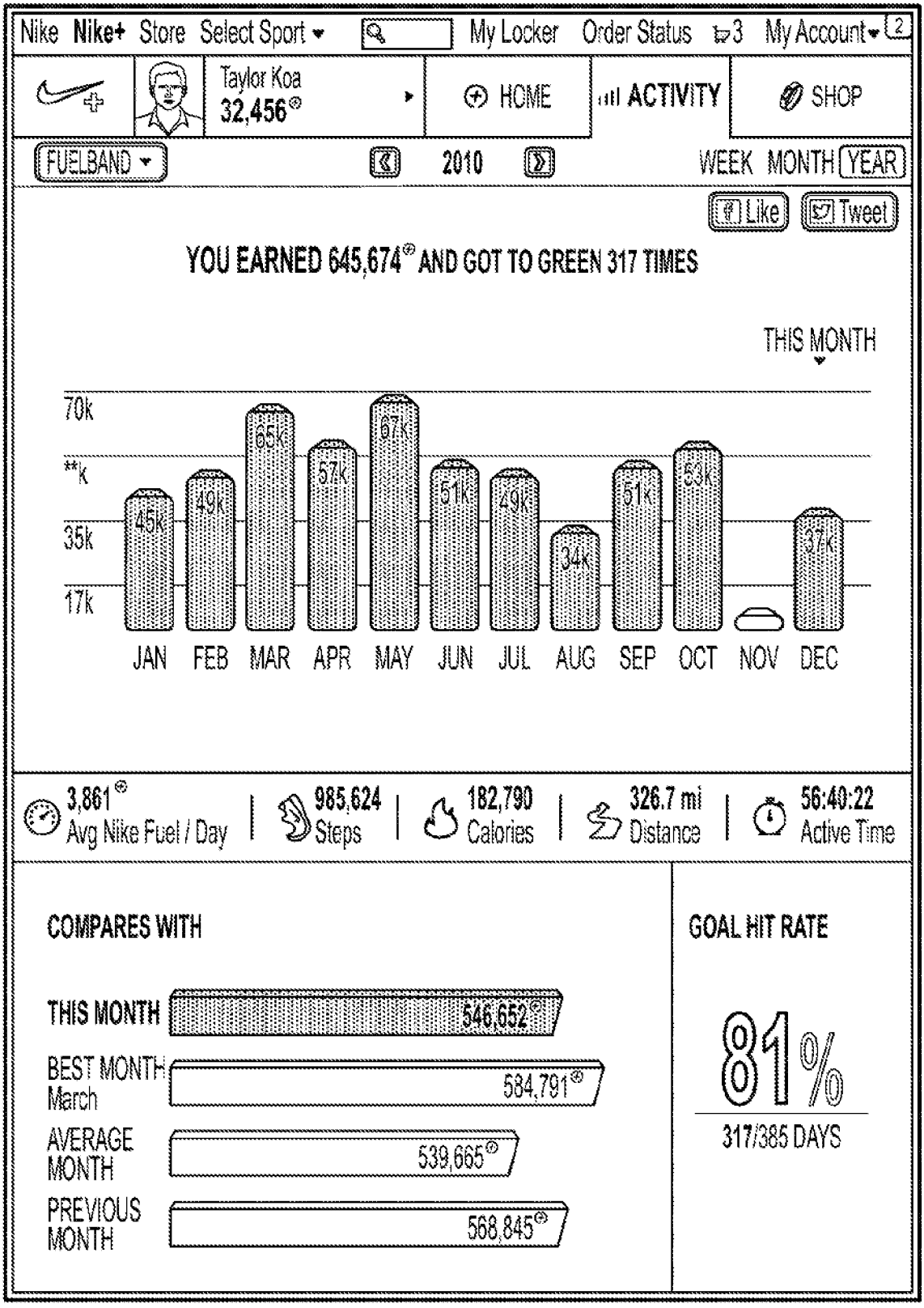



FIG. 13D



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
393 of 1413

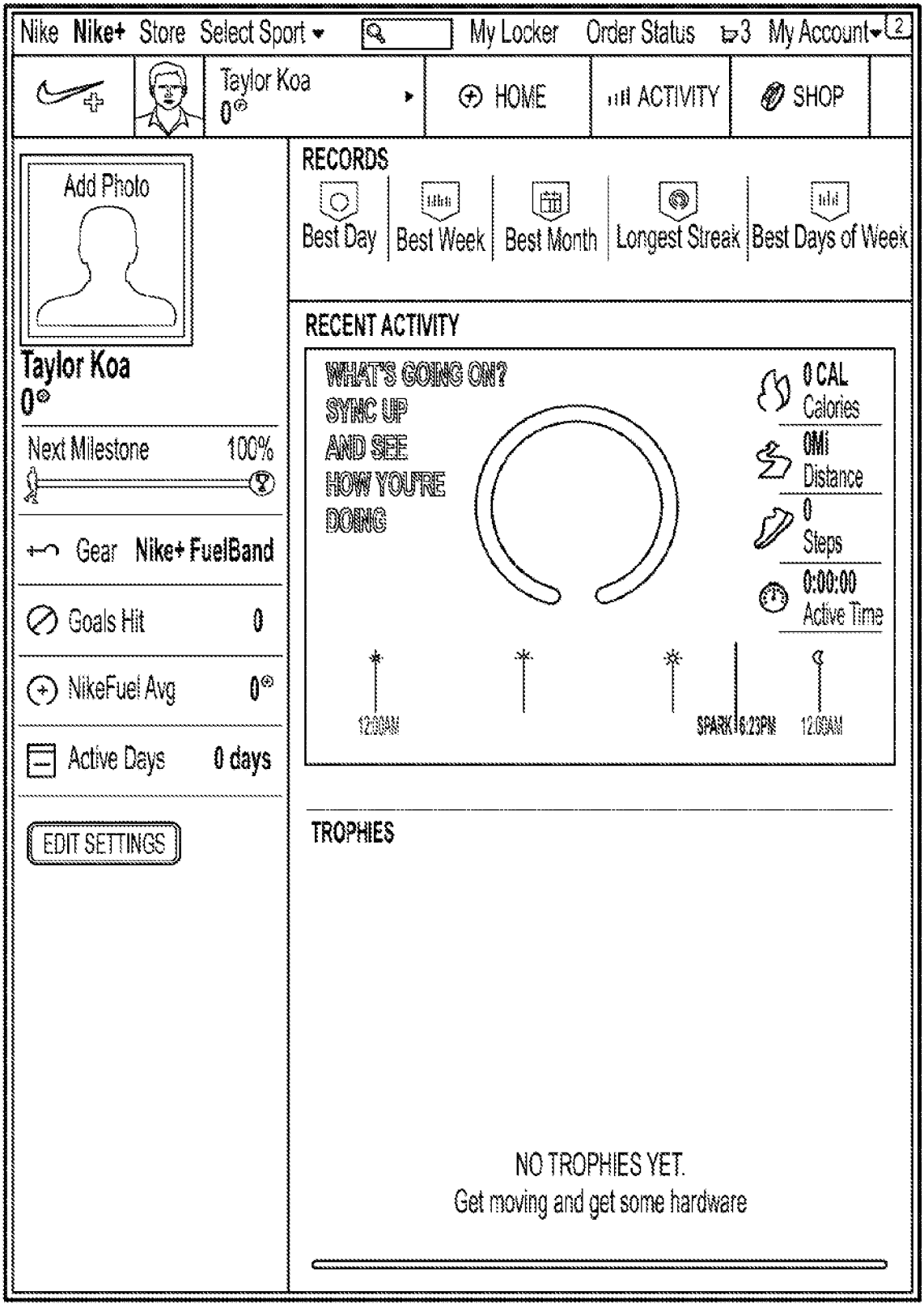



FIG. 14A



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
394 of 1413

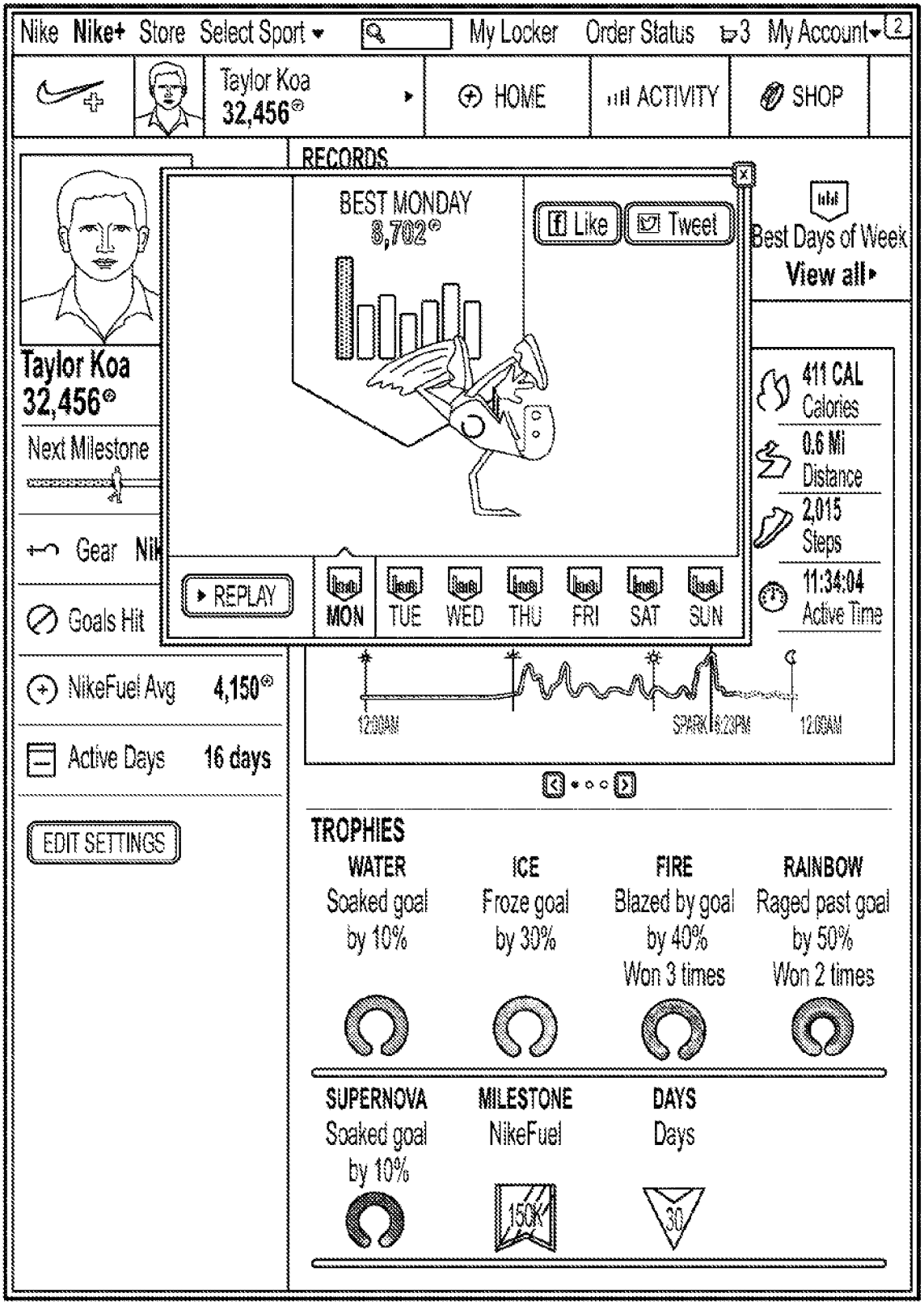



FIG. 14B



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
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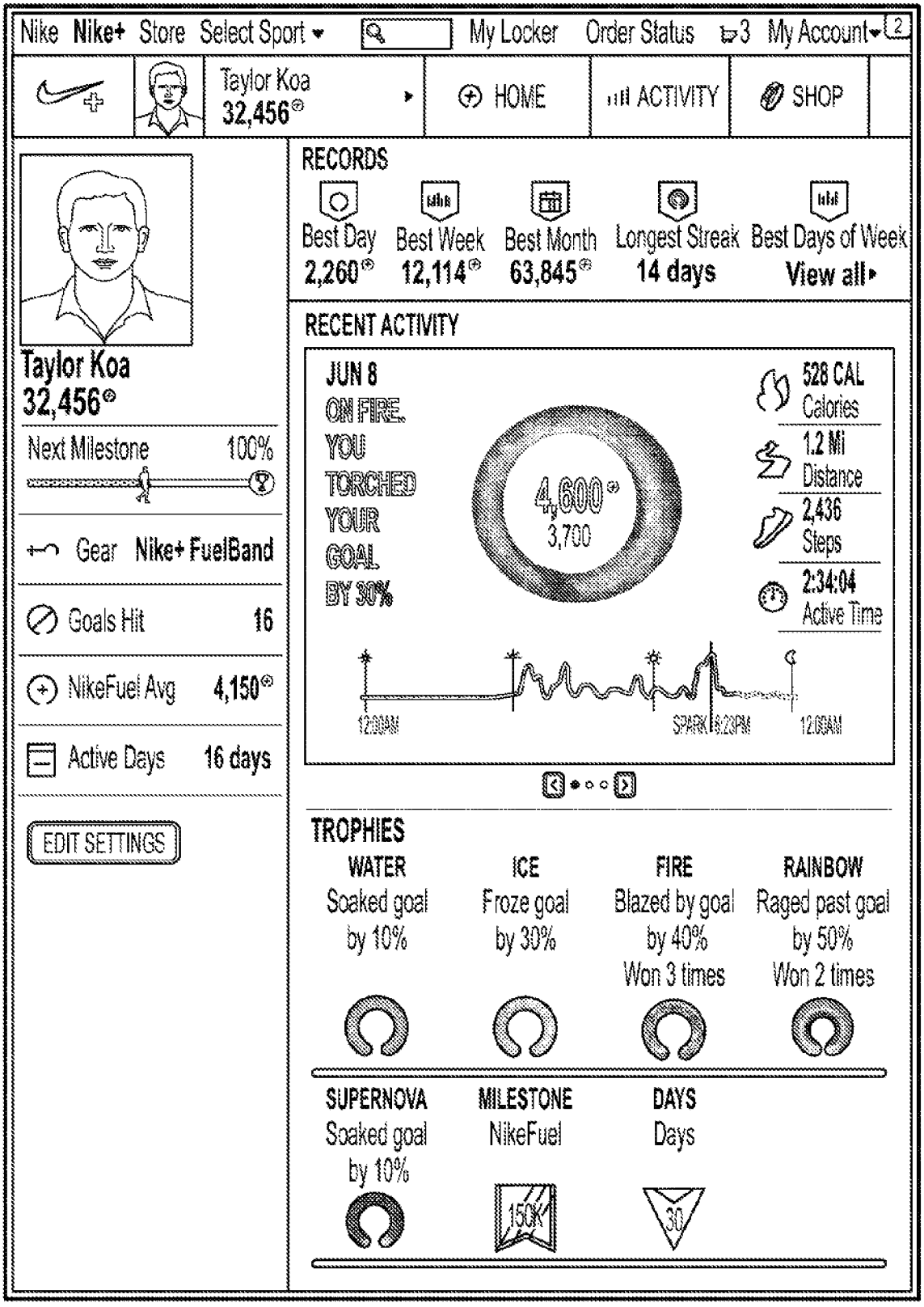



FIG. 14C



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
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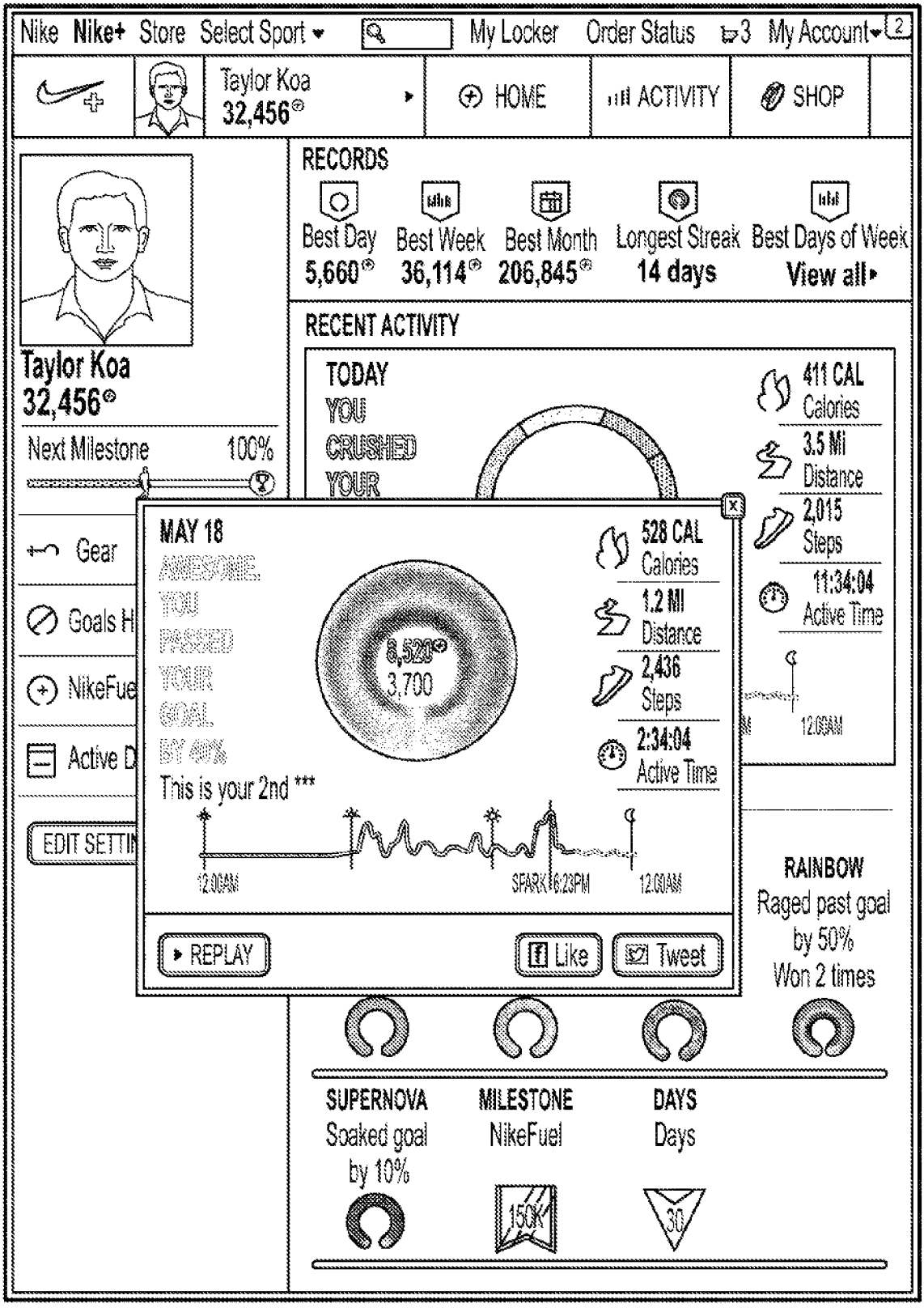



FIG. 14D



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
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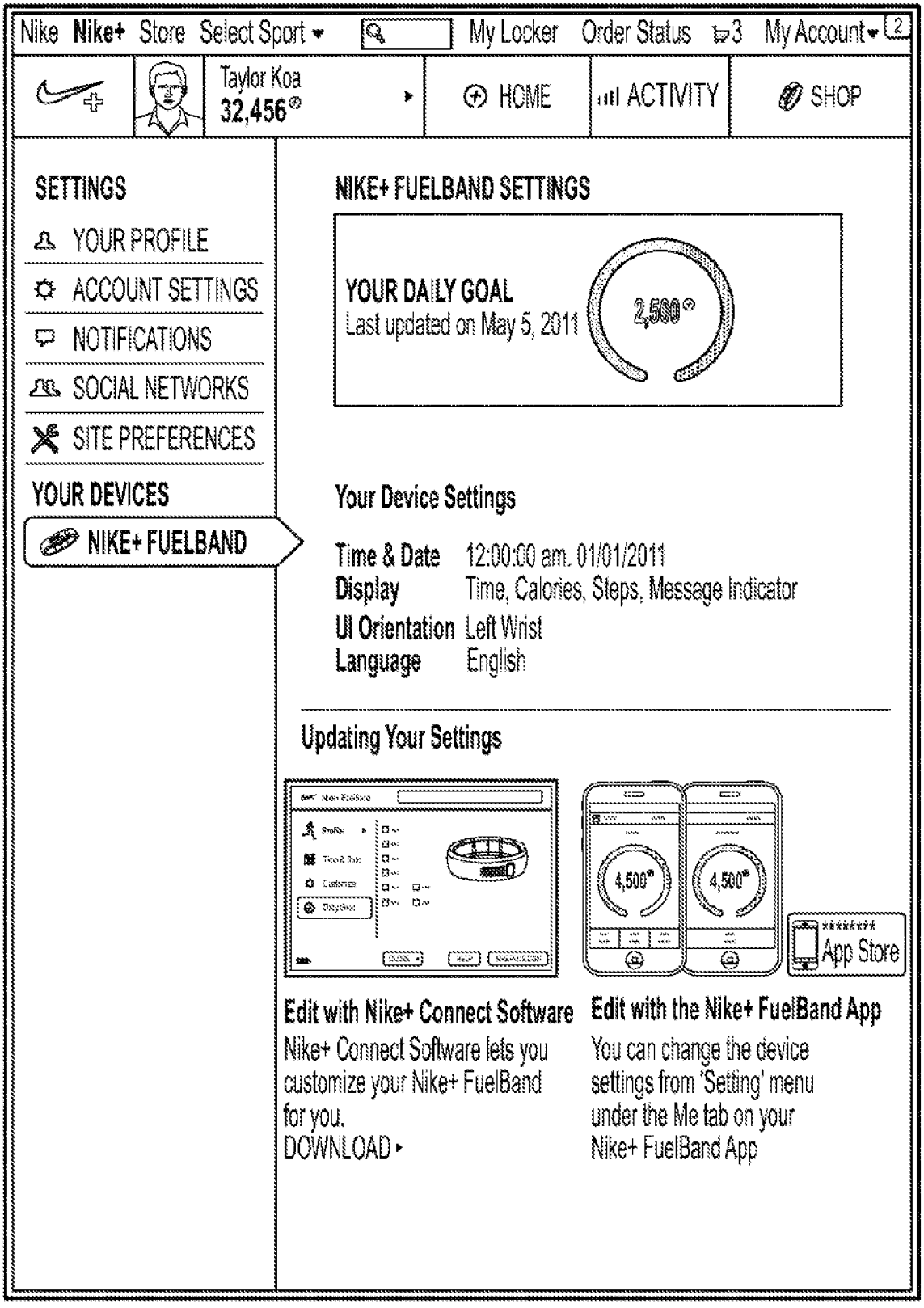



FIG. 15



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
398 of 1413

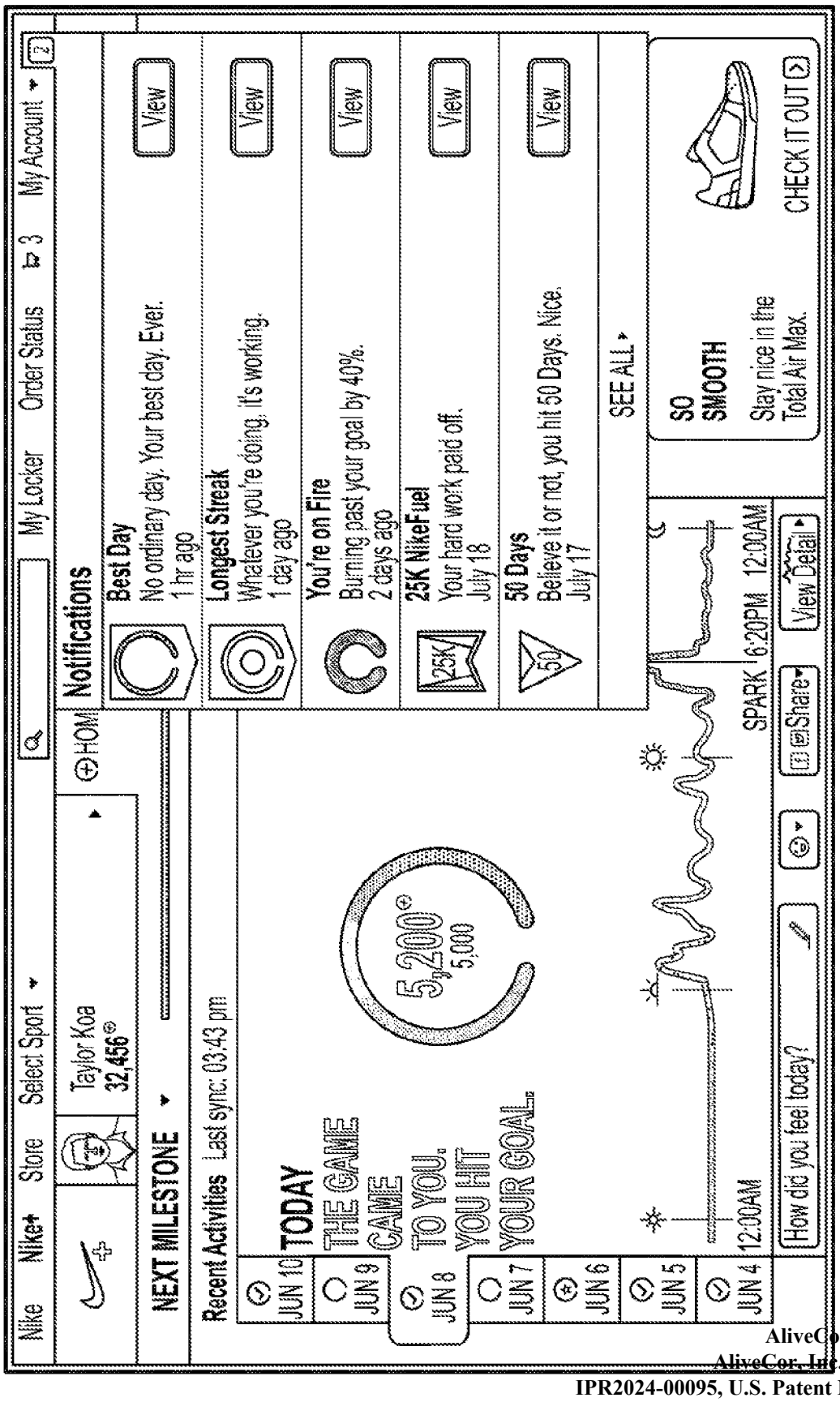



FIG. 16A



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
399 of 1413

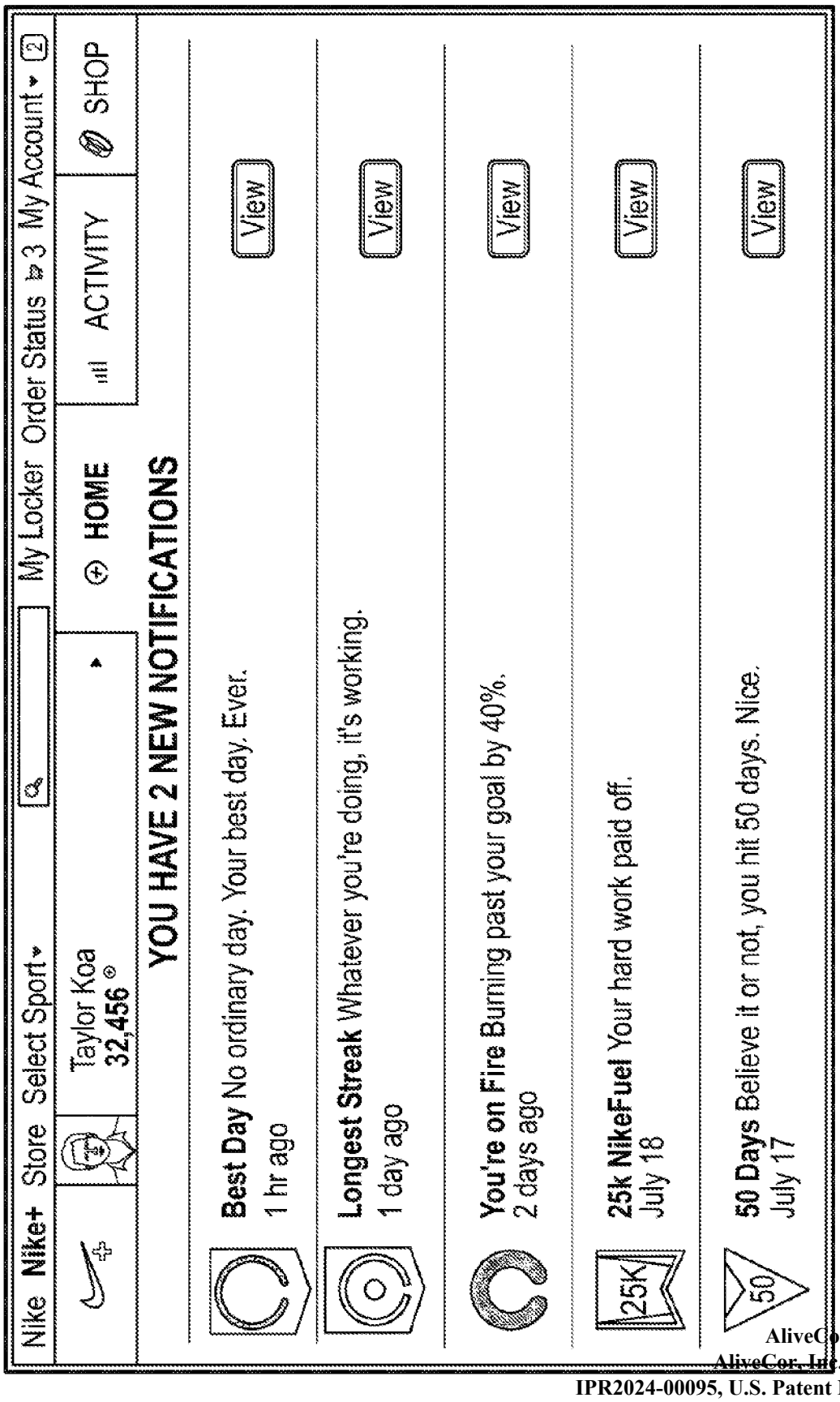



FIG. 16B



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
400 of 1413

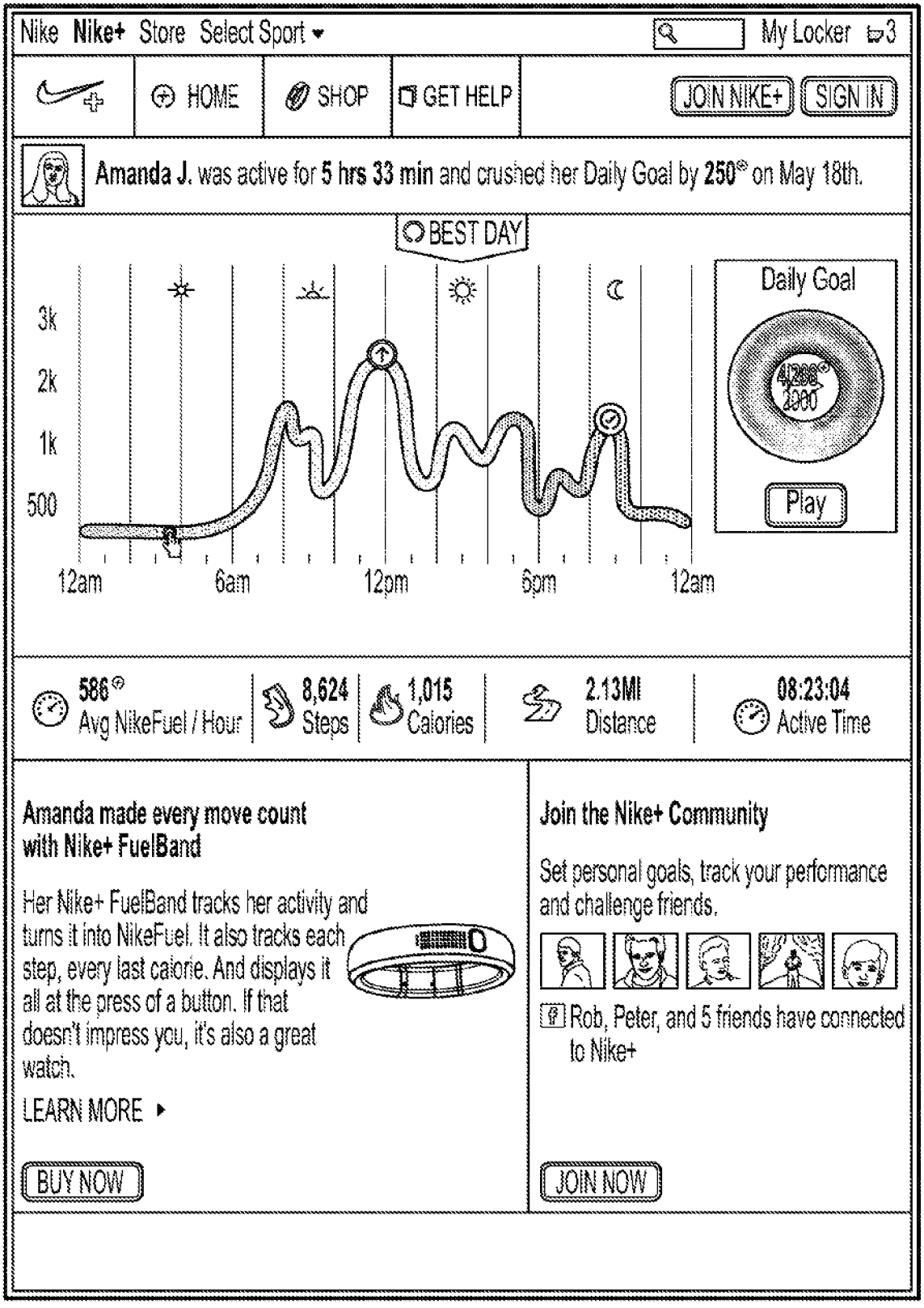



FIG. 17A



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
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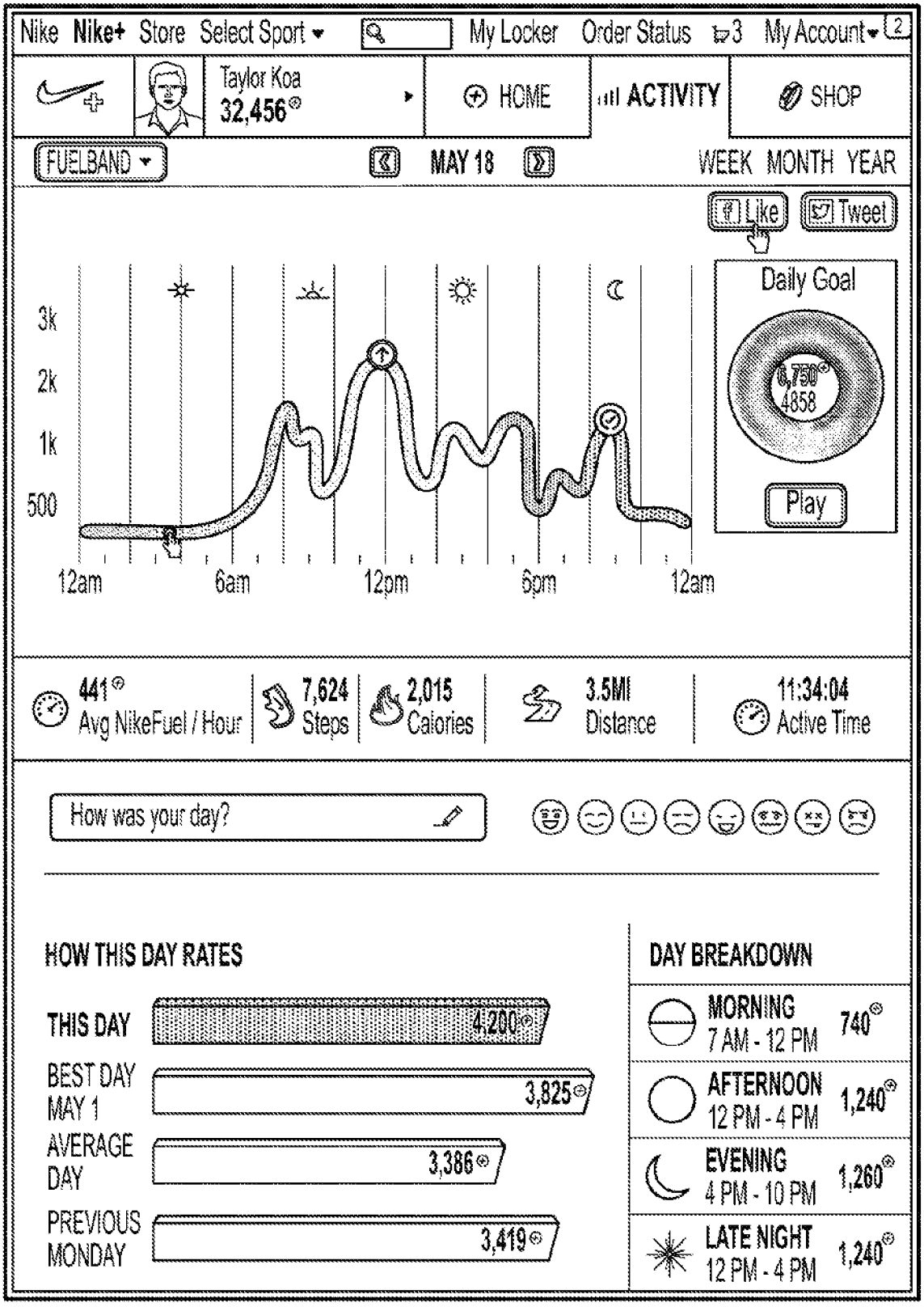



FIG. 17B



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
402 of 1413

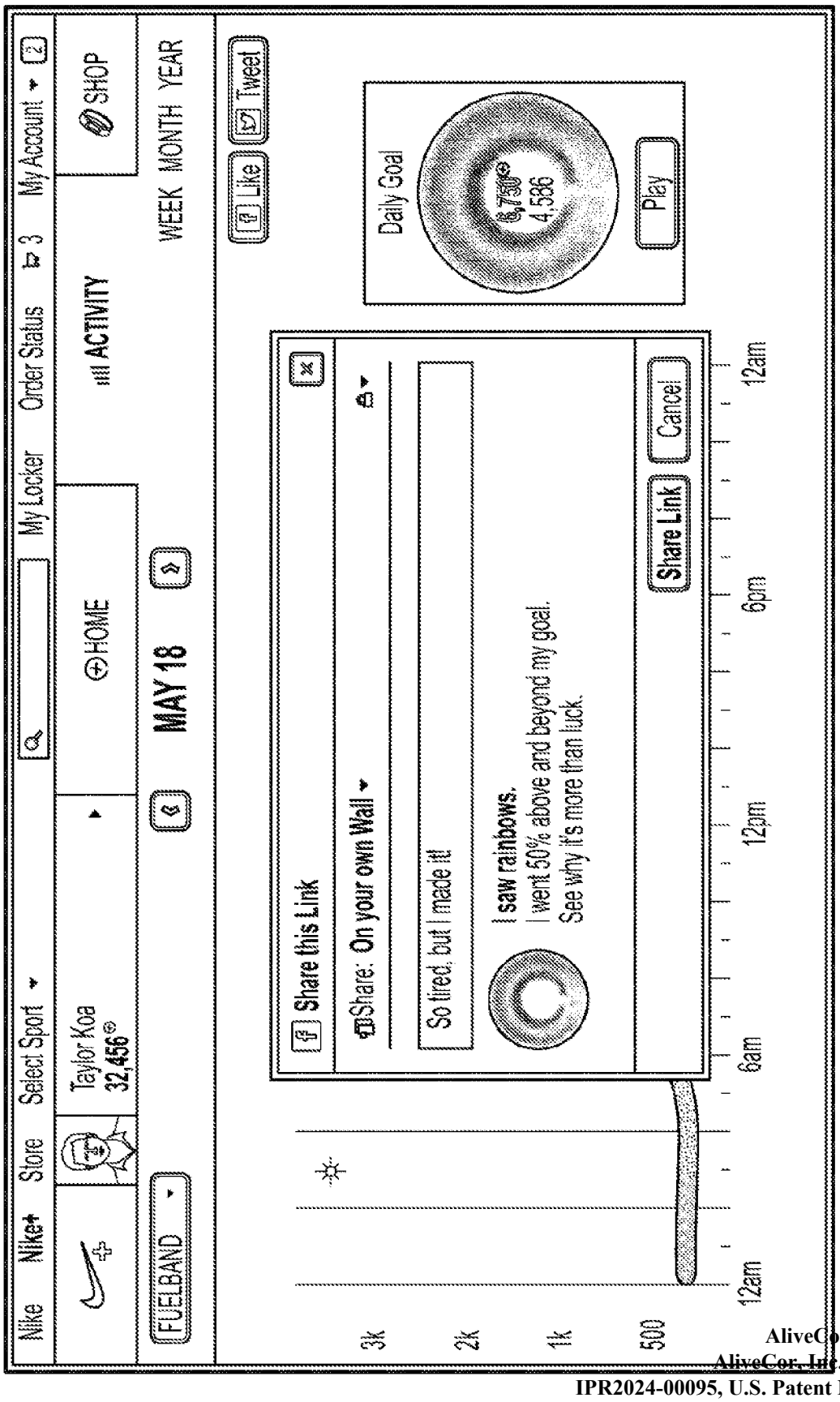



FIG. 17C



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
403 of 1413

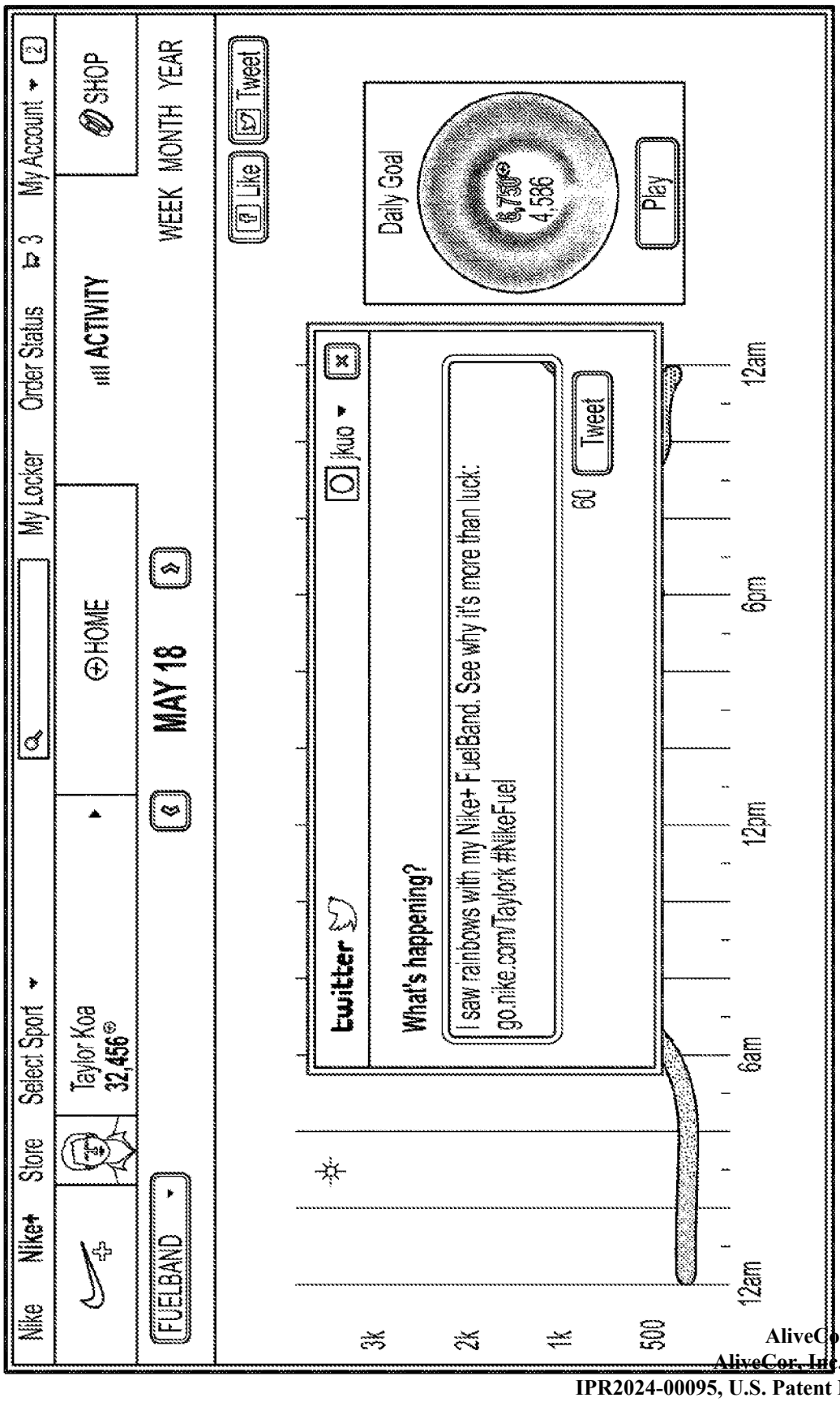



FIG. 17D



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
404 of 1413

# INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/022180

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B5/11 A61B5/22 A63B24/00 G06F19/00
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61B A63B G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | EP 0 700 661 A2 (OMRON TATEISI ELECTRONICS CO [JP] OMRON HEALTHCARE CO LTD [JP])<br>13 March 1996 (1996-03-13)<br>abstract; figures 1,4,5,8A-9B,12,13<br>page 4, lines 13-28<br>page 6, lines 19-49 | 1-8,<br>13-17 |
| X | US 8 088 044 B2 (TCHAO MICHAEL [US] ET AL)<br>3 January 2012 (2012-01-03)<br>column 15, line 43 - column 21, line 51;<br>figures 4,5,8A-9B,15,17 | 1-8,<br>13-17 |

-/--

[X] Further documents are listed in the continuation of Box C. [X] 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 |
|---|---|
| 11 April 2013 | 10/06/2013 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040,<br>Fax. (+31-70) 340-3016 | Jonsson, P.O. |

1

AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
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# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/022180

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-8, 13-17

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

**AliveCor Exhibit 1002**
**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**

# INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/022180

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | GARMIN: "FORERUNNER 405CX owner's manual", INTERNET CITATION, 1 March 2009 (2009-03-01), pages 1-55, XP002587382, Retrieved from the Internet: URL:http://www8.garmin.com/manuals/Forerunner405CX_OwnersManual.pdf [retrieved on 2010-07-07] Pages 11,14,15,19,24 ----- | 1-8, 13-17 |



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2013/022180

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| EP 0700661 A2 | 13-03-1996 | CN 1133165 A | 16-10-1996 |
| | | CN 1425356 A | 25-06-2003 |
| | | CN 1425357 A | 25-06-2003 |
| | | CN 1425358 A | 25-06-2003 |
| | | CN 1425359 A | 25-06-2003 |
| | | DE 69533819 D1 | 05-01-2005 |
| | | DE 69533819 T2 | 27-10-2005 |
| | | EP 0700661 A2 | 13-03-1996 |
| | | EP 1302162 A2 | 16-04-2003 |
| | | ES 2229224 T3 | 16-04-2005 |
| | | US 5788655 A | 04-08-1998 |
| | | US 5989200 A | 23-11-1999 |
| US 8088044 B2 | 03-01-2012 | CN 101978374 A | 16-02-2011 |
| | | EP 2252955 A1 | 24-11-2010 |
| | | JP 2011517966 A | 23-06-2011 |
| | | US 2010048358 A1 | 25-02-2010 |
| | | US 2012095578 A1 | 19-04-2012 |
| | | WO 2009111472 A2 | 11-09-2009 |



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-8, 13-17

A system comprising: a processor; and memory storing computer readable instructions that, when executed, cause the system to:
provide an application interface configured to facilitate uploading and downloading of physical activity data;
receive physical activity data;
storing and categorizing the received physical activity data;
providing a visualization of the received physical activity data; and
determine whether the user has reached a goal.

