user. These parameters may include the age, the gender, the weight, the height, the body type, the body mass index (BMI), the personal medical history, the family medical history, the exercise and activity level, the diet, the hydration level, the amount of sleep, the cholesterol level, the alcohol intake level, the caffeine intake level, the smoking status, and the like of the user. For example, the heart health score may be weighted by age and/or gender to provide the user an accurate assessment of his or her heart health in response to the heart rate data. In a step 612, feature extraction is used to analyze the inputted physiological parameters.

[0093] In a step 614 feature ranking and/or feature selection occurs. In a step 618, a real time prediction or detection of atrial fibrillation, and/or in a step 616, the heart rate variability measurements may be labelled and saved for offline training of a machine learning algorithm or set of machine learning operations, and then may be subsequently used to make a real time prediction and/or detection of atrial fibrillation. A plurality of heart health scores may be generated by a plurality of users to generate a set of population data. This population data may be used to train the machine learning algorithms described herein such that the trained algorithm may be able to detect and predict atrial fibrillation or other health conditions from user data.

[0094] Although the above steps show a method 600 in accordance with many embodiments, a person of ordinary skill in the art will recognize many variations based on the teaching described herein. The steps may be completed in a different order. Steps may be added or deleted. Some of the steps may comprise sub-steps. Many of the steps may be repeated as often as beneficial to the user or subject.

[0095] One or more of the steps of a method 600 may be performed with circuitry, for example, one or more of a processor or a logic circuitry such as a programmable array logic for a field programmable gate array. The circuitry may be programmed to provide one or more of the steps of a method 600, and the program may comprise program instructions stored on a non-transitory computer readable medium or memory or programmed steps of the logic circuitry such as the programmable array logic or the field programmable gate array, for example.

[0096] The systems and methods for generating a heart health score in response to continuously measured or monitored physiological parameter(s) may comprise a processor of a computing device

and software. A processor of a computing device (e.g. a tablet computer, a smartphone, a smart watch, a smart band, a wearable computing device, or the like) may execute this set of instructions to receive the input data and detect and/or predict atrial fibrillation therefrom. The software may be downloaded from an online application distribution platform such as the Apple iTunes or App Store, Google Play, Amazon App Store, and the like. A display of the computing device may notify the user of the calculated heart health score and/or if further measurements are required (e.g. to perform a more accurate analysis).

[0097] FIG. 7 shows a schematic diagram of the executed application described herein. The heart health score may be provided on a software application such as a mobile app downloaded from an application distribution platform and executed on a local computing device of the user as described above. This executed application may instruct the user to take active steps in response to a poor or moderate heart health score. For example, the instructions to the user may be to make a corrective measure such as to modify his or her diet, exercise pattern, sleep pattern, or the like. Alternatively or in combination, the instructions to the user may be to take a further step such as to take an electrocardiogram (e.g. to verify the presence of an arrhythmia), enroll in an electrocardiogram over-read service, or schedule an appointment with a physician or other medical specialist. If the heart health score is below a desired threshold for good heart health, the executed application may link the user to a second execute application with further application features. Alternatively or in combination, these further features may be unlocked on the first executed application if the heart health score is below the threshold. In at least some cases, a prescription or verification from a medical professional may also be required to unlock the further application features.

[0098] FIG. 8 shows screenshots of the executed application. The further features unlocked may include the ability to read electrocardiogram (ECG) data from a sensor coupled to the local computing device and display the electrocardiogram (ECG) in real-time and/or detect and alert for atrial fibrillation based on the electrocardiogram (ECG) in real-time (e.g. as described in U.S. Appln. Nos. 12/796,188, 13/108,738, 13/420,540, and 13/964,490). As shown in FIG. 8, these further features may include an electrocardiogram (ECG) over-read service such as that described in U.S. Appln. No. 14/217,032. The first executed application may comprise a consumer software application and the second executed application may comprise a medical professional or regulated software application or set of features of the first executed application. As described herein and shown in FIG. 8, the executed application may provide a dash board to track the heart health of the user and show risk factors which may be monitored and tracked by the user. The dash board may be provided with further features such as that described in U.S. Ser. No. 61/915,113 (filed 12/12/2013).

[0099] FIG. 9 shows a method 900 for cardiac disease and rhythm management, which may, for example, be implemented with the system 100 described herein. In a step 902, a user or subject is provided access to a cardiac disease and/or rhythm management system such as system 100. Step 902 may comprise prescribing the use of the system 100 for the user or subject. In a step 904, the user or subject is provided one or more biometric sensors. These biometric sensor(s) may couple to a computing device of the user or subject, e.g. a personal desktop computer, a laptop computer, a tablet computer, a smartphone, etc., and associated software loaded thereon.

[00100] In a step 906, the user or subject downloads the cardiac disease and/or rhythm management system software onto their computing device. For example, the system software may comprise a mobile software application ("mobile app") downloaded from the Apple App Store, Google Play, Amazon Appstore, BlackBerry World, Nokia Store, Windows Store, Windows Phone Store, Samsung Apps Store, and the like. The downloaded system software, e.g. mobile app 101a, may be configured to interface with the biometric sensors provided to the user or subject in the step 154.

[00101] In a step 908, personal information input to the cardiac disease management system is received. For example, the user or subject may enter his or her gender, height, weight, diet, disease risk factors, etc. into the mobile app 101a. Alternatively or in combination, this personal information may be input on behalf of the user or subject, for example, by a physician of the user or subject.

[00102] In a step 910, biometric data is received from the biometric sensors provided to the user or subject. For example, the system 100 and the mobile app 101a may receive ECG data and heart rate from handheld sensor 103, activity data from wrist-worn activity sensor 105, blood pressure and heart rate data from mobile blood pressure monitor 107a, and other data such as weight and body fat percentage data from a "smart" scale in communication with the local computing device 101.

[00103] In a step 912, a cardiac health score is generated. The cardiac health score can be generated by considering and weighing one or more influencing factors including the incidence of atrial fibrillation or arrhythmia as detected by the handheld ECG monitor, the heart rate of the user or subject, the activity of the user or subject, hours of sleep and rest of the user or subject, blood pressure of the user or subject, etc. Often, the incidence of atrial fibrillation or arrhythmia will be weighed the most. The cardiac health score may be generated by a physician or a machine learning algorithm provided by the remote server or cloud-based service 113, for example. A plurality of users and subject may concurrently use the cardiac health and/or rhythm management system 100

and the machine learning algorithm may, for example, consider population data and trends to generate an individual user or subject's cardiac health score.

[00104] In a step 914, one or more recommendations or goals is generated for the user or subject based on or in response to the generated cardiac health score. These recommendation(s) and/or goal(s) may be generated automatically based on or in response to the biometric and personal information of the user or subject. For example, the machine learning algorithm may generate these recommendation(s)/goal(s). Alternatively or in combination, a physician or other medical specialist may generate the recommendation(s) and/or goal(s), for example, based on or in response to the biometric and personal information of the user or subject. The physician or other medical professional may access the patient data through the Internet as described above.

[00105] In a step 916, the patient implements many if not all of the recommendation(s) and/or goal(s) provided to him or her. And in a step 916, steps 908 to 916 may be repeated such that the user or subject may iteratively improve their cardiac health score and their overall health.

[00106] Although the above steps show method 900 of managing cardiac disease and/or rhythm in accordance with many embodiments, a person of ordinary skill in the art will recognize many variations based on the teaching described herein. The steps may be completed in a different order. Steps may be added or deleted. Some of the steps may comprise sub-steps. Many of the steps may be repeated as often as beneficial to the user or subject.

[00107] One or more of the steps of the method 900 may be performed with circuitry, for example, one or more of a processor or a logic circuitry such as a programmable array logic for a field programmable gate array. The circuitry may be programmed to provide one or more of the steps of the method 900, and the program may comprise program instructions stored on a non-transitory computer readable medium or memory or programmed steps of the logic circuitry such as the programmable array logic or the field programmable gate array, for example.

[00108] In some embodiments, the heart rate information (or an extracted portion of HR information) may be used to compare to a database of similar information that has been correlated with cardiac events. For example, heart rate information may be compared to a database of HR information extracted for ECG recordings of patients known to be experiencing cardiac problems. Thus, patterns of heart rate information taken from a subject may be compared to patterns of cardiac information in a database. If there is a match (or a match within a reasonable closeness of fit), the patient may be instructed to record an ECG, e.g. using an ambulatory ECG monitor. This may then provide a more detailed view of the heart. This method may be particularly useful, as it may allow recording and/or transmission and/or analysis of detailed electrical information about the heart at or

near the time (or shortly thereafter) when a clinically significant cardiac event is occurring. Thus, the continuous monitoring may allow a subject to be alerted immediately upon an indication of the potential problem (e.g. an increase in HRV suggestive of a cardiac dysfunction). This may allow the coupling of continuous HR monitoring with ECG recording and analysis for disease diagnosis and disease management.

[00109] FIG. 10 illustrates one variation of a method for monitoring a subject to determine when to record an electrocardiogram (ECG). In FIG. 10, a subject is wearing a continuous heart rate monitor (configured as a watch 1010, including electrodes 1016), shown in step 1002. The heart rate monitor transmits (wirelessly 1012) heart rate information that is received by the smartphone 1018, as shown in step 1004. The smartphone includes a processor that may analyze the heart rate information 1004, and when an irregularity is determined, may indicate 1006 to the subject that an ECG should be recorded. In FIG. 10, an ambulatory ECG monitor 1014 is attached (as a case having electrodes) to the phone 1018. The user may apply the ECG monitor as to their body (e.g. chest, between arms, etc.) 1008 to record ECGs that can then be saved and/or transmitted for analysis.