---

2. claims: 9, 10

As in 1, further comprising means to process a challenge between a first user and a second user;
receive a first set of physical activity data from the first user;
receive a second set of physical activity data from the second user; and
determine a winner of the challenge based on the first and second sets of physical activity data.

---

3. claims: 11, 12, 18-28

An apparatus comprising: a processor and a memory operatively coupled to the processor and storing computer readable instructions that, when executed, cause the apparatus to
receive physical activity data;
store the physical activity data;
store a first synchronization offset for a first portion of the physical activity data; and
store a second synchronization offset for a second portion of the physical activity data;
wherein the first and second synchronization offsets specify a respective point at which synchronization of the respective first and second portions of the physical activity data is to begin.

---

# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

# PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

To:
Ho, Brian B.
DENTONS US LLP
4655 Executive Drive, suite 700
San Diego CA 92121
ETATS-UNIS D'AMERIQUE

| | |
|---|---|
| Applicant's or agent's file reference<br>P33106WO1 | **FOR FURTHER ACTION** See paragraphs 1 and 4 below |
| International application No.<br>PCT/US2019/024570 | International filing date<br>*(day/month/year)* 28 March 2019 (28-03-2019) |
| Applicant<br>APPLE INC. | |
| | Date of mailing<br>*(day/month/year)* 8 August 2019 (08-08-2019) |

1. [X] The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

**Filing of amendments and statement under Article 19:**
The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46).

**When?** The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

**How?** Directly to the International Bureau of WIPO, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70

**For more detailed instructions, see** *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9.011.

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. [ ] **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

[ ] the protest together with the decision thereon has been transmitted to the International Bureau together with any applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

[ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4 **Reminders**

The applicant may **submit comments on an informal basis on the written opinion of the International Searching Authority** to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within **22 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

| | |
|---|---|
| Name and mailing address of the International Searching Authority<br>European Patent Office, P.B. 5818 Patentlaan 2<br>NL-2280 HV Rijswijk<br>Tel. (+31-70) 340-2040<br>Fax: (+31-70) 340-3016 | Authorized officer<br>MATIAS GARRAZ, Bruno<br>Tel: +31 (0)70 340-4371 |



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
410 of 1413

PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| Applicant's or agent's file reference | FOR FURTHER ACTION | see Form PCT/ISA/220 as well as, where applicable, item 5 below. |
|---|---|---|
| P38108WO1 | | |
| International application No. | International filing date *(day/month/year)* | (Earliest) Priority Date *(day/month/year)* |
| PCT/US2019/024570 | 28 March 2019 (28-03-2019) | 7 May 2018 (07-05-2018) |

Applicant

APPLE 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 6 sheets.

[X] 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:

[X] 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. [X] **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,**

[X] 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,**

[X] 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. 8E

[ ] as suggested by the applicant

[ ] as selected by this Authority, because the applicant failed to suggest a figure

[X] as selected by this Authority, because this figure better characterizes the invention

b. [ ] none of the figures is to be published with the abstract



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
411 of 1413

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/024570

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 1-11, 25-48, 50-52, 54-56, 58-60, 62-64, 66-68, 70, 71
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
412 of 1413

# INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/024570

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F3/0488 A61B5/00 A61B5/11 A63B24/00
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F A61B A63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 2014/038781 A1 (FOLEY JOHN PAUL [US] ET AL) 6 February 2014 (2014-02-06)<br><br>paragraphs [0046] - [0059]; figures 5-12<br>paragraphs [0077] - [0082]; figure 17<br>----- | 12-24, 49,53, 57,61, 65,69 |
| A | US 2017/354845 A1 (WILLIAMS ALED HYWEL [US] ET AL) 14 December 2017 (2017-12-14)<br><br>paragraphs [0218] - [0232]; figures 6,7<br>paragraphs [0265] - [0271]; figure 10<br>paragraph [0286]<br>paragraph [0299]; figure 13F<br>paragraphs [0325] - [0329]; figure 16<br>-----<br>-/-- | 12-24, 49,53, 57,61, 65,69 |

[X] Further documents are listed in the continuation of Box C.

[X] 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 |
|---|---|
| 30 July 2019 | 08/08/2019 |

Name and mailing address of the ISA/
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax. (+31-70) 340-3016

Authorized officer
de Biolley, Luc

Form PCT/ISA/210 (second sheet) (April 2005)



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
413 of 1413

# INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/024570

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | WO 2013/109916 A1 (NIKE INTERNATIONAL LTD [US]) 25 July 2013 (2013-07-25)<br><br>abstract<br>paragraphs [0124] - [0141]<br>claims 1,9 | 12-24,<br>49,53,<br>57,61,<br>65,69 |
| A | US 2016/346607 A1 (RAPFOGEL JONATHAN [US]) 1 December 2016 (2016-12-01)<br><br>paragraphs [0009], [0012], [0049] | 12,<br>16-18,<br>49,53,<br>57,61,<br>65,69 |

1

Form PCT/ISA/210 (continuation of second sheet) (April 2005)



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2019/024570

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 2014038781 A1 | 06-02-2014 | US 9233276 B1 | 12-01-2016 |
| | | US 2014038781 A1 | 06-02-2014 |
| | | US 2016121165 A1 | 05-05-2016 |
| | | US 2018126223 A1 | 10-05-2018 |
| | | US 2018318647 A1 | 08-11-2018 |
| US 2017354845 A1 | 14-12-2017 | AU 2017100667 A4 | 06-07-2017 |
| | | AU 2017277971 A1 | 20-12-2018 |
| | | AU 2018100158 A4 | 01-03-2018 |
| | | AU 2018101855 A4 | 03-01-2019 |
| | | CN 107491259 A | 19-12-2017 |
| | | CN 109463001 A | 12-03-2019 |
| | | DK 201770423 A1 | 15-01-2018 |
| | | EP 3448534 A1 | 06-03-2019 |
| | | US 2017354845 A1 | 14-12-2017 |
| WO 2013109916 A1 | 25-07-2013 | CA 2861333 A1 | 25-07-2013 |
| | | CN 104203096 A | 10-12-2014 |
| | | CN 107516008 A | 26-12-2017 |
| | | EP 2804530 A1 | 26-11-2014 |
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| | | JP 6254199 B2 | 27-12-2017 |
| | | JP 2015509019 A | 26-03-2015 |
| | | JP 2016120302 A | 07-07-2016 |
| | | KR 20140119127 A | 08-10-2014 |
| | | KR 20170024135 A | 06-03-2017 |
| | | US 2013197679 A1 | 01-08-2013 |
| | | US 2016296798 A1 | 13-10-2016 |
| | | WO 2013109916 A1 | 25-07-2013 |
| US 2016346607 A1 | 01-12-2016 | NONE | |



**AliveCor Exhibit 1002**
**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 1-11, 25-48, 50-52, 54-56, 58-60, 62-64, 66-68, 70, 71

See fax of the Applicant received on 25-07-2019 requesting search and examination of independent claims 12, 49, 53, 57, 61, 65, 69 and the corresponding dependent claims.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

**Information on Search Strategy** - Pilot phase (see OJ 2015, A88)
The type of information contained in this sheet may change during the pilot for improving the usefulness of this new service.

Application Number
PCT/US2019/024570

TITLE: DISPLAYING USER INTERFACES ASSOCIATED WITH PHYSICAL ACTIVITIES

APPLICANT: APPLE INC.

IPC CLASSIFICATION: G06F3/0488, A61B5/00, A61B5/11, A63B24/00

EXAMINER: de Bielley, Luc

CONSULTED DATABASES: EPODOC

CLASSIFICATION SYMBOLS DEFINING EXTENT OF THE SEARCH:

IPC:

CPC: G06F3/04886, A61B5/742, A61B5/1118, A63B24/0059, A63B24/0084

FI/F-TERMS:

KEYWORDS OR OTHER ELEMENTS FEATURING THE INVENTION:
electronic device; display;
user activity data , time period , elapsed sub-period, unelapsed sub-period ,
activity competition;
representation of user activity data;
user interface, affordance, competition between users, awards, icon

EPO FORM P0A42

# PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

# PCT

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
*(day/month/year)* see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

**FOR FURTHER ACTION**
See paragraph 2 below

| International application No. | International filing date *(day/month/year)* | Priority date *(day/month/year)* |
|---|---|---|
| PCT/US2019/024570 | 28.03.2019 | 07.05.2018 |

International Patent Classification (IPC) or both national classification and IPC
INV. G06F3/0488 A61B5/00 A61B5/11 A63B24/00

Applicant
APPLE 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 and 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 usually 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: | Date of completion of this opinion | Authorized Officer |
|---|---|---|
| European Patent Office<br>P.B. 5818 Patentlaan 2<br>NL-2280 HV Rijswijk - Pays Bas<br>Tel. +31 70 340 - 2040<br>Fax: +31 70 340 - 3016 | see form PCT/ISA/210 | de Bioley, Luc<br>Telephone No. +31 70 340 [illegible] |



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Box No. I Basis of the 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:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

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 forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:



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**Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

☐ the entire international application

☒ claims Nos. 1-11, 25-48, 50-52, 54-56, 58-60, 62-64, 66-68, 70, 71

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search *(specify)*:

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed *(specify)*:

☒ no international search report has been established for the whole application or for said claims Nos. 1-11, 25-48, 50-52, 54-56, 58-60, 62-64, 66-68, 70, 71

☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

- ☐ furnish a sequence listing in the form of an Annex C/ST.25 text file, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.
- ☐ furnish a sequence listing on paper or in the form of an image file complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in the form and manner acceptable to it, or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.
- ☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rule 13*ter*.1(a) or (b).

☒ See Supplemental Box for further details



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**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) | Yes: | Claims | 16-18, 20-24 |
| | No: | Claims | 12-15, 19, 49, 53, 57, 61, 65, 69 |
| Inventive step (IS) | Yes: | Claims | |
| | No: | Claims | 12-24, 49, 53, 57, 61, 65, 69 |
| Industrial applicability (IA) | Yes: | Claims | 12-24, 49, 53, 57, 61, 65, 69 |
| | No: | Claims | |

2. Citations and explanations

see separate sheet

**Box No. VII Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

see separate sheet

**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:

see separate sheet



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Re Item III

**Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

1 In accordance with the request of the Applicant submitted with the telefax received on 25-07-2019, the search and examination have been carried out for claims 12-24, 49, 53, 57, 61, 65, 69.

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

2 Reference is made to the following documents:

D1 US 2014/038781 A1 (FOLEY JOHN PAUL [US] ET AL) 6 February 2014 (2014-02-06)

D2 US 2017/354845 A1 (WILLIAMS ALED HYWEL [US] ET AL) 14 December 2017 (2017-12-14)

D3 WO 2013/109916 A1 (NIKE INTERNATIONAL LTD [US]) 25 July 2013 (2013-07-25)

D4 US 2016/346607 A1 (RAPFOGEL JONATHAN [US]) 1 December 2016 (2016-12-01)

3 The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of independent claims 12, 49, 53, 57, 61, 65 and 69 is not new.

3.1 D1 discloses all the features of claim 12 (the references in parenthesis applying to D1) :

A method comprising:

at an electronic device including a display ([0046]; "display");

receiving first user activity data (fig. 9, ref. 226 : "Total 682", ref. 234 : "18 RachelC 682") for a first user, wherein the first user activity data corresponds to a first time period and a second ptime period ([0053] ; see fig. 9, ref. 234: RachelC");

receiving second user activity data for a second user (see fig. 9, ref. 234, for example "Melanie"), wherein the second user activity data corresponds to the first time period (corresponding to the length of the class in which Melanie and RachelC are taking part, i.e. 45 min. in view of fig. 8, ref. 240), and wherein the first time period includes a first elapsed sub-period and a first unelapsed sub-period for an activity competition between the first user and the second user (fig. 9, ref; 242 : "12:27 left", corresponding to the unelapsed sub-period);

receiving third user activity data for the third user (see fig. 9, ref. 234, for example "Ellie"), wherein the third user activity data corresponds to the second time period (in this case, the second time period is the same as the first time period because RachelC, Melanie and Ellie have started the class at the same time, but it is implicit that Melanie and RachelC could take part in a first class and Ellie and RachelC could take place in a different class, in which case the second period would be different from the first period), and wherein the second time period includes a second elapsed sub-period and a second unelapsed sub-period for an activity competition between the first user and the third user (fig. 9, ref; 242 : "12:27 left", corresponding to the unelapsed sub-period); and

displaying, on the display, a user interface including:

a representation of the first user activity data and the second user activity data during the first elapsed sub-period for the activity competition between the first user and the second user (fig. 9, ref. 234 : "RachelC 682"; "Melanie 732") ;

an indication of an amount of time in the first unelapsed sub-period for the activity competition between the first user and the second user (fig. 9, ref; 242 : "12:27 left") ;

a representation of the first activity data and the third activity data during the second elapsed sub-period for the activity competition between the first user and the third user (fig. 9, ref. 234 : "RachelC 682"; "Ellie 710"); and

an indication of an amount of time in the second unelapsed sub-period for the activity competition between the first user and the third user (fig. 9, ref; 242 : "12:27 left").

The subject-matter of claim 12 is therefore not new.

3.2 Similar reasoning can be applied to corresponding independent claims 49, 53, 57, 61, 65 and 69. The subject-matter of said claims is therefore also not new.



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4 Dependent claims 13-24 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, because the features of said claims are either known from D1 or are directly derivable, without exercise of inventive skills, from the teachings of D1 in view of the general knowledge of the art or in combination with D2 or D3.

See the following passages :

- claims 13-15, 19 : fig. 8, ref. 240 :"45 Min Pure Cycle". It is furthermore implicit that in case -taking the same users RachelC, Melanie and Ellie as in section 3.1 above- the second time period corresponding to a class between RachelC and Ellie could have a different length and could begin at a different time.

- claims 16, 17, 23 : see fig. 8, 9, ref. 234.
As to a third affordance with an identification of a fourth user not in an active activity competition, the third affordance including a notification to initiate an activity competition, see D2, fig. 10C, 10D, 10E and [0269]-[0271] : "*Selection of affordance 1030 or 1032 may open a communication application (e.g., email, messaging, or social networking) with Jeff's contact information for the communication application. A message may then be entered or a pre-defined message may be selected for sending to Jeff. Pre-defined message can include any type of messages, such as messages of encouragement, competition, or praise.*"

- claims 18, 20, 21 : displaying additional information regarding the activity competition between the users is not considered to render the claim inventive. Said information is readily available for all users in the system of D1 (see fig. 8, ref. 222, 224, 226, 228, 230); presenting such available information on a dedicated screen as claimed in claim 18 is not considered to have a technical effect. Said features therefore do not provide a technical contribution to the prior art and may thus be ignored in assessing inventive step (see the Guidelines for Search and Examination at the EPO as PCT Authority, G-VII-5.4).

- claim 22 : D2, [0329], fig; 16H

- claim 24 : D2, [221]-[0222]. D2 discloses a swipe gesture whereas claim 24 defines a rotatable input mechanism. Rotatable input mechanisms are well known in the art. It would be obvious for the skilled person to include such a mechanism in the devices disclosed in D1 or D2. Claim 24 is therefore not considered to involve an inventive step.



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Re Item VII

**Certain defects in the international application**

5 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1-D3 is not mentioned in the description, nor are these documents identified therein.

6 The independent claims are not in the two-part form in accordance with Rule 6.3(b) PCT.

7 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

8 The "incorporated by reference" statements on various paragraphs of the description should be deleted, since the application should be self-contained and these documents clearly are not vital for detailing essential features of the invention (see PCT-Guidelines II-4.26).

Re Item VIII

**Certain observations on the international application**

9 The application does not meet the requirements of Article 6 PCT, because the claims are not clear.

9.1 Although claims 49, 61 (computer-readable storage medium claims) and respectively claims 53, 57, 65 and 69 (device claims) have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and/or in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT.

9.2 The vague and imprecise statement in the description on paragraph 445 implies that the subject-matter for which protection is sought may be different to that defined by the claims, thereby resulting in lack of clarity (Article 6 PCT) when used to interpret them.



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**IPR2024-00095, U.S. Patent No. 10,568,533**
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## Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO/ISA)

**General information**

For all international applications, the competent International Searching Authority (**ISA**) will establish an international search report (**ISR**) accompanied by a written opinion of the International Searching Authority (**WO/ISA**). The **WO/ISA** may be responded to by

- filing informal comments with the **International Bureau of WIPO (IB)** (where no demand for international preliminary examination (**demand**) is filed)
- filing amendments under Art. 19 PCT (this can be done whether or not a **demand** is filed)
- filing amendments under Art. 34 PCT and/or formal observations in response to objections raised in the **WO/ISA** (where a **demand** *is* actually filed)

This document explains these possibilities.

**Filing informal comments**

After receipt of the **ISR and WO/ISA**, the applicant may file informal comments on the **WO/ISA, directly with the IB** (see International Search and Preliminary Examination Guidelines 2.15). These will be communicated to the designated/elected Offices, together with the International Preliminary Report on Patentability (**IPRP**) at 30 months from the priority date.

**Amending claims under Art. 19 PCT**

The applicant may file **amended claims** under Art. 19 PCT, **directly with the IB** by the later of the following dates:

- 2 months from the date of mailing of the **ISR** and the **WO/ISA**
- 16 months from the priority date

**However**, any such amendment received by the **IB** after the expiration of the applicable time limit shall be **considered to have been received on time** by the **IB**, if it reaches it **before** the technical preparations for international publication have been completed (the 15th day prior to the date of publication, see PCT Applicant's Guide, International Phase, 9.013).

For further information, please see Rule 46 PCT as well as form PCT/ISA/220.

Please also note that, when filing amended claims under Art. 19 PCT, such amendments shall be **accompanied by a letter** identifying the amendments made and also the basis for the amendments in the application as originally filed (Rule 46.5(b) PCT). Where a **demand** is filed, failure to comply with this requirement may result in the amendments being ignored in the International Preliminary Examination Report (**IPER**), see Rule 70.2(c-*bis*) PCT.



EPA/EPO/OEB Form 1037 04.10 (Cover sheet)

**Filing a demand for international preliminary examination**

In principle, the **WO/ISA** will be considered to be the written opinion of the International Preliminary Examining Authority (**IPEA**). Where the **WO/ISA** issued by the **EPO** as **ISA** gives a positive opinion on the international application and the invention to which it relates, filing a **demand** with the **EPO** as **IPEA** would normally be unnecessary, since a positive IPRP would anyway be established by the IB based on the WO/ISA (see also further below).

If the applicant wishes to file a **demand** (for example, to allow him to argue his case in international preliminary examination with regard to objections raised in a negative **WO/ISA** before the **IPEA** issues an **IPER**), this must be done before expiration of **3 months after the date of mailing of the ISR and WO/ISA** or **22 months after priority date,** whichever expires later (Rule 54*bis* PCT). Amendments under Art. 34 PCT can be filed with the IPEA, normally at the same time as filing the demand (Rule 66.1(b) PCT) or within the time limit set for reply to any written opinion issued during international preliminary examination by the **IPEA**.

If a **demand** is filed at the **EPO** as **IPEA** and no comments/amendments have been received by the time the **EPO** starts drawing up the **IPER** (Rule 66.4*bis* PCT), the **WO/ISA** will be transformed by the **IPEA** into an **IPER** (also called the **IPRP (Chapter II)** which would merely reflect the content of the **WO/ISA** (OJ 10/2011, 532). The **demand** can still be withdrawn (Art. 37 PCT).

Please also note that, when filing amendments under Art. 34 PCT, such amendments shall be accompanied by a letter which identifies the amendments made and also the basis for the amendments in the application as originally filed (Rule 66.8(a) PCT). Failure to comply with this requirement may result in the amendments being ignored in the **IPER (IPRP (Chapter II))**, see Rule 70.2(c-*bis*) PCT.

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**Filing a request for supplementary international search**

The applicant may, with the **IB**, file a request for **supplementary international search** under Rule 45*bis*.1 PCT. The present **ISR** and **WO/ISA** may also be taken into account in the execution of that supplementary international search, provided that these are available to the Authority charged with this task before it starts the supplementary search (Rule 45*bis*.5 PCT).

This kind of request **cannot be filed specifying the ISA** who did the **international search**.

More information on this topic can be found in the **PCT Applicant's Guide**, Chapter 8 (http://www.wipo.int/pct/en/guide/p08.html).

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**End of the international phase**

Where no **demand** is filed, at the end of the international phase, the **IB** will transform the **WO/ISA** into the IPRP (PCT Chapter I) (Rule 44*bis* PCT), which will then be transmitted together with possible informal comments to the designated Offices. Where a demand is filed, the **WO/ISA** is not transformed into an **IPRP (Chapter I)** by the **IB**, but rather the **IPEA** will establish an **IPER**, (the IPER is the same as the IPRP (PCT Chapter II), see Rule 70.15 PCT).

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# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 16143959 |
| **Filing Date:** | 27-Sep-2018 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Filer:** | Peter Jung-Hyon Yim/Swarnava Chakraborty |
| **Attorney Docket Number:** | P38213US2/77770000489102 |

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:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| SUBMISSION- INFORMATION DISCLOSURE STMT | 1806 | 1 | 240 | 240 |
| | | **Total in USD ($)** | | **240** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 37140373 |
| **Application Number:** | 16143959 |
| **International Application Number:** | |
| **Confirmation Number:** | 6224 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Customer Number:** | 150004 |
| **Filer:** | Peter Jung-Hyon Yim/Swarnava Chakraborty |
| **Filer Authorized By:** | Peter Jung-Hyon Yim |
| **Attorney Docket Number:** | P38213US2/77770000489102 |
| **Receipt Date:** | 12-SEP-2019 |
| **Filing Date:** | 27-SEP-2018 |
| **Time Stamp:** | 07:46:27 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | CARD |
| Payment was successfully received in RAM | $240 |
| RAM confirmation Number | E20199B847013852 |
| Deposit Account | |
| Authorized User | |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
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## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | P38213US2_IDS.pdf | 197002<br>c5b393e1529a3c37a1ab832020b5dc9f0db58847 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied IDS fillable form | | | | | |
| 2 | Foreign Reference | WO_2013109916_A1.pdf | 11680520<br>e31fca168638b28fb00615b0ee7f27f17eac2320 | no | 109 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Non Patent Literature | 16143909_FOA_08_28_2019.pdf | 731766<br>00f2e58e991065e96611526e92b179fbd99c008d | no | 20 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Non Patent Literature | PCTUS2019024570_ISRWO_08_08_2019.pdf | 8847988<br>f79c1b31a3721e1dd2640a061dfc7c11978bda96 | no | 18 |
| **Warnings:** | | | | | |
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| 5 | Fee Worksheet (SB06) | fee-info.pdf | 30935<br>b45018dea4599c7a73732b04cff5ea2dffcfe950 | no | 2 |
| **Warnings:** | | | | | |
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| | | **Total Files Size (in bytes):** | 21488211 | | |

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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.**

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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

**U.S. PATENTS**

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|

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| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1. | 20150297134 | A1 | 2015-10-22 | Albert et al. | |
| | 2. | 20160132046 | A1 | 2016-05-12 | Beoughter et al. | |
| | 3. | 20160302666 | A1 | 2016-10-20 | Shaya, Fawzi | |

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| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|
| | 1. | 2017/062621 | WO | A1 | 2017-04-13 | Berardinelli, Raymond, A. | | |

**NON-PATENT LITERATURE DOCUMENTS**

| Examiner Initials* | Cite No | 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[5] |
|---|---|---|---|
| | 1. | Advisory Action received for U.S. Patent Application No. 16/144,849, mailed on August 12, 2019, 5 pages. | |
| | 2. | Invitation to Pay Addition Fees and Partial International Search Report received for PCT Patent Application No. PCT/2019/019694, mailed on July 10, 2019, 12 pages. | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

| EXAMINER SIGNATURE | | | |
|---|---|---|---|
| Examiner Signature | | Date Considered | |

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.
[4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 16/143,959 |
| | Filing Date | 2018-09-27 |
| | First Named Inventor | Christopher D. SOLI |
| | Art Unit | 3792 |
| | Examiner Name | M. J. Lau |
| | Attorney Docket Number | P38213US2/77770000489102 |

## 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.

☒ The 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 | /Randy Omid/ | Date (YYYY-MM-DD) | 2019-08-19 |
| Name/Print | Randy Omid | Registration Number | 67,439 |

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 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.**



**AliveCor Exhibit 1002**
**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**
**435 of 1413**

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 16143959 |
| **Filing Date:** | 27-Sep-2018 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Filer:** | Peter Jung-Hyon Yim/Ganesh Tripathi |
| **Attorney Docket Number:** | P38213US2/77770000489102 |

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:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| SUBMISSION- INFORMATION DISCLOSURE STMT | 1806 | 1 | 240 | 240 |
| | | **Total in USD ($)** | | **240** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 36912427 |
| **Application Number:** | 16143959 |
| **International Application Number:** | |
| **Confirmation Number:** | 6224 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Customer Number:** | 150004 |
| **Filer:** | Peter Jung-Hyon Yim/Ganesh Tripathi |
| **Filer Authorized By:** | Peter Jung-Hyon Yim |
| **Attorney Docket Number:** | P38213US2/77770000489102 |
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| **Filing Date:** | 27-SEP-2018 |
| **Time Stamp:** | 14:54:19 |
| **Application Type:** | Utility under 35 USC 111(a) |

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|---|---|
| Submitted with Payment | yes |
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| Payment was successfully received in RAM | $240 |
| RAM confirmation Number | E20198IE55082706 |
| Deposit Account | |
| Authorized User | |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
438 of 1413

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | P38213US2_IDS.pdf | 197967<br>4ddaaf9eeb543922b0ae604b99a0b97fc6dbfbfe | no | 3 |
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| **Information:** | | | | | |
| This is not an USPTO supplied IDS fillable form | | | | | |
| 2 | Foreign Reference | WO_2017062621_A1_1.pdf | 15388996<br>e7ba9033b78484f2128c3c1069e937133e311b8c | no | 60 |
| **Warnings:** | | | | | |
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| 3 | Foreign Reference | WO_2017062621_A1_2.pdf | 6111935<br>8e800ea12db063c2b11011683c84dbd07aa815e8 | no | 60 |
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| 4 | Non Patent Literature | 16144849_ADAR_08_12_2019.pdf | 565412<br>546d1985d3e6a3e5f1221030e8d98c1e93fab36b | no | 5 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Non Patent Literature | PCTUS2019019694_INVT_07_10_2019.pdf | 9652845<br>41321e337a389b3e42413bdb4291819b56763c0a | no | 12 |
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| 6 | Fee Worksheet (SB06) | fee-info.pdf | 30617<br>c0f2f0367dfbe04fb70679b5008ff28baabd06c4 | no | 2 |
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**New International Application Filed with the USPTO as a Receiving Office**

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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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| 62/237,664 | 6 October 2015 (06.10.2015) | US |
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| 62/341,864 | 26 May 2016 (26.05.2016) | US |


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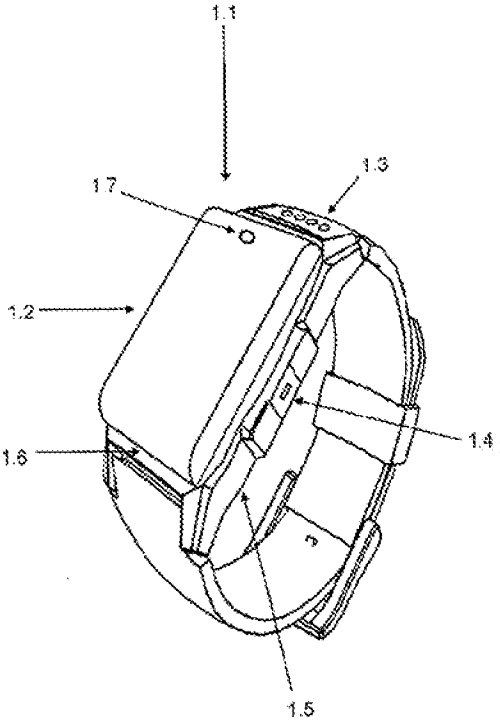
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*[Continued on next page]*

(54) Title: SMARTWATCH DEVICE AND METHOD

(57) Abstract: A smart-watch tracking system includes a smart-watch and a mobile phone which provide sensor data, such as motion data, to a server that analyzes and stores the detected sensor information, and provides an associated user interface to the smart-watch and/or mobile phone.

FIG. 1




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OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Published**:

— *with international search report (Art. 21(3))*

[0001] SMARTWATCH DEVICE AND METHOD

[0002] FIELD

[0003] The present application relates to a smartwatch device and method.

[0004] BACKGROUND

[0005] Background information is for informational purposes only and does not necessarily admit that subsequently mentioned information and publications are prior art.

[0006] A smartwatch is a computerized wristwatch with functionality that is enhanced beyond timekeeping. Some early models of smartwatches could only perform the most basic of tasks, such as mathematical calculations, translations from one language to another, and playing simple electronic games. In contrast, most modern smartwatches are effectively wearable computers. Many run mobile applications (apps) using a mobile operating system.

[0007] Some smartwatches function as portable media players. Such smartwatches can replace other media players, like CD players, DVD players, MP3 players, etc., by offering playback of FM radio, audio files, and video files to the user, either over a built-in speaker or via a connected listening device, such as headphones or a headset, which could be wired or wireless. Some smartwatches, also known as "watch phones," are designed to replace a mobile or cellular telephone. These models have full mobile phone capability, and can be used to make or answer phone calls.

[0008] Smartwatches can be designed with a substantial variety of internal hardware components. Most have a rechargeable battery and graphical display. Many include a touch screen or similar interface. Peripheral devices may possibly include, but are not limited to, such devices as a camera, thermometer, accelerometer, altimeter, barometer, compass, global positioning system (GPS) receiver, audio speaker, and digital memory card that is recognized as a mass storage device by a computer. In addition to hardware, the smartwatch can include a variety of software to perform different tasks and functions, such as, but not limited to, displaying a map, a personal scheduler or calendar, a calculator, and various kinds of watch faces and displays. The smartwatch may also be designed to communicate with a number of different external devices, such as, but not limited to, different types of sensors, a wireless headset, a heads-up display, a computer, or a server.

[0009] It should be understood that smartwatches are part of the general category of wearable devices. Any discussion herein relating to smartwatches also should be considered as including other wearable devices that may be worn on parts of the body aside from the wrist or arm, as is common with smartwatches. For example, some wearable devices may comprise bands or straps to allow wearing on the head, torso, or legs in addition to arms. Other wearable devices are articles of clothing, such as shirts, vests, pants, glasses, gloves, and jackets, with technological components built in to the clothing. These wearable devices could have similar components and functions as a smartwatch disclosed herein.



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[0010] Like other computers, a smartwatch may be used to collect information from internal or external sensors. A smartwatch may also be used to control other instruments or computers, or retrieve data from them. The smartwatch may support wireless technologies like Wi-Fi®, Bluetooth®, and GPS. For many purposes, a "wristwatch computer" simply serves as a front end for a remote system, communicating by various radio technologies.

[0011] Many current smartwatch models are completely functional as standalone products. Some serve as sport watches, with the GPS tracking unit being used to record exercise data, such as travel time, distance, and location. For example, after a workout, data can be uploaded onto a computer or online to create a log of activities for analysis or sharing. Some smartwatches can serve as full GPS watches, displaying maps and current coordinates, and recording tracks. Users can "mark" their current location and then edit the entry's name and coordinates, which enables navigation to those new coordinates.

[0012] Some smartwatches function as "sport watches," which often include activity tracker or fitness tracker features as seen in GPS watches made for outdoor sports. Functions may include training programs, stopwatch, speed display, GPS tracking unit, route tracking, dive computer, heart rate monitor compatibility, and cadence sensor compatibility. Smartwatches also walk through tutorials/videos on the watch face.

[0013] Other smartwatches can cooperate with an app in a smartphone to carry out their functions. These smartwatches may be little more than timepieces unless they are paired, usually wirelessly, with a mobile phone. Some of these smartwatches only work with a phone that runs the same mobile operating system, whereas others use an operating system unique to the smartwatch, or otherwise are able to work with most smartphones. When paired, a smartwatch may function as a remote access point for the phone, which generally allows the smartwatch to display data such as calls, SMS messages, e-mails, and calendar invites, and any data that may be made available by relevant phone apps.

[0014] Current smartwatches and electronic fitness tracker designs often incorporate wireless technology (such as Wi-Fi® and Bluetooth®) or have heart-rate and oxygen saturation and blood pressure monitoring capabilities. Smartwatches and fitness trackers can be designed to allow users to track complex motions requiring the use of motion sensors such as gyroscopes, accelerometers, compasses, and pressure sensors, fusing the sensor outputs into a single and accurate data stream for use as input commands in consumer electronics devices, and ongoing run-time calibration to ensure an optimal user experience.

[0015] SUMMARY

[0016] An object of the present application may be to provide a smartwatch device and method.

[0017] Smartwatches, as discussed above, can be used in different areas or industries to perform different functions usually performed by computers, electronic devices, or other devices. Such smartwatches can handle, store, and communicate data, much like a computer. Other smartwatches incorporate detection and measurement devices, such as motion sensors, monitors, gyroscopes,



BNSDOCID: <WO_____2017062621A1_I_>

accelerometers, compasses, pressure sensors, and GPS and tracking devices. The present application describes smartwatch devices and methods of using smartwatch devices.

[0018] BRIEF DESCRIPTION OF DRAWINGS

[0019] Figure 1 shows an exemplification of a smartwatch;

[0020] Figure 2 shows an exemplification of a smartwatch;

[0021] Figure 3 is a rear view of a smartwatch, according to an exemplification of the disclosure;

[0022] Figure 4 shows a perspective view of a smartwatch according to at least one possible exemplification of the present application;

[0023] Figure 5 shows a front view of a smartwatch according to at least one possible exemplification of the present application;

[0024] Figure 6 is a view showing a smartwatch according to one exemplification of the disclosure;

[0025] Figure 7 illustrates a schematic diagram of an exemplary gesture to be detected consistent with the disclosed exemplifications;

[0026] Figure 8 shows three axes of a smart wearable device consistent with the disclosed exemplifications;

[0027] Figure 9 shows a smartwatch with a display according to a possible exemplification;

[0028] Figure 10 shows a smartwatch with a display according to a possible exemplification;

[0029] Figure 11 shows a smartwatch with a display according to a possible exemplification;

[0030] Figure 12 shows a smartwatch with a display according to a possible exemplification;

[0031] Figure 13 shows a smartwatch with a display according to a possible exemplification;

[0032] Figure 14 shows a smartwatch with a display according to a possible exemplification;

[0033] Figure 15 is a schematic depiction of an exemplary electronic device for carrying out aspects of the present application;

[0034] Figure 16 is a front perspective view of a tablet computing device;

[0035] Figure 17 is a front, right side, perspective view of a laptop computer;

[0036] Figure 18 is a view showing pairing between a smartwatch and an external digital device according to one exemplification of the disclosure;

[0037] Figure 19 is a view showing a second exemplification of a control method for a smartwatch according to the disclosure;

[0038] Figure 20 is a diagram illustrating pairing of a smartwatch with an external digital device;

[0039] Figures 21, 22, and 23 illustrate a transaction sequence to facilitate client-based triangulation using a dynamic geodetic triangulation mechanism according to one exemplification of the present application;

[0040] Figure 24 is a schematic plan view representation of an object tracking system;

[0041] Figure 25 is a schematic plan view representation of another object tracking system;

[0042] Figure 26 is a schematic plan view representation of an alternative exemplification of the object tracking system of Figure 25;

[0043] Figure 27 shows an exemplification of a tracking system;



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[0044] Figure 28 shows components of a tracking system;

[0045] Figure 29 shows components of a tracking system;

[0046] Figure 30 shows components of a tracking system;

[0047] Figure 31 illustrates an exemplification of an image of a participant displayed together with participant information for the participant;

[0048] Figure 32 illustrates a callout box displayed proximally to each participant on a display screen;

[0049] Figure 33 illustrates multiple portions of participant information displayed simultaneously with images of different participants;

[0050] Figure 34 depicts an illustrative illustration relating to facial recognition in accordance with the present application;

[0051] Figures 35, 36 and 37 illustrate an example of a computing device detecting an artificial representation of a human face in an image based on changes in facial skin color, in accordance with various exemplifications;

[0052] Figure 38 shows a block diagram of an exemplification of a smartwatch system and related components;

[0053] Figures 39, 40, and 41 show an exemplification of a glove device; and

[0054] Figures 42, 43, and 44 show an exemplification of a glove device.

[0055] DESCRIPTION OF EMBODIMENTS

[0056] Referring now to the present application in more detail, in Figure 1 there is shown a smartwatch device 1.1, which utilizes a touch screen graphical user interface 1.2. The smartwatch device 1.1 utilizes both an internal rechargeable battery, as well as an external battery charging connecting points 1.3. An external charge can also be fed to the smartwatch device by way of the wired data transfer connection in the form of the MicroUSB connector 1.4. The smartwatch device 1.1 maintains multiple sub-systems including accelerometer, GPS system, GMS chip slot, Micro SD memory slot, processing unit, WiFi, Bluetooth and cellular transmitter/receiver inside the primary casing 1.5. A water resistant sealed casing 1.6 is shown and front-facing camera 1.7.

[0057] The smartwatch device 2.1 of Figure 2 includes tracking sensor systems, such as but not limited to both temperature sensors 2.2, pulse sensors 2.3, other sensors 2.4, a series of reflective light emitting diodes (LED) 2.5, including but not limited to 660 nanometer and 940 nanometer wavelengths, and receiving units 2.6. The smartwatch device 2.1 also includes a side facing camera and lighting source 2.7.

[0058] As shown in Figure 3, according to the disclosure, a smartwatch 3.1 may detect whether the smartwatch 3.1 is worn using a wearing sensor unit. For example, the smartwatch 3.1 may detect whether the smartwatch 3.1 is worn using a proximity sensor. Alternatively, the smartwatch 3.1 may detect whether the smartwatch 3.1 is worn using a sensor included in a buckle 3.2 of the smartwatch 3.1. If the smartwatch 3.1 is buckled, the smartwatch 3.1 may determine that the smartwatch 3.1 is worn by a user. Alternatively, the smartwatch 3.1 may detect whether the



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smartwatch 3.1 is worn using a touch sensor included in a rear surface of a main body 3.4 or a band 3.3 of the smartwatch 3.1. If the smartwatch 3.1 senses touch of the user on the rear surface of the main body 3.4 or the band 3.3, the smartwatch 3.1 may determine that the smartwatch 3.1 is worn by the user. That is, the smartwatch 3.1 may determine whether the smartwatch 3.1 is worn by the user using the above-described sensors. In the disclosure, at least one of the above sensors for providing sensing results to be referred for determination is referred to as the wearing sensor unit.

[0059] According to the disclosure, the smartwatch 3.1 may detect movement of the smartwatch 3.1 using a movement sensor unit. For example, the smartwatch 3.1 may detect movement of the smartwatch 3.1 using a proximity sensor. Alternatively, the smartwatch 3.1 may detect movement of the smartwatch 3.1 using a touch sensor included in a rear surface of the main body 3.4 or the band 3.3.

[0060] In addition, the smartwatch 3.1 may include at least one of a gyro sensor, an acceleration sensor, and a gravity sensor. As such, the smartwatch 3.1 may detect movement by detecting the position of the smartwatch 3.1 on an arm of the user.

[0061] According to one possible exemplification, the smartwatch 3.1 may detect movement by detecting a position where the smartwatch 3.1 is worn and then measuring a time when a signal varies as the smartwatch 3.1 moves. Alternatively, the smartwatch 3.1 may detect movement of the smartwatch 3.1 based on variation in coordinates of the smartwatch 3.1 detected on the arm. That is, the smartwatch 3.1 may detect movement of the smartwatch 3.1 on the arm using the above-described sensors. In the disclosure, at least one of the above sensors for providing sensing results to be referred for determination is referred to as the movement sensor unit.

[0062] The above-described sensors included in the smartwatch 3.1 may be formed as separate elements or at least one integrated element. According to an exemplification, the wearing sensor unit and the movement sensor unit may be an integrated sensor unit. The integrated sensor unit may simultaneously or substantially simultaneously detect whether the smartwatch 3.1 is worn and movement of the smartwatch 3.1, and may transmit a signal regarding the detected results to the processor.

[0063] The display unit may display visual information. In this case, the visual information may include at least one of a still image, a moving image, and text and may refer to information visually recognizable by the user. In addition, the visual information may be a result of execution of various types of digital content by the smartwatch 3.1.

[0064] According to the disclosure, the display unit may display information regarding a function performed by the processor or feedback information regarding the performed function as the visual information.

[0065] The processor may perform a function based on signals received from the wearing sensor unit and the movement sensor unit. When the smartwatch 3.1 is worn by the user, the processor may detect movement of the smartwatch 3.1 on the arm to obtain the direction and distance of movement. In addition, the processor may perform a function by determining whether the obtained



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direction and distance of movement of the smartwatch 3.1 correspond to a predetermined direction and distance of movement.

[0066] The performed function may include a function related to capture of a screen image and storing of the captured image, a function related to control of an external device, a function related to payment, a function related to link connection to or link disconnection from a portable device, a function related to execution of a search mode, a function related to bookmarking, a function related to display of visual information, a function related to switching on or off of a setup value, a function related to returning to a previous operation, a function related to separation of user interface structures, and a function related to reception of a call signal. However, functions performed by the smartwatch 3.1 are not limited to the above-listed functions.

[0067] In addition, the processor may determine whether to operate each unit of the smartwatch 3.1. The processor may set an on or off state of each unit. According to one possible exemplification, in order to prevent, restrict, and/or minimize the smartwatch 3.1 from performing unintended functions, the processor may set the wearing sensor unit or the movement sensor unit not to detect input. As such, the smartwatch 3.1 may perform a function only as desired by the user.

[0068] The elements may be mounted in the form of one integrated chip or a plurality of separate chips based on design of the smartwatch 3.1.

[0069] The smartwatch 3.1 may include a rotation sensor unit for detecting rotation of the smartwatch 3.1 about a rotation axis thereof. The smartwatch 3.1 may also include a front-surface touch sensor unit for sensing additional touch on a front surface of the main body 3.4 or the band 3.3. The smartwatch 3.1 may further include a tightness sensor unit for detecting how tightly the band 3.3 is fastened. In addition, the smartwatch 3.1 may include a storage unit for storing digital data.

[0070] The rotation sensor unit may include at least one of a gyro sensor, an acceleration sensor, and a gravity sensor. The rotation sensor unit may detect rotation of the smartwatch 3.1 about a rotation axis thereof. In this case, the smartwatch 3.1 may obtain the direction and distance of rotation. The processor may perform a function by determining whether the direction and distance of rotation correspond to a predetermined direction and distance of rotation.

[0071] The front-surface touch sensor unit may be formed in the front surface of the main body 3.4 or the band 3.3 of the smartwatch 3.1. The front-surface touch sensor unit may detect an additional input signal. In this case, the additional input signal may be different from an input signal sensed by the wearing sensor unit and the movement sensor unit. The front-surface touch sensor unit may detect additional touch input of the user on the front surface of the main body 3.4 or the band 3.3.

[0072] The storage unit may store a variety of digital data such as video, audio, image, and application. According to the disclosure, the processor may store an image captured by performing a function, or history information regarding performed functions, in the storage unit. According to one possible exemplification, the smartwatch 3.1 may store programs used for control by the processor, or may temporarily store input/output data. The storage unit may include a variety of



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digital data storage devices such as flash memory, random access memory (RAM), and a solid state drive (SSD).

[0073] The tightness sensor unit may detect how tightly the band 3.3 of the smartwatch 3.1 is fastened. Here, the tightness sensor unit may include at least one of a pressure sensor, a proximity sensor, and an infrared sensor. In this case, the processor may adjust a threshold distance corresponding to a reference value regarding the distance of movement of the smartwatch 3.1, based on the detected tightness.

[0074] The above-described sensors included in the smartwatch 3.1 may be formed as separate elements or at least one integrated element.

[0075] Figure 4 shows a perspective view of a smartwatch 4.1 according to at least one possible exemplification of the present application.

[0076] Figure 5 shows a front view of a smartwatch 5.1 according to at least one possible exemplification of the present application.

[0077] Figure 6 is a view showing the smartwatch according to one exemplification of the disclosure. Figure 6 shows a state in which the smartwatch 3.1 is worn by the user designated by reference numeral 6.2. In other words, Figure 6 shows a worn mode.

[0078] As shown by (a), the face 6.3 of the smartwatch 6.1, disposed on the wrist of a user 6.2, is pointing toward the view of the user 6.2, such that the buckle (not shown) is pointing away from the view of the user 6.2. As shown by (b), the buckle 6.4 of the smartwatch 6.1, disposed on the wrist of a user 6.2, is pointing toward the view of the user 6.2, such that the face 6.3 (not shown) is pointing away from the view of the user 6.2. By the user 6.2 rotating his or her wrist, the user 6.2 can rotate the view of the smartwatch 6.1. The smartwatch 6.1 can be configured with sensors to determine such rotation and/or movement, which can be used to control the programming of the smartwatch 6.1 or to input into a program of the smartwatch 6.1.

[0079] Figure 7 illustrates a schematic diagram of an exemplary gesture to be detected consistent with the disclosed exemplifications. The gesture to be detected is defined as two initial movements and a stop motion to take a look for information (i.e., a lookup gesture). The two initial movements include moving up-down to take a smart wearable device in front of a user's eyes and twisting the smart wearable device to bring a display screen (e.g., a touch screen) of the smart wearable device in front of the user's eyes.

[0080] When the smart wearable device is a smartwatch, if the lookup gesture (a sequence of movements) is detected, it may indicate that a user of the smartwatch wants to see information displayed on the display screen of the smartwatch. Therefore, the display screen of the smartwatch is turned on to show the information. While the second motion (i.e., a stop motion) is being detected, the user does not intend to see the display screen if the user keeps the up-down and/or twist motion. In addition to this scenario, an angle of the display screen may be detected because the user may not watch the display screen when the display screen points to certain angles.

[0081] Figure 8 shows three axes of a smart wearable device consistent with the disclosed exemplifications. As shown in Figure 8, a three-dimensional (3D) coordinate system on a smart



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wearable device (e.g., a smartwatch) is established, where an X axis (i.e., horizontal axis) direction is from left to right horizontally; a Y axis (i.e., vertical axis) direction is from bottom to top vertically; and a Z axis direction is from back to front and perpendicular to a display screen of the smart wearable device. If the Z axis of the smart wearable device shares the direction of the display screen as shown in Figure 8, a stop motion is detected by tracking the direction of the Z axis. That is, the direction of the display screen (i.e., the center of the Z axis) is not out of range to be aligned to the user's eyes for a predefined waiting period, the stop motion is detected.

[0082] A mapping relationship between a set of pre-defined gestures and a set of power management functions needs to be established. The set of pre-defined gestures may include at least one lookup gesture. Other swipe gestures (e.g., a swipe gesture) may also be included in the set of pre-defined gestures. The set of power management functions may include at least one function for turning on the display screen of the wearable device. Other power management functions (e.g., adjusting screen brightness) may also be included in the set of power management functions. In one application scenario, a user views time and/or his/her health index (e.g., heart rate) by using a smartwatch on his/her wrist. The power for the display screen of the smartwatch may be controlled by detecting the lookup gesture which indicates that the user wants to check information on the display screen. That is, a mapping relationship between the lookup gesture and the function for turning on the display screen of the wearable device is established.

[0083] Smartwatches can be used for communication and delivery of information to a user. In an exemplification according to Figure 9, the smartwatch can initially display a welcome or greeting message or image. Such an initial screen could display several different types of general information, such as information about the smartwatch, the user, or the provider of the smartwatch. As seen in Figure 10, the smartwatch can provide a smartwatch task message to the user. The user can press a button on the display, such as a "start" or "begin" to start the task. As seen in Figure 11, a smartwatch task adjustment message can also be displayed. The user can use this feature to choose an adjustment to the task by using the plus or minus buttons for an increase or decrease. In other exemplifications, other adjustments could be made available. If the user is unsure about an adjustment, a help button could be included, which is represented by the question mark symbol. As seen in Figure 12, a smartwatch task message or image could be accessed or provided to the user, such as a question regarding the task or other function, to which the user could answer yes or no. As seen in Figure 13, the smartwatch could also include a smartwatch task timer to countdown or record the length of time of a task. As seen in Figure 14, the smartwatch could also have a communication interface to allow the user to communicate with another person, who is using another smartwatch, a mobile device, a smart phone, a tablet, a mobile phone, a computer, or a computer server portal.

[0084] Figure 15 is a schematic depiction of an exemplary electronic device 15.1 for carrying out aspects of the present disclosure, in this instance, social media communications with similar devices, as discussed in greater detail below. It will be appreciated by those skilled in the art that the electronic device 15.1 shown and described herein is illustrative, and that variations on



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electronic device 15.1 can include, without limitation, a cellular telephone, tablet or like network access device.

[0085] Referring to Figure 15, electronic device 15.1 comprises a housing 15.2 that supports a display 15.3. Display 15.3 can comprise one or more light emitters such as an array of light emitting diodes (LED), liquid crystals, plasma cells, or organic light emitting diodes (OLED) or the like. A touch-sensitive membrane 15.4 is overlaid on display 15.3 and configured to function as an input device for electronic device 15.1. As a non-limiting example, electronic device 15.1 can be configured to selectively show or hide a virtual keyboard 15.5. Other types of input devices, other than touch membrane 15.4, or in addition to touch membrane 15.4, are contemplated. For example, a physical keyboard, touch-pad, joystick or trackball or track-wheel may be employed to enable inputs to be made to electronic device 15.1. The electronic device 15.1 further comprises a microphone 15.6, speaker 15.7 and camera 15.8 (although one camera is shown in the drawings, the electronic device may comprise a plurality of cameras, including front and rear facing cameras, as known in the art).

[0086] Figure 16 is a front perspective view of a tablet computing device 16.1, which may be utilized in the present application.

[0087] Figure 17 is a front, right side, perspective view of a laptop computer 17.1, which may be utilized in the present application.

[0088] Figure 18 is a view showing pairing between the smartwatch and an external digital device according to one exemplification of the disclosure. Figure 18 shows pairing of the smartwatch 18.1 with the external digital device 18.2, such as a smart-phone. Here, the external digital device 18.2 may include a smart-phone, a laptop computer, or a Portable Multimedia Player (PMP), for example.

[0089] Pairing refers to connection for data transmission/reception between the smartwatch 18.1 and the external digital device 18.2. When performing pairing, the smartwatch 18.1 and the external digital device 18.2 may establish communication to realize bidirectional data transmission/reception. In the disclosure, pairing may be performed via Bluetooth, Near Field Communication (NFC), etc. In one example, pairing may be performed via user input using the smartwatch 18.1 or the external digital device 18.2. Here, the user input may include touch input, voice input, etc. For example, the smartwatch 18.1 may provide a separate button or user interface for communication with the external digital device 18.2. In addition, the user may realize communication between the smartwatch 18.1 and the external digital device 18.2 via user input using the button or the user interface. Once communication is established, the smartwatch 18.1 may transmit or receive data to or from the external digital device 18.2 through an open session.

[0090] In the disclosure, the smartwatch 18.1 may perform pairing with the external digital device 18.2 using the communication unit (not shown). In addition, through pairing, the smartwatch 18.1 may receive a notification indicating at least one event that is scheduled to occur after detecting the take-off signal, from the external digital device 18.2. In addition, the smartwatch 18.1 may provide the user with the notification received from the external digital device 18.2.



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[0091] Although not shown in Figure 18, when performing pairing with the external digital device 18.2, the smartwatch 18.1 may display an indicator, representing pairing success, on the display unit. In addition, when released from pairing with the external digital device 18.2, the smartwatch 18.1 may display an indicator, representing that pairing has been released, on the display unit.

[0092] Figure 19 is a view showing a second exemplification of a control method for the smartwatch according to the disclosure. Figure 19 shows whether or not to unpair between the smartwatch 18.1 and the external digital device 18.2 if the smartwatch 18.1 is switched from a worn mode to an unworn mode.

[0093] First, in a worn mode of the smartwatch 18.1, the smartwatch 18.1 may perform pairing with the external digital device 18.2. As described above with reference to Figure 18, once pairing is completed, the smartwatch 18.1 may transmit or receive data via communication with the external digital device 18.2. Next, the smartwatch 18.1 may detect a take-off signal. Next, the smartwatch 18.1 may be switched to an unworn mode in response to the detected take-off signal.

[0094] In this case, the smartwatch 18.1 may display a pairing interface 19.1 on the display unit. The pairing interface 19.1 is used to set whether or not to unpair between the smartwatch 18.1 and the external digital device 18.2. In one exemplification, when detecting an input signal with regard to the unpairing, the smartwatch 18.1 may unpair with the external digital device 18.2. Here, the smartwatch 18.1 may display an indicator (not shown) that represents the unpairing on the display unit. In another exemplification, when detecting an input signal with regard to the maintenance of pairing, the smartwatch 18.1 may remain paired with the external digital device 18.2. Here, the smartwatch 18.1 may display an indicator 19.2 representing that pairing is maintained, on the display unit. For example, referring to Figure 19, the smartwatch 18.1 may display the indicator 19.2, representing that Bluetooth communication is continued, on the display unit.

[0095] Meanwhile, upon detecting a take-off signal, the smartwatch 18.1 may unpair with the external digital device 18.2, rather than displaying the pairing interface 19.1 on the display unit, according to automatic setting. In addition, upon detecting a take-off signal, the smartwatch 18.1 may remain paired with the external digital device 18.2, rather than displaying the pairing interface 19.1 on the display unit, according to automatic setting. Here, the setting may include setting by user input, or automatic setting with regard to the smartwatch 18.1, for example. Through the exemplifications described above, the smartwatch 18.1 may set or unpair according to whether or not the smartwatch 18.1 is in use, which may reduce consumption of battery power.

[0096] Figure 20 is a diagram illustrating pairing of a smartwatch with an external digital device. Figure 20 illustrates pairing performed between the smartwatch 20.1 and an external digital device 20.2 such as a smart phone. The external digital device 20.2 may be a digital device that can perform communication with the smartwatch 20.1. For example, the external digital device 200 may include a smart phone, a notebook computer 20.3, an Internet Protocol Television (IPTV) 20.4, etc. as shown in Figure 20.

[0097] Pairing refers to connection for data transmission/reception between the smartwatch 20.1 and the external digital device 20.2. When pairing is performed, the smartwatch 20.1 and the



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external digital device 20.2 communicate with each other to enable two-way data transmission/reception. In this disclosure, the smartwatch 20.1 may be paired with the external digital device 20.2 using a communication unit (not shown). In addition, in this disclosure, pairing may be performed through Bluetooth, Near Field Communication (NFC), etc. As an example, pairing may be performed through user input using the smartwatch 20.1 or the external digital device 20.2. The user input may include touch input and voice input. For example, the smartwatch 20.1 may provide a separate button or a user interface for communication with the external digital device 20.2. The user may perform communication between the smartwatch 20.1 and the external digital device 20.2 through user input using the button or the user interface.

[0098] If communication access is achieved, the smartwatch 20.1 may exchange data with the external digital device 20.2 in a session open state. Meanwhile, the smartwatch 20.1 may perform pairing with a plurality of external digital devices 20.2, 20.3, and 20.4. In this case, the smartwatch 20.1 may achieve communication access through pairing and thus may selectively exchanges data with the plural external digital devices 20.2, 20.3, and 20.4.

[0099] The smartwatch 20.1 may detect the paired external digital device 20.2 to determine a notification device that will provide a notification of an event occurring in the smartwatch 20.1 or the external digital device 20.2. The notification device may be a device that provides a notification of an event occurring in at least one of the smartwatch 20.1 and the external digital device 20.2. In this disclosure, the notification device may include at least one of the smartwatch 20.1 and the external digital device 20.2.

[0100] The event occurring in at least one of the smartwatch 20.1 and the external digital device 20.2 may be a state change occurred from at least one of the smartwatch 20.1 and the external digital device 20.2. For example, the event may include an incoming telephone call, text message reception, new message reception of a Social Networking Service (SNS), scheduled alarm, weather alert, etc. The notification of the occurred event may include notifying the user of the above-described event. For example, the notification may be occurred in the form of a text message notification, a speech notification, a vibration notification, etc. The notification device may be determined according to whether the user is wearing the smartwatch 20.1, whether the smartwatch 20.1 is paired with the external digital device 20.2, or the distance between the smartwatch 20.1 and the external digital device 20.2.

[0101] On the other hand, in determining a notification device including at least one of the smartwatch 20.1 and the external digital device 20.2 in this disclosure, the external digital device 20.2 may be set to a main device and the smartwatch 20.1 may be set to a sub device. In this case, the external digital device 20.2 has priority over the smartwatch 20.1 as the notification device under the same condition so that the external digital device 20.2 may provide the notification to the user. Conversely to the above case, the smartwatch 20.1 may be set to the main device and the external digital device 20.2 may be set to the sub device. Notably, in description of this disclosure, the external digital device 20.2 is assumed to be the main device.



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[0102] In consideration of the above description, the disclosure is directed to a method for determining which device will provide a notification of an event occurring in at least one of the smartwatch 20.1 and the external digital device 20.2, in the smartwatch 20.1 paired with the external digital device 20.2. The disclosure is directed to a method for the smartwatch 20.1 to determine a notification device based on wearing/non-wearing of the smartwatch and the distance between the smartwatch 20.1 and the external digital device 20.2.

[0103] In one exemplification, the smartwatch 20.1 may determine the notification device that provides a notification for at least one of the smartwatch 20.1 and the external digital device 20.2, based on a smartwatch worn mode or unworn mode. For example, in the smartwatch worn mode, the smartwatch 20.1 may determine the smartwatch 20.1 as the notification device. In this case, the smartwatch 20.1 may provide a notification of an event occurring in at least one of the smartwatch 20.1 and the external digital device 20.2. For instance, in the smartwatch unworn mode, the smartwatch 20.1 may determine the external digital device 20.2 as the notification device. At this time, the smartwatch 20.1 may transmit a notification start signal to the external digital device 20.2 so that the external digital device may provide a notification of an event occurring in at least one of the smartwatch 20.1 and the external digital device 20.2.

[0104] In another exemplification, the smartwatch 20.1 may determine the notification device that provides the notification for at least one of the smartwatch 20.1 and the external digital device 20.2, according to whether there is the external digital device 20.2 paired with the smartwatch 20.1. For example, the smartwatch 20.1 may determine the smartwatch 20.1 as the notification device when the external digital device 20.1 is not paired therewith. Further, for example, the smartwatch 20.1 may determine at least one of the smartwatch 20.1 and the external digital device 20.2 as the notification device, when the external digital device 20.2 is paired therewith.

[0105] As still another example, the smartwatch 20.1 may determine the notification device that provides a notification as at least one of the smartwatch 20.1 and the external digital device 20.2, based on a distance between the smartwatch 20.1 and the external digital device 20.2 paired with the smartwatch 20.1. For example, if the smartwatch 20.1 and the external digital device 20.2 are within a preset distance, the external digital device 20.2 may be determined as the notification device. In addition, if the smartwatch 20.1 and the external digital device 20.2 are separated by more than a preset distance, the smartwatch 20.1 and the external digital device may be determined as the notification device.

[0106] Furthermore, the smartwatch 20.1 may determine the notification device based on the mode of the smartwatch 20.1 and the distance between the smartwatch 20.1 and the external digital device 20.2.

[0107] Figures 21, 22, and 23 illustrate a transaction sequence to facilitate client-based triangulation using a dynamic geodetic triangulation mechanism according to one exemplification of the present application. Referring to Figure 21, a Wi-Fi-enabled client computing device 21.1 seeks to locate itself (e.g., a roaming computing device (e.g., a smartphone belonging to a user) to find its own geographic location and/or a destination,) by recognizing and/or connecting with any available



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locations that are of highest confidences, such as any number of available Wi-Fi access points 21.3, 21.5, 21.7 of highest confidence within a defined area or range of the computing device 21.1. For example and as illustrated, each circle 21.4, 21.6 and 21.8 represents a wireless range of its corresponding Wi-Fi access point 21.3, 21.5 and 21.7, respectively. Similarly, circle 21.2 represents the range or access of the client device 21.1 which is shown as overlapping (or in contact) with other circles 21.4, 21.6, 21.8.

[0108] Let us now suppose the client device 21.1 belongs to an individual user seeking to find a specific location. In one exemplification, as soon as the client device 21.1 approaches the location's area, it is first put in contact with one or more of those AP locations 21.3, 21.5, 21.7 (as represented by their corresponding circles 21.4, 21.6, 21.8) that carry the highest weight, such as Wi-Fi APs 21.3, 21.5, 21.7 at places around the specific location. In other words, AP locations 21.3, 21.5, 21.7 having the highest confidence take high priority and thus are used first as the highest weight in this client-side triangulation (over other low confidence locations, such as other roaming client devices, etc., as will be further described with reference to Figure 22). In one exemplification, one of the high-weight or static AP 21.3, 21.5, 21.7 may include a beacon from a client device similar to the client device 21.1 belong to a user being stationary at the same location for a defined period of time as predefined by the triangulation mechanism and/or any of the participants, such as by the user of the computing device 21.1 who then feeds the time period information into a triangulation mechanism via the computing device 21.1.

[0109] Referring now to Figure 22, once the high-weight APs 21.3, 21.5, 21.7 have been identified and put in touch with the client device 21.1, low-weight locations 21.9, 21.11 and 21.13 (e.g., roaming client computing devices) are then identified and put in contact with the client device 21.1 as represented by their corresponding area or signal or access circles 21.10, 21.12 and 21.14, respectively, that are shown as overlapping with other circles 21.4, 21.6, 21.8. For example and in one exemplification, these low-weight locations 21.9, 21.11, 21.13 include Wi-Fi-enabled roaming client computing devices that belong to other users who are within the predefined area around the computing device 21.1, such as near or at a specific location. For example, the users of these Wi-Fi-enabled computing devices 21.9, 21.11, 21.13 may include other patients in the facility as the user of the client device 21.1, which helps with and results in a better knowledge of the geographic positioning of the client device 21.1. In other words, first, the high-weight, low-confidence locations associated with static APs 21.3, 21.5, 21.7 are put in proximity and connection with the client device 21.1, which is then followed by putting the low(er)-weigh, low(er)-confidence computing devices 21.9, 21.11, 21.13 (that beacon out their locations) in proximity with the client device 21.1 to improve the accuracy and confidence of the client device's 21.1 geographic location.

[0110] In one exemplification, these low-weight locations of Wi-Fi enabled roaming computing devices 21.9, 21.11, 21.13 and may be determined based on the low confidence beacons (such as locations or location-related updates (e.g., one or more users of the client devices 21.9, 21.11, 21.13 updating their locations) that are received from these client devices 21.9, 21.11, 21.13. This client-side triangulation technique helps the client device 21.1 (and thus the user of the client device



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21.1) determine its exact location in relation to in a specific location without having the user to access the Internet on the client device 21.1, which may not be possible due to bad reception, such as the client device 21.1 being indoors and/or not having a clear view of the sky (and thus, the satellites).

[0111] In one exemplification, the location SSID module of the triangulation mechanism communicates the access location information between the client device 21.1 and the APs 21.3, 21.5, 21.7 and other roaming client devices 21.9, 21.11, 21.13 without having the client device 21.1 (and other participating client devices 21.9, 21.11, 21.13) connect with a Wi-Fi infrastructure. It is the static indicator that differentiates between the high-weight static configured locations 21.3, 21.5, 21.7 and the low-weight roaming locations 21.9, 21.11, 21.13. Similarly, the signal strength predictor facilitates the client device 21.1, the static APs 21.3, 21.5, 21.7, and the roaming client devices 21.9, 21.11, 21.13 to predict their signal strength, while the confidence indicator facilitates the client device 21.1, the static APs 21.3, 21.5, 21.7, and the roaming devices 21.9, 21.11, 21.13 to broadcast or advertise their confidence level relating to their own location which is then received by the computing devices 21.1, 21.9, 21.11, 21.13 (and the static configured APs 21.3, 21.5, 21.7) and used to assign (e.g., adjust or re-adjust) weight to each confidence level (e.g., high weight, low weight, medium weight, etc.). These weighted confidence levels are used to add confidence to each AP or client device's current learned location (e.g., the client device's 21.1 current location with respect to its desired destination of a location).

[0112] Figure 23 illustrates the client device 21.1 beacons out its position to others, such as to the high-weight APs 21.3, 21.5, 21.7, low-weight client devices 21.9, 21.11, 21.13, etc., so that each participating AP 21.3, 21.5, 21.7 and client device 21.9, 21.11, 21.13 can calibrate its own location using the information being beaconed out by the client device's 21.1. This beaconing out by the client device 21.1 and the collective confidence in learned positions of the participating APs 21.3, 21.5, 21.7 and client devices 21.9, 21.11, 21.13 is represented by the illustrated circle 21.15. Stated differently, once the client device 21.1 has determined its location (as aforementioned with reference to Figures 21 and 22), it then broadcasts its own location to APs 21.3, 21.5, 21.7 and client devices 21.9, 21.11, 21.13 so they may benefit from this information and gain confidence in their own positions, particularly the client devices 21.9, 21.11, 21.13 that are on the move.

[0113] Figure 24 is a schematic plan view representation of an object tracking system 24.1. The object tracking system 24.1 is installed in a factory facility 24.2. The object tracking system 24.1 utilizes tags 24.3 (represented in the drawing by octagonal symbols that also serve to represent objects, not separately shown, to which the tags are affixed to permit tracking of the objects).

[0114] The object tracking system 24.1 utilizes two different procedures--proximity detection and triangulation--to track the tags 24.3. Interrogation gates 24.4 are used for proximity detection, and triangulation stations 24.5 allow tag locations to be determined by triangulation. Another significant element of the system 24.1, but not shown in the drawing, is a central computer that is coupled by signal paths (also not shown) to the interrogation gates 24.4 and triangulation stations 24.5.



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[0115] In accordance with conventional practices, a tag 24.3 that is in proximity to an interrogation gate 24.4 receives an interrogation signal from the interrogation gate and responds to the interrogation signal by transmitting a response signal that includes a tag identification code that uniquely identifies the tag. The interrogation gate then effectively reports to the central computer that the particular tag is at the interrogation gate. The interaction between the tag and the interrogation gate may be in accordance with conventional RFID (radio frequency identification) practices. In other variations, the interrogation gate may read a barcode or the like from the tag.

[0116] The tags 24.3 send out signals at brief regular intervals which are received by triangulation station 24.4. By using the triangulation stations 24.4, the central computer utilizes a triangulation procedure to determine the location of tags that are not in proximity to one of the interrogation gates 24.3. The central computer may use a differential time of arrival (DTOA) procedure in which a tag ID signal transmitted by a tag 24.3 is received by three or more of the triangulation stations 24.4. Differences in the timing at which the tag ID signal is received at each triangulation station are used by the central computer to calculate the location of the tag, based on the locations of the stations 108 which received the tag ID signal. For example, in Figure 24, a tag ID signal transmitted by tag 24.3a is received by line-of-sight at triangulation stations 24.51, 24.5b, 24.5c, thereby allowing the location of tag 24.3a to be determined by triangulation. Similarly, a tag ID signal transmitted by tag 24.3b is received by triangulation stations 24.5d, 24.5e, 24.5f so that the location of tag 24.3b can be determined by triangulation.

[0117] The "MOBY R" object locating system available from Siemens A G is an example of a system that employs DTOA to locate objects.

[0118] Figure 25 is a schematic plan view representation of an object tracking system 25.1 in accordance with some aspects of the present application.

[0119] The object tracking system 25.1 is installed, at least in part, in a factory building 25.2. The system 25.1 includes tags 25.3, represented in the drawing by small triangles. (The triangles may also be considered to represent objects to which the respective tags are affixed to permit tracking of the objects. The objects are not separately shown.) In some exemplifications, the factory building 25.2 is employed for assembly of motor vehicles, and each tag 25.3 is affixed to a respective vehicle that is being assembled or has been assembled at the factory building 25.2. Although only a few tags 25.3 are indicated for purposes of illustration in Figure 25, in practice the number of tags included in the system 25.1 may be in the thousands. The tags may have features provided in accordance with some aspects of the present applications, and are described in more detail below.

[0120] The object tracking system 25.1 also includes interrogation gates 24.4 and triangulation stations 24.5, which may be essentially the same as, or generally similar to, the items of the same names discussed above in connection with Figure 24. It will be noted that the number of triangulation stations shown in Figure 25 is substantially less than the number shown in Figure 24, notwithstanding that the building 25.2 has substantially the same types of obstructions 25.4 as the building of Figure 24.

[0121] Also included in the object tracking system in accordance with some aspects of the invention are antennas 25.5, which are provided to receive from the tags 25.3 tag self-tracking position information, as described in more detail below. Although not separately shown, each antenna may have associated therewith appropriate receive circuitry as well as a capability for buffering data and relaying the data to a central (server) computer, which is discussed below. Thus each antenna symbol 25.5 may be considered to represent a receiver for receiving tag self-tracking position information transmitted by tags 25.3.

[0122] Figure 26 illustrates, in the form of a schematic plan view, an alternative exemplification of the object tracking system 25.1, including the factory building 25.2 shown in Figure 25, together with an associated parking, storage and/or testing lot 26.1. It will be observed that the lot 26.1 has tags 25.3 of the object tracking system present therein, and that antennas 25.5 of the object tracking system are installed in the lot 26.1. Although not shown in detail, it may be assumed that the factory building 25.2 is equipped with system components as illustrated in Figure 25.

[0123] According to one possible exemplification, the smartwatch can include a wireless or radio-frequency identification (RFID) tag to permit tracking the position and status of the smartwatch. A wireless tag to be associated with the object to be linked, tracked, or both is disclosed along with an electronic device for communicating with the tag and updating the information to an external device, such as a computer, network, or the cloud. Information such as, but not limited to time, position (including latitude, longitude, and altitude), speed, direction, temperature, and identification can be transmitted for either real-time linking/tracking and analysis, or a historical view. In one embodiment, the electronic device for communicating with the tag is a cellular phone, a tablet computer, a laptop computer, a pair of electronic glasses, or a watch.

[0124] According to another exemplification, a wireless tag for determining the position of an attached physical object or status of an environment in which the tag is placed is disclosed. In one embodiment, the wireless tag includes a power source for providing electrical power to the wireless tag, a radio transmitter and receiver system for wirelessly exchanging data and command with an electronic device, and a user interface including at least one input and at least one output, wherein the electronic device determines the location or status of the electronic device and a status of whether the distance between the electronic device and wireless tag exceeds a predetermined distance and wirelessly communicates data including the time, the location of the electronic device (including latitude, longitude, and altitude), speed and the status. In another embodiment, the electronic device communicates data to the network at predetermined period intervals and/or upon the initiation of a predetermined event. In still another embodiment, the wireless tag has a thickness of about 10 mm or less, and in another embodiment about 6 mm or less. In yet another embodiment, the communication between the tag and electronic device is encrypted. In yet still another embodiment the wireless tag includes one or more sensors having an output reading. In another embodiment, a plurality of tags is provided.

[0125] According to another exemplification, a system for tracking the position of an object is disclosed. In one embodiment, the system includes a wireless tag including a first radio transmitter

and receiver system and a user interface including at least one input and at least one output; an electronic device includes a second radio transmitter and receiver system in communication with the first radio transmitter and receiver system, a user interface including at least one output, a module for determining the position of the electronic device, a module for determining the distance or proximity and/or direction of the tag from the device and also for determining a status of whether the distance between the electronic device and wireless tag exceeds a predetermined distance, and a data transmitter for transmitting commands and data including the position of the electronic device and status of the distance between the electronic device and wireless tag; and an external device receiving the data transmitted by the data transmitter and storing the data in a computer readable storage medium. In another embodiment, the system includes a second wireless tag secured to a second object to be linked or tracked, the second wireless tag including a third radio transmitter and receiver system; and a user interface including at least one input and one output; wherein the second radio transmitter and receiver system is in communication with the third radio transmitter and receiver system, the electronic device includes a module for determining the distance or proximity and/or direction of the tag from the phone and also for determining a second status of whether the distance between the electronic device and second wireless tag exceeds a second predetermined distance, and the data transmitter for transmits data including the second status.

[0126] According to another exemplification, a method for monitoring the location of an object is disclosed. In one embodiment, the method includes securing a wireless tag to the object, wherein the wireless tag includes a first radio transmitter and receiver system for transmitting and receiving a radio frequency signal; providing a first identification for the wireless tag; associating the wireless tag with an electronic device, wherein the electronic device includes a second radio transmitter and receiver system for transmitting and receiving a radio frequency signal and the electronic device is capable of determining the position of the electronic device; determining the position of the electronic device; providing a second identification for the electronic device; receiving with the second radio transmitter and receiver system the radio frequency signal from first radio transmitter and receiver system; determining with the electronic device the distance or proximity and/or direction of the tag from the phone and also a status of whether the distance between the wireless tag and the electronic device exceeds a predetermined distance based at least in part on the strength or absence of the radio frequency signal; and transmitting data including the first identification, the second identification, the time, the speed, the position of the electronic device, and the status to an external device. In another embodiment, the radio transmitter and receiver systems are Bluetooth transceivers and the tag has a thickness of about 10 mm or less or about 6 mm or less. In still another embodiment, the wireless tag includes an alarm and the second Bluetooth transceiver sends a signal to the first Bluetooth transceiver to activate the alarm or carry out any other predetermined action or command when the status changes because the predetermined distance was exceeded. Alarming or carrying out other actions or commands, could also be initiated by the user, by demand, from any part of the overall system (tag, phone, cloud).

[0127] According to another exemplification, a method of monitoring a patient in a health care facility is disclosed. In one embodiment, the method includes attaching a wireless tag to the patient, the wireless tag including a first radio transceiver for transmitting and receiving a radio frequency signal and a tag alarm; associating the wireless tag with an electronic device, the electronic device including a second radio transceiver for transmitting and receiving a radio frequency signal and a device alarm, wherein the electronic device is capable of determining the position of the electronic device; providing an allowable distance or range; monitoring the radio frequency signal from the first radio transceiver received by the second radio transceiver and activating the device alarm if the radio frequency signal is broken; monitoring the radio frequency signal from the second radio transceiver received by the first radio transceiver and activating the tag alarm if the radio frequency signal is broken; and determining with the electronic device a status of whether the distance between the wireless tag and the electronic device exceeds the allowable distance or range based at least in part on the strength or absence of the radio frequency signal; wherein the electronic device activates at least one of the tag alarm and device alarm, determines the position of the electronic device and wirelessly transmits data including the time, the temperature, and the position of the electronic device to an external device if the distance exceeds the allowable distance or range. In another embodiment, the method includes saving locally (on the device) and wirelessly transmitting data to the external device including the time and position and speed of the electronic device each time the determining step is performed.

[0128] According to another exemplification, a method of providing a positioning service to a customer is disclosed. In one embodiment, the method includes providing a plurality of wireless tags to the customer for small or no charge, each tag having a unique identification and including a power source for providing electrical power to the wireless tag, a radio transceiver for wirelessly exchanging encrypted data with an electronic device, and a user interface including at least one input and at least one output wherein the electronic device determines the position of the electronic device and a status of whether the distance between the electronic device and wireless tag exceeds one or more predetermined distances and wirelessly communicates data including the position, with time and speed of the electronic device and the status; providing a computer-readable medium containing an application programming interface and/or software development kit to the customer and/or a developer, the application programming interface and/or software development kit being configured to support a software application on the tag and/or the electronic device and/or the cloud, wherein the electronic device includes a radio transceiver capable of communicating with the wireless tag radio transceiver, a user interface including at least one input and one output, a module for determining the position, the speed and time of the electronic device, a module for determining a status of whether the distance between the electronic device and wireless tag exceeds one or more predetermined distance, and a data transmitter for transmitting data including the position, with time and speed of the electronic device and status of the distance between the electronic device and wireless tag to an external device for storage in a computer readable storage medium and carrying out commands/actions; and associating the plurality of tags with the application programming



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interface and/or software development kit for a periodic fee or a consumption-based fee, such as based on how many tags being linked, how many times data or commands are communicated or how much data or commands are communicated in a given period. In another embodiment, the method includes developing programs utilizing the application programming interface and/or software development kit and allowing access to the programs for a free or for a fee.

[0129] According to another exemplification shown in Figure 27, an electronic device 27.4, such as a cellular phone or smartwatch, is provided. Electronic device includes a module determining the current or last known position of electronic device 27.4. In some embodiments, the current or last position includes one or more of the current or last known altitude, the current or last known latitude and longitude, and the current or last known speed of electronic device 27.4.

[0130] Also shown in the exemplary, non-limiting example illustrated in Figure 27, an object 27.2, such as a wallet is attached to a wireless tag 27.1. Wireless tag 27.1 includes a radio transceiver in communication with a radio transceiver included in electronic device 27.4. Electronic device 27.4 monitors the strength of the radio signal received from wireless tag 27.1 to determine the distance between electronic device 27.4 and wireless tag 27.1. When the object 27.2 and tag 27.1 are within a first distance 182 from electronic device 27.4, such as at point 27.6, electronic device 27.4 determines the status of wireless tag 27.1 to be "in range." When the object 27.2 and tag 27.1 are beyond the distance from electronic device 27.4, such as at point 27.7, electronic device 27.4 determines the status of wireless tag 27.1 to be "out of range." When the status of wireless tag 27.1 change from "in range" to "out of range," either electronic device 27.4, wireless tag 27.1, or both alarm.

[0131] Also as shown in the exemplary non-limiting example illustrated in Figure 27, electronic device periodically sends information relating to its current or last known location and the status of wireless tag 27.1 to an external device 27.5, such as an external network or cloud data service. When the status of wireless tag 27.1 change from "in range" to "out of range," electronic device 27.4 sends information relating to its current or last known location and the change of status to the external device 27.5. In this way, a user is given both an alarm when the change in status occurs, as well as a last known location for object 27.2 based on the strength of the radio signal from tag 27.1 received by wireless device 27.4.