[00110] FIGS. 11 and 11A show screenshots of an atrial fibrillation dashboard 1100 of a user interface for the cardiac disease and/or rhythm management system 100. FIG. 11 shows a top portion 1100a of the atrial fibrillation dashboard 1100 while FIG. 10A shows a bottom portion 1100b of the atrial fibrillation dashboard 1100.

[00111] The top portion 1100a of the atrial fibrillation dashboard 1100 as shown in FIG. 10 may display the current cardiac health score of the user or subject, a recent best cardiac health score of the user or subject, and a completion percentage of recommendation(s) and/or goal(s) for the user or subject. The user or subject may tap any one of the cardiac health score displays or the recommendation(s) and/or goal(s) displays to access more detailed information regarding the calculated health score(s) or recommendation(s) and/or goal(s), respectively. The top portion 1100a may also show an ECG of the user or subject and a button which may be tapped to record the ECG of the user or subject for the day. As discussed with reference to FIG. 1, the ECG may be recorded with a handheld sensor 103 in communication with the local computing device 100. The top portion 1000a may also show the number of atrial fibrillation episodes and the average duration of these atrial fibrillation episodes. This number and duration may be generated automatically by software or logic of the mobile app 101a based on or in response to the ECG measurements taken by the user or subject. Alternatively or in combination, a physician may access the atrial fibrillation dashboard 1100 of an individual user or subject, evaluate his or her ECGs, and provide the number of atrial

fibrillation episodes and their duration to the mobile app 101a or other software loaded on the local computing device 101 of the user or subject. The shortest and longest durations of the atrial fibrillation episodes may also be shown by the top portion 1100a as well as the user or subject's daily adherence to a medication regime.

[00112] The bottom portion 1100b of the atrial fibrillation dashboard 1100 as shown in FIG. 10A may display one or more influencers which influence how the cardiac health score is generated. These influencers may include, for example, caffeine intake, alcohol intake, stress levels, sleep levels, weight, nutrition, fitness and activity levels, and blood pressure. Data for these influencers may be input automatically by one or more biometric sensors coupled to the local computing device 101 and/or the mobile app 101a. Alternatively or in combination, the data for these influencers may be input manually by the user or subject by tapping on the respective influencer display. For example, tapping on the blood pressure display area may cause a slider input 1100c for blood pressure to pop up. The user or subject may use the slider to enter and save his or her blood pressure for the day. Similar pop-ups or user-selected inputs may be provided for the other influencers. For example, the user or subject may enter his or her daily caffeine or alcohol intake, stress and sleep levels, nutrition levels, or activity and fitness levels (e.g. low/bad, medium/so-so, or high/good based on the user's age, gender, height, weight, etc. as can be indicated by an instruction page of the mobile app 101a). The influencer displays may also show the goal progression of the user or subject.

[00113] FIGS. 12 and 12A show screenshots of a goals and recommendations page 1200 of the cardiac disease and rhythm management system interface or mobile app 101a. A top portion 1200a of the goals and recommendations page 1100 may comprise a listing of 7-day goals for the user or subject. The top portion 1200a may further comprise everyday goals for the user or subject which often cannot be removed or changed. The user or subject can check off these goals or recommendations as he or she meets them. The top portion 1200a may track goal completion percentage over a 7-day period. The user or subject can set the same goals for the next day and/or set new goals.

[00114] A bottom portion 1200b of the goals and recommendations page 1200 may comprise a listing of new goals which the user or subject may add. The new goals may be categorized into goals or recommendations for atrial fibrillation management, stress management, and/or other categories. For example, goals for atrial fibrillation management may include taking daily medications, reducing caffeine intake, and reducing alcohol intake. And, goals for stress management may include meditate for 5 minutes daily, take blood pressure reading daily, and

getting at least 7 hours of sleep nightly. Using the goals and recommendations page 1200, the user or subject can set their goals for the week. One or more of these goals may be automatically recommended to the user or subject or be recommended by a physician having access to the dashboard 1100. For example, goals may be recommended based on last week's progress. The completion of recommended goals can result in the user or subject earning more "points," in effect gamifying health and cardiac rhythm management for the user or subject. Alternatively or in combination, the goals may be set by a physician having access to the dashboard 1100.

[00115] FIG. 13 shows a screenshot of a user's local computing device notifying the user with a pop-up notice 1300 to meet their daily recommendations and goals. By tapping on the pop-up notice, 1300, the user or subject can be taken to the atrial fibrillation dashboard where the user or subject can update or otherwise manage their cardiac health.

[00116] FIG. 14 shows an embodiment comprising a smart watch 1400 which includes at least one heart rate monitor 1402 and at least one activity monitor 1404. One or more processors are coupled to one or more non-transitory memories of the smart watch and configured to communicate with the heart rate monitor 1402 and the activity monitor 1404. The one or more processors are further coupled to an output device 1408. Processor executable code is stored on the one or more memories and when executed by the one or more processors causes the one or more processors to determine if heart rate and activity measurements represent an advisory condition for recording an ECG, and generate and send notification signals through the output device 1408 when an advisory condition for recording an ECG is determined.

[00117] For example, presently available smart watches include motion sensors such as pedometers. Pedometers can be based on an accelerometer or electromechanical mechanism such as a pendulum, magnetic reed proximity switch, and a spring suspended lever arm with metal-on-metal contact. Modern accelerometers are often small micro electro-mechanical systems and are well known by those skilled in the art. Heart rate monitors are readily available with smart phones as well as smart watches. One type uses an optical sensor to detect the fluctuation of blood flow. The signal can be amplified further using, for example, a microcontroller to count the rate of fluctuation, which is actually the heart rate.

[00118] An advisory condition for recording an ECG may occur due to, for example, large continuing fluctuations in heart rate. An advisory condition for recording an ECG can also occur when a measured heart rate increases rapidly without a corresponding increase in activity monitored by, for example, an accelerometer. By comparing measured heart rate changes with measured activity changes, the presently disclosed software or "app" minimizes false alarms are minimized.

ECG devices are described in U.S. Ser. No 12/796,188, filed June 8, 2010, now U.S. Patent No. 8,509,882, hereby expressly incorporated herein by reference in its entirety. The ECG device can be present in a smart watch band or a smart phone. In one embodiment, the ECG device includes an electrode assembly configured to sense heart-related signals upon contact with a user's skin, and to convert the sensed heart-related signals to an ECG electric signal. The ECG device transmits an ultrasonic frequency modulated ECG signal to a computing device such as, for example, a smartphone. Software running on the computing device or smartphone digitizes and processes the audio in real-time, where the frequency modulated ECG signal is demodulated. The ECG can be further processed using algorithms to calculate heart rate and identify arrhythmias. The ECG, heart rate, and rhythm information can be displayed on the computer or smartphone, stored locally for later retrieval, and/or transmitted in real-time to a web server via a 2G/3G/4G, WiFi or other Internet connection. In addition to the display and local processing of the ECG data, the computer or smartphone can transmit, in real-time, the ECG, heart rate and rhythm data via a secure web connection for viewing, storage and further analysis via a web browser interface.

[00119] In another embodiment, the converter assembly of an ECG device is integrated with, and electrically connected to the electrode assembly and is configured to convert the electric ECG signal generated by electrode assembly to a frequency modulated ECG ultrasonic signal having a carrier frequency in the range of from about 18 kHz to about 24 kHz. It is sometimes desirable to utilize a carrier frequency in the 20 kHz to 24 kHz range. The ultrasonic range creates both a lower noise and a silent communication between the acquisition electronics and the computing device such as the smartphone, notebook, smart watch and the like.

[00120] A kit can include downloadable software such as an "app" for detecting an advisory condition for recording an ECG and an ECG device. The ECG device can be present on a watch band for replacing a specific band on a smart watch. The ECG device can also be provided on a smart phone back plate for replacing an existing removable smartphone back. In another configuration, the ECG device is usable as a smartphone protective case.

[00121] Software on the smartphone or smart watch can also combine data and signals from other sensors built into the smartphone or smart watch such as a GPS.

[00122] While preferred embodiments of the present disclosure have been shown and described herein, it will be obvious to those skilled in the art that such embodiments are provided by way of example only. Numerous variations, changes, and substitutions will now occur to those skilled in the art without departing from the subject matter described herein. It should be understood that various alternatives to the embodiments of the subject matter described herein may be employed

in practicing the subject matter described herein. It is intended that the following claims define the scope of the disclosure and that methods and structures within the scope of these claims and their equivalents be covered thereby.

CLAIMS

WHAT IS CLAIMED IS:

1. A method of determining a presence of an arrhythmia of a first user, said method comprising

sensing a heart rate of said first user with a heart rate sensor coupled to said first user;

transmitting said heart rate of said first user to a mobile computing device, wherein said mobile computing device is configured to sense an electrocardiogram;

determining, using said mobile computing device, a heart rate variability of said first user based on said transmitted heart rate of said first user; and

alerting said first user to sense an electrocardiogram of said first user, using said mobile computing device, in response to an irregularity in said heart rate variability.

2. The method of claim 1, wherein said heart rate sensor comprises one or more of a patch, a wristband, and an armband.

3. The method of claim 1, further comprising receiving biometric data of said first user from a biometric data sensor coupled to said first user.

4. The method claim 3, wherein said biometric data comprises one or more of a temperature of said first user, a blood pressure of said first user, and inertial data of said first user.

5. The method of claim 1, further comprising sensing an activity level of said first user with a motion sensor and comparing, using said mobile computing device, said heart rate variability of said first user to said activity level.