[0132] In one embodiment shown in Figure 30, electronic device 27.4 is a cellular phone. In another embodiment, electronic device 27.4 is a tablet or laptop computer or portable computing device. In still another embodiment, electronic device 27.4 is an electronic watch or wristband. In yet still another embodiment, electronic device 27.4 is a portable music player. Other suitable electronic devices, including but not limited to a pair of electronic glasses or sunglasses, may also be used.

[0133] In one embodiment, electronic device 27.4 includes absolute position data receiver 30.1 and absolute position module 30.2. Absolute position data receiver 30.1 receives location-based data from external sources. In one exemplary embodiment, absolute position data receiver 30.1 receives data from a combination of cellular towers, wireless networks including Wi-Fi networks, and global positioning systems (GPS). Absolute position module 30.2 determines the location of electronic

device 27.4 from the location based data received by absolute position data receiver 30.1. In another embodiment, absolute position module 30.2 determines the speed of electronic device 27.4 from the location based data received by absolute position data receiver 30.1. In one exemplary embodiment, absolute position data receiver 30.1 and absolute position module 30.2 are provided as part of the operating software of electronic device 27.4. In another exemplary embodiment, absolute position data receiver 30.1 and/or absolute position module 30.2 are included on a card, hardware, device or software program in communication with the operating software of electronic device 27.4.

[0134] In another exemplary embodiment, absolute position module 30.2 determines the latitude and longitude of electronic device 27.4. In still another exemplary embodiment, absolute position module 30.2 determines the altitude of electronic device 27.4. In yet still another exemplary embodiment, absolute position module 30.2 determines the speed of electronic device 27.4.

[0135] In the exemplary embodiment illustrated in Figure 30, electronic device 27.4 includes radio transceiver 30.7. Radio transceiver 30.7 sends and receives data to and from other radio transceivers, including radio transceiver 28.11 incorporated in wireless tag 27.1. In one embodiment, radio transceiver 30.7 may comprise a single transceiver. In another embodiment, radio transceiver 30.7 comprises a separate transmitter and receiver. The electronic device 27.4 can also include an alarm/speaker 30.3 for sound.

[0136] In one embodiment, radio transceiver 30.7 is a Bluetooth.RTM transceiver that operates on Bluetooth protocols. As used herein, Bluetooth includes Bluetooth, ULP Bluetooth (Ultra Low Power Bluetooth), BLE (Bluetooth Low Energy), and other standards sets by Bluetooth SIG, Inc. In another embodiment, radio transceiver operates on RF protocols. In still another embodiment, radio transceiver 30.7 operates on NFC protocols. Other suitable radio transceivers may also be used. In one embodiment, at least some of the data exchanged is encrypted.

[0137] Bluetooth connections are relatively power efficient, have relatively little interference issues, are supported by a variety of phone manufacturers and models, and allow bidirectional communication over relatively long ranges. RFID and NFC connections may require less expensive components and may use less power from power supply 28.13 of wireless tag 27.1 (see Figure 28).

[0138] In the exemplary embodiment illustrated in Figure 30, electronic device 27.4 includes distance monitor 30.8. In one embodiment, distance monitor 30.8 monitors communication between radio transceiver 30.7 and wireless tag 27.1. In this embodiment, distance monitor 30.8 may determine the status of the connection between electronic device 27.4 and wireless tag 27.1 to determine if the connection is dropped, broken, lost, or otherwise not present. In another embodiment, distance monitor 30.8 determines a distance between electronic device 27.4 and wireless tag 27.1 based at least in part on the strength of the signal received from wireless tag 27.1. In still another embodiment, controller 30.9 may compare the distance determined by distance monitor 30.8 with a selected distance to alert the user if the determined distance exceeds the selected or predetermined distance. In yet still another embodiment, controller 30.9 may compare the signal strength with desired signal strength from a user to alert the user if the signal strength is



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weaker than the desired signal strength. In another embodiment, controller 30.9 may compare the distance determined by distance monitor 30.8 with a predetermined distance or predetermined signal strength, such as but not limited to a received signal strength indicator, corresponding to a user input, such as but not limited to "Close," "Mid," or "Far." In still another embodiment, controller 30.9 may compare the signal strength with desired signal strength from a user and alert the user if the signal strength is stronger than the desired signal strength.

[0139] In the exemplary embodiment illustrated in Figure 30, electronic device 27.4 includes data transmitter 30.4 and data receiver 30.5. Data transmitter 30.4 sends data to external device 27.5, and data receiver 30.5 receives data from external device 27.5. In one exemplary embodiment, radio transceiver 30.7 also functions as data transmitter 30.4 and/or data receiver 30.5. In another exemplary embodiment, data transmitter 30.4 and data receiver 30.5 are separate from radio transceiver 30.7. In one embodiment, data transmitter 30.4 and data receiver 30.5 exchange data with external device 27.5 using Wi-Fi standards, such as the IEEE802.11 family of standards or WiMAX standards, such as IEEE802.16. In another embodiment, data is exchanged using a wide area network standard, including but not limited to, LTE, HPSA, UMTS, GPRS, EDGE, iBurst, EV-DO. In still another embodiment, data is exchanged using a personal area network standard, including, but not limited to Bluetooth, ZigBee, ANT, and Wireless USB. Other suitable mobile data standards may also be used. In another embodiment, wireless tag 27.1 saves data locally and later communicates data to wireless device 27.4 or external network 27.5 over a wired connection. Exemplary wired connections include a USB connection, although other suitable connections may also be used.

[0140] In one embodiment, at least one of the following communications channels is encrypted: between radio transceiver 28.11 and controller 28.6, between wireless tag 27.1 and electronic device 27.4, between radio transceiver 30.7 and controller 30.9, between electronic device 27.4 and external device 27.5, within components of external device 27.5, between external device 27.5 and an external user interface.

[0141] In one exemplary embodiment, data from data transmitter 30.4 and data receiver 30.5 is exchanged with data on external device 27.5. External device 27.5 may comprise a single device or a plurality of devices in communication with each other. In one embodiment, external device 27.5 is a machine capable of storing data, including, but not limited to a computer, a laptop computer, a tablet computer, a mobile electronic device, or a server. In another embodiment, external device 27.5 is a network capable of storing data, including but not limited to a local area network, a public switched network, a CAN network, and any type of wired or wireless network. In still another embodiment, external device 27.5 is a network or cloud data service. As used herein, a cloud service refers to remotely hosted data, remotely hosted servers, or both over the internet, web or a network which is accessible from multiple locations and devices or machines. As used herein, the term includes at least Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Hardware-as-a-Service, and Software-as-a-Service (SaaS) service, and other remote data computation, application, management, or storage resources. As used herein, network, refers to a local area



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network, a private network, a public switched network such as but not limited to the Internet, a CAN network, and any type of wired or wireless network.

[0142] Referring next to Figure 28, an exemplary wireless tag 27.1 is illustrated. In one embodiment, wireless tag 27.1 includes user interface 28.10 comprising one or more I/O modules which provide an interface between an operator and wireless tag 27.1. An operator may include a human operator or a computer, machine, or software application interfacing with wireless tag 27.1, electronic device 27.4, or external device 27.5. Exemplary I/O modules include input members and output members. Exemplary input members include buttons, such as button 28.4, switches, keys, a touch display, a keyboard, a sensor, a mouse, and other suitable devices for providing information to controller 28.6. Exemplary output devices include lights, a display (such as a touch screen), printer, speaker, visual devices, and audio devices including alarm 28.5, tactile devices, and other suitable devices for presenting information to an operator.

[0143] In the exemplary embodiment illustrated in Figure 28, wireless tag 27.1 includes a plurality of hardware and software, including a controller 28.6. Controller 28.6 includes logic which may control operation of wireless tag 27.1. The logic of controller 28.6 may be implemented in hardware or in hardware executing software. Exemplary software may be stored in a memory 28.7. Memory 28.7 includes instructions executed by controller 28.6, as described for controller 30.9 above. Controller 28.6 may include one or more processors or other structures to implement the logic of controller 28.6.

[0144] In the exemplary embodiment illustrated in Figure 28, wireless tag 27.1 includes radio transceiver 28.11. Radio transceiver 28.11 sends and receives data from other radio transceivers, including radio transceiver 30.7 incorporated in electronic device 27.4. In one embodiment, radio transceiver 28.11 may comprise a single transceiver. In another embodiment, radio transceiver 28.11 comprises a separate transmitter and receiver.

[0145] In one embodiment, radio transceiver 28.11 is a Bluetooth transceiver that operates on Bluetooth protocols. In another embodiment, radio transceiver 28.11 operates on RF protocols. In still another embodiment, radio transceiver 28.11 operates on NFC protocols. Other suitable radio transceivers may also be used. In one embodiment, at least some of the data exchanged is encrypted.

[0146] In the exemplary embodiment illustrated in Figure 28 wireless tag 27.1 includes distance monitor 28.12. In one embodiment, distance monitor 28.12 monitors communication between radio transceiver 28.11 and electronic device 27.4. In another embodiment, distance monitor 28.12 may determine the status of the connection between electronic device 27.4 and wireless tag 27.1 to determine if the connection is dropped, broken, lost, or otherwise not present. In still another embodiment, distance monitor 28.12 may determine the distance or range between wireless tag 27.1 and electronic device 27.4.

[0147] In the exemplary embodiment illustrated in Figure 28, wireless tag 27.1 includes data transmitter 28.8 and data receiver 28.9. Data transmitter 28.8 and data receiver 28.9 function similarly to data transmitter 30.4 and data receiver 30.5 of electronic device 27.4. Data transmitter



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28.8 sends data to external device 27.5, and data receiver 28.9 receives data from external device 27.5. In one exemplary embodiment, radio transceiver 28.11 also functions as data transmitter 28.8 and/or data receiver 28.9. In another exemplary embodiment, data transmitter 28.8 and data receiver 28.9 are separate from radio transceiver 28.11. In one embodiment, data transmitter 28.8 and data receiver 28.9 exchange data with external device 27.5 as described above. Other suitable mobile data standards may also be used. In one embodiment, at least some of the data exchanged is encrypted. In still another exemplary embodiment, wireless tag 27.1 does not include data transmitter 28.8 and/or data receiver 28.9.

[0148] In another embodiment, wireless tag includes power supply 28.13. Exemplary power supplies 28.13 include rechargeable batteries, including but not limited to nickel-cadmium and lithium ion batteries, and non-rechargeable batteries. Other suitable power supplies 28.13 may also be used.

[0149] In still another embodiment, wireless tag 27.1 includes one or more sensors 28.3. Exemplary sensors 28.3 include, but are not limited to, temperature sensors, altimeters, barometers, pressure sensors, humidity sensors, chronometers, pedometers, accelerometers, level sensors, impact sensors, and compasses. Other suitable sensors may be used depending on the desired application.

[0150] In yet still another embodiment, wireless tag 27.1 may include a GPS or other suitable location detection technologies (not shown). In this embodiment, wireless tag 27.1 may communicate its position over at least one of data transmitter 28.8 and radio transceiver 28.11. Using the communicated position information, a direction to wireless tag 27.1 may be displayed or communicated on user interface 30.6 or a user interface associated with external device 27.5. In one embodiment, the direction may be saved locally in memory 28.7 associated with the electronic device 27.4. In another embodiment, the direction may be communicated to the external device 27.5 and saved in memory 30.10 associated with the electronic device 27.4. In still another embodiment, the position may be saved locally in memory 30.10 associated with the wireless tag data and later communicated to wireless device 27.4 or external network 27.5 over a wired or wireless connection, such as network 30.11.

[0151] In yet another exemplary embodiment, wireless tag 27.1 includes securing element 28.2 to secure wireless tag to object 27.2. In one embodiment, object 27.2 is a person or animal. In another embodiment, object 27.2 is an inanimate physical object. In one embodiment, securing element 28.2 includes a mechanical or chemical fastener to secure wireless tag 27.1 to object 27.2. Other securing elements 72 may also be used. In another embodiment, wireless tag 27.1 is not secured to object 27.2, but is positioned near, in, or on object 27.2, or in an environment. Other positions of wireless tag 27.1 in relation to object 27.2 may also be used.

[0152] Referring next to Figure 29, an exemplary wireless tag 27.1 is illustrated. The exemplary wireless tag 27.1 includes a button 28.4, plurality of lights 29.4, and speaker 29.1 for alarm 28.5 as part of user interface 28.10. In other embodiments, other suitable inputs and outputs may be used. The exemplary wireless tag 27.1 also includes power socket 29.2 for recharging power supply

28.13. The exemplary wireless tag 27.1 also includes an area for displaying identifying information 29.3. In other embodiments, no information is displayed on wireless tag 27.1.

[0153] According to one possible exemplification, the facial recognition system can use multilayered discriminant analysis that includes systems and methods applying an initial linear discriminate analysis to a database of face images in a more-or less conventional manner. Initial fuzzy logic then is applied to the results of the initial linear discriminate analysis to produce a subset of the database of face images. Thereafter, a subsequent linear discriminate analysis is applied to the subset of the database of face images and subsequent fuzzy logic is applied to the results of the subsequent linear discriminate analysis to produce a further subset of the subset of the database of face images. The application of the subsequent linear discriminate analysis and application of the subsequent fuzzy logic may be repeated until the further subset contains only one, or zero, face images.

[0154] Face recognition is a branch of pattern recognition, in which human visual perception in terms of face recognition is imitated in a computer. Face recognition has become one of the most important research areas of pattern recognition. In the last few decades, biometrics recognition has been an intensive field of research and consequently, a number of face recognition algorithms have been proposed by computer scientists, neuroscientists, and psychologists. Computer scientists attempt to develop methods for face recognition, whereas psychologists and neuroscientists typically work on the biological process of human face recognition.

[0155] Facial recognition is a popular biometric used for investigative, security, and anti-terrorism purposes due to its ease of end-user use and potential ability to identify an individual from distance. Unsupervised statistical methods such as Principal Component Analysis (PCA), Linear Discriminate Analysis (LDA), Direct Linear Discriminate analysis (DLDA), Independent Component Analysis (ICA), Kernel Principal Component Analysis (KPCA), and Support Vector Machines (SVM) are the most popular face recognition algorithms. These algorithms find a set of base images and represent faces as linear combinations of those base images. However, accurate facial recognition involves several challenges. For example, different types of variabilities of facial images in different environments make facial recognition more difficult and existing facial recognition algorithms less accurate. Such variabilities, which make the face recognition more complex, include face illumination, face pose, expression, eyeglasses, makeup, etc. These variabilities have a great influence when dealing with large databases of face images using existing algorithms. As a result, two issues arise in existing face recognition algorithms, feature representation and classification based on features.

[0156] Conventional face recognition methods can be classified into two groups, face and constituent. Face-based method (appearance-based technique) uses raw information from face images, i.e., pixels. These methods include PCA-, LDA-, KPCA-, and SVM-based methods, whereas constituent-based approaches use the relationships between face features, i.e., nose, lips, and eyes. Among appearance-based representation, PCA- and LDA-based methods are the two most powerful methods for dimensionality reduction and are successfully applied in many complex



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classification problems such as speech recognition face recognition, etc. In general, LDA-based methods perform better than PCA-based methods; but on the other hand, LDA-based methods face problems with Small Sample Size (SSS) and separability criteria. The conventional solution to misclassification for SSS problem and large data set with similar faces is the use of PCA into LDA, typically referred to as "Fisherfaces." PCA is used for dimensionality reduction, and then LDA is performed on to the lower dimensional space. However, the use of LDA over PCA results in loss of significant discriminatory information.

[0157] The described facial recognition systems and methods relate to computer-implemented face recognition using multilayered discriminant analysis, which includes applying an initial linear discriminate analysis to a database of face images. Initial fuzzy logic then is applied to the results of the initial linear discriminate analysis to produce a subset of the database of face images. Thereafter, a subsequent linear discriminate analysis is applied to the subset of the database of face images and subsequent fuzzy logic is applied to the results of the subsequent linear discriminate analysis to produce a further subset of the subset of the database of face images. The application of the subsequent linear discriminate analysis and application of the subsequent fuzzy logic may be repeated until the further subset contains only one, or zero, face images.

[0158] The systems and methods described herein relate to bio-inspired face recognition using multilayered linear discriminant analysis. The present systems and methods employ a technique of classification that reduces the dataset of facial images to produce better separability criteria using LDA-based methods in a layered manner. This technique is intensive to both Small Sample Size (SSS) and large face variation, due to light or face expression, by optimizing separability criteria.

[0159] In contrast to existing techniques that use feature extraction, linear discriminant analysis (LDA) is applied in a layered manner to extract the most similar pattern from a large dataset of facial images, by finding the best projection onto a feature vector. In accordance with various embodiments, fuzzy rules such as based on Euclidian distance may be applied to the LDA results to reduce the dataset to a smaller subset. These steps may then be repeated to further reduce the subset, until an individual image is identified, or all images are eliminated. The present systems and methods decrease False Acceptance Rate (FAR) by reducing the face dataset to very small size through Multilayered Linear Discriminant Analysis (ML-LDA).

[0160] Although the computational complexity at recognition time is more than conventional PCA and LDA algorithms, due to computation of weights at run time, the present ML-LDA provides significant performance gains, especially with respect to similar face databases and SSS problems. In particular, ML-LDA is computationally complex as compared to previous methods because creating of new adaptive database and re-computation of feature space is performed at classification time. Secondly, LDA is performed at least twice, and oftentimes, three or more times, at the time of classification. This makes ML-LDA more computational complex, but on the other hand, FAR is minimized to a negligible level by performing the present ML-LDA. However, ever-decreasing computing costs and decreasing prices for computer memory, data storage, and or the



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like, coupled with the importance of accurate security screening techniques, such as may be facilitated by the present systems and methods, justify such added computational complexity.

[0161] Particular examples discussed herein use a multilayer approach to the application of LDA-based techniques to facial recognition. However, the present invention is also applicable on other pattern recognition applications and methods, i.e. PCA-based, IDA-based, DLDA-based, etc.

[0162] In an exemplary procedure for face recognition, multilayered discriminant analysis is used. Therein, an initial linear discriminate analysis is applied to a database of face images. In various embodiments, the linear discriminate analysis applied might entail calculating between a class scatter matrix and within the class scatter matrix on N classes of faces in a database of n face images.

[0163] Fuzzy logic is applied to the results of the first linear discriminate analysis to produce a subset of the database of face images. This application of fuzzy logic might include finding minimum Euclidean distances for a probe image by projecting the probe image onto the feature space on a number, N of classes, which results in the creation of the new subset database, M, where the size of M is much less than N. Unlike conventional LDA approaches, which select one optimized face as a recognition result, the present process selects several faces from the large initial dataset using LDA to reduce the dataset from N to M. Thus, LDA is used for adaptive classification into subclasses to find the better seperability criteria on the small dataset instead of the large dataset.

[0164] Subsequent linear discriminate analysis is applied to the subset of the database of face images. This layer of application of linear discriminate analysis might entail calculating new feature space on the new database, such as by calculating between the class scatter matrix and within the class scatter matrix on the M classes of faces in the subset database of face images.

[0165] Fuzzy logic is applied to the results of the subsequent linear discriminate analysis of to produce a further subset of the subset of the database of face images. Again, the minimum Euclidean distances of the probe image may be found, this time, by projecting the probe image on to the new feature space on M classes. This again results in the creation of a new subset, this time of database M, which is much smaller than M.

[0166] A determination is made at as to whether the application of fuzzy logic at results in a database subset of a single or zero facial images. If not, that is if the subset is greater than one, process again applies the subsequent linear discriminate analysis and application of the subsequent fuzzy logic is repeated until the further resulting subset contains only one face image or zero images at. That is, application of subsequent linear discriminate analyses to the further subset of the database of face images is repeated and application of (subsequent) fuzzy logic to the results of repeated subsequent linear discriminate analyses is repeated to produce further, successive subset(s) of the database subset of face images initially produced at, until the further subset contains only one, or zero, face images. This repeated analysis might entail repeating creation of a new, successive database at, calculation of new feature space on the new database, and finding minimum Euclidean distances of the probe image by projecting the probe image on to the new



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feature space on the classes of the new database at, until the new database includes only one, or zero, images.

[0167] Output may take the form of a single image if the probe image is of an individual whose image is in the database of images. In this manner, process may be used to identify an individual that is a subject of a probe image, such as may be useful for identifying criminal or terrorist suspects, or the like. If no image (i.e., zero images) is output, this may be an indication that the subject of the probe image is not in the database. Thus, process may alternatively be used to confirm that an individual who is the subject of a probe image is a member of a dataset (i.e., a database of images of employees, authorized personnel, etc.). In such an implementation, process would either output a single image, confirming that the probe image is of a member of the database, or a "zero" output would indicate that the subject of the probe image is not a member of the database and thus is an imposter or otherwise not an authorized person. Also, it should be noted that in either of the above implementations an output of zero images may also be an indication that a positive match of the probe image could not be made against the database. This may help prevent false matches and/or false identity confirmations typical in conventional face recognition systems.

[0168] Many of the methods and systems and programs may be executed or implemented in a computing environment capable of implementing the systems and methods described herein, according to one embodiment. A computing device can function as a server, a client, a worker node, or any other computing entity. Computing device can be any of a wide variety of computing devices, such as a desktop computer, a notebook computer, a server computer, a handheld computer, a work station, and/or the like.

[0169] The computing device includes one or more processor(s), one or more memory device(s), one or more interface(s), one or more mass storage device(s), one or more Input/Output (I/O) device(s), and a display device all of which are coupled to a bus. Processor(s) include one or more processors or controllers that execute instructions stored in memory device(s) and/or mass storage device(s), such as one or more programs implementing process. Processor(s) may also include various types of computer-readable media such as cache memory.

[0170] Memory device(s) include various computer-readable media, such as volatile memory (e.g., random access memory (RAM)) and/or nonvolatile memory (e.g., read-only memory (ROM)). Memory device(s) may also include rewritable ROM, such as Flash memory.

[0171] Mass storage device(s) include various computer readable media, such as magnetic tapes, magnetic disks, optical disks, solid-state memory (e.g., Flash memory), and so forth. Program implementing process may be stored in such mass storage. Data, such as one or more databases of facial images, such as discussed above, may also be stored on mass storage device(s). One mass storage device may be a local hard disk drive, which may store program and/or database. Various drives may also be included in mass storage device(s) to enable reading from and/or writing to the various computer readable media. Mass storage device(s) include removable media and/or non-removable media and/or remote drives or databases accessible by system.



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[0172] I/O device(s) include various devices that allow data and/or other information to be input to or retrieved from computing device. Example I/O device(s) include cursor control devices, keyboards, keypads, microphones, monitors or other display devices, speakers, printers, network interface cards, modems, lenses, CCDs or other image capture devices, and the like. For example, a probe image may be input to system via a CCD-based camera or the like for use by system implementing process, such as via a request entered into a keyboard by a user of system.

[0173] Display device optionally is directly coupled to the computing device. If display device is not coupled to device, such a device is operatively coupled to another device that is operatively coupled to device and accessible by a user of the results of the method. Display device includes any type of device capable of displaying information to one or more users of computing device. Examples of display device include a monitor, display terminal, video projection device, and the like.

[0174] Interface(s) include various interfaces that allow computing device to interact with other systems, devices, or computing environments. Example interface(s) include any number of different network interfaces, such as interfaces to local area networks (LANs); wide area networks (WANs), wireless networks, and the Internet. Other interfaces include user interface and peripheral device interface.

[0175] Bus allows processor(s), memory device(s), interface(s), mass storage device(s), and I/O device(s) to communicate with one another, as well as other devices or components coupled to bus. Bus represents one or more of several types of bus structures, such as a system bus, PCI bus, IEEE 1394 bus, USB bus, and so forth.

[0176] For purposes of illustration, programs and other executable program components, are discrete blocks, although it is understood that such programs and components may reside at various times in different storage components of computing device, and are executed by processor(s). Alternatively, the systems and procedures described herein can be implemented in hardware, or a combination of hardware, software, and/or firmware. For example, one or more application specific integrated circuits (ASICs) can be programmed to carry out one or more of the systems and procedures described herein.

[0177] Figure 31 illustrates an exemplification in which an image of an individual is displayed on display device 31.1. Information for the participant may be displayed together on display device 31.1 substantially simultaneously with the image of the participant (e.g., the information may appear to be displayed at the same time as the image of the participant). In this exemplification the participant information may include a name of the participant (John Smith). In some exemplifications, a participant (or other entity) may indicate the extent of the participant information to display. For example, a participant may specify that the extent of the participant information displayed should only include their first and/or last name.

[0178] Multiple participants (or a single participant) may be displayed on display device 31.1, and patient information for the participant(s) may be displayed together on display device 31.1 simultaneously or substantially simultaneously with the images of the participant(s). In some exemplifications, the participant information for the participants may be displayed proximally to the

respective images of the participants to which the participant information corresponds. Displaying the various portions of participant information proximally to the corresponding participants may visually associate the portions of participant information with the respective participants, thus enabling viewers at the local endpoint to ascertain which portions of participant information corresponds to which participants.

[0179] The different portions of participant information may be displayed in various ways such that the portions of participant information may be visually associated with their corresponding participants. For example, Figure 32 illustrates an exemplification in which the device displays a callout box 32.1, 32.2, 32.3, 32.4 proximally to each participant. Each callout box 32.1, 32.2, 32.3, 32.4 may display a name of the respective participant. This may allow the viewers at the endpoint to identify the participants by looking at the callout boxes 32.1, 32.2, 32.3, 32.4 displayed proximally to the respective participants.

[0180] Figure 33 illustrates an exemplification in which multiple portions of participant information may be displayed simultaneously or substantially simultaneously with images of different participants. In this exemplification, the portions of participant information are visually associated with their corresponding participants by displaying a box 33.1, 33.2, 33.3, 33.4 around each participant and displaying the name 33.5, 33.6, 33.7, 33.8 of each participant within each respective box 33.1, 33.2, 33.3, 33.4.

[0181] Figure 34 illustrates a facial detection screenshot in accordance with the present application. Screen 34.1 illustrates a non-smiling face/pose in accordance with the present application. Secondary verification method 34.2 is also shown as an activation sequence.

[0182] Figures 35, 36, and 37 illustrate an example 35.1 of a computing device detecting an artificial representation of a human face in an image based on changes in facial skin color, in accordance with various exemplifications. In Figure 35, the computing device 35.2 (e.g., mobile phone) having a front-facing camera 35.4 can use facial recognition to identify the user 35.3 of the device and to grant access to one or more functions of the device 35.2, as previously described. In various exemplifications, however, it is also desirable to prevent unauthorized users from using an artificial representation, such as a picture 36.1 to gain access to the device 35.2. In the illustrated exemplification, the computing device can detect one or more changes in facial skin color (e.g., shade, tone etc.) and use the information about the skin color changes to determine when an artificial representation of the human face has been placed in front of the camera 35.4 of the device 35.2. This approach may detect both two dimensional (2D) artificial representations (e.g., pictures, photographs) and three dimensional artificial representations (e.g., face mask).

[0183] In accordance with an exemplification, the computing device captures two or more images over a period of time, where each image contains data corresponding to a human face, or a portion thereof. The image data may be a result of a real user's face 35.3 or an artificial representation of a human face 36.1 placed in front of the camera. The computing device 35.2 can detect subtle changes in facial skin color by performing a signal analysis (e.g., Eulerian signal analysis) of the image data in the several images captured by the camera. In one exemplification, the device



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compares the several images to determine whether any changes in color, tone and shade are present between the two or more images. As illustrated in Figure 36, multiple sequential images of the same artificial representation of a human face 36.1 will contain no changes in the facial skin color between the images. The image 37.1 of Figure 37, however, illustrates changes in facial skin color 37.2 that ordinarily occur over time due to breathing, blood circulation, pulse rate and the like. For example, the red values of a human face can vary with the pulse cycles as the amount of blood flow to the face varies. While this variation may be too subtle to be noticed by the human eye, some digital cameras of a computing device 35.2 can be sensitive enough to detect the variations in skin color. These variations then can be used to verify that captured image information reflects an actual person, and not an artificial representation of a person placed in front of the camera.

[0184] In the illustrated exemplification, if no changes in facial skin color 37.2 are detected between a predetermined number of images (e.g., 2 or more images), the device 35.2 may deny access to the user based on the assumption that the images contain data for an artificial representation of a human face. If facial skin color changes are detected, however, the computing device 35.2 can enable the user 35.3 to access the device.

[0185] Smartwatches, as discussed above, can be used in different areas to perform different functions usually performed by computers or similar electronic devices. Some smartwatches can be used in different industries, such as chiropracty, physical therapy, occupational therapy, physical rehabilitation, sports medicine, and athletic training. Such smartwatches allow users to track complex motions requiring the use of motion sensors such as gyroscopes, accelerometers, compasses, and pressure sensors, fusing the sensor outputs into a single and accurate data stream for use as input commands in consumer electronics devices, and ongoing run-time calibration to ensure an optimal user experience.

[0186] One area in which smartwatches can be utilized is the area of physical therapy or therapeutic rehabilitation. In therapeutic rehabilitation, clinicians instruct patients through a therapeutic exercise routine, which routine is created by a licensed clinician to treat a patient's condition. Routines can include a list of therapeutic exercises, manual therapy techniques, modalities, as well as numerous other treatment procedures. During an initial patient visit, the clinician generally instructs the patient through the exercises, displays the exercise techniques, and/or follows the patient through the therapeutic exercise routine. On subsequent visits, the patient will need to recall treatment exercises or ask the clinical staff what the next scheduled treatment procedure is. If there are any changes or issues, the patient must alert the clinician who will then explain, demonstrate, and/or watch the patient perform the new exercise.

[0187] However, there are a number of problems, obstacles, or issues with current physical therapy procedures, especially with respect to treatment procedure and workflow in the areas of chiropracty, physical therapy, occupational therapy, physical rehabilitation, sports medicine, and athletic training. These problems decrease efficiency and accuracy of treatment, and increase patient wait time. One problem is that the patients do not know or cannot recall the treatment exercises, therapeutic exercises, and/or other therapeutic treatments, and/or cannot recall the order in which such



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exercises and/or treatments should be performed. For example, if a patient is assigned three or four therapeutic exercises to be performed sequentially, it is easy for the patient to forget how to perform the individual exercises and/or the order in which they are to be performed. Consequently, the patient can hinder the therapy by incorrectly performing the exercises and/or performing them in the wrong order.

[0188] One way to address the problem of incorrect performance of the therapeutic procedures is for the patient to receive additional assistance from a clinician. The clinician may stay with the patient throughout the therapeutic session to instruct the patient on each exercise by telling the patient what the next exercise is and the parameters for performing the exercise, such as the proper form, what weight(s) to use, the number of repetitions and sets, and what the rest periods are. However, such an approach is impractical, especially if the clinician is working with multiple patients. Most clinicians usually provide basic instructions to a patient to complete a therapeutic program, and then assist other patients or perform other tasks in the clinic while the patient completes the therapeutic program. Staying with a patient and monitoring the patient's performance throughout a therapy session is therefore a rather inefficient use of the clinician's time.

[0189] As an alternative, many clinicians will instruct a patient regarding the exercise or exercises to be performed, then leave the patient to complete the exercise(s) alone. The clinician will then check in periodically with the patient to check if the patient needs assistance and/or is performing the therapeutic program correctly. While this approach does not take as much time as directly monitoring the entire therapeutic program, it is still quite inefficient. The clinician checks in with the patient as the clinician is able to do so, rather than when the patient completes an exercise or when the patient needs assistance. If a patient is doing an exercise correctly and/or is not finished with the exercise, then the clinician wastes time checking in on the patient. In addition, if the patient is performing an exercise incorrectly, the clinician may not be present at the right time to detect the error, thereby hindering the patient's recovery and lessen the therapeutic benefit. Further, if a patient needs assistance, the patient must wait until the clinician arrives before proceeding further, which wastes the patient's time and could possibly hinder the effectiveness of the therapeutic program. In situations where the clinician knows that the patient requires further instruction, sometimes the clinician will instruct a patient to complete an exercise, then wait for further instruction from the clinician. In this scenario, often the clinician has to estimate when a patient will complete an exercise to determine when the clinician should return to provide further instruction. If the clinician returns before the patient has completed the exercise, then the clinician's time is wasted. On the other hand, if the clinician returns some time after the patient has completed the exercise, then the patient's time is wasted. In addition, it may be advantageous with some therapeutic programs to promptly move to the next exercise, so an extended interruption of the program while waiting for the clinician may be undesirable and should be avoided. Furthermore, time wasted on individual patients and/or by individual clinicians can have a cumulative effect on the overall efficiency of a clinic, thereby generating a higher per patient operating cost.



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[0190] Aside from the implementation of therapeutic programs and the waste of time related thereto, there are also issues that arise in the proper execution of the therapeutic programs. In some instances, a selected exercise or exercises may either be too difficult or too easy for the patient to perform. Exercises that are too difficult could possibly injure a patient or discourage proper and consistent effort in therapy, whereas exercises that are too easy may not produce the desired therapeutic effect. Unfortunately, such information can only be obtained by interaction between the clinician and the patient, usually during the actual exercise, at which time the clinician is usually not present, as discussed above. The clinician is therefore usually not aware whether the patient is having difficulty with exercises, or is finding them to be too easy. Optimal therapeutic treatment is hindered until an adjustment of the exercise is performed, which may require the clinician to inefficiently check in on patients more frequently, or require the patient to interrupt the treatment until assistance is provided.

[0191] While the clinician usually performs adjustments of a therapeutic exercise, in some instances the patient may adjust the weight of the therapeutic exercise, depending upon how easy or difficult the exercise is. Since such an adjustment occurs during the exercise, the adjustment may possibly not be recorded in the patient's records. The clinician may forget the adjustment that was performed, or may not be aware of the adjustment if it is performed by the patient. The therapist may want the patient to progress but becomes too easy to instruct them on the progression. As a result, the wrong weight may be instituted in the future, which again could reduce the effectiveness of the therapy and waste valuable time in repeating the adjustment.

[0192] Aside from adjustments that occur during the procedure, adjustments can also be made based on the progress of the patient in the overall therapeutic process. For example, if a patient is not experiencing an improvement in health in accordance with the overall treatment plan, it may be necessary to adjust the parameters of the plan to achieve the desired result. As another example, if a patient is experiencing an improvement in health that is faster than expected, the clinician may wish to accelerate the time line of the overall plan. However, such adjustments are usually based on interaction between the patient and the clinician, which can result in inaccurate information being recorded, and/or the accidental omission of information from the patient's record. In such situation, a patient may inadvertently continue in a treatment or exercise program that is inefficient and/or does not produce the desired result.

[0193] Another component of many therapeutic exercises is the incorporation of a rest period in between exercises. However, some patients either forget to rest or simply ignore the instruction to rest between exercises, which could hinder the therapeutic effectiveness of the exercise, and possibly cause injury. Again, since the clinician is not always present during the performance of the exercises, the clinician cannot instruct the patient to rest, and routine checks of the patient for this reason would be inefficient.

[0194] Other inefficient processes in the clinic environment can also waste time and money. One inefficiency is that the clinician has to go to a computer or mobile device to manually enter a patient's treatment results. Another inefficiency is that all treatments have to be manually logged into



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the electronic medical record, or EMR. These inefficient processes can be especially problematic in a large clinic, simply because the distance from one area to another can be substantial. One other inefficiency can be in billing, because clinicians often tend to estimate the total time for therapy exercises. Inaccurate estimates could possibly lead to loss of billable time, which could translate into a substantial amount of lost revenue over an extended period of time or inadvertent fraudulent billing.

[0195] A smartwatch system and method according to the present application can be used to address some of the inefficiencies and/or deficiencies in current approaches for therapeutic treatment of patients in a clinic. The present application proposes to address these inefficiencies using an individual information device, such as a smartwatch (also referred to as a "watch") or similar device, as part of an electronic monitoring and communication system. As discussed above, one of the inefficiencies is that the patients do not know or cannot recall the types and proper execution of the treatment exercises, therapeutic exercises, and/or other therapeutic treatments, and/or cannot recall the order in which such exercises and/or treatments should be performed. The clinician can personally instruct the patient regarding the parameters of the treatment or exercise protocol, but this is also an inefficient use of the clinician's time, so it is preferable to leave the patient to perform the treatments or exercises. However, this means that the clinician is not always present to personally verify that all parameters of the treatment or exercise protocol are being properly performed or achieved, and thus is not able to always be aware of any problems with the performance of the protocol. To address these problems, according to one exemplification, an individual information device, such as a smartwatch or similar device, can be assigned to each patient in a clinic. The information device can contain information specific to the patient's treatment or exercise procedure or protocol. The information device can be used to assist or guide the patient through the treatment or exercise protocol, such as, but not limited to, the name of each treatment or exercise, written, photo or video representation and how to properly perform each treatment or exercise, the number of repetitions for each treatment or exercise, the sets of repetitions, the order of the treatments or exercises, changes to one or more treatments or exercises, additions to or deletions from the overall program, and durations and occurrences of prescribed rest periods. In addition to the information device, a movement tracking device, such as a gyroscope and/or accelerometer, can be worn on one of the extremities of a patient, such as wrists or ankles depending on the nature of the treatment or exercise procedure, in order to track performance of the treatment or exercise. The tracking device can communicate wirelessly with the information device. The tracking device can detect actual performance of the repetitions and/or sets of the exercise procedure, and then communicate such information to the information device in order to inform the patient of success or failure in completing the prescribed treatment or exercise. In this manner, the patient is instructed as to the proper performance of the treatment or exercise protocol without the need for the clinician to be present or to periodically check in on the patient to personally monitor and verify the performance.



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[0196] Some other inefficiencies are that the clinician might not realize when the patient is ready for instruction, or that further instruction is needed, or that the patient has completed a protocol or program. The information device assigned to the patient can be linked to an overall electronic monitoring and record-keeping system to provide information on the patient's progress. If a patient needs assistance in order to proceed further, the patient can request such assistance via a digital and/or electronic and/or electromechanical interface of the information device, or the information device can send out a message that the patient is ready for instruction as part of the exercise protocol. The information device can also provide information that all or a portion of the exercise protocol has been completed. A notification can then be sent to a personal electronic device, such as a smart phone or smartwatch or similar device, of the clinician to provide such information. In addition, if the patient does not rest for the prescribed rest period, the information device will count down the prescribed rest periods and alerts when the next set and/or exercise is to begin. This gives the patient the needed time to recuperate during exercise regimens. The patient can be instructed regarding the rest periods, and the clinician can be alerted in the patient is not resting appropriately. In this manner, the clinician can be quickly and efficiently made aware of the needs of a patient without having to periodically check on the patient.

[0197] Also as discussed above, the overall treatment or exercise programs, or portions thereof, often must be adjusted or changed, before, during, or after the patient visit, in order to achieve the most efficient and effective treatment of the patient. By using the information device, the patient can request immediate assistance from the clinician if an exercise is not having the desired effect, such as, for example, being too easy or too hard. In addition, any changes in the exercise program can be entered into the information device and thereby immediately recorded and stored in the electronic database, rather than relying on the clinician to record such information. Also, by automatically recording the patient's actual performance of the treatment or exercises, the clinician can review the records between and during visits to verify if the exercises are being performed appropriately. The clinician can then make adjustments or changes to the treatment or exercise plan as desired, which will then be stored for the next time that the patient comes in for a visit. By electronically storing these adjustments or changes, they can be automatically retrieved and implemented when the patient arrives for the next visit. Finally, the clinician can more efficiently consult with the patient because instead of the clinician having to go to a computer or mobile device to manually retrieve patient record, the clinician can access the patient's information device and quickly and instantly retrieve the patient's records for the session from the electronic system.

[0198] In addition, as discussed above, clinicians often estimate the total time for therapy exercises, which can affect the billing process. Since the information device walks the patient through the exercise treatment, and counts down each exercise rep, set and rest time between, an extremely accurate record of the time that expired during the therapeutic session can be automatically obtained and recorded in the EMR. Such an approach eliminates any estimation errors, and thus results in much more accurate billing.

[0199] According to at least one possible exemplification of a treatment method, a patient first arrives in a clinic for a treatment session. The patient then signs in or registers at the reception area. If the patient is not already registered in the clinic's EMR system, the office staff enters the patient's data into the EMR system using EMR software. Once the patient is registered or signs in, the office staff marks the patient as arrived in the EMR. The office staff then assigns the patient to a clinician or a clinical work group, using the app, if the patient is not already assigned to one. The clinician or clinical work group (C/WG) is the clinical staff assigned to patient's care. The office staff will then verify that a treatment protocol is assigned to the patient. If no treatment protocol is assigned, the office staff will send an alert to the clinician, who will then make or select a treatment protocol by creating a flowsheet, which is a list of physical therapy treatments or exercises in the numeric order that they are to occur during the visit. Once a protocol is assigned, or if already set, the office staff will scan a matrix barcode, such as a QR Code™, or similar identification label or structure of an information device, such as a smartwatch or similar device, and/or a tracking device, such as a gyroscope or accelerometer, to upload the patient's template on the device and assign the patient to the given clinician or clinical workgroup. The smartwatch and/or gyroscope/accelerometer is then given to the patient to wear. Activation is sent to the server and the smartwatch is paired with the system. The server then sends an alert to the clinician or clinical workgroup that the patient is in the waiting room.

[0200] As an alternative, several smartwatches can always be paired to the server. Each smartwatch is given an identification name and/or number. When a patient is ready for therapy, a smartwatch is assigned to the patient, and the identification name and/or number is matched to the patient. When the therapy session is complete, the smartwatch is removed from the patient's electronic record, but remains paired to the server or system.

[0201] Next, one or more of the clinical staff greets the patient and instructs the patient regarding the first treatment procedure. The smartwatch will display the first treatment procedure. Once ready, the patient chooses an appropriate instruction, such as "start" or "help," on the smartwatch. If the patient chooses "start," the smartwatch displays the first treatment procedure and exercise to begin. The patient then goes to the first station for the first treatment procedure or exercise.