6. The method of claim 5, wherein said mobile computing device comprises a smartphone.

7. The method of claim 5, wherein said mobile computing device comprises a smartwatch.

8. The method of claim 1, further comprises determining a presence of said arrhythmia using a machine learning algorithm.

9. The method of claim 8, wherein said machine learning algorithm stores heart rate and heart rate variability data previously associated with arrhythmias in said first user and determines said presence of said arrhythmia based on said stored heart and heart rate variability data.

10. The method of claim 8, wherein said machine learning algorithm stores heart rate and heart rate variability data associated with arrhythmias in a second user and determines said presence of said

arrhythmia in said first user based on said stored heart and heart rate variability data associated with arrhythmias in said second user.

11. A system for determining the presence of an arrhythmia of a first user, comprising

a heart rate sensor coupled to said first user;

a mobile computing device comprising a processor, wherein said mobile computing device is coupled to said heart rate sensor, and wherein said mobile computing device is configured to sense an electrocardiogram of said first user;

a non-transitory computer readable medium encoded with a computer program including instructions executable by said processor to cause said processor to receive a heart rate of said first user from said heart rate sensor, determine a heart rate variability of said first user based on said heart rate of said first user, and alert said first user to record an electrocardiogram using said mobile computing device.

12. The system of claim 11, wherein said heart rate sensor comprises one or more of a patch, a wristband, and an armband.

13. The system of claim 11, wherein said system further comprises a biometric data sensor, and wherein said computer program including instructions executable by said processor further causes said processor to sense biometric data of said first user from said biometric data sensor.

14. The system claim 13, wherein said biometric data comprises one or more of a temperature of said first user, a blood pressure of said first user, and inertial data of said first user.

15. The system of claim 11, wherein said system further comprises a motion sensor, and wherein said computer program including instructions executable by said processor further causes said processor to sense an activity level of said first user from said motion sensor and compare said activity level to said heart rate variability of said first user.

16. The system of claim 15, wherein said mobile computing device comprises a smartphone.

17. The system of claim 15, wherein said mobile computing device comprises a smartwatch.

18. The system of claim 11, further comprises determining a presence of said arrhythmia using a machine learning algorithm.

19. The system of claim 18, wherein said machine learning algorithm stores heart rate and heart rate variability data previously associated with arrhythmias in said first user and determines said presence of said arrhythmia based on said stored heart and heart rate variability data.

20. The system of claim 19, wherein said machine learning algorithm stores heart rate and heart rate variability data associated with arrhythmias in a second user and determines said presence of said arrhythmia in said first user based on said stored heart and heart rate variability data associated with arrhythmias in said second user.

ABSTRACT OF THE DISCLOSURE

A dashboard centered around arrhythmia or atrial fibrillation tracking is provided. The dashboard includes a heart or cardiac health score that can be calculated in response to data from the user such as their ECG and other personal information and cardiac health influencing factors. The dashboard also provides to the user recommendations or goals, such as daily goals, for the user to meet and thereby improve their heart or cardiac health score. These goals and recommendations may be set by the user or a medical professional and routinely updated as his or her heart or cardiac health score improves or otherwise changes. The dashboard is generally displayed from an application provided on a smartphone or tablet computer of the user.

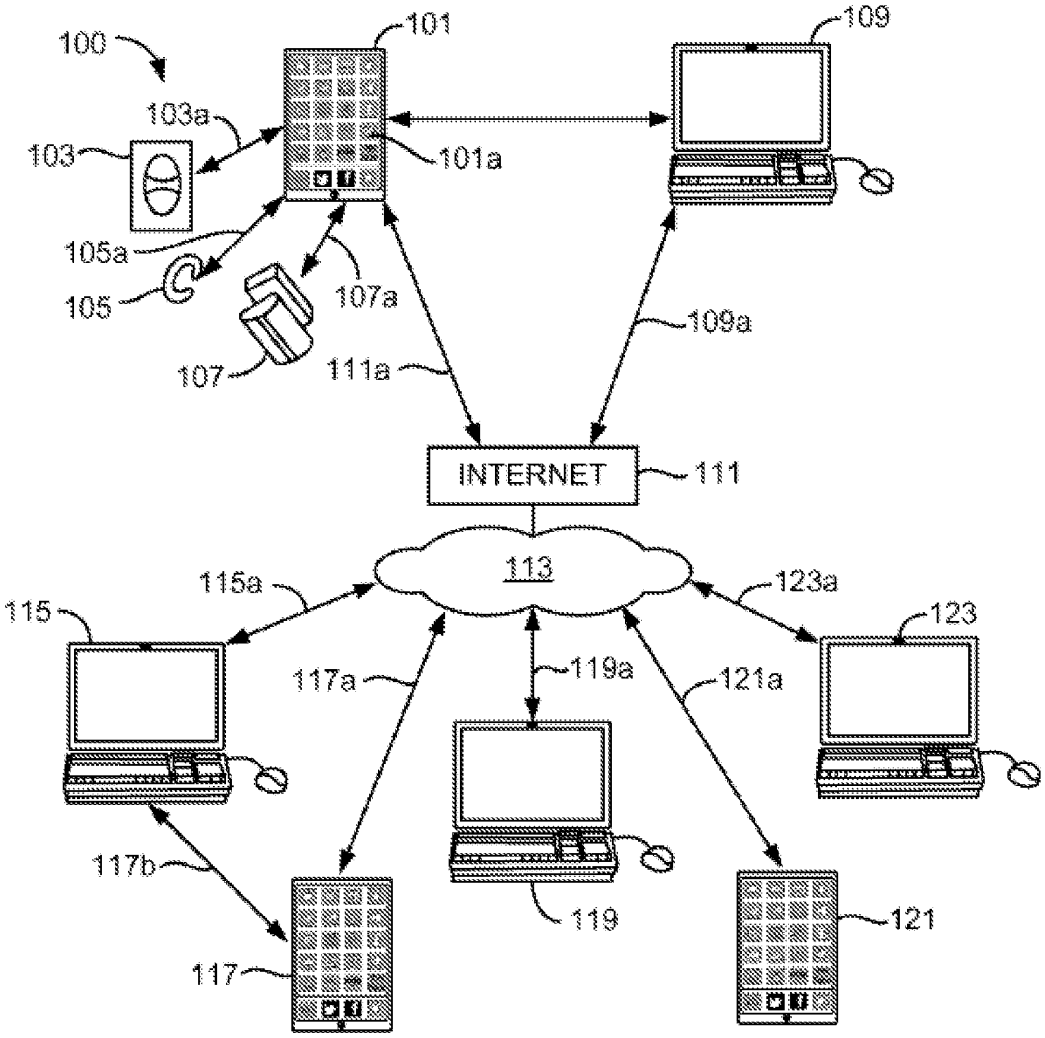
100
101
109
103a
103
101a
105a
105
107a
107
109a
111a
INTERNET
111
113
115a
123a
115
123
117a
119a
121a
117b
119
121
117

FIG. 1

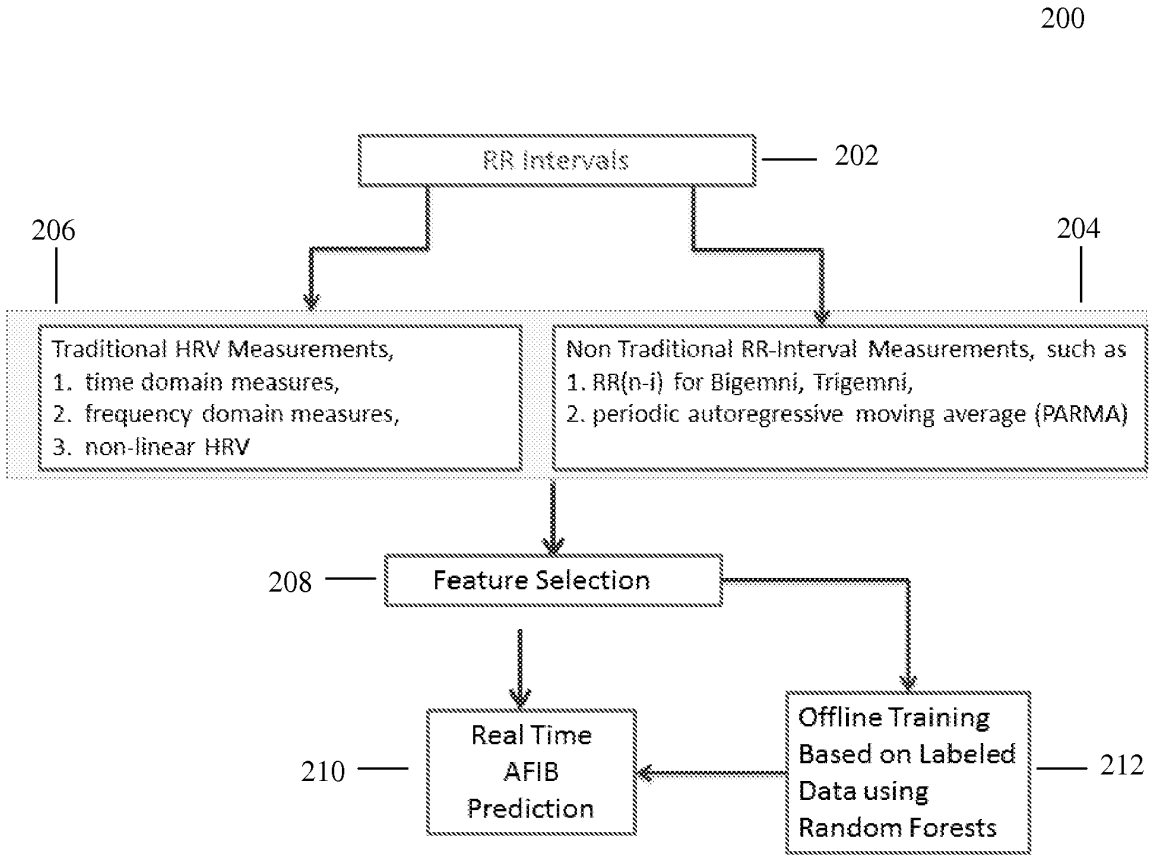
200
RR Intervals
202
206
204
Traditional HRV Measurements,
1. time domain measures,
2. frequency domain measures,
3. non-linear HRV
Non Traditional RR-Interval Measurements, such as
1. RR(n-i) for Bigemni, Trigemni,
2. periodic autoregressive moving average (PARMA)
208
Feature Selection
210
Real Time
AFIB
Prediction
Offline Training
Based on Labeled
Data using
Random Forests
212