[0202] At the first station, the patient scans a matrix barcode or similar identification tag located at the station with the smartwatch. The pre-loaded exercise or treatment protocol is then displayed on the smartwatch, or possibly on a video display at the station in another possible exemplification. The displayed protocol includes the name of the exercise and the prescribed number of repetitions (reps) and sets. The patient then selects "start/help" on the display. Upon choosing "start," the patient begins the exercise while the smartwatch counts the prescribed number of reps. Once a set is complete, the smartwatch will alert the patient by a series of vibrations. The smartwatch will then display a rest time count down. If all sets are not complete for a given exercise, the smartwatch will start over and begin counting the prescribed number of reps until the exercise is complete. Once the exercise is completed, the smartwatch will initiate another exercise – if additional exercises are part of the scheduled program – by displaying the name of the exercise, the reps, and the sets from the



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protocol. The smartwatch will also vibrate and alert the patient it is time to start the next set. If no other treatment or exercise is available or part of the program, then therapy exercises would be complete.

[0203] During this process, the server pushes all exercises and rest times as per pre-created/selected protocols to the smartwatch upon initial pairing. If a new exercise is added by the clinician during the patient's appointment or a session, an alert will be sent to the patient that a new exercise has been added, and that the clinician will be with the patient shortly to provide instruction and/or assistance. A corresponding push notification will be sent out from the central server or system to the clinician's mobile device to remind or instruct the clinician to go and consult with the patient regarding the new exercise.

[0204] In one exemplification, a motion tracking device, such as a gyroscope and/or accelerometer, can be worn on an ankle of the patient if treatment of a lower extremity is required. This device will wirelessly communicate with the smartwatch. Once a therapeutic exercise is complete, the gyroscope/accelerometer device will transmit such information to the smartwatch, and then the smartwatch will display the next set/exercise. The gyroscope/accelerometer device could be built into the smartwatch, which will be worn on the wrist, if treatment of an upper extremity is required. Alternatively, the gyroscope/accelerometer device could be used in both lower and upper extremity treatments.

[0205] After performing the preceding steps to upload the exercise, the patient is ready to begin the exercise. For an upper extremity exercise, i.e., an arm or shoulder exercise, the patient wears the smartwatch on the arm, such as on the wrist or forearm, or possibly the upper arm. The smartwatch can be designed to include gyroscope/accelerometer device, and thus the smartwatch can be used to count the number of reps for the exercise. Meanwhile, a control display is shown on the smartwatch, which will be discussed further herein. After the set of reps is completed, the smartwatch vibrates to alert the patient to stop. The smartwatch then displays and counts down a rest period. After the rest period, the smartwatch starts another set of the exercise as needed according to the program. Once the all sets of the exercise are completed, the smartwatch either initiates the next exercise, or indicates that all exercises are complete. The preceding steps can also be used for a lower extremity exercise, except that the gyroscope/accelerometer device worn on the lower extremity counts the number of reps for the exercise and then wirelessly sends or pushes the information to the smartwatch.

[0206] If the patient is performing a series or set of exercises, the server can monitor the patient's progress and notify the clinician after the next to last exercise that the patient is finishing up. Before commencement of a treatment or exercise, the smartwatch displays two options: "start" or "help." Choosing "start" will begin the exercise, whereas choosing "help" will alert the clinical staff that the patient needs assistance. It should be noted that the terms or phrasing of the choices, the number of choices, and/or the types of choices available to the patient at any time before, during, or after a therapeutic procedure, could be different in different exemplifications, and could be customized to



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meet the particular needs of a clinical environment, and thus are not limited to any of the specific, exemplary descriptions provided herein.

[0207] At any time a patient can press the "help" button or select the "help" option, and the clinical staff will be immediately alerted that the patient needs assistance. During execution or performance of a treatment or exercise, the smartwatch will display three options: "too easy," "too hard," and "help." If a patient selects the "too easy" option, the smartwatch sends a signal to the server that the given exercise is too easy. The server will then send a message back to the smartwatch, such as "increase to next level," to instruct the patient. In addition, a push notification could also be sent to the clinician that a change in the exercise has been requested or initiated by the patient. From there the patient can start performing the exercise at the increased resistance or higher level of difficulty, or press "help" to request assistance from the clinician. If a patient selects the "too hard" option, the smartwatch sends a signal to the server that the given exercise is too hard. The server will send a message back to the smartwatch, such as "decrease to lower level," to instruct the patient. In addition, a push notification could also be sent to the clinician that a change in the exercise has been requested or initiated by the patient. From there the patient can start performing the exercise at the decreased resistance or lower level of difficulty, or press "help" to request assistance from the clinician.

[0208] In addition, if "help" is selected during execution of the exercise, the smartwatch will send a signal to the server. The server will then send a high priority alert to the assigned clinician or clinical workgroup's mobile device notifying them that a named patient requires help on a named exercise along with the patient's location. The server also will send a message to the smartwatch, such as "please wait, your clinical workgroup will be right with you," to instruct the patient to wait for the clinician or staff member to arrive. The clinician will have the capability to track and record patient heart-rate, oxygen saturation and blood pressure levels. Minimum and maximum levels will be set either by automatic calculations or predetermined numbers set by the clinician. If a patient falls below or exceeds a predetermined target rate zone, the clinician/workgroup will be notified. The clinician can then directly interact with the patient to determine what assistance is required. If the treatment or exercise routine needs to be re-evaluated and/or changed or adjusted, the clinician will be able to scan the matrix barcode tag on either the smartwatch or the gyroscope/accelerometer device to pull up the patient's flowsheet. The clinician can then make changes to the patient's program by choosing from a number of options, such as "skip/delete/edit," on the clinician's mobile device. The clinician could choose to skip a particular exercise, delete a particular exercise from the overall program, or adjust one or more exercises as desired by changing parameters of the exercise, such as increasing or decreasing weight, resistance, reps, and/or duration. The changes made and/or approved by the clinician are then saved to the server and sent to the smartwatch to provide the patient with an updated or adjusted exercise program.

[0209] The smartwatch devices disclosed herein can be used in conjunction with an app in a clinical setting. The electronic patient processing device and a method of using the electronic patient processing device is used to service the physical therapy industry, but has crossover application in



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chiropracty, occupational therapy, physical rehabilitation, sports medicine, and athletic training. It should be noted that the devices and methods disclosed herein will be discussed primarily as they relate to the field of physical therapy, and the use of the devices and/or performance of the methods by physical therapists. However, it should be understood that the devices and methods disclosed herein may be used in many different professional fields or technological areas, and thus the devices and methods are not limited to only physical therapy, and any discussion herein relating to physical therapy should be understood as encompassing other different professional fields and technological areas. Also, the persons using the devices and/or practicing the methods may include other personnel in the field of medicine besides physical therapists, such as doctors, nurses, clinicians, licensed practitioners, medical assistants, physician assistants, or other physical therapy clinic or medical staff. Further, the persons using the devices and/or practicing the methods may include other personnel in different professional fields and technological areas besides physical therapy, as mentioned above. Therefore, any discussion herein relating to physical therapists should be understood as encompassing other different personnel in the field of medicine, or personnel in different professional fields and technological areas besides physical therapy or medicine.

[0210] Most physical therapy clinics take the form of a gymnasium or gym, a large hall, or similar building. The clinic contains physical therapy tables and other equipment located in either individual rooms or in a common area. For example, each room could contain a physical therapy table for some type of a static treatment, which treatment could include application of ice or cooling packs, application of hot or heating packs, and/or electro-stimulation. Such treatments are generally timed, so each table and/or room is generally equipped with a countdown timer. In these or other rooms or areas, a patient may perform exercises, which are set to a number of repetitions (reps) or to a specific time. It is the responsibility of the physical therapist to monitor each individual therapy session. Physical therapy clinics can range in size from a small gym with a few or several rooms or areas, such as approximately three to ten, to a large gym with many rooms or areas, such as approximately 30 to 50, or possibly even more. As a result, a physical therapist on a busy day may have several to many rooms with patients that he must monitor at one time or in overlapping therapy sessions.

[0211] This application relates primarily to a computer program for computers, internet or web-based computing, and mobile computing on mobile devices, such as smartphones, smartwatches, and other mobile devices. The program or software or computing application will be referred to herein as an "app." The present application therefore relates to an app, a server which hosts the information accessed by the app, and a server portal from which that information can be accessed. The phrase "mobile devices," as used herein, refers to any and all mobile devices including, but not limited to, such devices as smart phones, cellular phones, mobile phones, pagers, portable or mobile computers, laptops, personal data assistants (PDA), handheld computers, mobile internet devices, tablet computers, wearable computers, calculator watches, smartwatches, and head-mounted displays.

[0212] The app is designed to address different problems that often occur within physical therapy clinics and related areas. A first problem relates to notifying the physical therapist in a timely and effective manner that a patient awaiting instruction and/or treatment. In many clinics, when a patient enters the clinic and waits in the waiting room, the clinic staff will communicate the patient's arrival to the physical therapist by taking the patient's medical chart and placing it in a slot outside the waiting room. The inherent deficiency of this method is that it depends on the physical therapist noticing the presence of the chart. Often the physical therapist is extremely busy moving from room to room and from patient to patient. It is not uncommon for the physical therapist to be on the opposite side of the clinic, which again can be very large, and thus he cannot easily see the chart. In other instances, the view of the chart could be blocked by gym equipment or other structures in the clinic. No matter the reason, if the physical therapist does not or cannot see or notice the chart, the patient can experience unnecessarily extended wait times. To compound this issue, many clinics have an exterior waiting room separated from the treatment and exercise areas, which makes it nearly impossible for physical therapists to easily check whether or not one of his patients is in the waiting room.

[0213] To address this first problem of undesirable delays, the device and method according to the present application first assigns each patient to a physical therapist. When a patient enters the waiting room, the clinic staff will access the server portal and use the drag n' drop feature or similar interface to place the patient in the server's virtual "waiting room." The server will then send a notification to the mobile device of the assigned physical therapist to thereby notify the physical therapist of the patient's presence in the waiting room. The physical therapist is therefore quickly made aware that the patient is waiting in the waiting room, and thus a potential unnecessary wait, such as 10, 15, or 20 minutes or more, can be substantially reduced to a much shorter time, such as five, three, or one minute or less. In addition to the specific notification regarding a specific patient for a specific physical therapist, the app may also provide a list of all patients in the waiting room. The physical therapist or other clinic staff can thereby view all patients in the waiting room at any time, to even further ensure that all patients are being attended to in a timely manner. The device and method disclosed herein thereby minimizes problems caused by the physical layout of the clinic, the placement and design of the waiting room, or the physical location of the charts on a wall of the clinic.

[0214] A second problem is that many clinics require a physical therapist to keep track of multiple patients simultaneously, or at least in overlapping therapy sessions. Such multi-patient monitoring can be difficult, especially since the therapies being performed vary in type and time. To further explain, in most therapy sessions or visits, once the patient is admitted or signed in, he is taken to a therapy room or area by the physical therapist. The physical therapist then commences the therapy session, which could involve a static treatment or the performance of therapy exercises. A countdown timer is often used to set the length of the therapy session to a desired time. Many of these countdown timers are equipped with rather loud alarms to ensure that the physical therapist can hear or notice the alarm, regardless of his location in the clinic. When the countdown timer



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expires and/or sounds an alarm, the physical therapist or the clinic staff will then visit the patient to either initiate additional therapy or discharge the patient. Since the physical therapist may be responsible for multiple patients, each with his own countdown timer set at a different time, it can become extremely difficult for the physical therapist to keep track of the multiple timers and therapy sessions. A physical therapist will often personally go to different rooms to check the timers in order to plan his next steps and coordinate his assistants. The more patients the physical therapist is treating, the more hectic the work becomes, and the more difficult it becomes to maintain efficiency. Randomly checking timers is an inefficient way to monitor patients, and wastes valuable time that the physical therapist and the clinic staff could devote to other work.

[0215] In addition, the unexpected and obnoxious sounding of the alarms makes it difficult for the therapist to effectively treat patients. As many medical professionals know, it can be advantageous in the treatment process to develop a good relationship with the patient to obtain the most accurate and honest feedback about how the patient is feeling and progressing. However, it can be difficult to develop these relationships if productive conversations are interrupted by shrieking alarms that the physical therapist must rush off to address. In addition, the mere sound of these alarms can be very bothersome to patients trying to relax as part of their treatments. The effectiveness of such treatments may be diminished if the patient is unexpectedly shocked or surprised by a sudden and piercing sound. For example, a patient who is experiencing muscle tightness, spasms, etc., may be prescribed a heat treatment to relax the muscles to relieve pain and improve the effectiveness of therapeutic exercises. However, if such a patient is suddenly frightened by a loud alarm, the patient could instinctively tighten up his muscles in response to the stress of the shocking and unexpected noise. In other situations, a patient may just want to focus on his exercises or enjoy a calm and quiet therapy session, and the loud alarms can be both distracting and irritating.

[0216] To address this second problem of inefficient and loud alarms, the device and method according to the present application utilizes a main page that contains a list of all tables, rooms, and therapy areas in the clinic. Each room or area can be assigned a patient and a timer. In this way, the physical therapist can easily reference all of the timers for which he is responsible whenever he wishes. In addition, the app can be programmed to alert the physical therapist some time in advance of the expiration of a timer so that the physical therapist can plan to address the needs of the patient when the timer expires, i.e., when the therapy session is concluded. The alert is sent from the server to the mobile device of the physical therapist. The alert may be in the form of a visual, audible, or tactile signal, such as an alert message, sound, or vibration. In this way, a physical therapist is notified before the alarm goes off, so that he can transition easily between tasks without sudden interruptions of what he is currently doing. Since the alarms can be strictly visual or tactile in the form of messages or vibrations, it is not necessary to use loud countdown timers at any of the room locations or treatment areas. The result is a much quieter and peaceful clinic, which is to the benefit of both the patients and the workers.

[0217] A third problem is inefficient communication between physical therapists and clinic staff, especially in large or larger clinics. For example, it is not uncommon for a clinic staff member to



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conduct a room to room search to try to find a particular staff member or patient in the clinic, such as for the purpose of conducting a conversation, delivering paper work, passing on messages, etc. This approach is inefficient and wastes time. While such a situation could be addressed by staff members utilizing their personal mobile devices to message one another, most workers value their privacy and prefer not to share personal information with their co-workers, or risk being bothered with work-related matters when not at work. Additional to this, messaging about patients on an unsecure app violates HIPAA standards (law).

[0218] To address this third problem of inefficient communication, the device and method according to the present application utilizes an app that includes a third party messaging section that allows clinic staff to message one another within the clinic without revealing personal information. The app can be installed on a personal mobile device. The app includes a switch or option to allow a user to disconnect the app from the server, thereby preventing the app from disturbing the user when the user is not in the clinic.

[0219] A fourth problem is a general inability for a physical therapist to both perform his work with his patients, while at the same time monitoring and coordinating the work of one or more assistants. In the same way a hectic environment makes it difficult for a physical therapist to organize his own work, a busy work environment also interferes with a physical therapist's ability to coordinate work with his assistants. Keeping track of the patients of one worker alone is difficult. In many states, a physical therapist can have as many as three assistants, and must track the work of all three.

[0220] To address this fourth problem of insufficient monitoring and coordination of assistants and clinic staff, the device and method according to the present application utilizes an app that not only allows users of the app to assign a timer to the room of a patient, but also allows a user to assign a timer to himself or another user. When a worker at the clinic takes a patient to a room and assigns that room to the patient and sets a timer for the room in his app, he will also have the option of assigning that timer to another user or himself. When another user is assigned, that user will receive a notification for the timer. Once a user is assigned to a timer, that information appears in the app under that particular room. In this way, a physical therapist can not only assign patients and timers to his assistants or himself efficiently (he doesn't need to track them down), he can also monitor what patients his assistants are working with at any given time to ensure equal distribution of labor.

[0221] A fifth problem is that physical therapists often need to set reminders for themselves regarding some aspect of a patient's therapy for the next time the patient comes in for physical therapy. Often the physical therapists have to resort to making mental notes, placing Post-It notes in the patient's file or in their office, or asking clinic staff and/or patient to remind them about the specific issue at the patient's next visit. These methods are all subject to various human errors – forgetting the mental note, losing the post-it note, or being on the opposite end of the clinic from the clinic staff – that are common occurrences that prevent a physical therapist from properly doing his job.

[0222] To address this fifth problem of inaccurate or lost reminders, the device and method according to the present application includes a reminder system or component. For example, under



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each patient's information could be a reminder section or option labeled "'remind me next time" or "reminder" or a similar indicator. To utilize this feature, the physical therapist can type a reminder note regarding the issue relating to the patient's physical therapy that needs to be addressed in the future. The note is then transmitted via the app or similar interface into the server and stored with the patient's records. When the patient visits the clinic the next time, the clinic staff members use the server portal to place the patient in the virtual waiting room and assign the patient to the physical therapist. The server will then access the reminder message and, if appropriate for that patient visit, send the reminder message to the physical therapist. In this way, a physical therapist needs to remember the note as long as it takes to type it into the system, and thus human error is minimized.

[0223] A sixth problem is that whenever a patient undergoes surgery and has follow-up physical therapy, the doctor in charge of the operation often has a set of "protocols" for the patient to go through at marked intervals of recovery. Each doctor has a different protocol for each operation, and each protocol has a different waiting period before the protocol may be implemented. Because of this, it can often be very difficult for a physical therapist to know and/or remember which patient has which protocol, and when each patient must progress through said protocol.

[0224] To address this sixth problem of tracking post-surgerical protocols, the device and method according to the present application includes a protocol section for each patient. In the portal of the server, users can upload a picture or scan of each doctor's protocols, along with the waiting period for each protocol. Whenever a patient has a surgery, he can inform a member of the clinic and they will input the information with the surgery date. When the protocol's wait-time has expired, the server will send a notification to the physical therapist assigned to the patient at the beginning of the patient's next visit, along with a note, as a description, and/or an image of the protocol itself displayed on the mobile device.

[0225] A seventh problem is that physical therapists and clinic staff in a clinic setting are constantly moving around to address patients, often multiple patients at one time. As such, keeping track of tasks can be very difficult as the workload increases.

[0226] To address this seventh problem of tracking post-surgerical protocols, the device and method according to the present application includes a "task list" in the app. Each user has his own task list that the user can modify at his own discretion. Users can manually add messages or notifications to the task list. The latter two options allow a physical therapist or clinic staff to keep important information for the clinic within easy reach without cluttering up the notifications on a mobile device.

[0227] The app will have similar functionality across different platforms and operating systems. The server will manage data transfer between users, store data relevant to the app usage, analyze user input, and contain a portal to the effect of these functions. Limited messaging will be a part of the functionality as well.

[0228] When accessing the app, the user will be able to do a number of functions, which include but are not limited to the tasks discussed in this paragraph. Users can set timers to each room/table in the clinic. Users can access separate lists, such as patients, gym, waiting room, employees, and

assign them to the rooms and users. Patients can be added to the gym/waiting room lists or assigned to a room via either app or server. Clinicians can be assigned to patients via app or server. Patient and employee lists can be managed via the server portal. Users can send and receive messages to and from other users logged into the portal. Users can manage a personal task list to keep track of priorities at the work place. Users can manage and display post-surgical protocols, and send notifications to alert clinical staff when progression is prescribed. The app can notify users of new information via the vibration function, with one setting for low priority, such as messages, and one setting for high priority, such as a timer going off or a new patient in the waiting room.

[0229] The main page of the app will primarily contain a list of rooms and tables in the clinic. From this page, the user can manage rooms and tables, including assigning patients and timers to the rooms and tables. From this page, the user can also access and manage lists of patients who are in the gym and in the waiting room. View options for the main page can be changed in the settings. For example, the main page can show only active/assigned rooms/tables as a default setting, but can be changed to show all tables or only rooms/tables in the user's work group.

[0230] A user can select a room/table to view its information, including the patient assigned to the room, the timer running, the clinician assigned to the room, and treatment details. The chat or messaging function allows users to message one another. The work space page is accessible from the menu. Viewing of all the employees can be organized by alphabetic order, employee title, work group, and work status, such as on duty or off duty. The work status and group status of the employees can be managed via the server portal. The patient list is also accessible from the menu. For example, when the menu page is first accessed, a patient search symbol could be visible, which symbol could be replaced with search results as the user begins typing in a name to search. When a patient's info is accessed, the clinician/work group to whom the patient is assigned could be displayed first, along with any timer assigned, and any notes and/or treatment information the user has entered. Both the patient and employee list information can be stored on the server.

[0231] When a message is received, or a timer/room is assigned to the user, or a patient is added to the waiting room by the secretary, a push notification or similar notification or message could be sent to the work group to whom the patient is assigned. The settings panel is accessible from the menu. From this panel the user will be able to access and/or change different information and settings, such as entering their login info into the app, changing user information, changing certain view options, viewing app information, and other settings functions. The menu allows the user to access different menus or lists on the app, such as patients, messaging, workplace, and settings. From the portal, the user has the ability to manage patient and employee lists and the addition of patients from the patient list to the waiting room list, and send and receive messages from users. The server also can be designed to permit analysis of app usage and information relating thereto, such as regarding the length of time patients remain in the waiting room, and the response time of users to assigned timers. The server portal could possibly be designed to automatically manage rooms, timers, etc., although in one exemplification only the app can perform such management functions, whereas the server portal cannot.



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[0232] The following is a description of how the app may be utilized in a physical therapy setting, although it should be understood that the functions and use of the app are not limited to this specific example. It should also be understood that the terms and menus used to describe parts or sections of the server portal and/or the app are for exemplary purposes only and are not meant to limit the exemplifications disclosed herein. Essentially any equivalent wording to the exemplary terms and phrases disclosed herein may be used in the app. For example, the following description may describe a user accessing a pop-up menu on the application. However, it should be further understood that a drop-down menu or any other similar interface could be utilized in place of a pop-up menu. In other words, well known alternatives could be utilized in place of the parts or components of the system described herein for purposes of example.

[0233] In a visit to a physical therapy clinic, a patient first enters the waiting room of the clinic and notifies the clinic staff of his presence. A staff member then checks the system via the server portal or the app to determine if the patient is registered in the clinic's patient database. If the patient is not registered, the staff member selects the "patient" tab or column on the main screen, and then selects "add patient" from a drop down menu. The staff member then enters the patient's information, such as name, date of birth, address, etc., into a pop-up dialogue box. As a possible alternative, the app could be designed to permit the patients themselves to access the app remotely, such as at home, so that the patients can enter their registration information into the app. In this manner, the patient can register as a new patient before arriving at the clinic.

[0234] It should be noted that the "menu" button provides access to essentially an overview of the clinic via the main informational sections of the app. For example, when a physical therapist presses the "menu" button on the app, several choices are listed, including, but not limited to, "rooms," "patients," "waiting room," "gym," "messaging," "task list," "settings," and "logout." The "rooms" button, when pressed, returns to the main page while a request is sent to the server for an update on room data. The server sends the information to the mobile device, and the main page now displays the current or updated data for the rooms and tables. The "patients" button switches to the patients page, and again a request is sent to the server for an update on patient data. The current or updated data is then shown on the patients page. Essentially any menu or page that requires the latest or current data can be automatically updated from the server when the menu or page is accessed. The "waiting room" and "gym" buttons switch to pages showing what patients are in the waiting room and the gym, respectively. The "messaging" and "task list" buttons access those features of the app. The "settings" button switches to the settings page. Finally the "logout" button logs the user out of the app so that the user no longer receives notifications or other information, such as when the user is no longer working for the day. More specific information regarding these buttons will be discussed herein below.

[0235] In addition to the patient information, the staff member also assigns the patient to a single physical therapist or a therapist group. It should be noted at this time that the therapist group could comprise any number of physical therapists and clinicians who work at the clinic. Assigning a patient to a therapist group can be advantageous since more than one person would be available to

address the needs of the patient. For example, a first physical therapist in the group may handle setting up a first patient's therapy session. That first physical therapist may also be scheduled to handle the conclusion of the first patient's therapy session. However, some instances may arise in which the first physical therapist is busy attending to a second patient when the first patient's therapy session is about to conclude. In this scenario, a second physical therapist in the therapist group could promptly attend to the conclusion of the first patient's therapy session, while the first physical therapist continues to attend to the second patient. As a result, all patients receive prompt and uninterrupted care, which improves efficiency and customer service, i.e., quality service and patient care.

[0236] Once all of the information for the new patient is entered by the staff member, the data is saved into the clinic's patient database. At this point the process is the same for both new and current patients. First, the staff member has the option of adding a "note" to the patient's information. The note may include many different kinds of specific information, including, but not limited to, information particular to the visit or therapy session, information relating to an ongoing therapy program, changes in a therapy program or in the patient's physical or health status, a reminder relating to scheduled changes and/or updates to the therapy program or session, special information regarding a patient's needs or requests, and other such information. In the case of a reminder or other such previously entered information, the note may already be in the system and thus may be present when the patient is logged in or registered. The notes could be listed in a section entitled "remind me" or "reminders" so that the physical therapist or members of the physical therapy group take care to read the note.

[0237] Regardless of whether a note is entered or not, or if a note is already present in the system, the patient is then added to a patient queue to await further processing. This can be done either automatically or by a staff member. When ready, the staff member can use the server portal to move the patient's name, such as by drag and drop, from the queue and into the "waiting room" section of the app. As an alternative, the queue section could be omitted and the staff member could add the patient directly to the waiting room, or the server could execute such a function automatically.

[0238] Once the patient has been added to the waiting room, an update is sent out in the form of a push notification from the server to the device(s) of the person(s) responsible for that patient, such as an individual physical therapist or physical therapy group. The patient's name is now listed in the waiting room and visible via the app by all staff in the clinic using the app. In addition, if there is a note present for the patient, the note is also included in the push notification. Otherwise, the push notification simply indicates that a patient has arrived in the clinic and is currently in the actual waiting room of the clinic.

[0239] After completion of the preceding steps and placement of the patient in the virtual waiting room, the patient will be sent to the appropriate treatment area in the clinic. The assignment of the patient is based on the type of therapy session. One assignment is to send the patient to the gym to perform exercises, and another assignment is to send the patient to an individual treatment room for

static treatment or other physical therapy. The assignment can be performed via the app or the server portal, either by a member of the clinic staff, a member of the physical therapy group, or possibly automatically by the server based on the scheduled therapy.

[0240] If the patient is scheduled to perform certain therapeutic exercises, then he is sent to the gym. In most instances, the physical therapist or a member of the physical therapy group assigned to the patient will access the app on his mobile device, select the patient from the waiting room, and then long press on the patient's name to bring up options for the patient. From those options, the physical therapist can select "Gym" to assign the patient to the gym. The mobile device then sends an update to the server to record the movement of the patient to the gym, and the name of the patient then appears on the gym list. Alternatively, a drag and drop system could be used in which the name of the patient is dragged from the waiting room list and into the gym list. The patient is then escorted, either by the physical therapist, a member of the physical therapy group, or a staff member, from the waiting room to the gym to perform the therapeutic exercises. In one exemplification, the app will simply list the patient as being in the gym. In another exemplification, the gym list could include sub-lists or sub-headings indicating specific areas in the gym to which the patient is specifically assigned, which could be advantageous for very large clinics with very large gyms and many therapy machines and areas.

[0241] Once the exercises are completed, the physical therapist or physical therapy group member will be notified, such as by a message, alert, or push notification. The physical therapist will then perform any necessary consultation, and then commence the next step in the therapy session. The physical therapist selects the patient's name in the gym list, such as by long pressing on the name in the gym list. A pop-up or similar menu will then appear with a list of choices. One of the choices is "remove patient" or "discharge patient." If the patient has successfully completed the exercises and no further therapy is needed, the physical therapist pushes on the "discharge patient" button. In one exemplification, a pop-up menu or dialogue box will appear with a message requesting confirmation of the discharge, such as by asking "Remove patient from gym?" or "Confirm discharge of patient?" or similar. If the patient is not to be discharged, the physical therapist selects "No" and the message disappears. If the patient is to be discharged, the physical therapist selects "Yes." An update is then sent from the mobile device to the server to record that the patient has been discharged. In another exemplification, the confirmation message can be omitted and the pressing of the "discharge patient" button immediately sends an update to the server that the patient has been discharged by the physical therapist. The clinic staff can then receive a message, alert, or similar notice, or simply note on the server portal that the patient is now listed as discharged or has been removed from the gym list. The clinic staff can then discharge or log out the patient.

[0242] If the patient is not to be discharged, one of the other possible choices in the pop-up menu could be an option for additional treatment, such as a "more treatment" button. When this button is pressed, a new menu or list appears with the list of available rooms. The patient can then be assigned to a room for additional treatment. The room assignment process is the same whether the patient is first sent to the gym, or immediately sent to the room from the waiting room. It should be



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noted that some physical therapy clinics have individual or private rooms, individual tables in a common area, or a combination of both. Thus, any discussion of rooms or treatment rooms herein should be understood as referring to both individual rooms and tables in a common area.

[0243] As discussed above, one option when a patient has been registered and placed in the waiting room is to send or assign the patient to the gym for therapeutic exercises. Another option is to send or assign the patient to an individual treatment room or therapy room or therapy table. During a therapy session or visit, a patient may be assigned only gym exercises, only therapy in a therapy room, or both. As discussed above, a patient may first perform exercises in the gym and then receive further treatment in a room. Alternatively, the patient can receive treatment in the room and then proceed to the gym for exercise. Whether the patient is assigned to a treatment room immediately after registration, or after exercising in the gym, the process is the same.

[0244] From the main menu, a staff member can drag and drop the patient's name from the waiting room to an empty room in a list of treatment rooms on the server portal. Alternatively, the physical therapist or physical therapy group member can use the app to move the patient from the waiting room to a treatment room. To do so, the physical therapist selects the patient name, such as by long pressing on the patient name in the waiting room list. A pop-up menu or dialogue box appears with a list of empty or unclaimed rooms. The physical therapist then selects one of rooms from the list, and the patient is added to the selected room. Whether initiated by the clinic staff via the server portal or by the physical therapist via the app, the server updates the information and now lists the patient as being assigned to the selected room. The clinic staff or the physical therapist or physical therapy group member then escorts the patient to the assigned room for treatment.

[0245] Either before, during, or after the patient is taken to the room, the physical therapist or a physical therapy group member accesses the room functions in the app, such as by long pressing on the room in the list. A drop-down menu or pop-up dialogue box appears with a list of room options. Some possible options include, but are not limited to, "set timer," "clear timer," "reassign room," "reassign therapist," "move to gym," "discharge patient," and "timer answered." Each of these menu choices can be selected and can initiate further pop-up menus or dialogue boxes depending on the function selected. For each of these menu selections, an optional yes/no dialogue box can be included that pops up to confirm whether or not the physical therapist wishes to continue with the particular selection. If "no" is selected, the dialogue box closes, whereas if "yes" is selected, additional dialogue boxes appear for the selected function. Alternatively, the app could be set such that the physical therapist can press either the "back" button on his mobile device, or anywhere on the screen outside of the dialogue box, to thereby exit the selected function.

[0246] The "set timer" function allows the physical therapist to set the time for a particular treatment or exercise. For example, the physical therapist may press "set timer," then enter the timer length. As an option, a yes/no confirmation screen can be included that pops up to confirm that the entered timer length is correct. As another option, once the timer is entered, another pop-up menu can be included that inquires if the timer has been assigned to an individual physical therapist or a physical therapy group. As discussed above, the patient should ideally be assigned to a physical therapist or



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physical therapy group when first registered in the clinic. If an individual physical therapist or physical therapy group has been assigned, then no further action needs to be taken, and the timer information is updated on the server for the selected room. However, if the patient has not been assigned to a physical therapist or physical therapy group, the physical therapist can assign the patient and the room to either himself, another physical therapist, or a physical therapy group. In the case of an individual assignment, the physical therapist can access a list of physical therapists, and then can either select his own name or the name of one of the other physical therapists and assign that name to the room. In the case of a group assignment, the physical therapist can access a list of physical therapy groups and select the desired group. The "set timer" button can also be accessed once a timer has been set to allow the physical therapist to cancel the current timer and set a new timer, or to edit the current timer to add or subtract time. As an alternative, a separate "reassign timer" or "change timer" button could be used strictly for editing the original timer or setting a new timer. A "clear timer" option can be included to allow the physical therapist or physical therapy group member to cancel or clear out a timer, such as in the case of an incorrect timer length or a timer that is no longer needed. After any of the above changes and/or selections, the assignment and timer data is then uploaded to the server.

[0247] During or before the therapy session in a particular room, the physical therapist or physical therapy group member or clinic staff can choose to change the room and/or the assigned physical therapist or physical therapy group by selecting the "reassign room" button and/or the "reassign therapist" button from the room function menu. Each of these buttons can access the room list and/or the patient list and/or the therapist list so that the patient can be assigned to a different room and/or to a different therapist. Before, during, or after the therapy session in a selected room, the physical therapist or physical therapy group member or clinic staff can choose to send the patient to the gym for exercise by selecting the "move to gym" button from the room function menu. The gym options are discussed herein above.

[0248] Similar to the gym options, another room option would be a "discharge patient" or "clear patient" button or selection. If the patient has completed therapy in the room and no further therapy is required, then the patient can be discharged by the physical therapist by selecting the "discharge patient" option.

[0249] The setting and assignment of timers is the most common and important of the room functions. The timer dictates the length of the therapy, which is important to effective therapy, and notifies the clinic staff when the therapy is complete, which is important to patient care and customer service. For example, if no one on the clinic staff is assigned to the timer, a patient may then be left to wait for an undesirable amount of time until a staff member notices that the therapy is complete. As discussed above, once a timer is set, it is either automatically assigned to the physical therapist or physical therapy group previously assigned to the patient, or it can be manually assigned to a physical therapist or physical therapy group. If the physical therapist entering the timer data assigns the patient or room to himself, the information is uploaded to the server. The physical therapist then waits for an alarm or alert to be sent to his mobile device, such as by push notification, some time in



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advance of the termination of the timer. For example, such an alarm or alert could be sent 30 seconds, one minute, 90 seconds, two minutes, or essentially any amount of time, prior to the termination of the timer. The time is selected based on how much time the physical therapist believes would be sufficient to allow him to go and attend to the patient at approximately the expiration of the timer so that the patient receives prompt attention. The alert itself can be done by vibration of the mobile device so that the alert is not noisy and disruptive to patient care.

[0250] As discussed above, the physical therapist entering the timer data, i.e., the first physical therapist, can assign the timer to another physical therapist, i.e., the second physical therapist, who can be either an individual physical therapist or a member of a physical therapy group. When the first physical therapist assigns the timer to the second physical therapist, a push notification or alert is sent to the mobile device of the second physical therapist. A pop-up menu then inquires whether or not the second physical therapist wishes to accept the timer assignment. If he answers "yes," then the timer is successfully assigned to the second physical therapist and uploaded to the server. The process then proceeds for the second physical therapist in the manner discussed above for the first physical therapist. If the second physical therapist answers "no" to not accept the timer assignment, either the assignment remains with the first physical therapist or is assigned to a physical therapy group, if such is available.

[0251] It is not required that a timer be assigned to a specific individual physical therapist, but rather the timer can be assigned to a physical therapy group as a whole. Whether this group assignment is done automatically or manually, the subsequent process is the same. In a similar manner as for an individual physical therapist, when the assigned timer is approaching zero, an alert is sent out, such as two minutes before the timer will reach zero. If an individual physical therapist is assigned to the timer, the alert or alarm only goes to the individual physical therapist. However, if the timer is assigned to a physical therapy group, all members of the physical therapy group receive the alert. At this point it is up to one of the members of the physical therapy group to accept responsibility for the timer and the patient.

[0252] When the alert is received, either by an individual physical therapist or the physical therapy group, a response to the alert must be entered into the app. The person(s) receiving the alert will have the option to respond in the affirmative or negative, such as by choosing "I got it" or "I can't", or equivalent phrasing indicating whether or not the person can tend to the patient. Once a physical therapist or other clinic staff accepts the timer, the results are uploaded to the server. Again, the physical therapist accepting the timer may be the physical therapist originally assigned to the timer, or may be a new physical therapist who has agreed to accept the timer assignment, or may be a member of the clinic staff, such as physician's assistants, nurses, etc. In addition, the original physical therapist has the option to reassign a timer that was originally assigned to him in the event that he is unable to attend to the patient when the timer reaches zero.

[0253] Once a physical therapist or staff member accepts the timer assignment, the patient and the timer are now the responsibility of that person. Any additional alerts, such as an additional alert at a time closer to the expiration of the timer, or an alert when the timer has expired or reached zero, will



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only be sent to the person who accepts the timer. Therefore, even if the timer was originally assigned to a physical therapy group, no more alerts will go to the other members of the group who did not accept the timer assignment.

[0254] If the physical therapist or a member of the physical therapy group cannot accept the timer assignment for some reason, then that person answers in the negative on the app. If the timer has been previously assigned to an individual physical therapist or physical therapy group member, then it is the responsibility of that person to reassign the timer to another person. In such a situation, the physical therapist or physical therapy group member accesses the options listed for that room on his app and selects "reassign therapist." The process then proceeds in the same manner as the original assignment of a physical therapist to the timer until someone in the clinic accepts responsibility for the timer. If the timer has been assigned to a physical therapy group, the alert to accept the timer will stay active until some member of the physical therapy group accepts the timer. If no person in the group accepts the timer, then another alert will be sent out at or near the expiration of the timer. Such an alert could be designed as a "high priority" alert to let the members of the physical therapy group know that someone must answer the alert immediately and accept responsibility for the timer and the patient. This approach is advantageous in situations where the primary physical therapist of the physical therapy group, for example, is busy with a patient or some other clinic task. Another person can be quickly and virtually automatically assigned to handle the physical therapist's responsibility to check on the patient. As a result, the patient does not have to wait a prolonged time to be attended to, and the physical therapist does not have to interrupt his current task. Such an approach draws on all of the resources of the clinic, as persons who may not be very busy or are generally available can be scheduled or requested to step in to assist those with a heavier work schedule, thereby maintaining a balanced division of labor and promoting optimum use of employee time.

[0255] Even if a physical therapist or physical therapy group member has accepted a timer assignment or reassignment, he can still further reassign the timer to another person. For example, if a physical therapist in a physical therapy group member receives the notification that a timer will be expiring in two minutes, he may respond in the affirmative. However, an unexpected event may occur in those remaining two minutes that requires the attention of the physical therapist. Again, it is his responsibility at that time to reassign the timer to another physical therapy group member, even if the timer is near expiration. However, if the timer has expired and the physical therapist then concludes that he cannot attend to the patient in a reasonable amount of time due to an unexpected event, he will be unable to reassign the timer because the timer has expired, i.e., the timer effectively no longer exists. In this situation, the physical therapist must then personally message another physical therapy group member to attend to the patient, such as via the messaging portion of the app.

[0256] When the timer reaches zero or expires, an alarm or alert is sent to the assigned physical therapist or physical therapy group member, or to all physical therapy group members if no one has accepted the timer. The assigned person then visits the patient in the selected room. The assigned



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person can then access the room menu and select "timer answered" to indicate that he has attended to the patient. Once the "timer answered" button is pressed or after the timer expires, the server is updated to reflect that the timer has expired.

[0257] In one exemplification, a color-coding system can be used to further indicate the status of a timer, such as how much time is approximately left in the timer. For example, the timer could be listed initially in green when it first starts to let the app users know that the timer is far from expiration. Then, part way through the time, the timer could be listed in yellow or orange to indicate a substantial portion, such as half, of the time has expired. The timer could then be listed in red to indicate that the timer is near expiration, such as within the last two minutes to 30 seconds. Finally, the timer could be listed in gray to indicate that the timer has expired, and also to notify other physical therapists and physical therapy group members that the treatment was completed. In this manner, a physical therapist or physical therapy group member could quickly ascertain the general status of the timer at a glance. The preceding are possible examples, and essentially any color scheme at any desired time interval could be utilized in at least one possible exemplification.

[0258] Such an approach solves the problem of inefficient patient care by promoting timely response to the conclusion of therapy via the use of all clinic staff. For example, in one scenario, after the patient finishes his workout, he notifies the physical therapist, who then may take the patient to the assigned room and ask the patient to do a specific exercise for ten minutes. While tending to the patient, the physical therapist's mobile device starts vibrating, indicating that he has received a new alert or push notification. In this scenario, the new push notification is from the clinic staff, indicating that a new patient is in the waiting room and needs evaluation. The physical therapist accesses the app and sets a ten-minute timer for the room for the patient he is currently attending. Since the physical therapist knows that it is likely that the new patient will require more than ten minutes of his time, and since the current patient will likely not require further consultation, the physical therapist assigns the timer to a member of the clinic staff or an assistant. The assistant then receives a notification on his mobile device that the timer is now assigned to him, and he responds by accepting the timer.

[0259] After acknowledging the appropriate alerts, the assistant attends to the patient around the end of the ten-minute timer. After confirming completion of the exercises, the assistant prepares to discharge the patient. However, in talking with the patient, the assistant discovers that the patient is experiencing a new pain. Since the physical therapist is still busy with the new patient, the assistant records, via the app on his mobile device, a short message to the physical therapist detailing the patient's situation. The assistant can also record a second message to the clinic staff detailing the patient's situation, which message is then added to the patient's file for further or future evaluation. The patient is finished for the day, and the assistant discharges the patient by selecting the discharge option in the app. The server receives the discharge notice and updates the room and patient lists so that the patient's name is now cleared from the room, and the room is now listed as being available.



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[0260] As can be understood from the preceding hypothetical scenario, the app system advantageously allows a physical therapist to effectively manage multiple patients essentially without sacrificing efficiency or quality patient care. Instead of the physical therapist running from room to room and patient to patient in an inefficient and disorganized manner, the physical therapist can be aware of the status of all patients in the clinic, and can manage the time and efforts of himself and the entire clinic staff for maximum productivity.

[0261] As discussed above, the app has a main menu that permits access to various components of the app and the information therein. For example, a user, such as a physical therapist, a physical therapy group member, or a member of the clinic staff, may wish to check the waiting room list or gym list. In one exemplification, the user goes to the main page, on which is located an image of a chair, which represents the waiting room, and an image of a dumbbell, which represents the gym. Upon selecting one or the other, the server updates the chosen list to the current status for viewing by the user on his mobile device.