FIG. 2

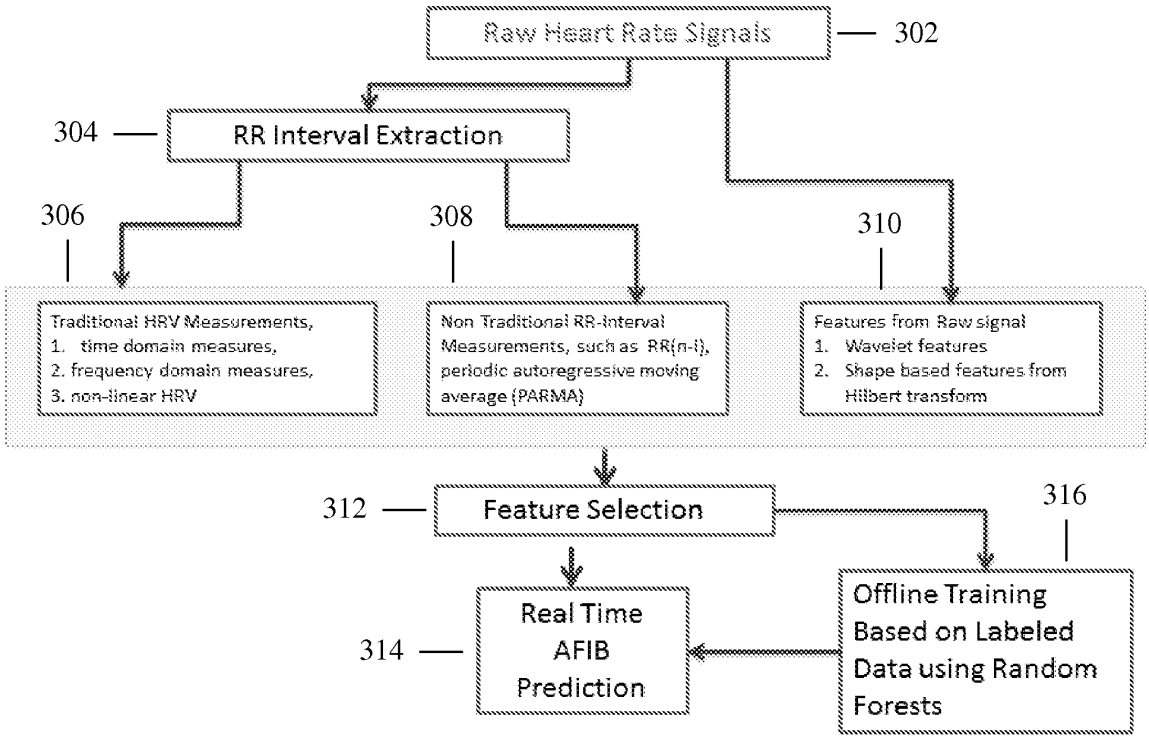
Raw Heart Rate Signals
302
304
RR Interval Extraction
306
308
310
Traditional HRV Measurements,
1. time domain measures,
2. frequency domain measures,
3. non-linear HRV
Non Traditional RR-Interval Measurements, such as RR(n-i), periodic autoregressive moving average (PARMA)
Features from Raw signal
1. Wavelet features
2. Shape based features from Hilbert transform
312
Feature Selection
316
314
Real Time AFIB Prediction
Offline Training Based on Labeled Data using Random Forests

FIG. 3

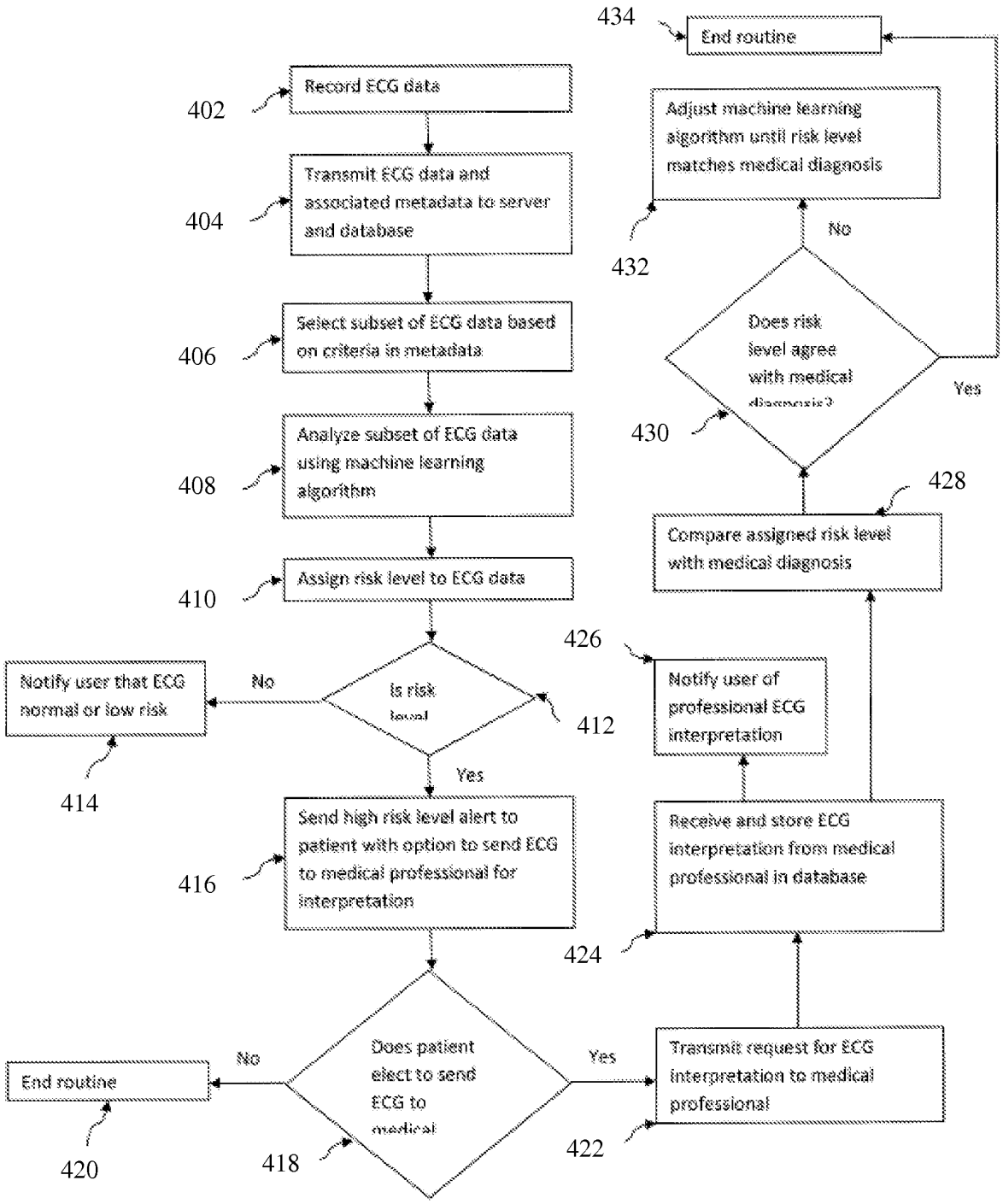
Record ECG data
402
Transmit ECG data and associated metadata to server and database
404
Select subset of ECG data based on criteria in metadata
406
Analyze subset of ECG data using machine learning algorithm
408
Assign risk level to ECG data
410
Is risk level
412
No
Notify user that ECG normal or low risk
414
Yes
Send high risk level alert to patient with option to send ECG to medical professional for interpretation
416
Does patient elect to send ECG to medical
418
No
End routine
420
Yes
Transmit request for ECG interpretation to medical professional
422
Receive and store ECG interpretation from medical professional in database
424
Notify user of professional ECG interpretation
426
Compare assigned risk level with medical diagnosis
428
Does risk level agree with medical diagnosis?
430
No
Adjust machine learning algorithm until risk level matches medical diagnosis
432
Yes
End routine
434

FIG. 4

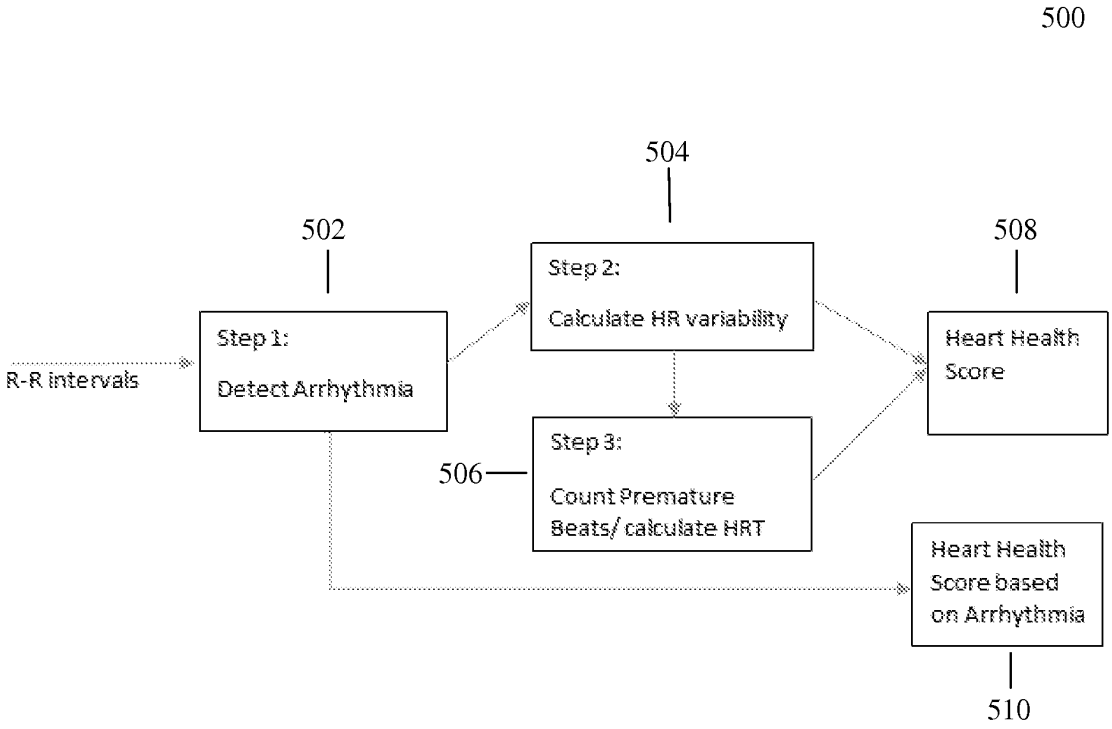
500
504
502
508
Step 2:
Calculate HR variability
Step 1:
Detect Arrhythmia
Heart Health
Score
R-R intervals
Step 3:
506
Count Premature
Beats/ calculate HRT
Heart Health
Score based
on Arrhythmia
510

FIG. 5

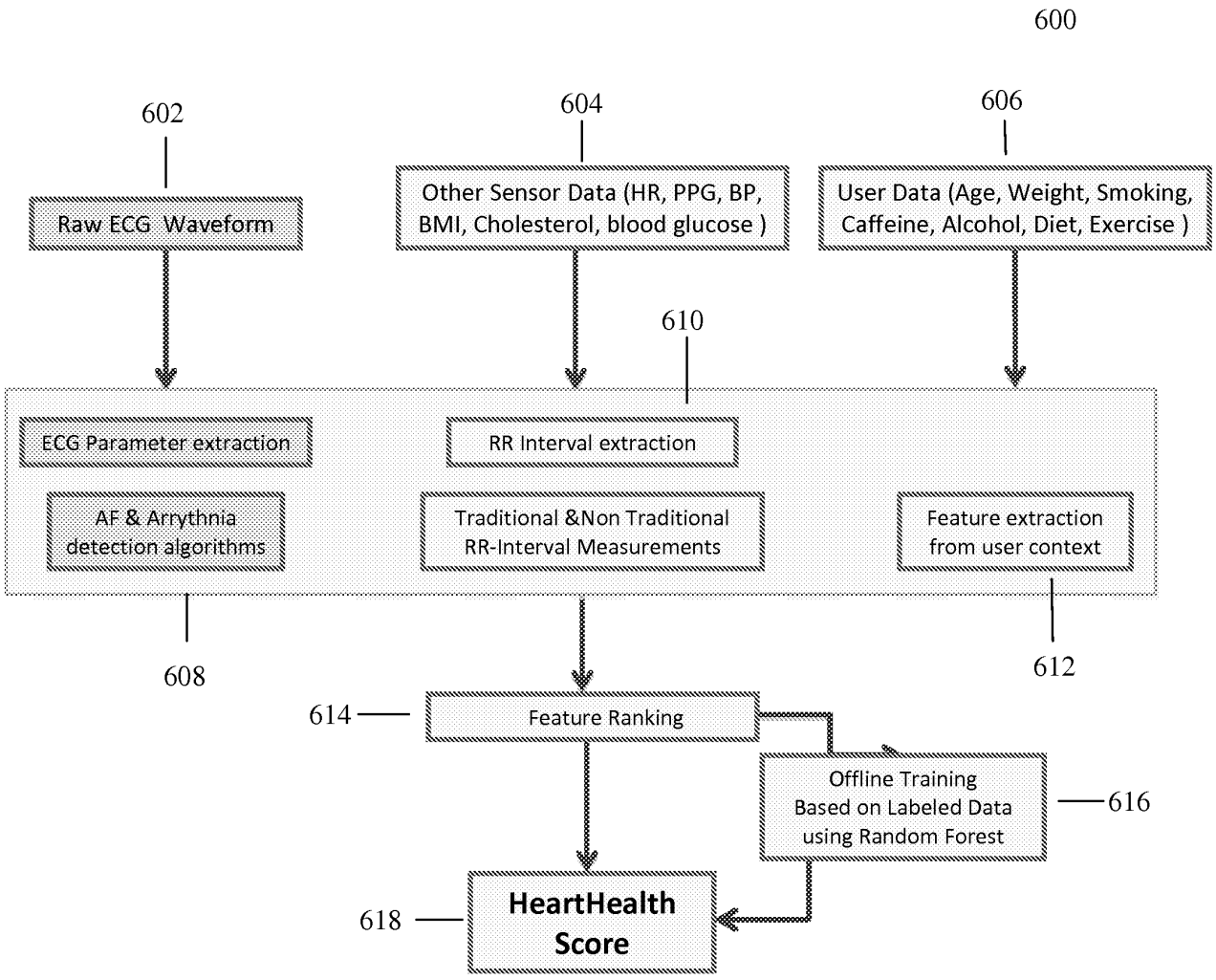
600
602
604
606
Raw ECG Waveform
Other Sensor Data (HR, PPG, BP, BMI, Cholesterol, blood glucose)
User Data (Age, Weight, Smoking, Caffeine, Alcohol, Diet, Exercise)
610
ECG Parameter extraction
RR Interval extraction
AF & Arrythnia detection algorithms
Traditional &Non Traditional RR-Interval Measurements
Feature extraction from user context
608
612
614
Feature Ranking
Offline Training Based on Labeled Data using Random Forest
616
618
HeartHealth Score

FIG. 6

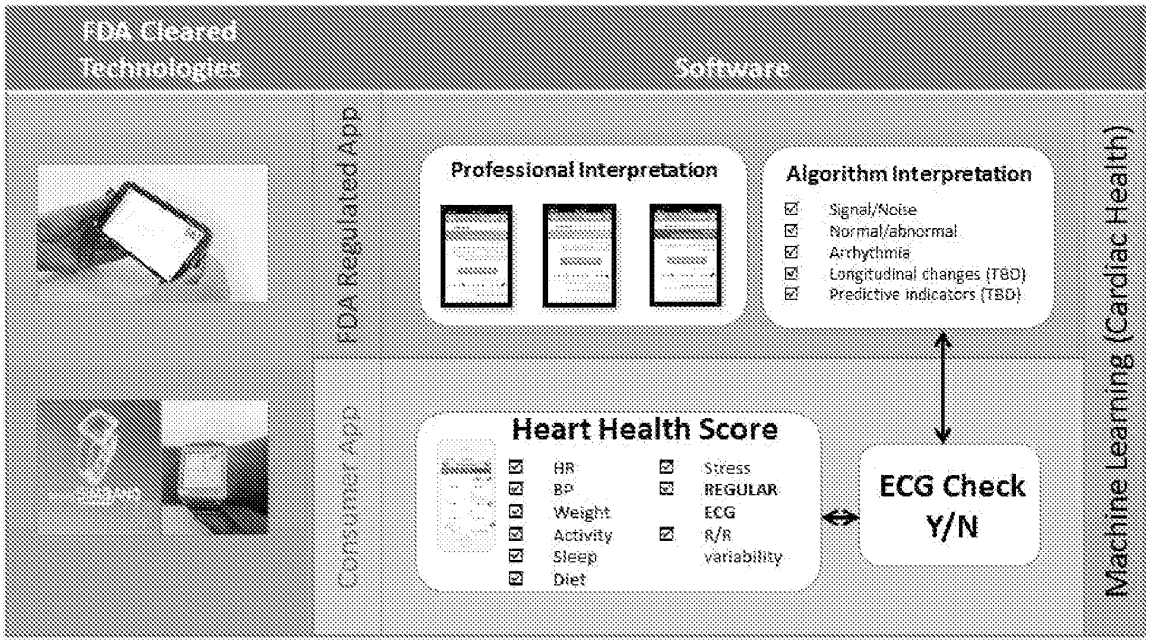
FDA Cleared Technologies
Software
FDA Regulated App
Professional Interpretation
Algorithm Interpretation
Signal/Noise
Normal/abnormal
Arrhythmia
Longitudinal changes (TBD)
Predictive indicators (TBD)
Consumer App
Heart Health Score
HR
BP
Weight
Activity
Sleep
Diet
Stress
REGULAR ECG
R/R variability
ECG Check Y/N
Machine Learning (Cardiac Health)