[0262] Also on the main page, or possibly in the main menu, can be located a "change view" button. The "change view" button is used if the user wants to change the room view options. After pressing the "change view" button, three choices are displayed: the name of the clinic, the name of the user's work group, and the user's user name. If the user chooses the clinic name, which could possibly be a single clinic or a list of clinics, the main page displays all of the rooms in the clinic. If the user chooses his work group, or possibly another work group, i.e., a physical therapy group, the main page displays all of the rooms assigned to the selected work group. Finally, if the user chooses his user name, or possibly the name of another clinic member or worker, the main page displays all of the rooms assigned to the selected person.

[0263] Another feature of the app is a messaging feature. If the user wants to send a message from his mobile device to another person in the clinic, the first question to be answered is whether the user wants to send a message regarding a specific room, or simply a general message. If a general message, the user clicks a message icon on the top corner of his mobile device. The mobile device then switches into messaging mode via the app to send a general message much like any messaging system. A pop-up dialogue box or other messaging interface lists online users who are logged into the app, and could possibly also list all users, including users who are not logged into the app but are part of the clinic staff. The user selects a person to send a message to, enters the message, and then sends same when finished. The message is stored in the server, and then, if the recipient is logged into the portal, the message is forwarded to the recipient via the recipient's mobile device or the server portal. Alternatively, messages could possibly be stored in the server until the recipient logs into the portal.

[0264] If the user wishes to send a message regarding a specific room, the user navigates to the room page if he is not already there. The user can navigate to the room page by accessing the main page, then swiping on or pressing the specific room from the list of rooms. When on the room page, the user clicks a message icon or "message" or "messaging" button on the room page, such as in the bottom right corner. A confirmation message pops up asking if the user wishes to send a



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message. If the user responds no, the messaging dialogue box closes. If the user responds yes, then a pop-up dialogue box appears with the list of clinic staff actively logged into the portal. Since the messaging process was initiated from a room page, when the user selects a person to send a message to, the app not only opens the messaging screen, but automatically fills in the re line with the room name/number and the patient name. The user then fills out and sends the message as described above.

[0265] One advantageous feature of the app is that the messages can be stored in the server as part of the overall records for future reference and accurate record keeping. Alternatively, the name of a patient can be tagged in the message, and then the message can be automatically stored in the electronic records pertaining to that patient. In this manner, information pertinent to the patient is saved in the records. As another option, the app can include a messaging alert feature for high priority messages that require immediate attention. Such messages will be received by a recipient in conjunction with an alert sound or vibration.

[0266] If a user wishes to view patient information, the user accesses the "patients" button on the menu. Again, the server first updates the patients list on the user's mobile device so all data is current. The mobile device then displays the patients page, which could be limited to a list of persons currently in the clinic. Alternatively the patients page could simply list all patients, such as alphabetically or chronologically by therapy visit dates. As another alternative, no patient names would be listed in the patient page. Regardless of the initial state of the patients page, the user can type a patient's name in a search bar, and the server starts to generate a list of patients from the database that match that search criteria. From the list of patients, the user can select a patient by clicking on his name. The mobile sends the request to the server, and the server sends the specific patient information to the mobile device. The patient page now lists the specific patient information, which can include, but is not limited to, the patient name and biographic data, total treatment time, timer information, assigned therapist or therapy group, and billing data, such as billing timers and billing units.

[0267] If an app user wants to edit patient information, it is possible to do so from his mobile device. If the user is not already on the patient information page, he can navigate to a particular patient as discussed above. On the patient information page, the user presses on the "edit" button and then is free to edit the patient details. When finished, the user presses the "back" button on his mobile device, at which time a dialogue box appears requesting to save changes or not. If the user selects "yes," the changes are saved and the mobile device sends the updated information to the server. If the user selects "no," the changes are discarded.

[0268] If an app user wants to assign a patient to a room, it is possible to do so from his mobile device. The user can assign a patient to a room from the waiting room page or the gym page in the manner discussed herein above. If the user is on the patient information page, as discussed above, the user can press the "assign to room" button. The process at that point is the same for assigning rooms, timers, etc., as discussed above.



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[0269] If an app user wants to view room information, it is possible to do so from his mobile device. If the user is not on the main page, he selects the menu button and then "rooms." The mobile device then requests and receives updated information regarding rooms and/or tables from the server, as discussed above. Once the room information is updated, or if it is already updated, the user presses on the room he wishes to view. The room information page then opens up. Updated room information for that specific room is then requested and received from the server, and then displayed on the mobile device.

[0270] If an app user wants to add a task to the task list, it is possible to do so from his mobile device. There are three ways a task can be added to the task list: by notification, by manual addition, or by message. For notifications, the user receives a notification that he wishes to add to his task list. The user then presses the "add to task list" button on the notification before selecting to acknowledge the notification. The notification then appears as a task in the task list. For manual addition, the user first navigates to the task list by selecting "task list" from the menu, and then selects "add task." The user then enters the task information, and selects "save" to cause the task to appear in the task list. For messaging, the user has or receives a message he wishes to add to the task list. The user navigates to the message, and then long presses on the message. A pop-up menu appears and the user selects "add to task list" from the menu to cause the message to appear in the task list. If the user wants to delete a task from the task list, he can check a box next to the task to indicate that it is completed. A pop-up window requests confirmation that the task is completed, and, upon approval, the task is removed from the task list.

[0271] As discussed herein above, another important feature of the app is the ability to manage special patient protocols. For example, if a patient has a surgery of some kind, there may be special protocols for physical therapy related to the surgery, such as, but not limited to, restrictions on certain exercises and/or treatments, a schedule of physical therapy goals, or a specific time line for when certain therapies are to be performed. When a patient registers in the clinic for a therapy session, the patient either notifies the clinic staff of the surgery, or the information regarding the surgery is sent to the clinic from the patient's surgical physician. If the surgery does not require a protocol, then the information is noted in the records but no further action is taken. If the surgery does require a protocol that has not yet been entered into the system, the clinic staff enter the protocol into the system through the server portal.

[0272] To do so, the user navigates to the physical therapist page on the terminal or portal and selects "add protocol." A pop-up window requests the name of the protocol and waiting period for the procedure. As an alternative, a drop-down menu or similar dialogue box could possibly be used which lists many common protocols for common surgeries, such as orthopedic surgeries. After the protocol is entered, the system asks or a protocol image. If an image is available, the clinic staff scans or selects the image and uploads it into the server. The image is generally a picture or scan of the specific protocols issued by the patient's doctor, along with the waiting period for each protocol. For example, a protocol may require that the patient not lift any weights for two weeks after a shoulder surgery. There can be multiple protocols that cover different time frames, which would be



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and currently are rather difficult for the physical therapist and his staff to track and manage. In the system according to the present application, all of the different protocols are entered into the system and the time line for each protocol is tracked. Therefore, when a protocol's wait-time has expired, for example, the server will send a notification to the physical therapist assigned to the patient at the beginning of the patient's next visit, along with a note as a description and/or an image of the protocol itself displayed on the mobile device. The physical therapist is then easily made aware that the wait-time has expired and the patient can begin the next protocol. Once the protocol is in the system, the clinic staff select "assign protocol" from the patient page. A pop-up window requests the date of the surgery, which is entered by the clinic staff, in order to calculate the time line for the protocols. The system is then set to notify the physical therapist, such as by push notification, regarding each protocol for each patient at the appropriate time, which notification can contain the protocol notes and any images containing protocol information. The system can be set to notify the physical therapist regarding several protocols for each patient. Since these protocols could span weeks or months, it is easy for the physical therapist and/or the patient to lose track of what protocols are to be executed and at what time. By tracking all of these protocols in the system, such confusion can be avoided or minimized.

[0273] Smartwatches can also be used in specific physical therapy testing. In some therapies, it is necessary for the physical therapist to perform a range of motion test or diagnostic on a patient. A range of motion test is performed when testing how far a patient can move an extremity. For example, a patient might normally have a range of motion for his shoulder that permits him to lift his arm straight up above the level of his head. However, if a patient has a shoulder injury, he may not be able to lift his arm above the level of his shoulders or his head. In other words, his current range of motion for his shoulder is less than the original range of motion for his shoulder. However, with therapy and healing of the injury, the patient should gradually regain his original range of motion, or at least make advances toward his original range of motion, even if the original range of motion cannot be achieved. A range of motion test is therefore performed to find the current range of motion after an injury, and is performed routinely thereafter as a gauge of the efficacy of therapy and to track the healing process.

[0274] In order to measure range of motion and joint angles, a goniometer is used. This measurement instrument is a helpful, clinical tool that allows for objective measurements in order to accurately track progress in a rehabilitation program. In most instances, the goniometer comprises two plastic or metal arms that are generally about twelve inches long. The arms are attached to one another at a pivot point, much like a pair of scissors. The goniometers are marked with one degree increments and other measurements.

[0275] When using a goniometer, the physical therapist must hold the goniometer in place next to the limb or part of the body to be measured. The physical therapist must find by palpation or touch reference points or areas on the body to locate the goniometer. The physical therapist then instructs the patient to move the limb or other part of the body while the physical therapist holds the goniometer. Once the range of motion test is completed, the physical therapist must put down the



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goniometer and record the result. After recording the result, the physical therapist must place the goniometer in the desired location with respect to the patient's body and perform another range of motion test.

[0276] A problem with this current use of goniometers is that the range of motion measurements need to be manually entered into a computer or mobile device, or even simply written down. Such recording of data takes time and requires the physical therapist to put down the goniometer. The physical therapist then has to start the range of motion test all over again. Stopping and starting the range of motion test over and over is quite inefficient in terms of time, and can be inaccurate in terms of measurements. For example, it can be difficult to find the same reference point to obtain the most accurate measurement data. In addition to these obstacles, many times a physical therapist needs to assist a patient in stabilizing a limb in order to allow the patient to even move the limb, such as if a patient has had surgery or a substantial injury. Since the goniometer requires the use of both hands, it is virtually impossible to manually stabilize a limb of a patient and simultaneously perform the range of motion test and measurements with the goniometer. One other problem with goniometers is the correctness of the reading is not always accurate. Issues with the intra-measure (between measures) and inter-tester (between clinicians) reliability seem to increase as the experience of the examiner decreases. Some studies suggest that these errors can be anywhere between five and ten degrees when completing repeated measures.

[0277] In one possible exemplification, the goniometer is equipped with a wireless connection device that allows the goniometer to connect to a server for the transmission of measurement data. The goniometer can also be equipped with an interface for the physical therapist to allow the physical therapist to access patient and measurement information, and input measurement data. In another possible exemplification, the goniometer is additionally equipped with appropriate electronics and/or measuring devices, such as an accelerometer and/or gyroscope, to detect the range of motion automatically, rather than the physical therapist taking and inputting the measurement. Regardless of how the measurement data is obtained and entered, the information can be automatically uploaded from the goniometer to the server and stored in the EMR without the need of data entry by the physical therapist or other clinic staff.

[0278] The following scenario describes a possible exemplification of a goniometer equipped with an interface and electronic measuring devices, and its use in an overall therapy method. First, a patient arrives in the clinic for an evaluation, reevaluation or when the clinician needs to assess where a patient is in their progress. Upon checking in, the front office staff verifies if a protocol is assigned to the patient in the server. If no protocol has been assigned, the server sends the clinician a notice that no protocol is assigned. At that time, the clinician makes or selects a therapy treatment protocol through the server or his mobile device using the app. The QR code tags are scanned on the goniometer device to upload the patient testing templates. Activation is then sent to the server and the goniometer device is paired with the system wirelessly. When it is time to perform the range of motion test(s), the clinician uses the interface on the goniometer, which can be a small touchscreen, to select a template and load the preselected body parts to be measured. The clinician



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then confirms on the screen the body part and side to be measured. The first range of motion test is then loaded for the involved side, i.e., the side with limited range of motion. The clinician then performs a first measurement, and the results are displayed on the goniometer interface. The clinician can then choose either "accept," "test again," or "skip" on the interface. If the first measurement is accurately performed to the satisfaction of the clinician, he chooses "accept." The first measurement is then stored and the next measurement protocol is loaded. If the first measurement is not accurately performed to the satisfaction of the clinician, he chooses "test again" and then repeats the test. If the first measurement shows that the patient is within normal limits for his range of motion, i.e., his range of motion is not restricted, then the clinician chooses "skip" and proceeds on to the next measurement protocol as needed. Once the designated numbers of measurements have been tested, the clinician will move on to measure the non-involved side, i.e., non-restricted or uninjured side, for a baseline comparison. For example, if a patient's right shoulder is injured or has reduced range of motion, the right side is the involved side, and the left side is the non-involved side since the left shoulder has full range of motion. The non-involved side allows the clinician to establish a baseline for what may constitute a "normal" range of motion for the limb or body part in question, which can be used to compare with the restricted range of motion on the involved side. The same steps or options are performed for the baseline comparison. Once all measurements are completed, the data will be uploaded to the EMR and saved to the patient's file.

[0279] However, even with electronics built into the goniometer itself for the recording and transfer of data, the physical therapist still must hold the goniometer in place during the testing. In another possible exemplification, the functions of the goniometer can be performed using a smartwatch that includes accelerometers and/or gyroscopes. Instead of the measuring devices and electronics being built into the goniometer, the smartwatch contains such technology. The smartwatch is worn by the patient during a range of motion test, thereby freeing the physical therapist to do other things, such as guide the patient in the testing motion and/or manually stabilize the patient's body or body part. There is no tool to pick up or put down as the measurement device – the smartwatch – is supported on the patient.

[0280] According to one possible exemplification, to perform a range of motion test using such a smartwatch, the physical therapist first selects the patient within the mobile app. A display will appear asking if the physical therapist wishes to obtain a range of motion and/or perform a range of motion test. The physical therapist answers "yes" and then is prompted to select an active range of motion (body part moved without assistance from physical therapist) or a passive range of motion (body part moved by physical therapist). After choosing between active or passive range of motion, a body part recorded in the patient's record, such as "right shoulder," will appear on the mobile app. A menu will then pop up that gives the option to select from different options, such as "all within normal limits," "capture on watch," or "enter manually." To further explain, in most range of motion testing, the physical therapist will first perform a screening by instructing the patient to move the body part in different ways. If no restriction in movement or other difficulties are readily apparent, and the patient makes no complaint during any of the movements, the physical therapist can



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reasonably conclude that there is no injury. In such a scenario, the physical therapist would select "all within normal limits" to cancel any range of motion testing for that body part and move on to the next test as needed. If restrictions or difficulties are observed, then the physical therapist will proceed with the range of motion testing. At that point the physical therapist will select "capture on watch" to automatically detect and record testing data. A signal is sent to the server, and the server identifies that the watch is assigned to a specific patient for the day. The server will then send back to the watch information for displaying the selected range of motion test, such as, for example, passive range of motion flexion. The therapist can then choose either "skip" or "start." "Skip" is chosen if the particular range of motion test is unnecessary due to the patient performing full, unrestricted motion for that particular test. However, if the test is needed, the physical therapist selects "start." The physical therapist then taps anywhere on the display to set the initial measurement value to zero. The clinician will then execute the range of motion test by moving the body part of the patient in the desired manner as far as possible. When the movement or motion has reached its limit, the physical therapist presses anywhere on the screen to capture the range of motion measurement. At this point a message is displayed with the captured data and/or a message requesting confirmation of the test. If the physical therapist is satisfied with the test, he will press yes to approve the test, and the system will then queue the next measurement. Alternatively, the system could be designed such that whenever data is captured, the system will confirm the capture and then automatically queue the next measurement. The process will continue until all schedule range of motion tests are completed. All measurements will be uploaded to the system and stored in the EMR for the patient.

[0281] Manual muscle testing is a procedure for the evaluation of the function and strength of individual muscles and muscle groups based on the effective performance of a movement in relation to the forces of gravity and manual resistance. Dynamometry is a method of strength testing using sophisticated strength measuring devices, e.g., hand-grip, hand-held, fixed, and isokinetic dynamometry.

[0282] When performing strength testing, a particular muscle or muscle group is first isolated, then an external force is applied. Resistance applied at the end of the tested range is termed a "break test." The handheld devices used in dynamometry can help quantify the "breaking force" necessary to depress a limb held in a specific position by the patient. Resistance should be applied and released gradually to give the patient sufficient time to offer resistance. Following the manual muscle test, the muscle tested is said to be "weak" or "strong" based upon the muscle's ability to resist the externally applied force over time. Currently a grading system is used for manual muscle testing. There are three notable manual muscle testing scales: the Medical Research Council (MRC); Daniels and Worthingham (DW); and Kendall and McCreary (KM). MRC uses a numeric scale of 0-5, DW uses words like poor and normal, and KM uses a percentage scale. The highest scores indicate that the patient holds the test position against moderate to maximum resistance, whereas the lowest scores indicate very little to no muscle contraction or movement.



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[0283] While these scales all measure muscle strength and functionality, they are all different to some degree. In the MRC scale, the grades of 0, 1, and 2 are tested in the gravity-minimized position (contraction is perpendicular to the gravitational force). All other grades are tested in the anti-gravity position. The DW grading system is considered the more functional of the three grading systems because it tests a motion that utilizes all of the agonists and synergists involved in the motion. The KM approach is designed to test a specific muscle rather than the motion, and requires both selective recruitment of a muscle by the patient and a sound knowledge of anatomy and kinesiology on the part of the clinician to determine the correct alignment of the muscle fibers. Choosing a particular grading system is based on skill level of the clinician while ensuring consistency for each patient, so that coworkers who may be re-examining the patient are using the same testing methods. However, it must be remembered that the grades obtained with manual muscle testing are largely subjective and depend on a number of factors including the effect of gravity, the manual force used by the clinician, the patient's age, the extent of the injury, and cognitive and emotional factors of both patient and clinician.

[0284] The test should be completed on the uninvolved side first to ascertain normal strength before being repeated on the involved side. The patient is instructed to complete the test movement again and then hold the body part in the desired position. The clinician alerts the patient that resistance will be applied and then applies resistance in the appropriate direction and in a smooth and gradual fashion.

[0285] There are a number of issues within the current treatment procedure. One problem is that manual muscle testing is a measurement assigned by the clinician and is not objective data so it can differ from clinician to clinician. According to one exemplification, a standardized device (dynamometry) can be used that can eliminate the discrepancy from clinician to clinician. Clinicians would no longer need to use an arbitrary scale, but rather could use an accurate gauge based on a template in the system. Another problem is that data needs to be manually entered into a computer or mobile device, which takes time. According to one exemplification, once a patient completes their assigned protocol and baseline comparison, all data is uploaded to the server and stored in the EMR.

[0286] The following scenario describes a possible exemplification of a manual muscle testing method. First, a patient arrives in the clinic for an evaluation, reevaluation or when the clinician needs to assess where a patient is in their progress. Upon checking in, the front office staff verifies if a protocol is assigned to the patient in the server. If no protocol has been assigned, the server sends the clinician a notice that no protocol is assigned. At that time, the clinician makes or selects a therapy treatment protocol through the server or his mobile device using the app. Once a protocol is assigned in the server, the QR code tags are scanned on the watch and on the manual muscle testing device to upload patient templates. Activation is then sent to the server and the manual muscle testing device is paired with the system via Bluetooth or Wi-Fi. The clinician will select a template on the involved side and load the preselected body part(s) to be tested. The clinician then confirms on the screen the body part and side. Test muscle/muscle group #1 is loaded on the



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involved side. The clinician tests the peak muscle strength which is displayed on the watch device. Options will be given to "accept," "test again," or "skip." If "accept" is chosen, the test for the muscle/muscle group #2 is loaded and then the clinician proceeds. If "test again" is chosen, the clinician repeats the process again. Choosing "skip" indicates that the patient is within normal limits. Once the designated number of muscles/muscle groups have been tested, the clinician will move on to test the non-involved side for a baseline comparison. The same steps/options are preformed for the baseline comparison. Once all testing is complete, the data will be uploaded to the EMR (Electric Medical Record) and saved to the patient's file.

[0287] According to one exemplification, a manual muscle testing device that can be used by itself or in conjunction with an EMR system, such as is described herein, is a glove device that can be worn by either the patient or the physical therapist, depending on the therapeutic procedure. The glove device has a body portion that fits around the hand of a user. The body portion is a partial glove that covers only the palm area of the user's hand with the fingers exposed, or is a complete glove that covers the entire hand of the users including fingers. The body portion can be made of cloth, fibrous material, plastic, mesh, nylon, polyester, or elastic material, with or without one or more securing straps. The securing straps could include a securing structure comprising hook and loop material or other temporary securing or holding or locking structures.

[0288] Attached to the body portion is a sensor portion that includes one or more pressure sensors located in the palm of a user's hand when the glove is worn. The pressure sensors could be flexible force sensors or other types of malleable sensors. The sensor portion is connected by wiring to a control device, such as a microcomputer, which is connected wirelessly to the EMR server. The information received from the sensor portion is then transmitted to the clinic server. As an alternative, the glove could be located at a particular treatment station and wired into a source of power and a data communication platform to transmit testing data to the clinic server. The sensor portion could also be divided into two portions, each wired to the control device.

[0289] In most manual muscle testing procedures, the physical therapist grips or presses against the body part of the patient to be tested. The physical therapist often estimates by feel the relative strength or weakness of the body part. Not only can this be inaccurate, but the data can be very subjective depending on the physical therapist conducting the test. In other cases, the physical therapist uses a handheld pressure sensor device, which is pressed against the body part being tested. The pressure measurement is more consistent and accurate than measuring by feel, but often the devices can be cumbersome and awkward to use. They can also be painful for the patient when they are pressed against the body part of the patient as the structure of the devices is often firm, rigid, or hard. The glove device, according to one exemplification, addresses these deficiencies. Since the glove device includes one or more pressure sensors, consistent, accurate, and objective data can be obtained that does not vary from physical therapist to physical therapist. The pressure sensors themselves can be made of soft and/or flexible material, and can be housed in soft and/or flexible material. Thus, when the pressure sensors are pressed against the patient's body part, pain and/or discomfort is minimized or eliminated. By placing the pressure sensors in a



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glove worn by the physical therapist, the pressure sensors take advantage of the natural gripping position or action of the human hand. Instead of possibly awkwardly holding a pressure device and trying to maneuver the device into the desired testing position to obtain the desired data, the pressure sensors can be easily positioned and manipulated as essentially an extension of the hand of the physical therapist. For example, should a physical therapist wish to test arm strength of a patient, the physical therapist can simply grasp the patient's arm and have the patient resist the pushing or pulling force of the physical therapist, or vice versa. Such a method would not only be comfortable for the patient, but also comfortable for the physical therapist, thereby promoting fast and accurate manual muscle testing. In addition, if the physical therapist wishes to test two or more motions, such as pushing and pulling by the arm of a patient, the physical therapist either judges by feel or uses a handheld device. The handheld device must be re-positioned for each different motion and direction of movement, which can be awkward and inefficient. In contrast, the glove can be designed so that the physical therapist just needs to grasp, in this scenario, the arm of the patient one time, and then push or pull the patient's arm in different motions, or have the patient execute different motions against the resistance of the physical therapist. To achieve this versatility, the glove can include multiple pressure sensors in the sensor portion to pick up pressure data from different motions. The sensor portion can even be divided into two separate sections with separate pressure sensors. This design can possibly increase comfort for the patient and control for the physical therapist as thicker cushioning material could be used, and the patient's body part can better settle into the groove or gap between the two sections for improved gripping. Different sensors in the separate sections could also be designated as measuring different motions or movements.

[0290] The manual muscle testing procedures are guided by a patient template that is uploaded to either the mobile device of the physical therapist, or possibly to the manual muscle testing device, such as the glove device. For that purpose, the glove device could include a display built into the control device, or possibly located elsewhere on the glove, such as on the back of the glove. Regardless of where the patient template is displayed, the display will show the first manual muscle test to be performed. If the patient initially demonstrates full strength and freedom of movement for that particular test, the physical therapist can choose to skip the test and move on to the next one. If the patient does not, then physical therapist conducts the test as instructed on the display. When the test is completed, the test results or data are shown on the display. In the case of the display being on the mobile device of the physical therapist, the test results are first sent from the control device on the glove to the server, and then relayed from the server to the mobile device. In the case of the display being on the glove itself, the test results are immediately shown on the display on the glove. At that point the physical therapist can either accept the test results if he believes the test was done properly or accurately, or reject the test results if he believes the test was not done properly or accurately. If he accepts the test results, the data is uploaded to the server and matched to the patient's record, and the display then shows the next test to be performed, if any. If he rejects the test, results, the display shows the test again and the physical therapist performs the test again,



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as many times as necessary until the test results are accepted. This process is repeated until all tests are performed and the results accepted and stored.

[0291] Figure 39 shows an exemplification of a glove 39.1 for manual muscle testing on a hand of a user. The sensor portion 39.2 is attached to the body portion 39.3 of the glove 39.1. Wiring 39.4 is connected to the sensor portion 39.2 and attached to the body portion 39.3. Figure 40 shows the back of the glove 39.1. A palm strap 40.1 and a wrist strap 40.2 are visible. The straps 40.1, 40.2 can be hook and loop straps or the like. The control device 40.3 is connected to the wrist strap 40.2. Figure 41 shows the palm or sensor side of the glove 39.1, but flattened out as it would appear when not wrapped around the hand of a user.

[0292] Figure 42 shows a different embodiment of a glove 42.1 for manual muscle testing on a hand of a user. Instead of a single sensor portion, there are two sensor portions 42.2 attached to the body portion 42.3 of the glove 42.1. Two sections of wiring 42.4 are connected to the sensor portions 42.2 and are attached to the body portion 42.3. Figure 43 shows the back of the glove 42.1. A palm strap 43.1 and a wrist strap 43.2 are visible. The straps 43.1, 43.2 can be hook and loop straps or the like. The control device 43.3 is connected to the wrist strap 43.2. Figure 44 shows the palm or sensor side of the glove 42.1, but flattened out as it would appear when not wrapped around the hand of a user.

[0293] According to one exemplification, the overall systems and devices are all connected together into a single system, as shown in Figure 38. At the center is a server or computer server 38.1, which controls and joins all of the other systems and devices. The smartwatches 38.2 are wirelessly connected or paired to the server 38.1. Mobile devices 38.3, such as smartphones and tablets, are also wirelessly connected to the server 38.1 via the app interface. A device such as a goniometer or a smartwatch functioning as a goniometer is wirelessly connected or paired to the server. One or more server portals, such as work stations or desktop computers or displays, are connected to the server either wirelessly or by a wired connection. The EMR may be stored locally on the server itself, or it may be stored elsewhere on another device, such as a computer or server, that the server can access. Any facial recognition components are connected to the server for the transmission of facial recognition information. A tracking system, such as a triangulation or RFID system, may be connected to the server either wirelessly or by a wired connection. Tracking devices are not directly connected to the server if they are in the form of wearable tags or beacons that only are detected by the tracking system. However, if the tracking device is part of a smartwatch, then the tracking device is connected via the smartwatch to the server for the transmission of tracking data, such as movement and positional data. Essentially all of the systems and devices are in some type of communication with one another via the server for the sharing and exchanging of information and data.

[0294] According to one exemplification, a tracking device, such as a beacon or RFID or triangulation device, can be used in conjunction with the app and smartwatch in a physical therapy clinic. The tracking device can provide accurate location indoors, to thereby provide the app with physical location information inside of a clinical setting. The tracking device will be secured to the



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watch device that the patient will be wearing. Data will be collected and utilized in various ways regarding the movement of patients and clinical staff. The tracking device will allow turn-by-turn guidance of the floor plan set. When a device is near or leaves a point of interest, it triggers a given action. This occurs to follow the real-time movement of people and their activities inside a specific building by setting up a wireless triangulation system or RFID grid. By capturing traffic throughout a site to analyze visitor movement and flow, including queue times, dwell times, wait times and first time/repeat visitors, it allows more accurate records for the patient/clinician. This device will allow tracking from wearable devices and smartwatches, smart phones, and tablets.

[0295] Smartwatches, fitness trackers, and beacons allow users to track complex motions requiring the use of motion sensors such as gyroscopes, accelerometers, compasses, and pressure sensors, fusing the sensor outputs into a single and accurate data stream for use as input commands in consumer electronics devices, and ongoing run-time calibration to ensure an optimal user experience.

[0296] In therapeutic rehabilitation, clinicians instruct patients through a therapeutic exercise routine. This is set up by a licensed clinician to treat a patient's condition. The clinician creates a treatment plan/protocol. The clinician instructs the patient through the exercises, demonstrates or displays the exercise techniques, and follows the patients through their therapeutic exercise routine. Commonly a flow sheet is used, which is a list of the treatment procedures and the order in which the patient is to receive them.

[0297] When a patient comes to the clinic, he is registered and assigned to clinician or workgroup if not already. A protocol/flow sheet for the prescribed therapy is assigned to the patient. The patient is then given a device, such as a smartwatch, with tracking capability. A member of the clinic staff will scan the QR code of the watch or other device to upload the patient's template on the device and assign the patient to the given clinical workgroup. The smartwatch could also be paired to the patient's account electronically via a wireless connection. Activation is sent to the server and the watch is paired with the computer system/mobile device. The server then sends an alert to the clinical workgroup that the patient is in the waiting room. The patient is then traceable through the tracking device. Once the patient reaches ambulation or gait activities, i.e. walking, jogging, running, from their flow sheets, the system pings to triangulate their location. The system pings all clinicians watches to see if any are with patients. When ready, the clinician or patient chooses "start" on the watch/mobile device. When choosing "start," the device displays the treatment procedure and exercise to begin. The preloaded exercise protocol is displayed. A wireless system (Wi-Fi®, Bluetooth®) pings the patient and any clinician in proximity in time intervals, such as every second, to determine location/triangulation until an exercise complete button, such as "walk completed," is pressed on the watch/mobile device. The watch will then display a message asking if another ambulation/walk is listed on the flow chart. If yes, the next task is performed. If no, the speed, distance, and time is saved to the patient's chart.



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[0298] The system, computer or mobile device, sends an alert to the clinician's mobile device and confirms whether or not the clinician performed the exercise with the patient and the level of assistance. The next item from the flow chart is listed on the patient's smartwatch/mobile device.

[0299] The system sends a push notification to the clinician's mobile deice that was present though the patient's entire walk. The screen displays a data message, such as "Did you assist <<patient's name>> with ambulation?" The clinician can select yes or no. If yes, the screen will show different levels of assistance, such as contact guard assistance, minimum assistance, moderate assistance, and maximum assistance. Once selected, this information will be saved to the patient's chart in the notes section with the clinician's name and assistance level.

[0300] According to one possible exemplification, the app can be used in conjunction with facial recognition technology. The purpose of facial recognition is to further expedite the paperwork process of the EMR. The facial recognition system allows a patient to be automatically logged into the system as he arrives for a scheduled appointment, without the need of the therapist to enter the patient or notify the therapist. Within the clinic, this system utilizes two cameras near the entrance/exit of the clinic: one at the entrance (within the clinic) pointed at the entrance, and one at the exit, facing from the door towards the inside of the clinic. While each clinic can have unique camera placements, the placements are such that the entrance camera captures the picture of patients entering the clinic, and the exit camera captures patients as they leave the clinic.

[0301] The facial recognition system can help address some deficiencies in current clinic operations. One problem is that when a patient enters a clinic, it can often take between five and twenty minutes before the clinician is notified of the patient's presence in the wait room. In current clinics, the patient's presence is denoted by the patient's chart being placed in a holder in view of most of the clinic. However, with the busyness of a clinic, the clinician may not immediately notice. In the past twenty years of technological advances, no practical method has been devised to quickly and efficiently notify clinicians of patient arrival in physical therapy clinics, chiropractic practices, and related healthcare practices.

[0302] The facial recognition system can interact with the app to identify patients as they enter the clinic and notify the clinician within moments of the patient entering the clinic. This is achieved using a camera and facial recognition software. When a patient approaches the door, the camera takes a snapshot of the patient and sends it to the server. The server runs facial recognition on the picture, and compares the photo to the patient profiles stored in the system. If there is a match, the system sends a message to the server to send a push notification to the clinician with whom the patient has an appointment. This works in conjunction with the ability of the clinic staff to notify the clinician through the app to promote shorter wait times for the patient of only a few minutes or less, and minimize the chances of the patient being subjected to wait times of more than a few minutes.

[0303] In addition, to reducing wait times for patients, the facial recognition system can also be used to help reduce, minimize, or eliminate fraud. In that regard, insurance companies are always looking for ways to eliminate fraud from the medical system. Unfortunately, auditing can only give the insurance companies so much information, and the insurance companies must rely on the word



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of medical professionals as to the accuracy of the statements. One source of fraud includes fake claims for nonexistent patients being billed to insurance companies, Medicare, and Medicaid.

[0304] When the facial recognition system uses a photo to recognize an incoming patient and notify the clinician, the system will also attach that photo to the electronic chart containing the notes from that visit. The clinic will also have a camera inside the front door that catches the faces of patients as they exit the clinic. This photo is added to the chart, along with time stamps to indicate patient entrance and exit. This documented information gives certifiable or verifiable proof that a patient in question has in fact been at the clinic and received treatment. Such information will also make fraudulent cases stand out. Patients with multiple visits and no picture whatsoever will be highlighted by insurance companies for investigation. This allows insurance companies to focus their efforts to eliminate fraud, and allows clinics to ensure that their clinics are above reproach.

[0305] The following patent publications are incorporated by reference as if set forth in their entirety herein: U.S. Patent Application Publication No. 2015/0172893; U.S. Patent No. 9,274,507; U.S. Patent No. 9,454,898; U.S. Patent No. 8,864,925; U.S. Patent No. 9,282,284; U.S. Patent No. 9,405,967; U.S. Patent No. 9,230,158; U.S. Patent No. 9,389,300; U.S. Patent No. 9,204,251; U.S. Patent No. 7,119,687; U.S. Design Patent No. D750,621; U.S. Design Patent No. D678,873; U.S. Patent No. 9,274,507; U.S. Design Patent No. D766,114; U.S. Patent No. 9,086,687; U.S. Design Patent No. D765,655; U.S. Patent No. 9,459,698; and U.S. Patent No. 9,282,127.

[0306] The components disclosed in the patents, patent applications, patent publications, and other documents disclosed or incorporated by reference herein, may possibly be used in possible exemplifications of the present invention, as well as equivalents thereof.

[0307] The purpose of the statements about the technical field is generally to enable the Patent and Trademark Office and the public to determine quickly, from a cursory inspection, the nature of this patent application. The description of the technical field is believed, at the time of the filing of this patent application, to adequately describe the technical field of this patent application. However, the description of the technical field may not be completely applicable to the claims as originally filed in this patent application, as amended during prosecution of this patent application, and as ultimately allowed in any patent issuing from this patent application. Therefore, any statements made relating to the technical field are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0308] The appended drawings in their entirety, including all dimensions, proportions and/or shapes in at least one exemplification of the invention, are accurate and are hereby included by reference into this specification.

[0309] The background information is believed, at the time of the filing of this patent application, to adequately provide background information for this patent application. However, the background information may not be completely applicable to the claims as originally filed in this patent application, as amended during prosecution of this patent application, and as ultimately allowed in any patent issuing from this patent application. Therefore, any statements made relating to the



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background information are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0310] All, or substantially all, of the components and methods of the various exemplifications may be used with at least one exemplification or all of the exemplifications, if more than one exemplification is described herein.

[0311] The purpose of the statements about the object or objects is generally to enable the Patent and Trademark Office and the public to determine quickly, from a cursory inspection, the nature of this patent application. The description of the object or objects is believed, at the time of the filing of this patent application, to adequately describe the object or objects of this patent application. However, the description of the object or objects may not be completely applicable to the claims as originally filed in this patent application, as amended during prosecution of this patent application, and as ultimately allowed in any patent issuing from this patent application. Therefore, any statements made relating to the object or objects are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0312] All of the patents, patent applications, patent publications, and other documents cited herein, and in the Declaration attached hereto, are hereby incorporated by reference as if set forth in their entirety herein except for the exceptions indicated herein.

[0313] The summary is believed, at the time of the filing of this patent application, to adequately summarize this patent application. However, portions or all of the information contained in the summary may not be completely applicable to the claims as originally filed in this patent application, as amended during prosecution of this patent application, and as ultimately allowed in any patent issuing from this patent application. Therefore, any statements made relating to the summary are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0314] It will be understood that the examples of patents, patent applications, patent publications, and other documents which are included in this application and which are referred to in paragraphs which state "Some examples of ... which may possibly be used in at least one possible exemplification of the present application..." may possibly not be used or useable in any one or more exemplifications of the application.

[0315] The sentence immediately above relates to patents, patent applications, patent publications, and other documents either incorporated by reference or not incorporated by reference.

[0316] All of the references and documents cited in any of the patents, patent applications, patent publications, and other documents cited herein, except for the exceptions indicated herein, are hereby incorporated by reference as if set forth in their entirety herein except for the exceptions indicated herein. All of the patents, patent applications, patent publications, and other documents cited herein, referred to in the immediately preceding sentence, include all of the patents, patent applications, patent publications, and other documents cited anywhere in the present application.



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[0317] Words relating to the opinions and judgments of the author of all patents, patent applications, patent publications, and other documents cited herein and not directly relating to the technical details of the description of the exemplifications therein are not incorporated by reference.

[0318] The words all, always, absolutely, consistently, preferably, guarantee, particularly, constantly, ensure, necessarily, immediately, endlessly, avoid, exactly, continually, expediently, ideal, need, must, only, perpetual, precise, perfect, require, requisite, simultaneous, total, unavoidable, and unnecessary, or words substantially equivalent to the above-mentioned words in this sentence, when not used to describe technical features of one or more exemplifications of the patents, patent applications, patent publications, and other documents, are not considered to be incorporated by reference herein for any of the patents, patent applications, patent publications, and other documents cited herein.

[0319] The description of the exemplification or exemplifications is believed, at the time of the filing of this patent application, to adequately describe the exemplification or exemplifications of this patent application. However, portions of the description of the exemplification or exemplifications may not be completely applicable to the claims as originally filed in this patent application, as amended during prosecution of this patent application, and as ultimately allowed in any patent issuing from this patent application. Therefore, any statements made relating to the exemplification or exemplifications are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0320] The details in the patents, patent applications, patent publications, and other documents cited herein may be considered to be incorporable, at applicant's option, into the claims during prosecution as further limitations in the claims to patentably distinguish any amended claims from any applied prior art.

[0321] The purpose of the title of this patent application is generally to enable the Patent and Trademark Office and the public to determine quickly, from a cursory inspection, the nature of this patent application. The title is believed, at the time of the filing of this patent application, to adequately reflect the general nature of this patent application. However, the title may not be completely applicable to the technical field, the object or objects, the summary, the description of the exemplification or exemplifications, and the claims as originally filed in this patent application, as amended during prosecution of this patent application, and as ultimately allowed in any patent issuing from this patent application. Therefore, the title is not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0322] Therefore, any statements made relating to the abstract are not intended to limit the claims in any manner and should not be interpreted as limiting the claims in any manner.

[0323] The exemplifications of the invention described herein above in the context of the preferred exemplifications are not to be taken as limiting the exemplifications of the invention to all of the provided details thereof, since modifications and variations thereof may be made without departing from the spirit and scope of the exemplifications of the invention.



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[0324] CLAIMS

[0325] 1. A smartwatch system comprising:

[0326] a computer server configured to store software and at least one database;

[0327] a server portal configured to permit access to said software and said at least one database on said computer server;

[0328] said server portal being configured to permit entry and uploading of data into said at least one database;

[0329] a smartwatch, said smartwatch comprising:

[0330] a housing;

[0331] an attachment structure to attach said smartwatch;

[0332] a display configured to display data and/or messages and/or images;

[0333] said display comprising an input interface to permit input of commands or data;

[0334] a power supply to supply power;

[0335] tracking components configured to permit detection of the location of said smartwatch in an area;

[0336] motion detection components configured to permit detection of the movement of said smartwatch in at least one plane of movement;

[0337] a microcomputer configured to store an operating system and data; and

[0338] a wireless interface configured to wirelessly connect said smartwatch to said computer server;

[0339] said smartwatch being configured to receive and display data from said at least one database on said computer server, and being configured to input and transmit data to said at least one database on said computer server via a program or application;

[0340] a mobile device comprising a smart phone or a tablet computer;

[0341] said mobile device comprising:

[0342] a housing;

[0343] a display configured to display data and/or messages and/or images;

[0344] said display comprising an input interface to permit input of commands or data;

[0345] a power supply to supply power;

[0346] tracking components configured to permit detection of the location of said mobile device in an area;

[0347] a microcomputer configured to store an operating system and data; and

[0348] a wireless interface configured to wirelessly connect said mobile device to said computer server; and

[0349] a software application being stored on said computer server and being accessible via said mobile device, said server portal, and said smartwatch, and being configured to transmit and receive data, information, and/or images between said computer server, said mobile device, said server portal, and said smartwatch.

[0350] 2. The smartwatch system according to claim 1, wherein:



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[0351] said smartwatch system comprises a tracking arrangement configured to track the location of said smartwatch and/or said mobile device in an area;

[0352] said tracking arrangement comprises tracking stations configured to permit triangulation of the location of said smartwatch and/or said mobile device in the area;

[0353] said tracking arrangement is configured to transmit data to said computer server regarding the location of said smartwatch and/or said mobile device in the area; and

[0354] said computer server is configured to transmit data via said software application to said mobile device and/or said server portal regarding the location of said smartwatch and/or said mobile device in the area.

[0355] 3. The smartwatch system according to at least one of claims 1 or 2, wherein:

[0356] said smartwatch system comprises an image detection arrangement configured to detect images of objects;

[0357] said image detection arrangement comprises image detection devices disposed at different locations in the area;

[0358] said image detection devices are configured to detect images of objects in the area, and then transmit detected image data to said computer server;

[0359] said computer server is configured to compare and analyze detected image data with stored image data; and

[0360] said computer server is configured to transmit image data via said software application to said mobile device and/or said server portal regarding detected images.