FIG. 7

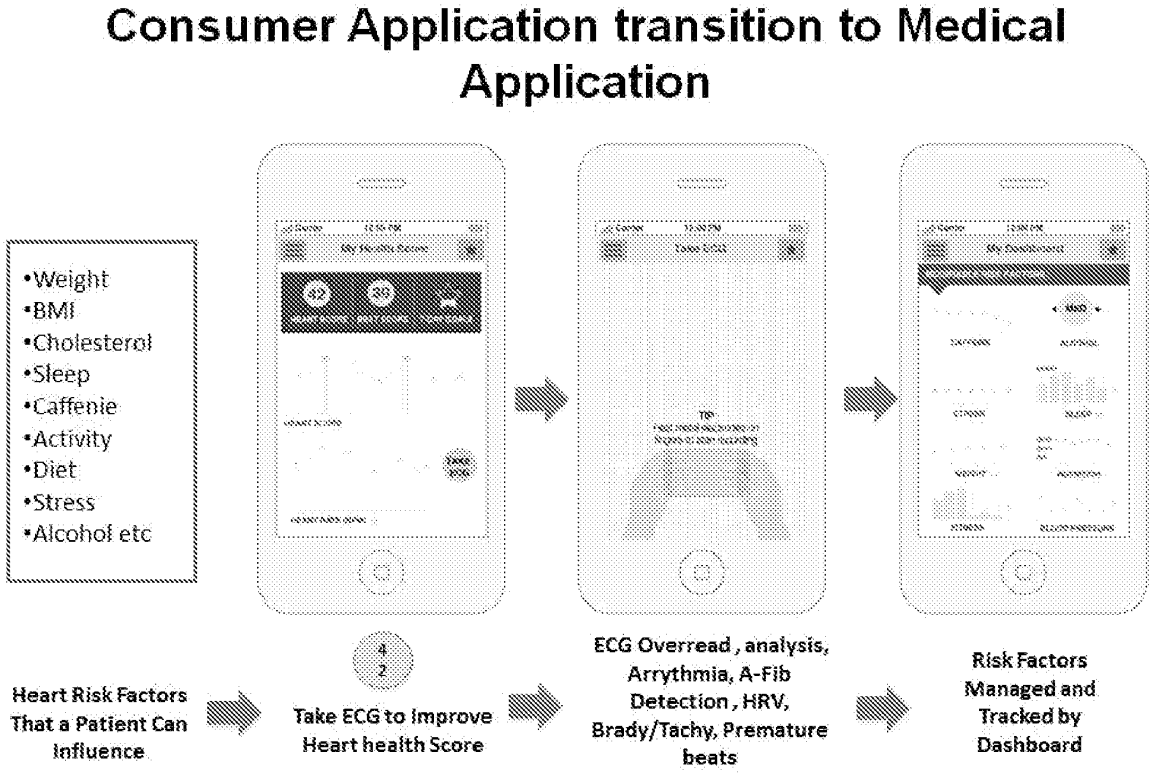
Consumer Application transition to Medical Application
•Weight
•BMI
•Cholesterol
•Sleep
•Caffenie
•Activity
•Diet
•Stress
•Alcohol etc
Heart Risk Factors That a Patient Can Influence
Take ECG to Improve Heart health Score
ECG Overread , analysis, Arrythmia, A-Fib Detection , HRV, Brady/Tachy, Premature beats
Risk Factors Managed and Tracked by Dashboard

FIG. 8

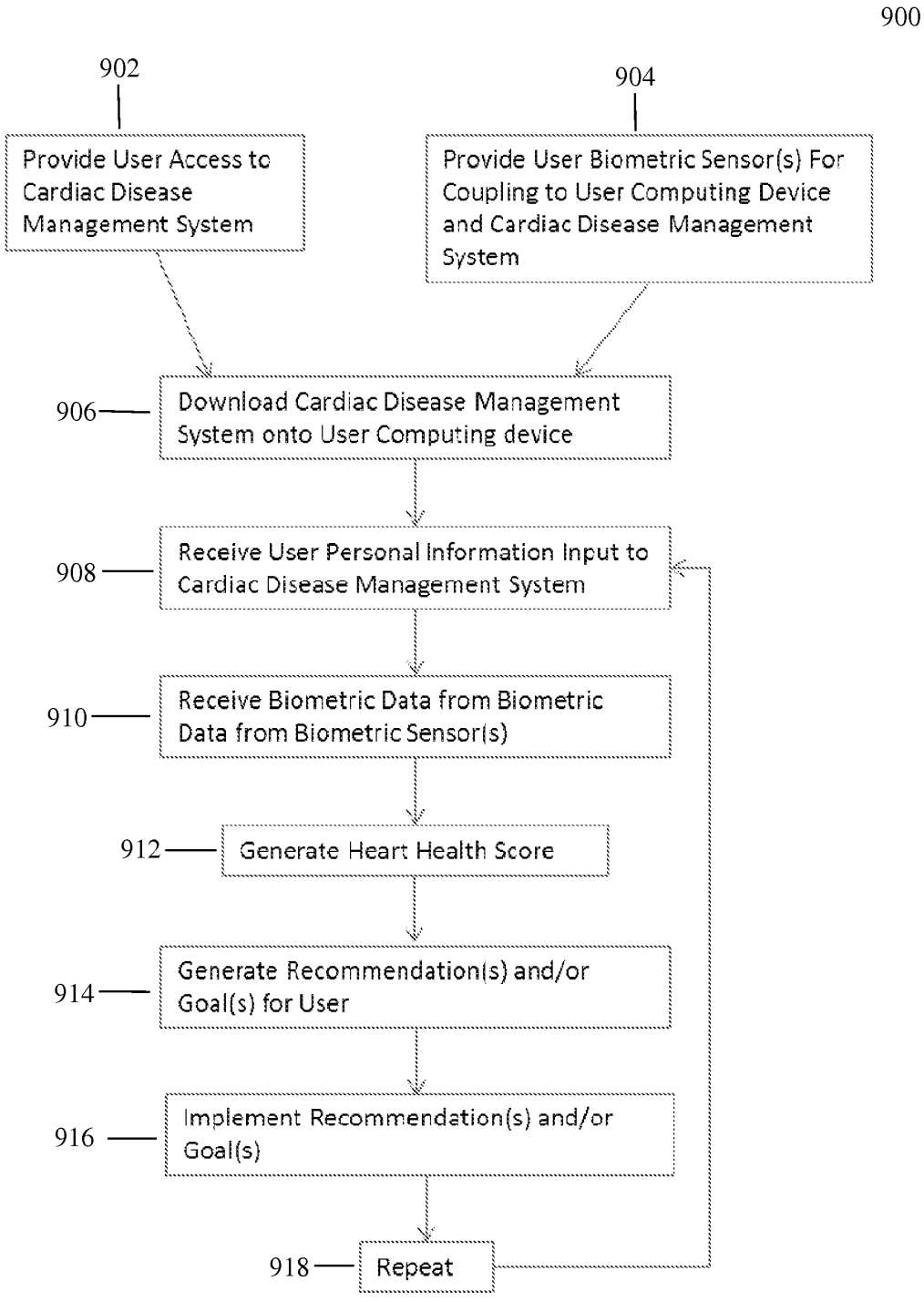
900
902
904
Provide User Access to Cardiac Disease Management System
Provide User Biometric Sensor(s) For Coupling to User Computing Device and Cardiac Disease Management System
906
Download Cardiac Disease Management System onto User Computing device
908
Receive User Personal Information Input to Cardiac Disease Management System
910
Receive Biometric Data from Biometric Data from Biometric Sensor(s)
912
Generate Heart Health Score
914
Generate Recommendation(s) and/or Goal(s) for User
916
Implement Recommendation(s) and/or Goal(s)
918
Repeat

FIG. 9

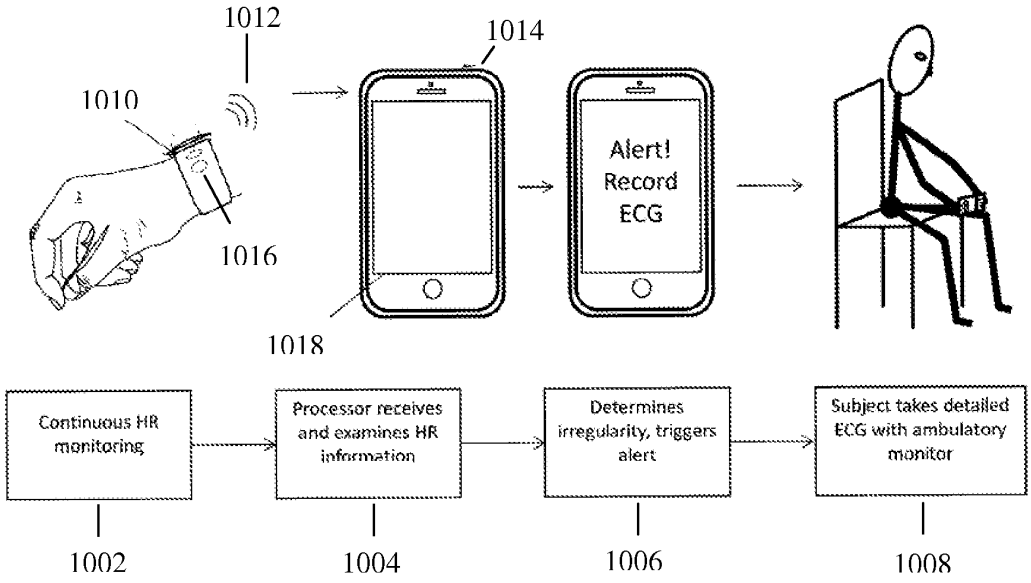
1012
1014
1010
1016
1018
Alert!
Record
ECG
Continuous HR monitoring
Processor receives and examines HR information
Determines irregularity, triggers alert
Subject takes detailed ECG with ambulatory monitor
1002
1004
1006
1008

FIG. 10

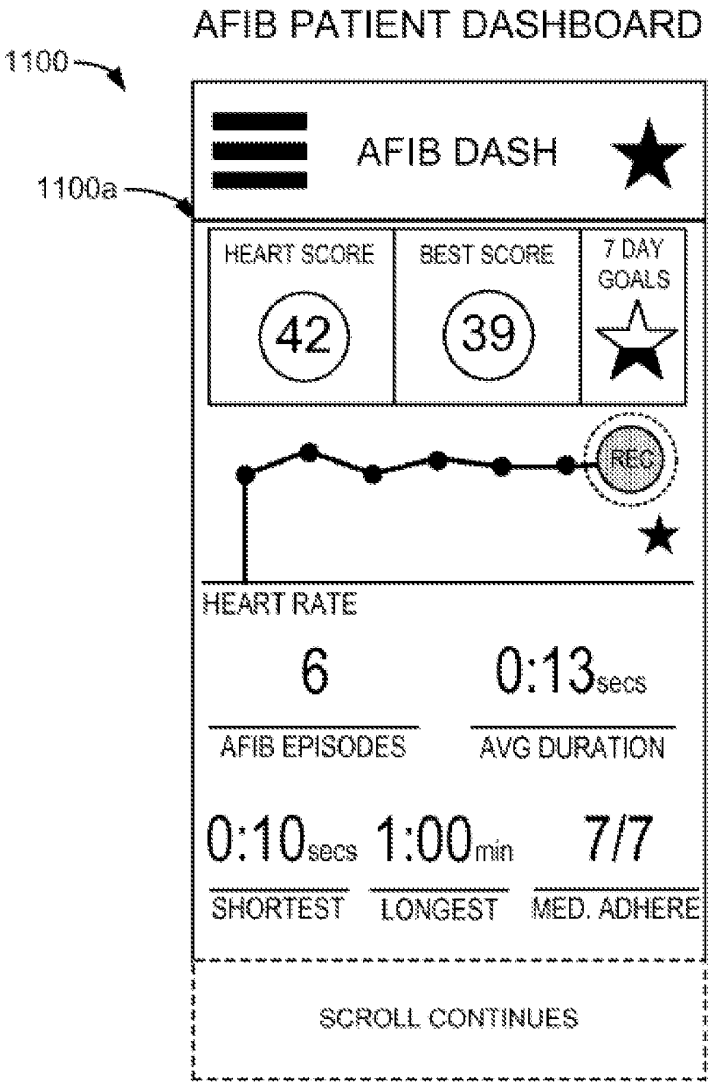
AFIB PATIENT DASHBOARD
1100
1100a
AFIB DASH
HEART SCORE
42
BEST SCORE
39
7 DAY GOALS
REC
HEART RATE
6
AFIB EPISODES
0:13secs
AVG DURATION
0:10secs
SHORTEST
1:00min
LONGEST
7/7
MED. ADHERE
SCROLL CONTINUES

FIG. 11

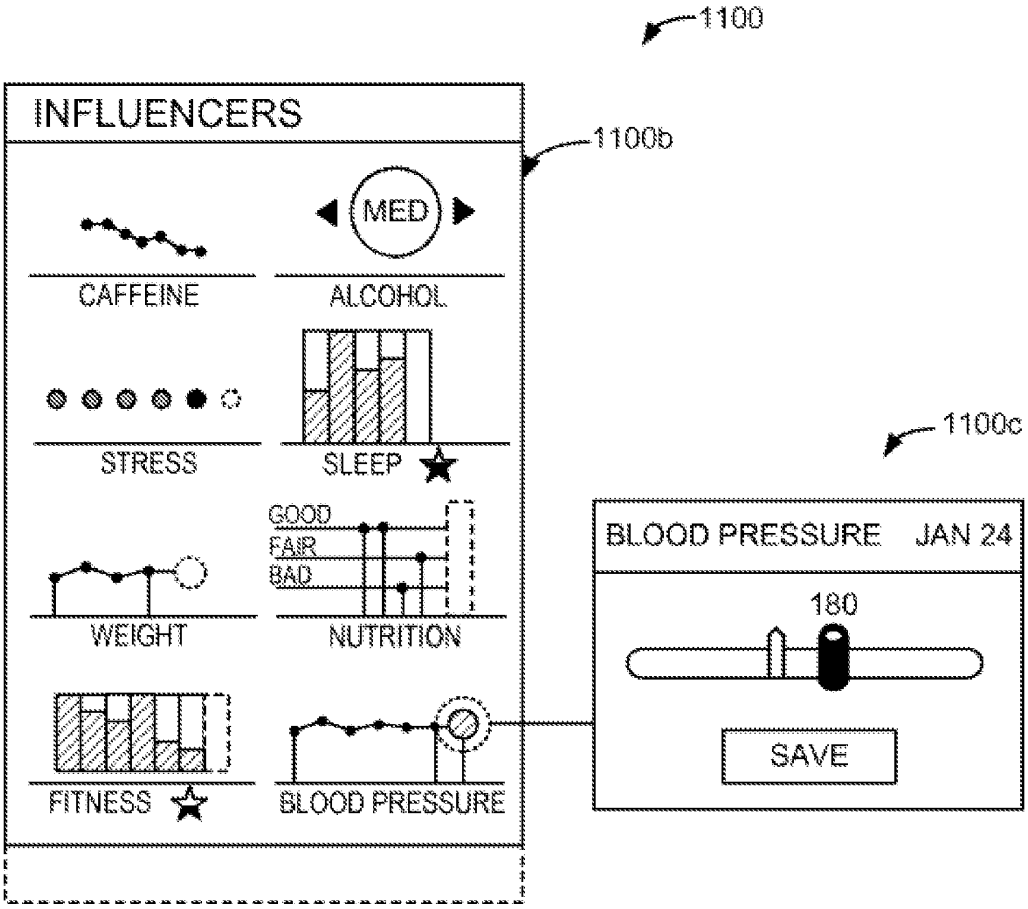
1100
INFLUENCERS
1100b
MED
CAFFEINE
ALCOHOL
STRESS
SLEEP
GOOD
FAIR
BAD
WEIGHT
NUTRITION
FITNESS
BLOOD PRESSURE
1100c
BLOOD PRESSURE JAN 24
180
SAVE

FIG. 11A

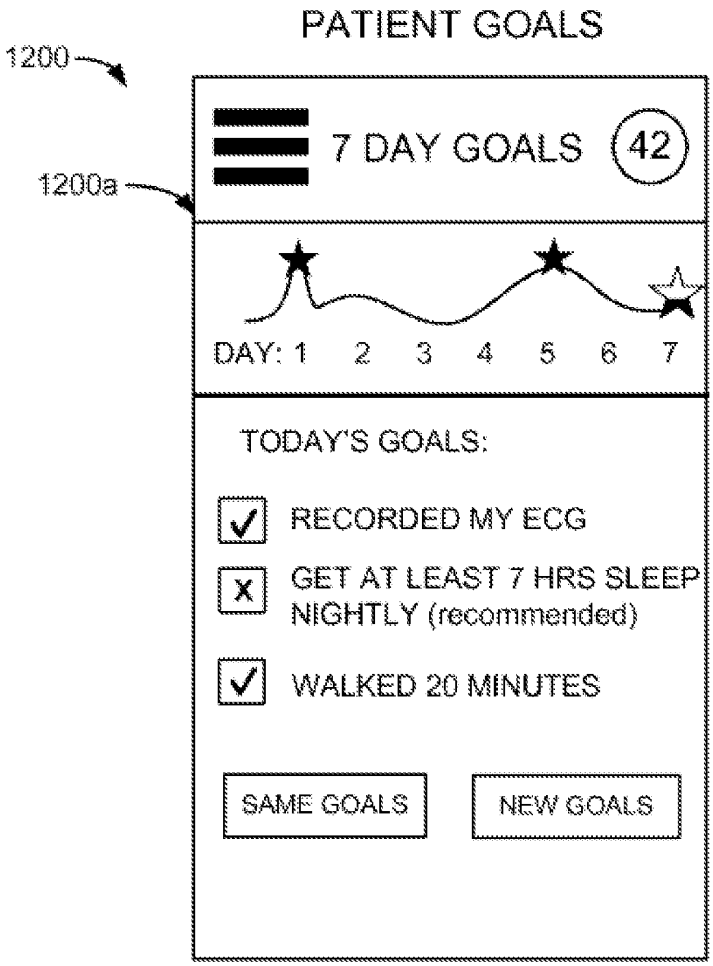
PATIENT GOALS
1200
1200a
7 DAY GOALS
42
DAY: 1 2 3 4 5 6 7
TODAY'S GOALS:
RECORDED MY ECG
GET AT LEAST 7 HRS SLEEP NIGHTLY (recommended)
WALKED 20 MINUTES
SAME GOALS
NEW GOALS