[0361] 4. The smartwatch system according to at least one of claims 1 to 3, wherein:

[0362] said smartwatch comprises a motion tracker configured to permit detection of angular movement from one point to another over a path of movement of said smartwatch;

[0363] said smartwatch is configured to capture angular movement data and transmit said angular movement data to said computer server via said software application; and

[0364] said computer server is configured to transmit said angular movement data to said mobile device via said software application.

[0365] 5. The smartwatch system according to at least one of claims 1 to 4, wherein:

[0366] said smartwatch system comprises a pressure sensing device;

[0367] said pressure sensing device comprises:

[0368] a body portion;

[0369] at least one flexible pressure sensor disposed on said body portion;

[0370] a soft or flexible covering disposed to cover said at least one flexible pressure sensor; and

[0371] a control device attached to said body portion and connected by wiring to said at least one flexible pressure sensor to receive pressure sensor data from said at least one flexible pressure sensor; and



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[0372] said control device is configured to receive pressure data from said at least one flexible pressure sensor, and then wirelessly transmit said pressure data to said computer server via said software application.

[0373] 6. A method of using a smartwatch system comprising:

[0374] a computer server configured to store software and at least one database;

[0375] a server portal configured to permit access to said software and said at least one database on said computer server;

[0376] said server portal being configured to permit entry and uploading of data into said at least one database;

[0377] a smartwatch, said smartwatch comprising:

[0378] a housing;

[0379] an attachment structure to attach said smartwatch;

[0380] a display configured to display data and/or messages and/or images;

[0381] said display comprising an input interface to permit input of commands or data;

[0382] a power supply to supply power;

[0383] tracking components configured to permit detection of the location of said smartwatch in an area;

[0384] motion detection components configured to permit detection of the movement of said smartwatch in at least one plane of movement;

[0385] a microcomputer configured to store an operating system and data; and

[0386] a wireless interface configured to wirelessly connect said smartwatch to said computer server;

[0387] said smartwatch being configured to receive and display data from said at least one database on said computer server, and being configured to input and transmit data to said at least one database on said computer server via a program or application;

[0388] a mobile device comprising a smart phone or a tablet computer;

[0389] said mobile device comprising:

[0390] a housing;

[0391] a display configured to display data and/or messages and/or images;

[0392] said display comprising an input interface to permit input of commands or data;

[0393] a power supply to supply power;

[0394] tracking components configured to permit detection of the location of said mobile device in an area;

[0400] a microcomputer configured to store an operating system and data; and

[0401] a wireless interface configured to wirelessly connect said mobile device to said computer server; and

[0402] a software application being stored on said computer server and being accessible via said mobile device, said server portal, and said smartwatch, and being configured to transmit and receive



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data, information, and/or images between said computer server, said mobile device, said server portal, and said smartwatch; and

[0403] said method comprising the steps of:

[0404] wirelessly connecting said smartwatch and/or said mobile device to said computer server via said software application; and

[0405] transmitting data between said smartwatch, said mobile device, said server portal, and/or said computer server via said software application.

[0406] 7. The method according to claim 6, wherein:

[0407] said smartwatch system comprises a tracking arrangement configured to track the location of said smartwatch and/or said mobile device in an area;

[0408] said tracking arrangement comprises tracking stations configured to permit triangulation of the location of said smartwatch and/or said mobile device in the area;

[0409] said tracking arrangement is configured to transmit data to said computer server regarding the location of said smartwatch and/or said mobile device in the area;

[0410] said computer server is configured to transmit data via said software application to said mobile device and/or said server portal regarding the location of said smartwatch and/or said mobile device in the area; and

[0411] said method further comprises:

[0412] tracking the location of said smartwatch and/or said mobile device in an area using said tracking arrangement;

[0413] transmitting data to said computer server regarding the location of said smartwatch and/or said mobile device in the area; and

[0414] transmitting data via said software application to said mobile device and/or said server portal regarding the location of said smartwatch and/or said mobile device in the area.

[0415] 8. The method according to at least one of claims 6 or 7, wherein:

[0416] said smartwatch system comprises an image detection arrangement configured to detect images of objects;

[0417] said image detection arrangement comprises image detection devices disposed at different locations in the area;

[0418] said image detection devices are configured to detect images of objects in the area, and then transmit detected image data to said computer server;

[0419] said computer server is configured to compare and analyze detected image data with stored image data;

[0420] said computer server is configured to transmit image data via said software application to said mobile device and/or said server portal regarding detected images; and

[0421] said method comprises the steps of:

[0422] detecting images of objects in the area with said image detection arrangement;

[0423] transmitting detected image data to said computer server;

[0424] comparing and analyzing detected image data with stored image data; and



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[0425] transmitting image data via said software application to said mobile device and/or said server portal regarding detected images.

[0426] 9. The method according to at least one of claims 6 to 8, wherein:

[0427] said smartwatch comprises a motion tracker configured to permit detection of angular movement from one point to another over a path of movement of said smartwatch;

[0428] said smartwatch is configured to capture angular movement data and transmit said data to said computer server via said software application;

[0429] said computer server is configured to transmit said angular movement data to said mobile device via said software application; and

[0430] said method comprises the steps of:

[0431] detecting and capturing angular movement from one point to another over a path of movement of said smartwatch;

[0432] transmitting said angular movement data to said computer server via said software application; and

[0433] transmitting said angular movement data to said mobile device via said software application.

[0434] 10. The method according to at least one of claims 6 to 9, wherein:

[0435] said smartwatch system comprises a pressure sensing device;

[0436] said pressure sensing device comprises:

[0437] a body portion;

[0438] at least one flexible pressure sensor disposed on said body portion;

[0439] a soft or flexible covering disposed to cover said at least one flexible pressure sensor; and

[0440] a control device attached to said body portion and connected by wiring to said at least one flexible pressure sensor to receive pressure sensor data from said at least one flexible pressure sensor;

[0441] said control device is configured to receive pressure data from said at least one flexible pressure sensor, and then wirelessly transmit said data to said computer server via said software application; and

[0442] said method comprises the steps of:

[0443] sensing pressure with said at least one flexible pressure sensor;

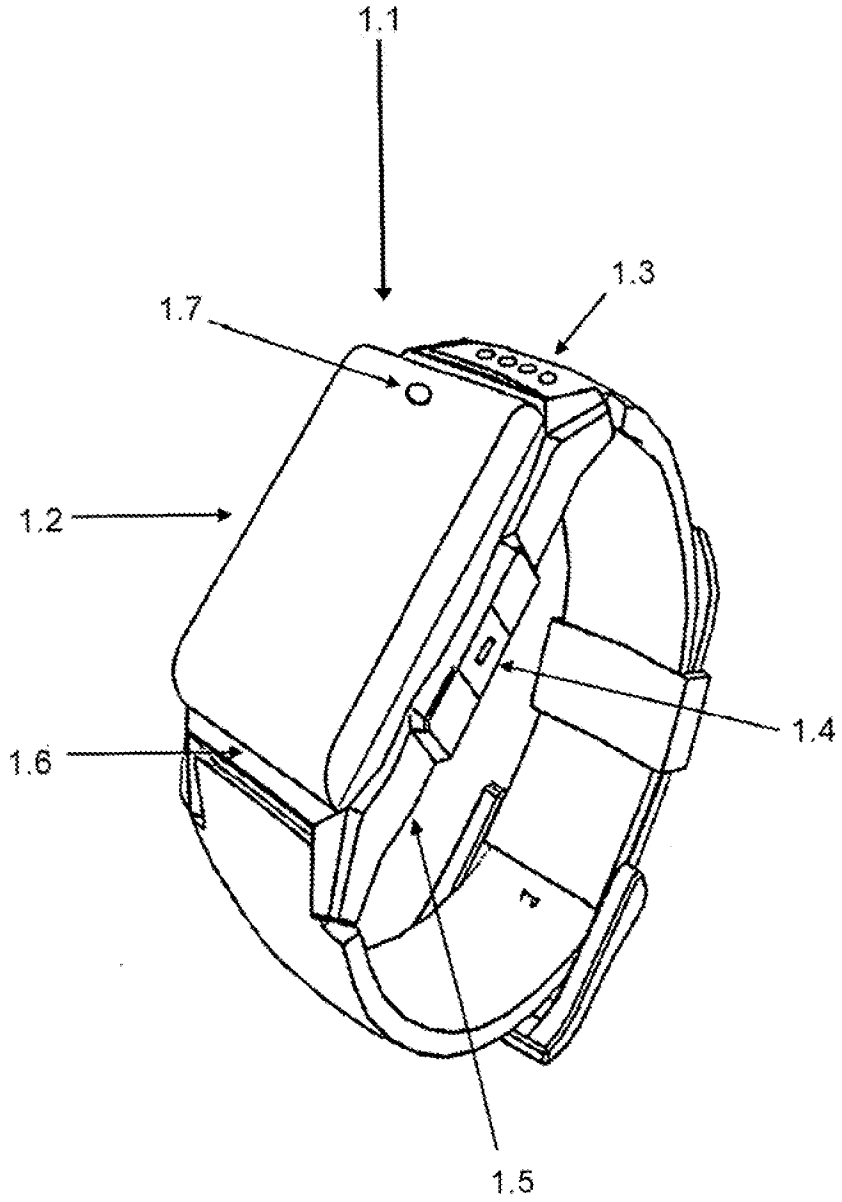
[0444] receiving pressure data with said control device from said at least one flexible pressure sensor; and

[0445] wirelessly transmitting said pressure data to said computer server via said software application.



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FIG. 1




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FIG. 2

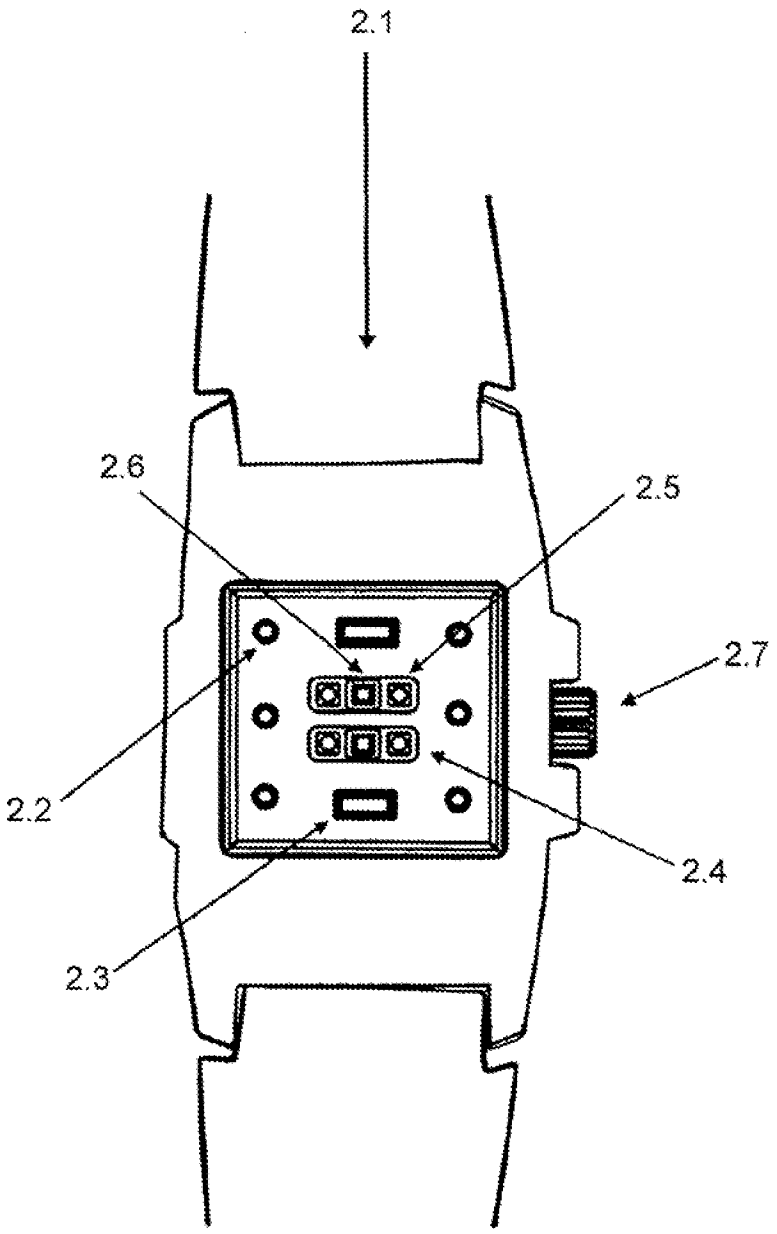
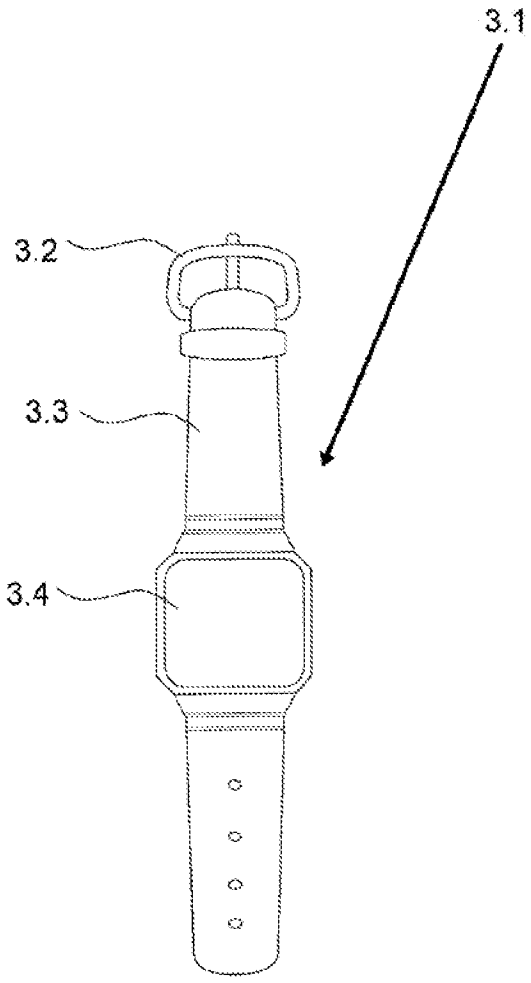


FIG. 3




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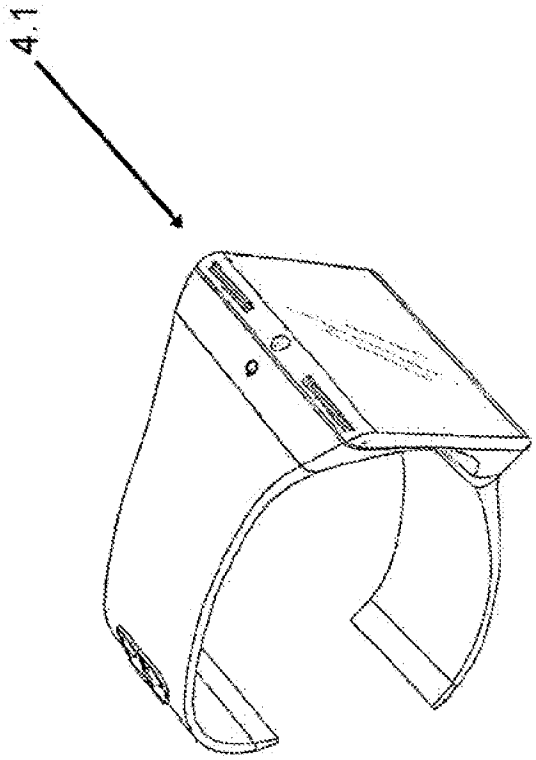



FIG. 4

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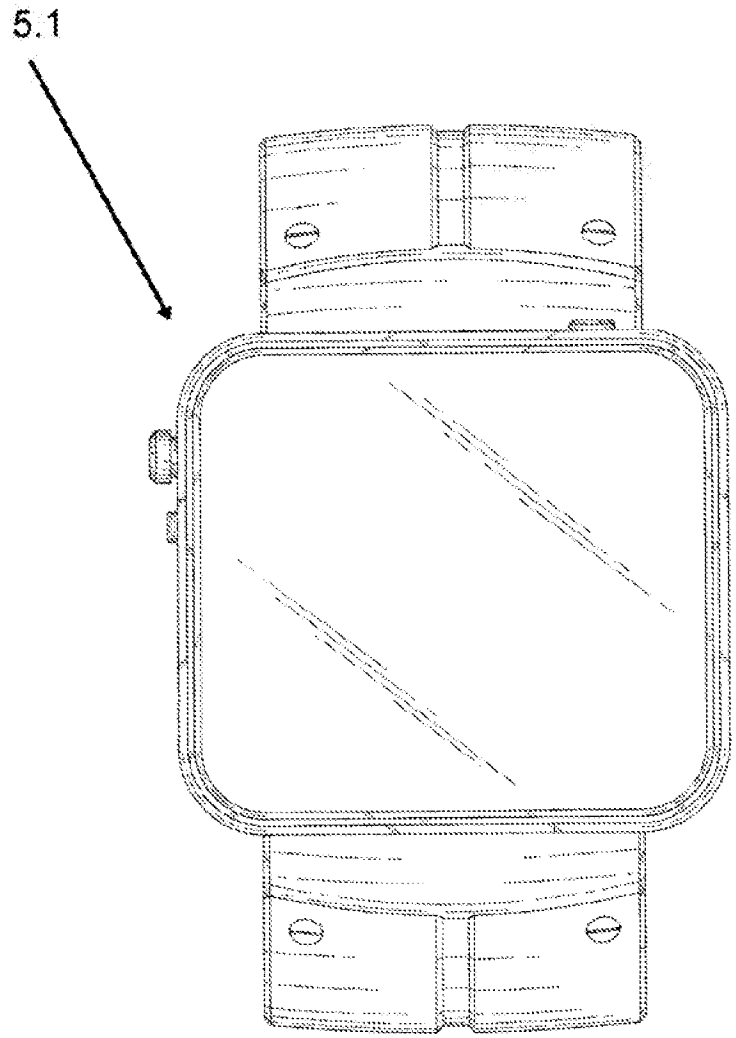
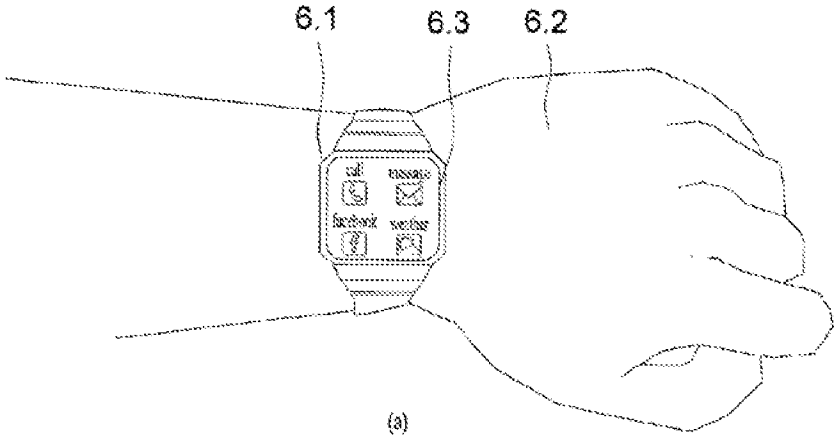



FIG. 5

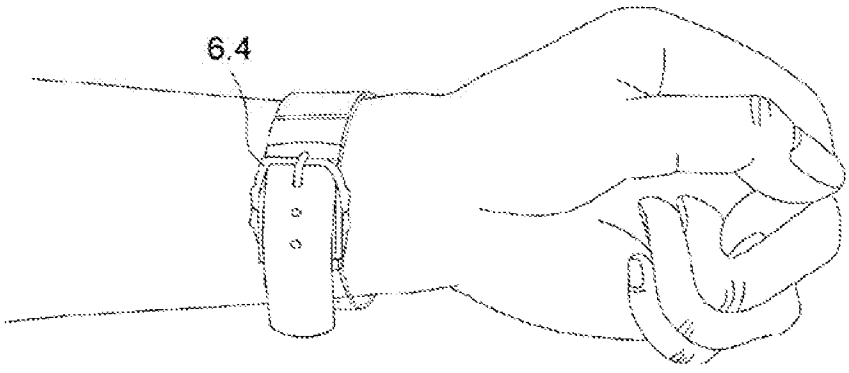
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FIG. 6




(a)




(b)



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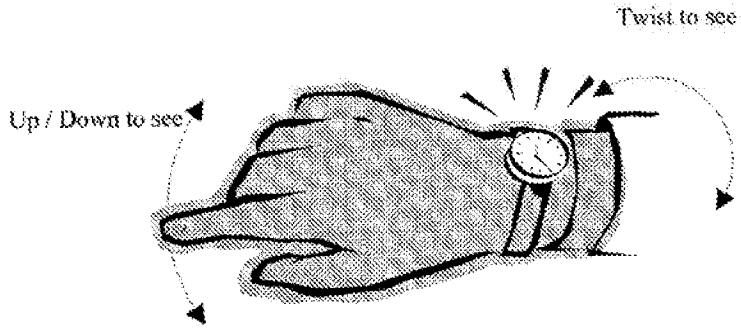



FIG. 7



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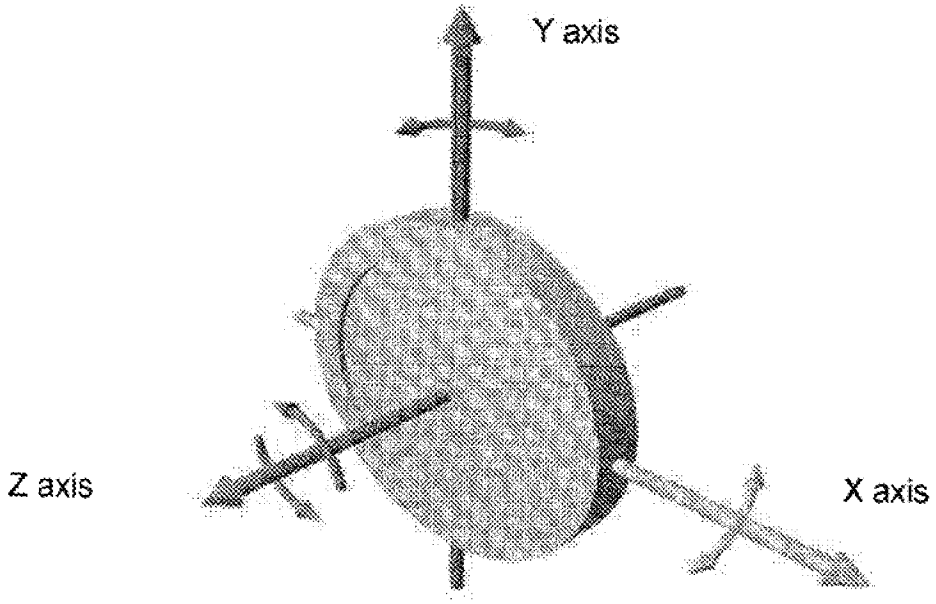



FIG. 8

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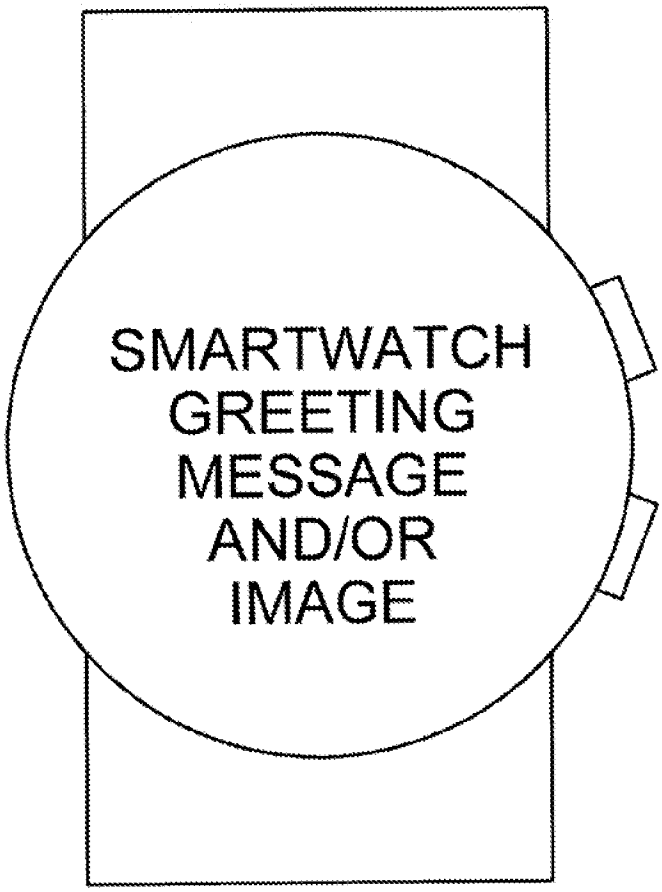



FIG. 9



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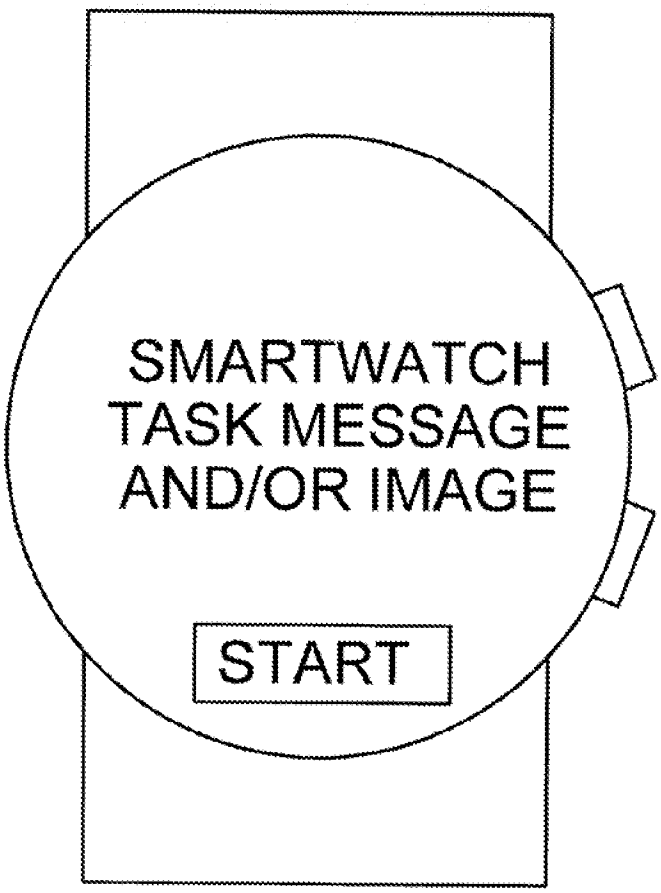



FIG. 10

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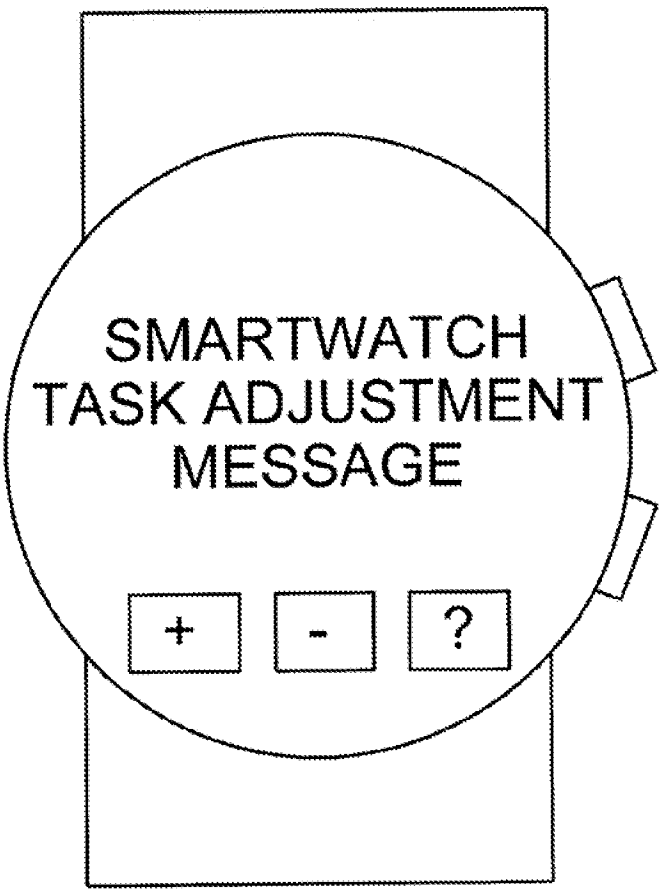



FIG. 11



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FIG. 12



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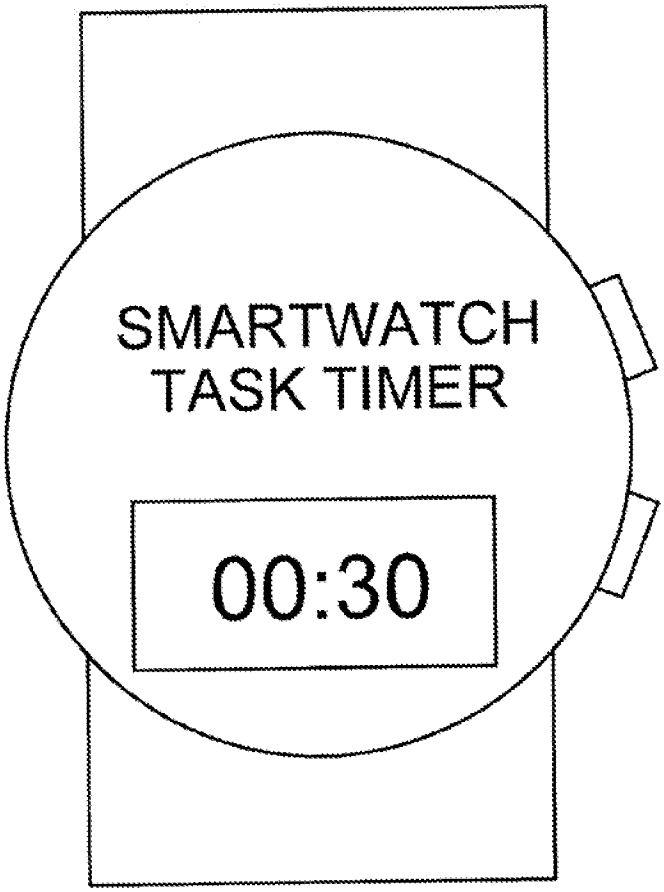



FIG. 13

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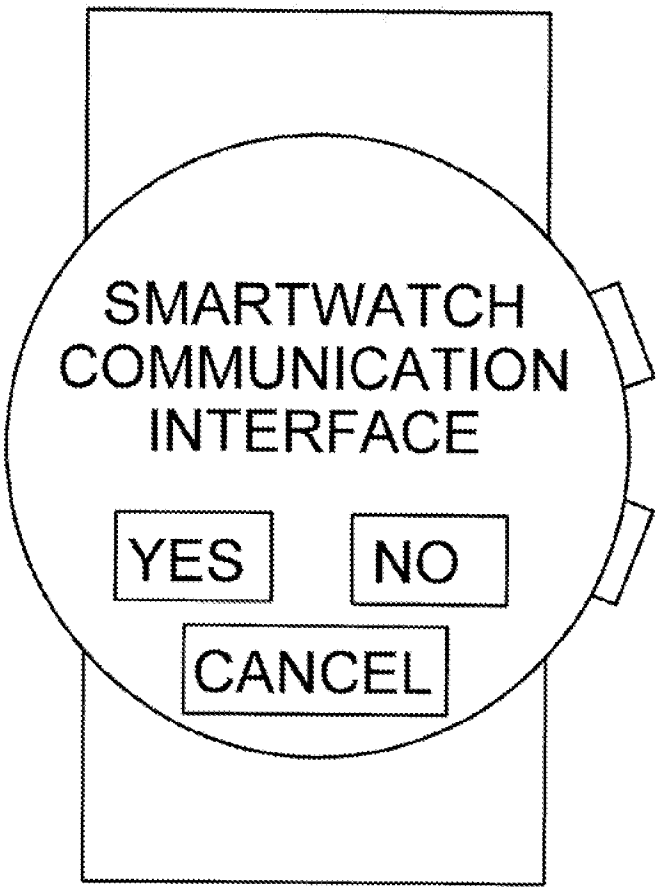
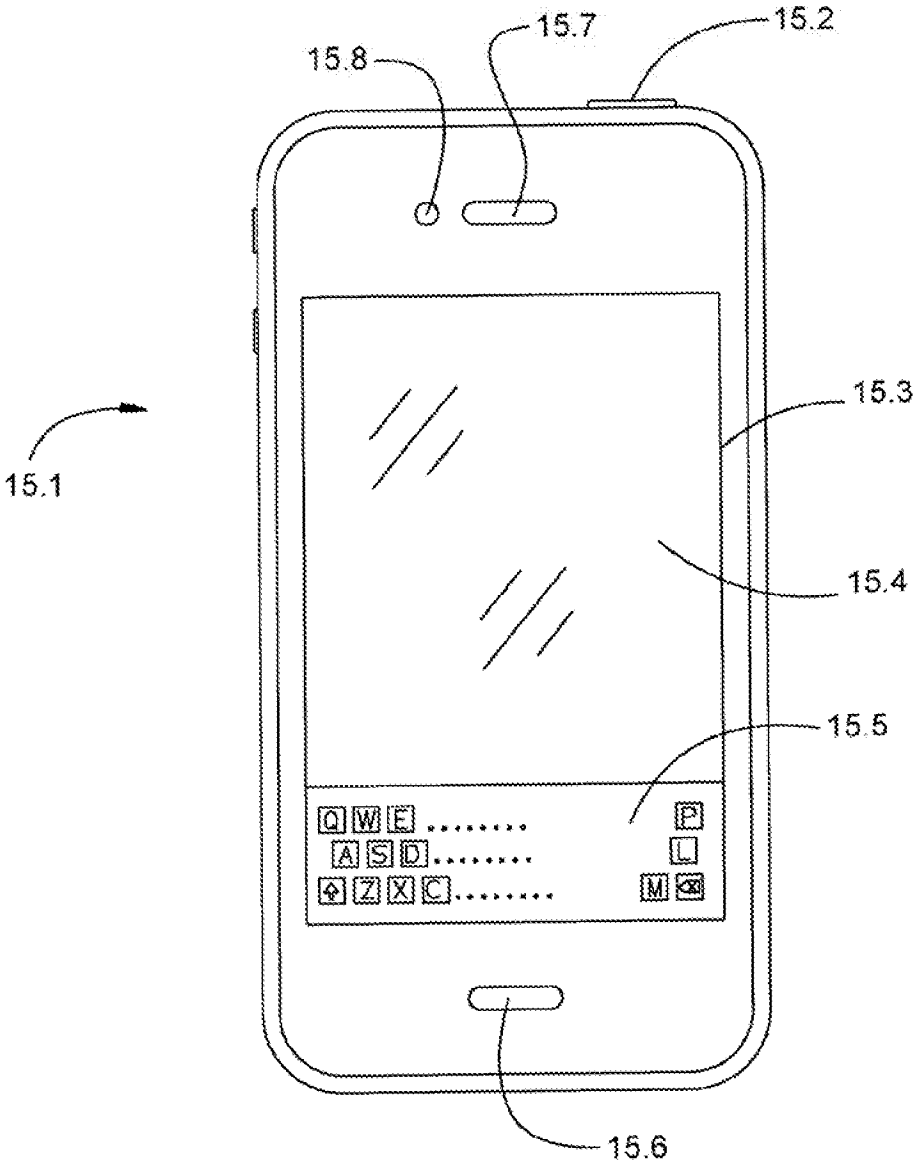



FIG. 14



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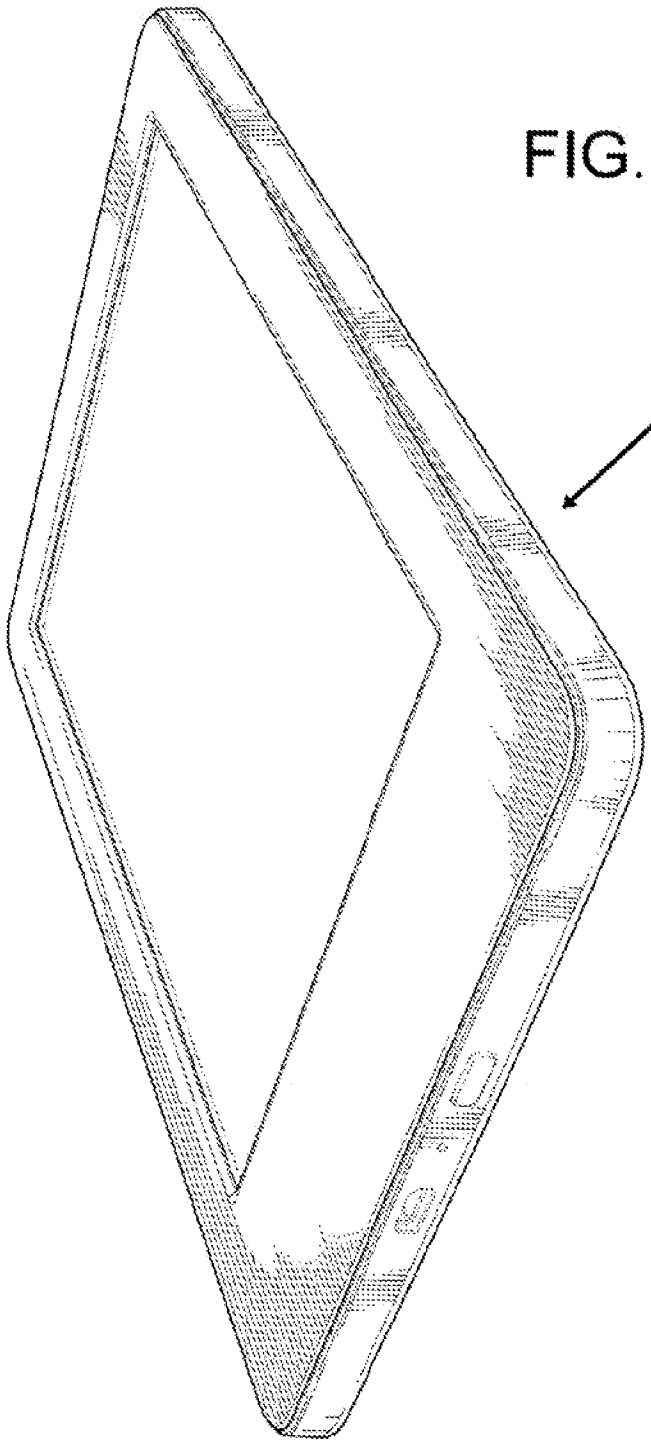
FIG. 15




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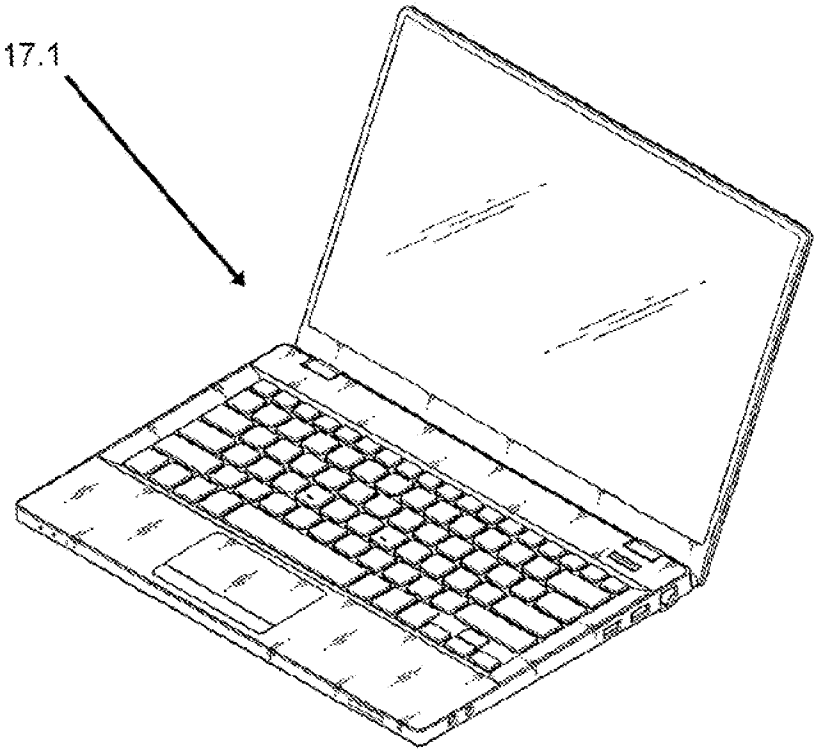
FIG. 16






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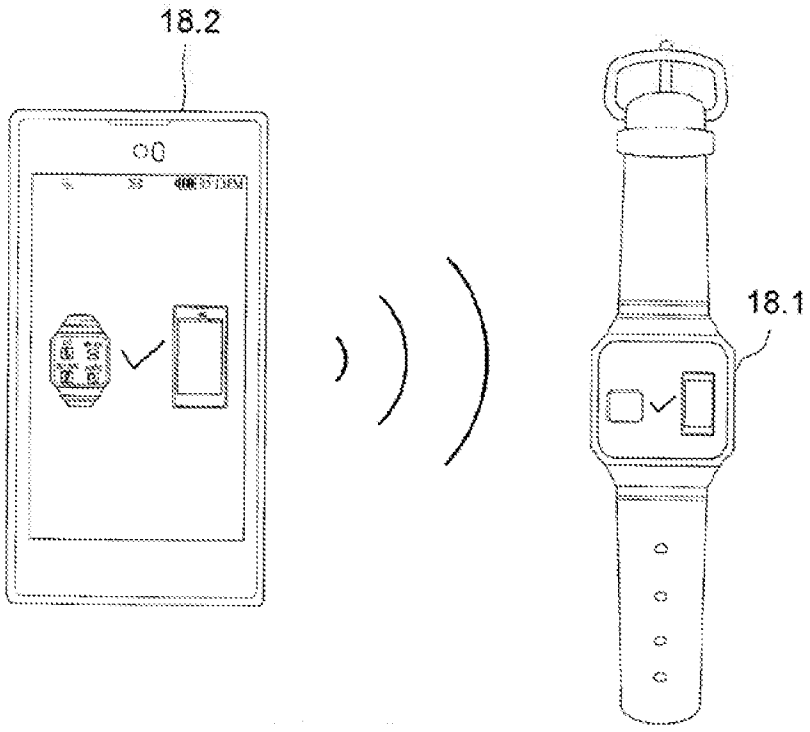
FIG. 17