FIG. 12

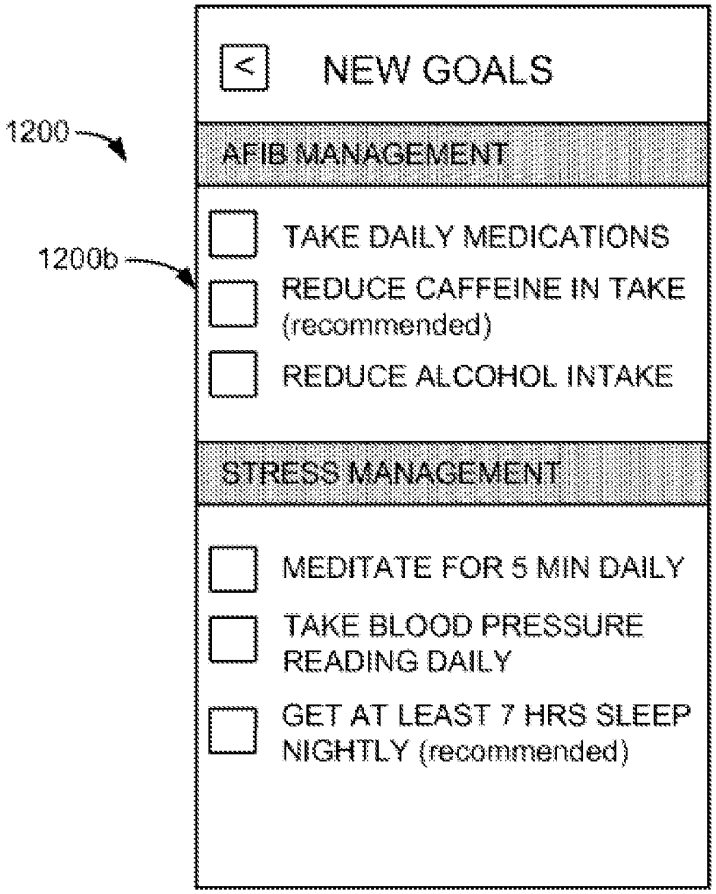
1200
1200b
NEW GOALS
AFIB MANAGEMENT
TAKE DAILY MEDICATIONS
REDUCE CAFFEINE IN TAKE (recommended)
REDUCE ALCOHOL INTAKE
STRESS MANAGEMENT
MEDITATE FOR 5 MIN DAILY
TAKE BLOOD PRESSURE READING DAILY
GET AT LEAST 7 HRS SLEEP NIGHTLY (recommended)

FIG. 12A

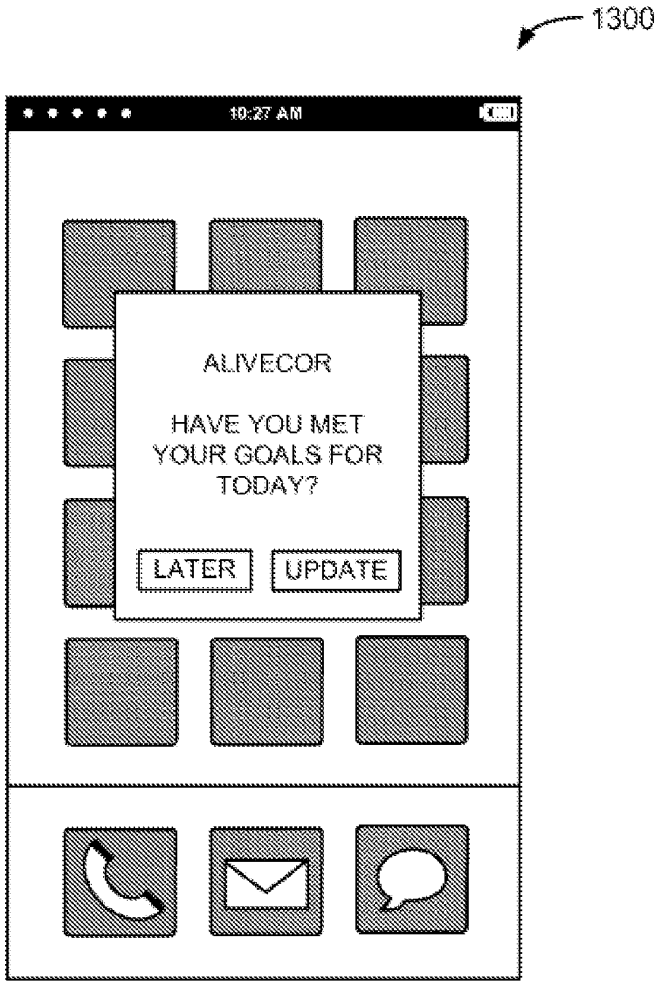
1300
10:27 AM
ALIVECOR
HAVE YOU MET YOUR GOALS FOR TODAY?
LATER
UPDATE

FIG. 13

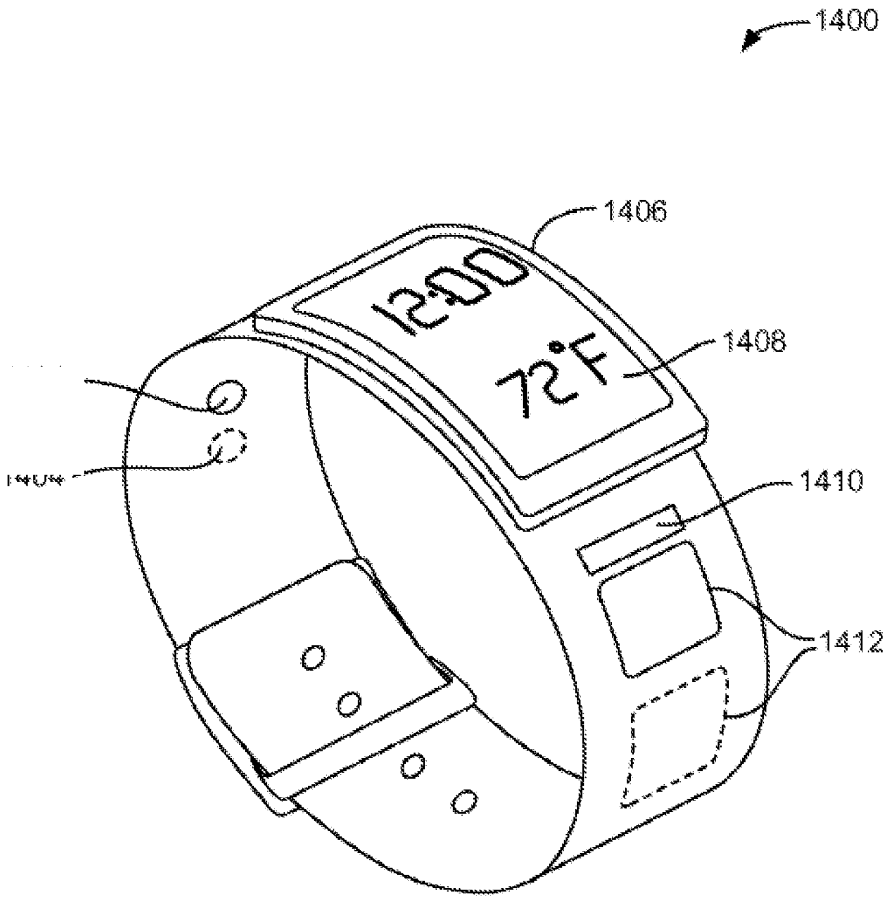

FIG. 14

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING
First Named Inventor/Applicant Name:	Ravi GOPALAKRISHNAN
Filer:	Uri M. Greenwald/Therese Fuentes
Attorney Docket Number:	41188-720.301

Filed as Large Entity

Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	280	280
Utility Search Fee	1111	1	600	600
Utility Examination Fee	1311	1	720	720
Request for Prioritized Examination	1817	1	4000	4000
Pages:				
Claims:				
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Publ. Fee- Early, Voluntary, or Normal	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**5740**

Electronic Acknowledgement Receipt	
EFS ID:	22529771
Application Number:	14730122
International Application Number:	
Confirmation Number:	2113
Title of Invention:	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING
First Named Inventor/Applicant Name:	Ravi GOPALAKRISHNAN
Customer Number:	21971
Filer:	Uri M. Greenwald/Therese Fuentes
Filer Authorized By:	Uri M. Greenwald
Attorney Docket Number:	41188-720.301
Receipt Date:	03-JUN-2015
Filing Date:	
Time Stamp:	19:44:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$5740
RAM confirmation Number	5867
Deposit Account	232415
Authorized User	FUENTES, THERESE M.
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	TrackOne Request	41188720301_track1.pdf	153151 08dd6332096354f83b466ac34d34237941ae517f	no	2
Warnings:					
Information:					
2	Transmittal of New Application	41188720301_transmittal.pdf	276606 c109b210745284c7f985ecb25a440461f0fac289	no	2
Warnings:					
Information:					
3	Application Data Sheet	41188720301_ADS.pdf	1895621 01520f858eeba4db101ab510dcbc0e524dc4107b	no	9
Warnings:					
Information:					
4		41188720301_SPEC.pdf	682806 b9fdbacc565bf430cb573f55bb7b1e310169a93b	yes	53

Multipart Description/PDF files in .zip description

Document Description	Start	End
Specification	1	32
Claims	33	36
Abstract	37	37
Drawings-only black and white line drawings	38	53

Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	40450 61c6aebc736629aa928ee0fca26492a90a2db48f	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	3048634	

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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/AIA/424 (03-13)

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	Ravi GOPALAKRISHNAN	Nonprovisional Application Number (if known):	
Title of Invention:	METHODS AND SYSTEMS FOR ARRHYTHMIA TRACKING AND SCORING		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1), the prioritized examination fee set forth in 37 CFR 1.17(c), and if not already paid, the publication fee set forth in 37 CFR 1.18(d) have been filed with the request. The basic filing fee, search fee, examination fee, and any required excess claims and application size fees are filed with the request or have been already been paid.

2. The application contains or is amended to contain no more than four independent claims and no more than thirty total claims, and no multiple dependent claims.

3. The applicable box is checked below:

I. ☑ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.

---OR---

(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. The executed inventor's oath or declaration is filed with the application. (37 CFR 1.63 and 1.64)

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature /Uri Greenwald/	Date 06/03/2015
Name (Print/Typed) Uri Greenwald	Practitioner Registration Number 72686

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.**

☑ *Total of 1 forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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