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FIG. 18




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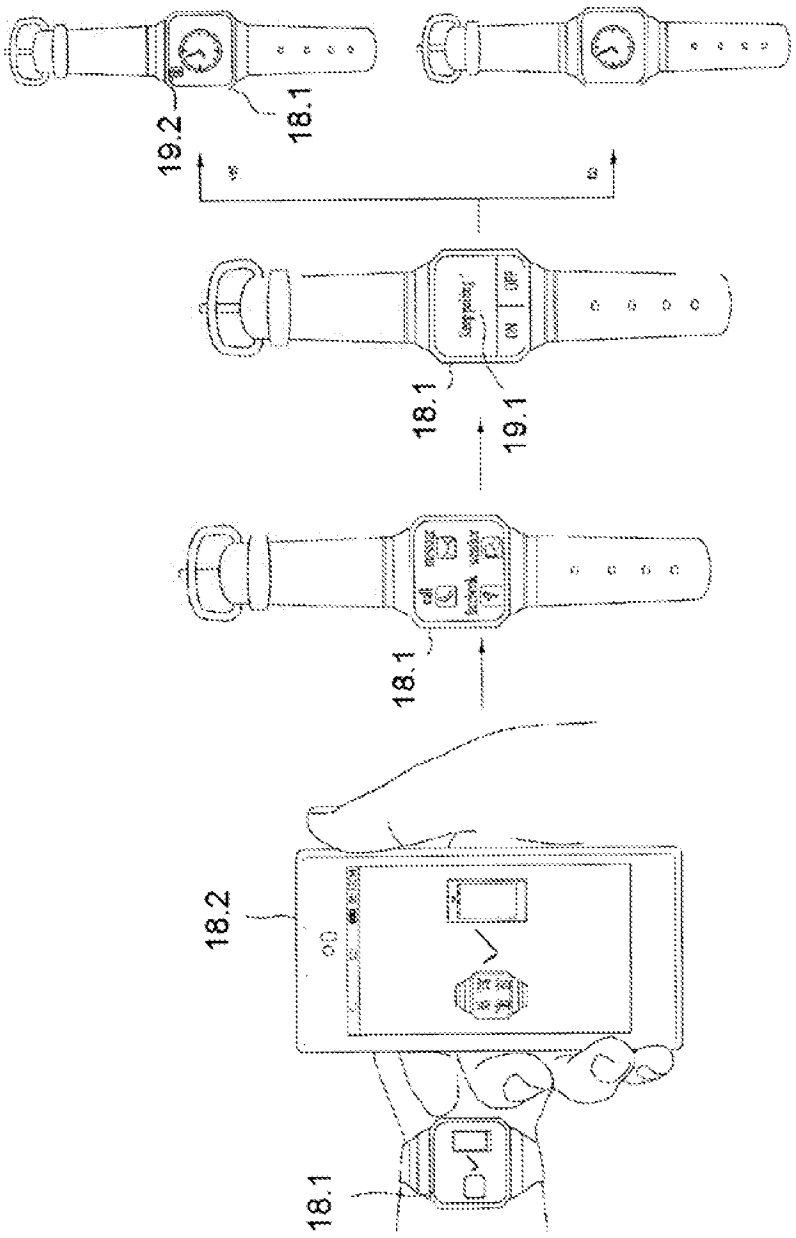



FIG. 19



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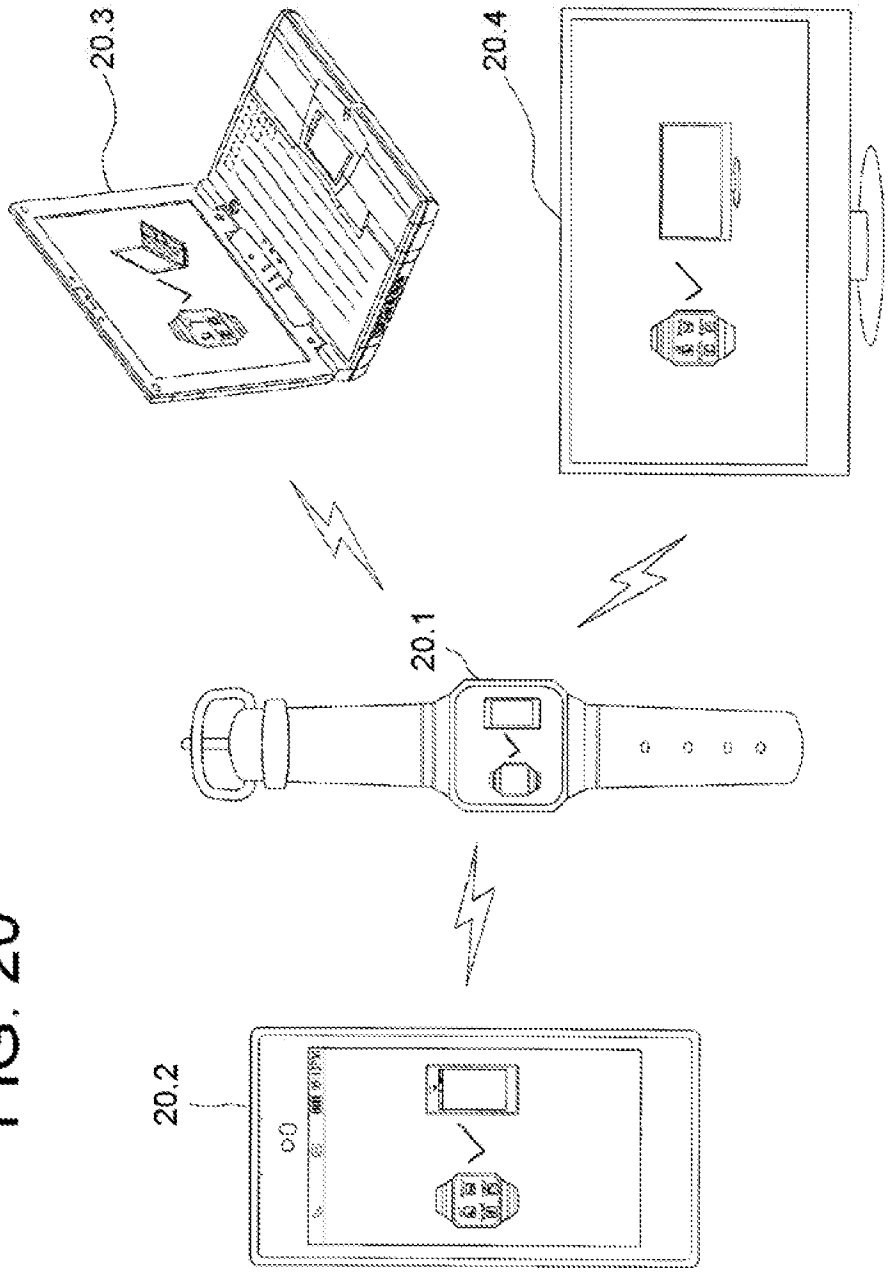



FIG. 20



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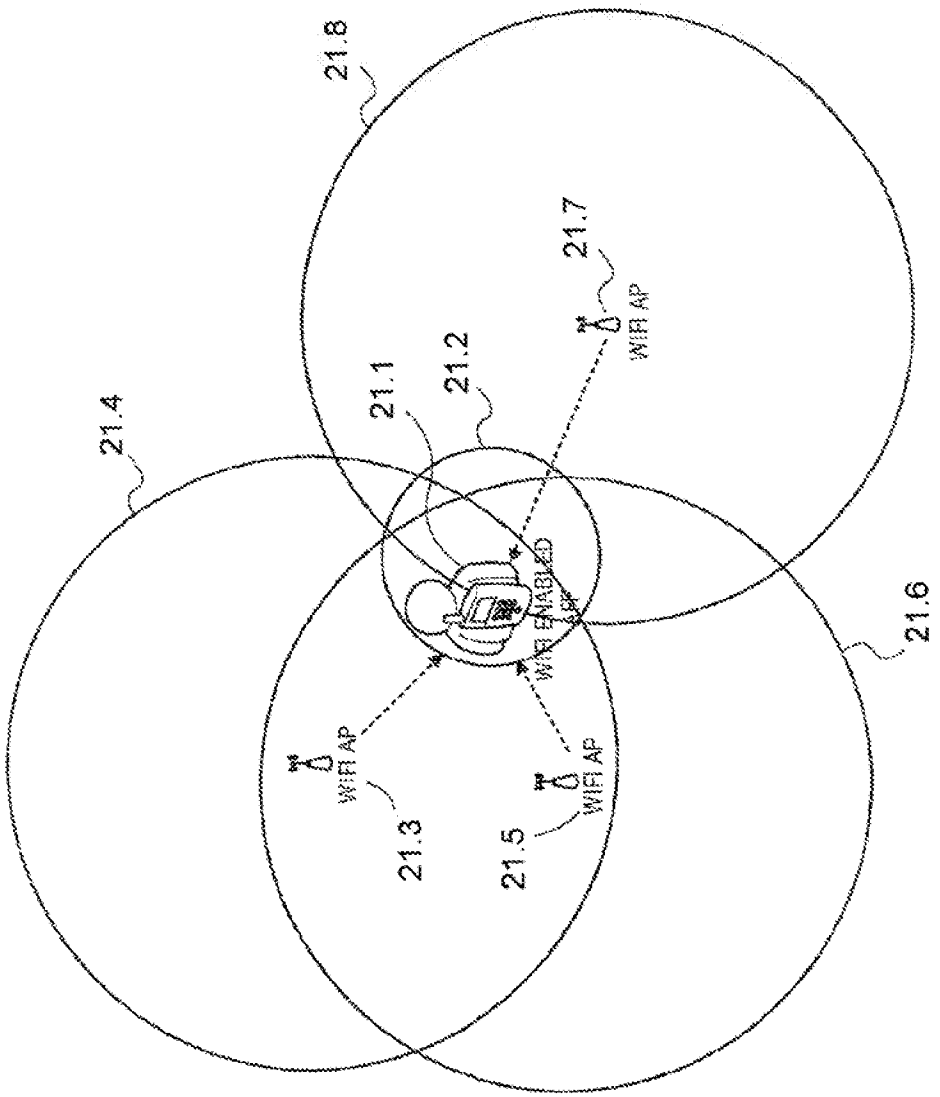



FIG. 21



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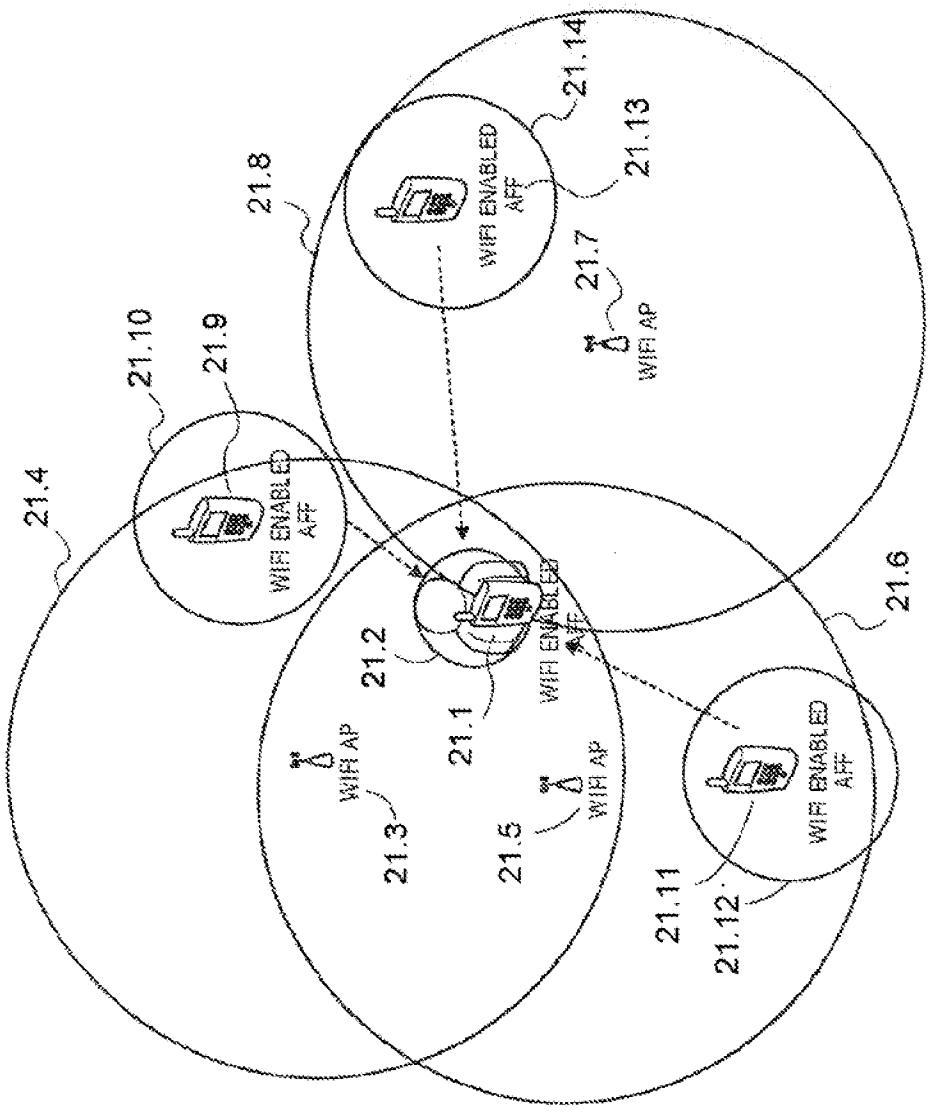



FIG. 22



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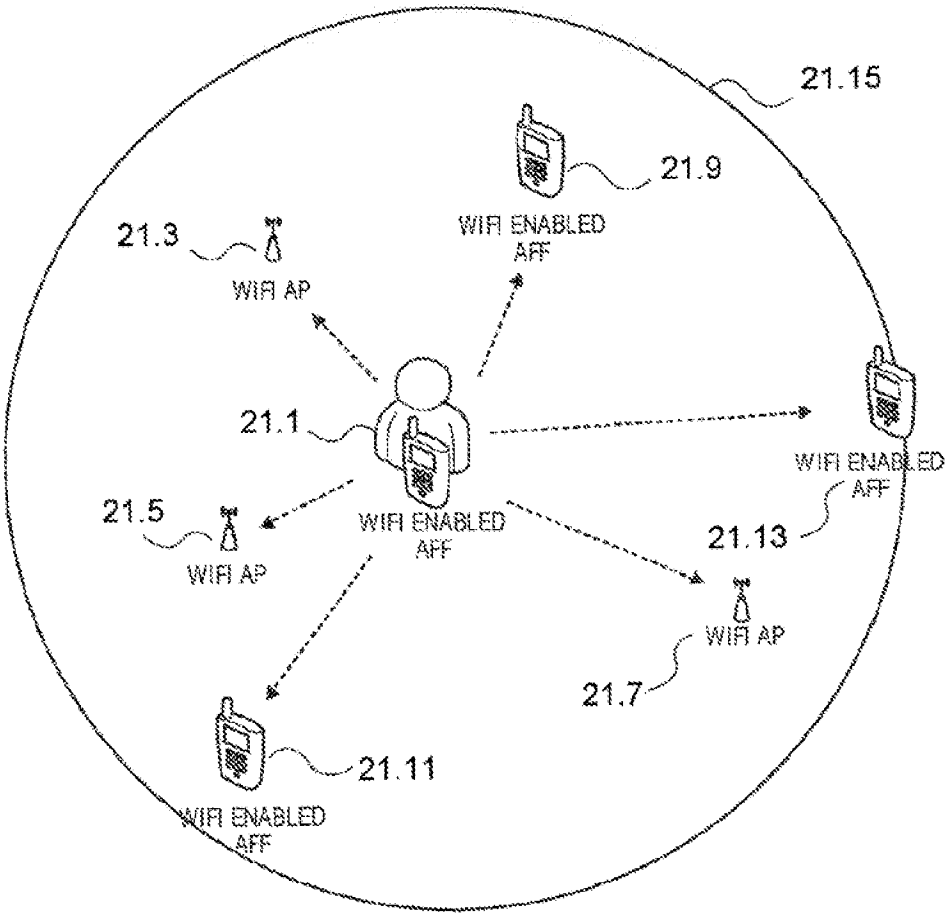



FIG. 23



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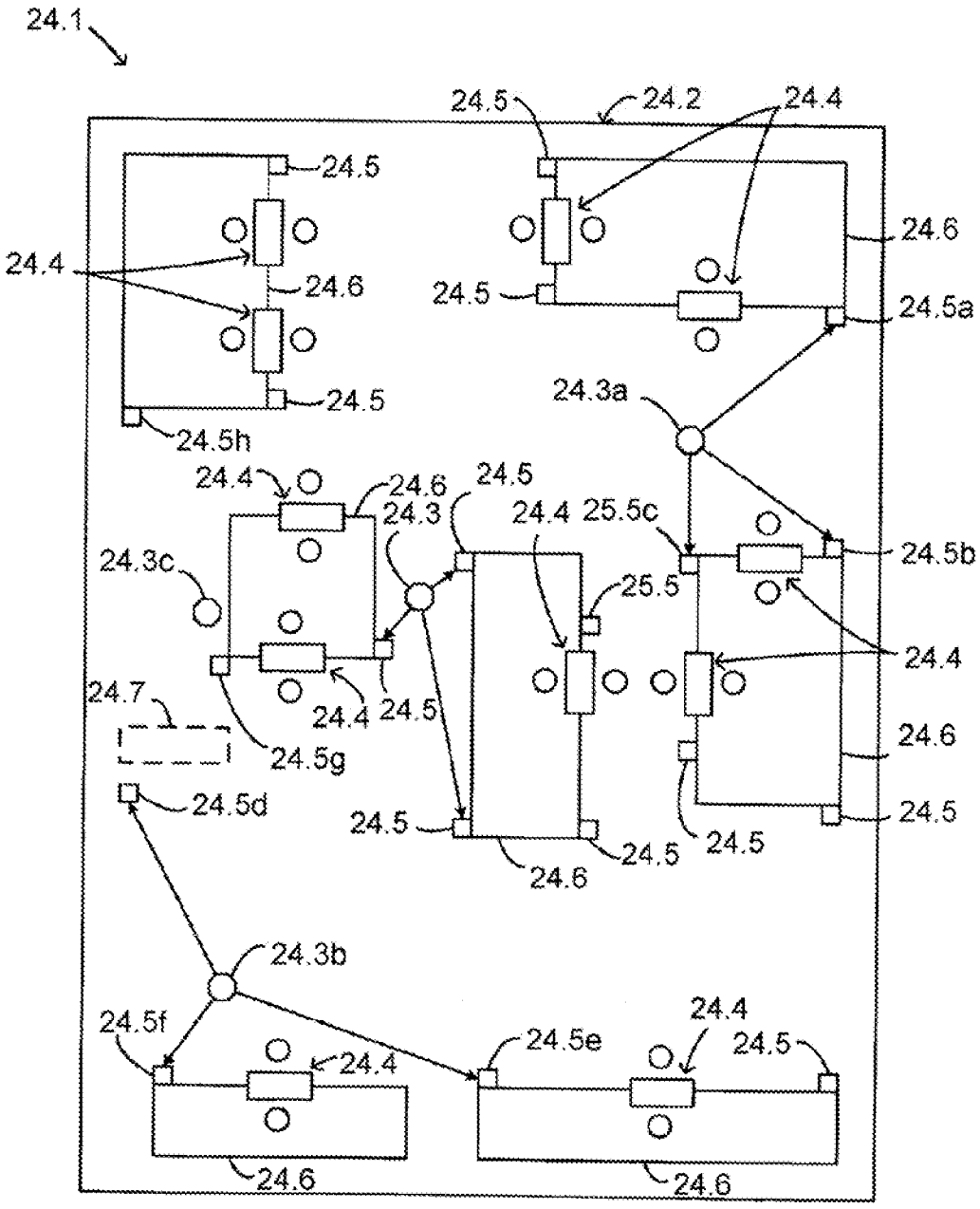



FIG. 24



SNSDOCID: <WO 2017062621A1 I >

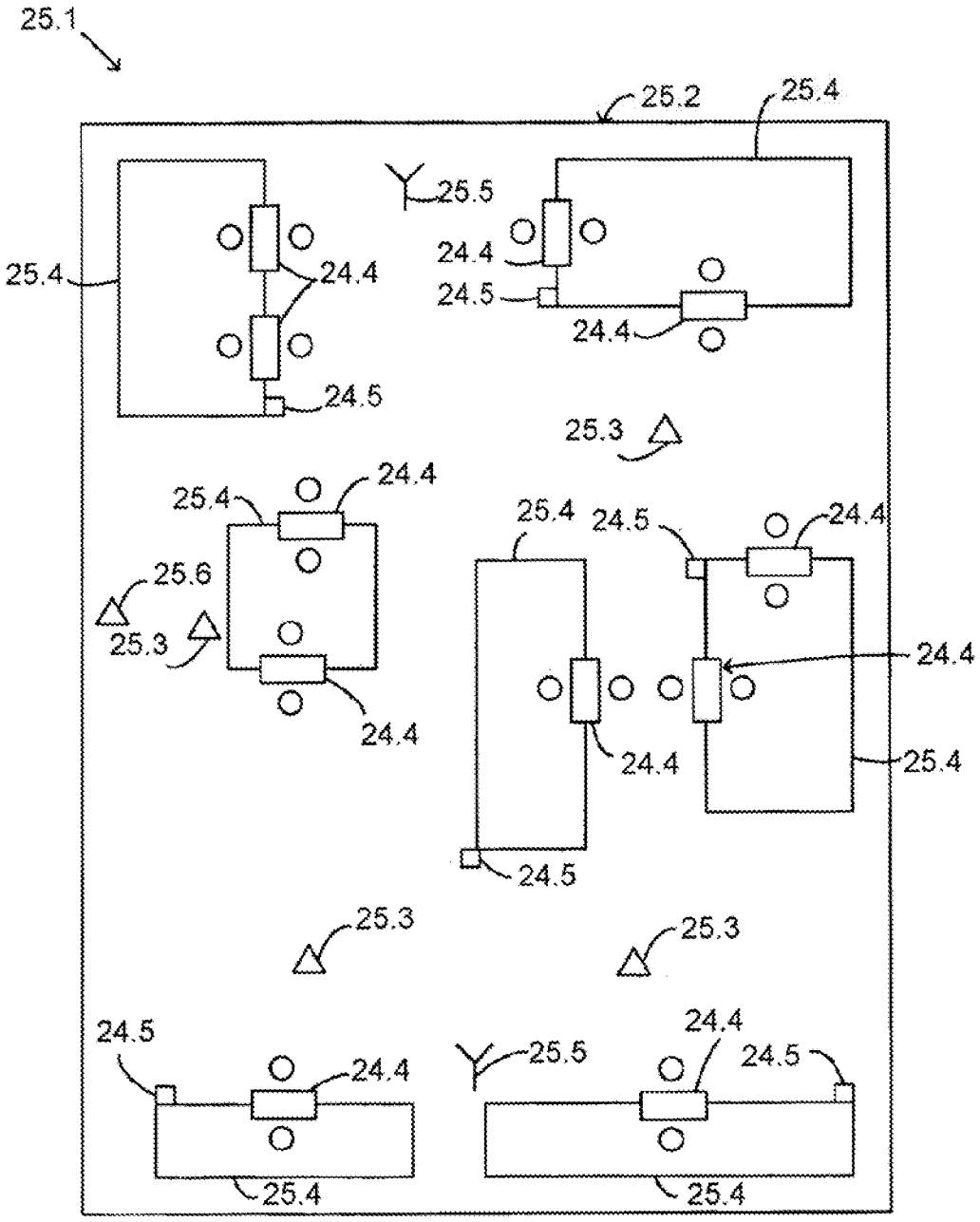



FIG. 25



SNSDOCID: <WO_____2017062621A1_I_>

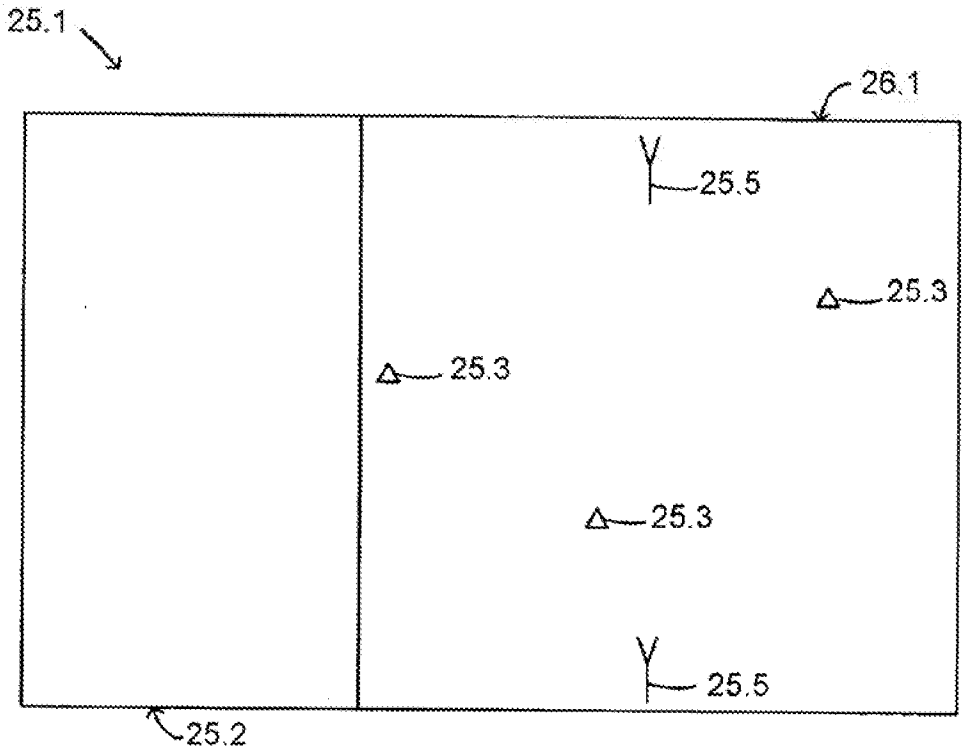
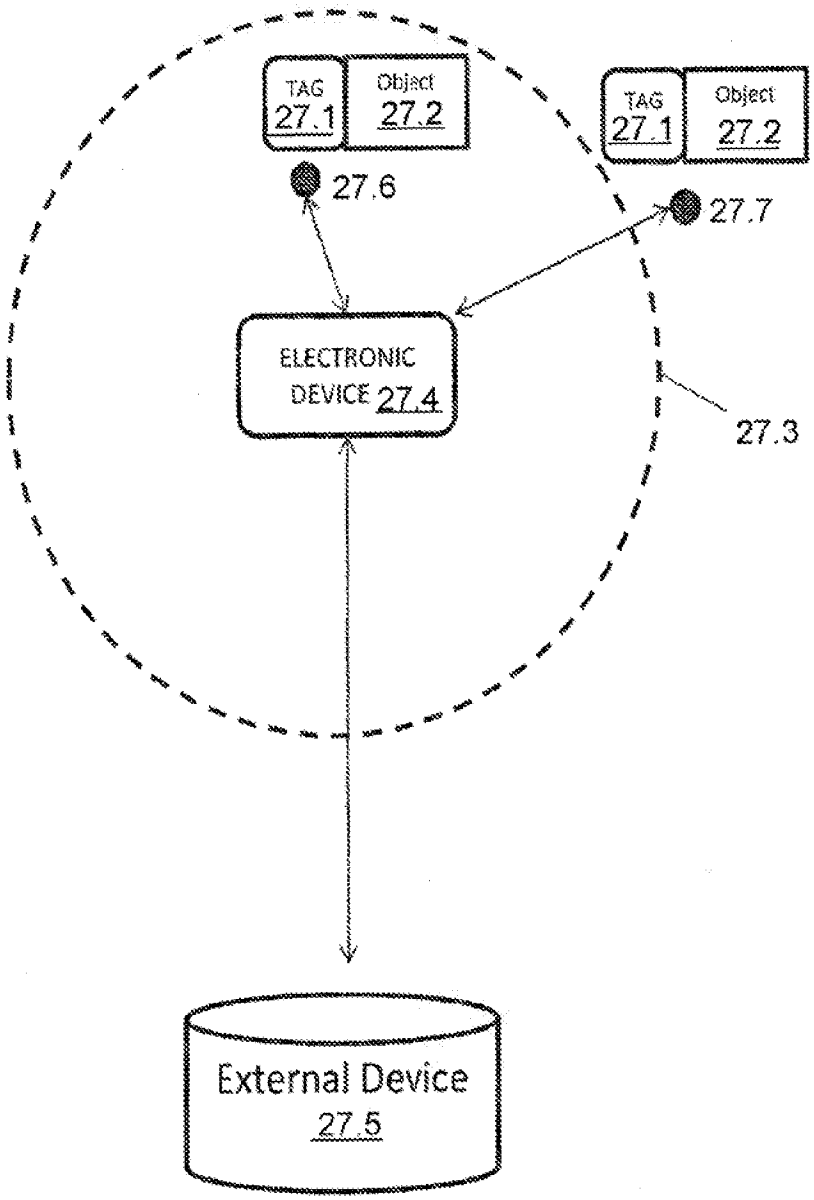



FIG. 26



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
540 of 1413

FIG. 27




AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
541 of 1413

BNSDOCID: <WO_____2017062621A1_I_>

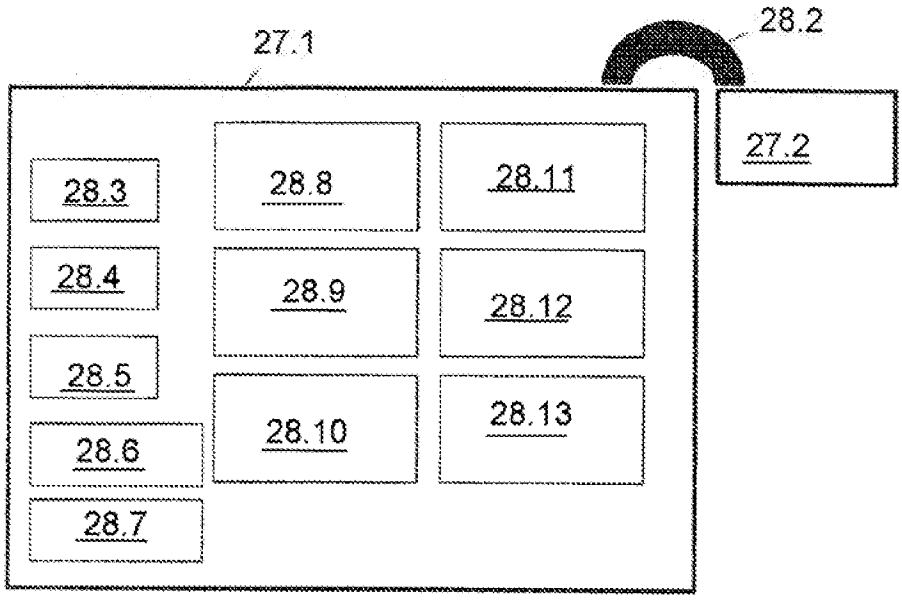



FIG. 28



BNSDOCID: <WO_____2017062621A1_I_>

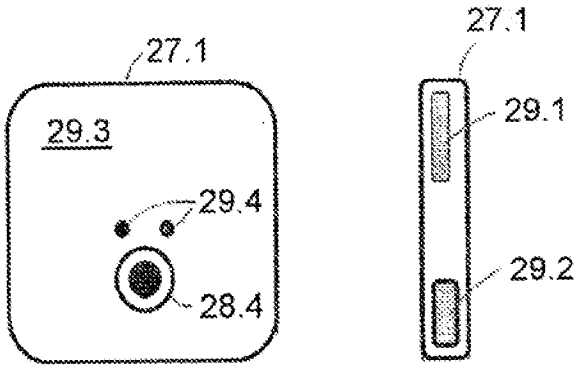
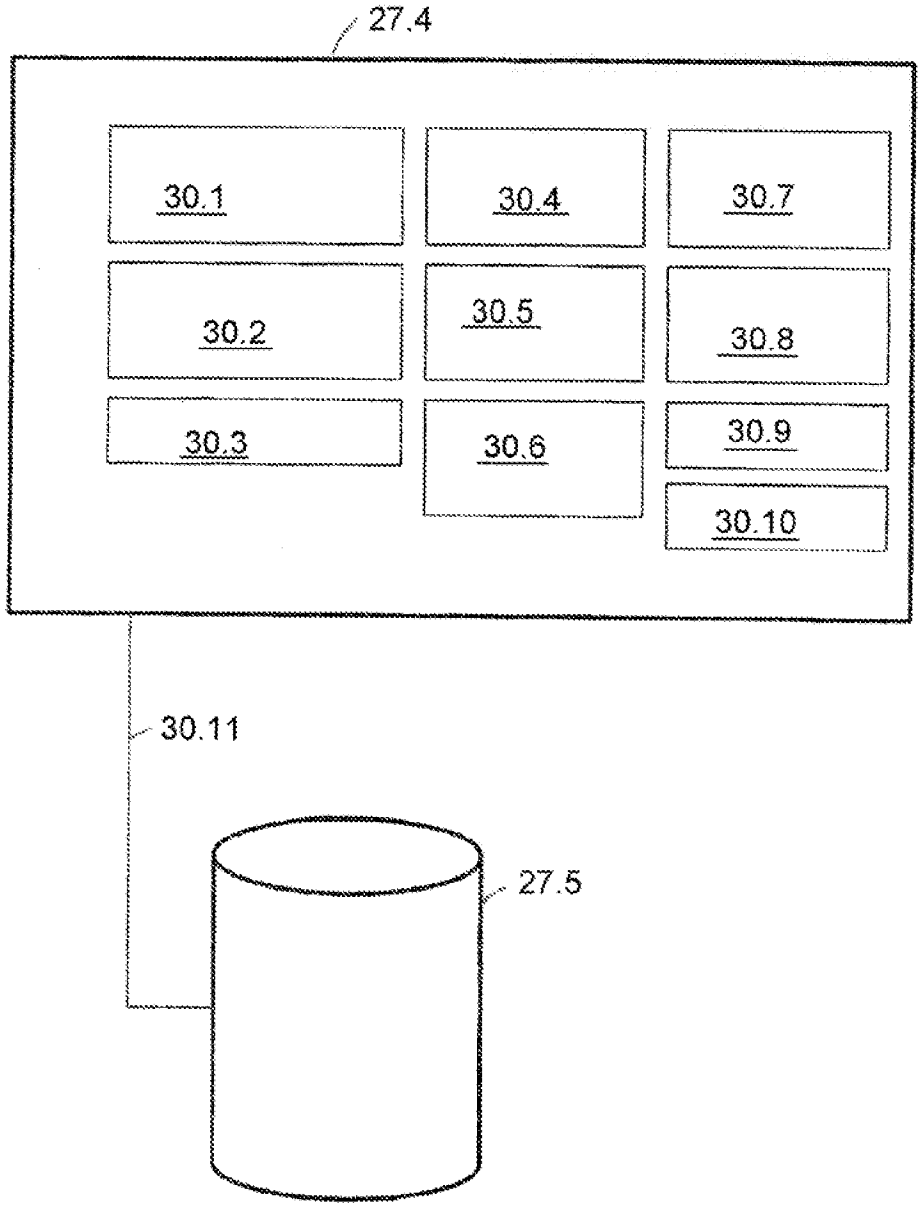



FIG. 29



BNSDOCID: <WO_____2017062621A1_I_>

FIG. 30






BNSDOCID: <WO_____2017062621A1_(_>

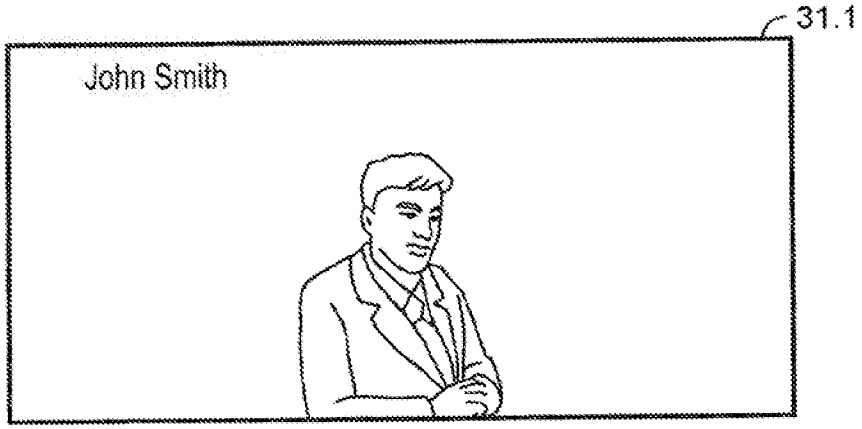



FIG. 31



SNSDOCID: <WO_____2017062621A1_I_>

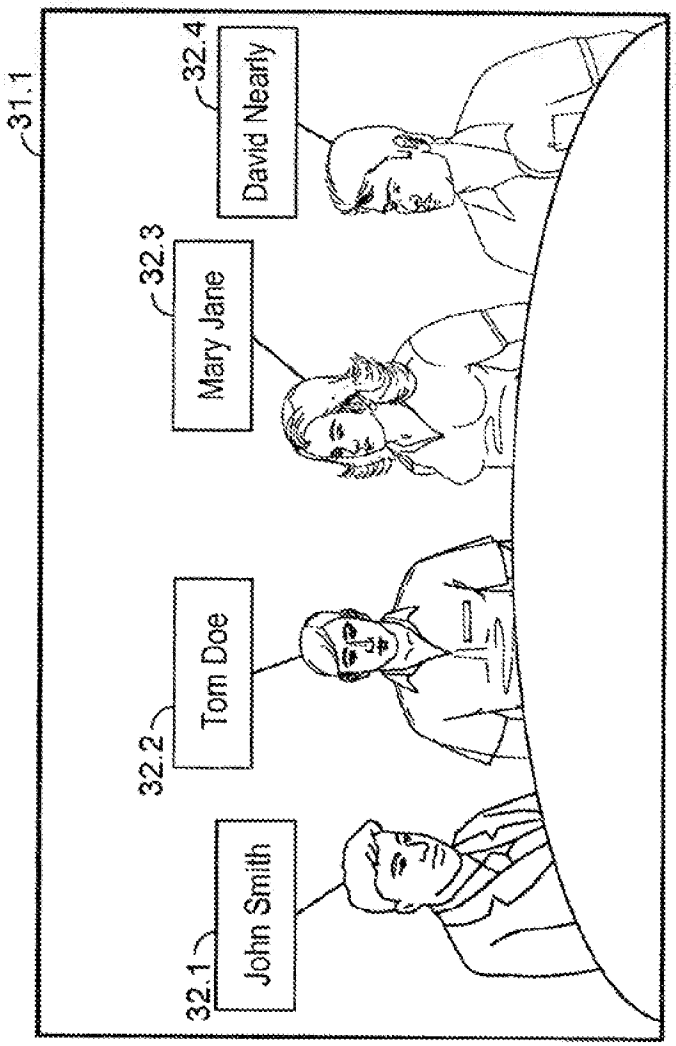



FIG. 32



BNSDOCID: <WO_____2017062621A1_I_>

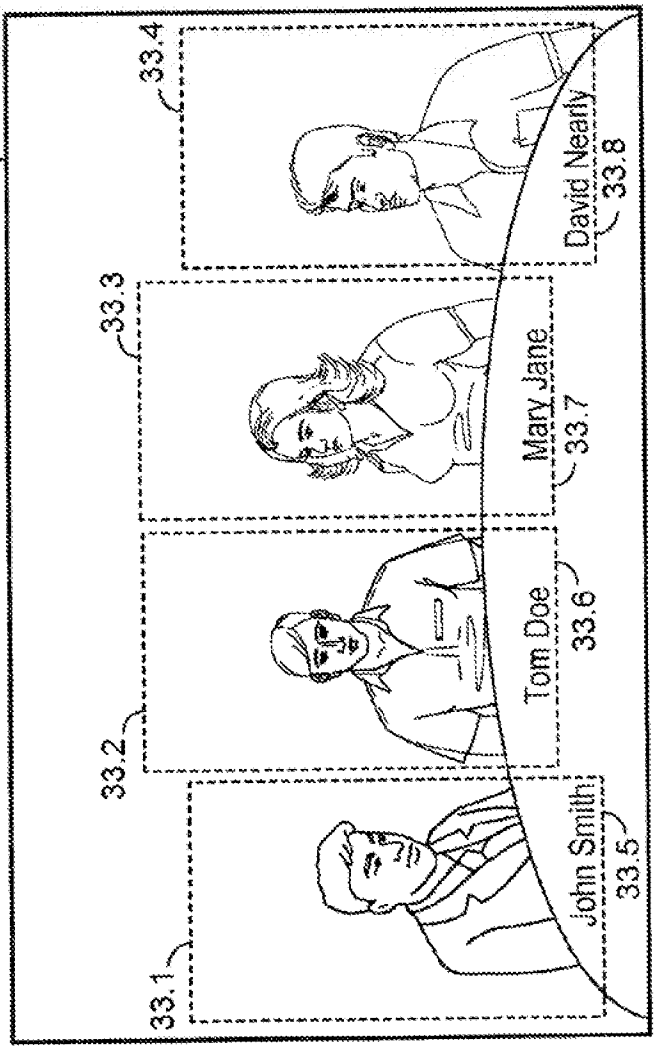

31.1
33.1
33.2
33.3
33.4
John Smith
33.5
Tom Doe
33.6
Mary Jane
33.7
David Nearly
33.8

FIG. 33

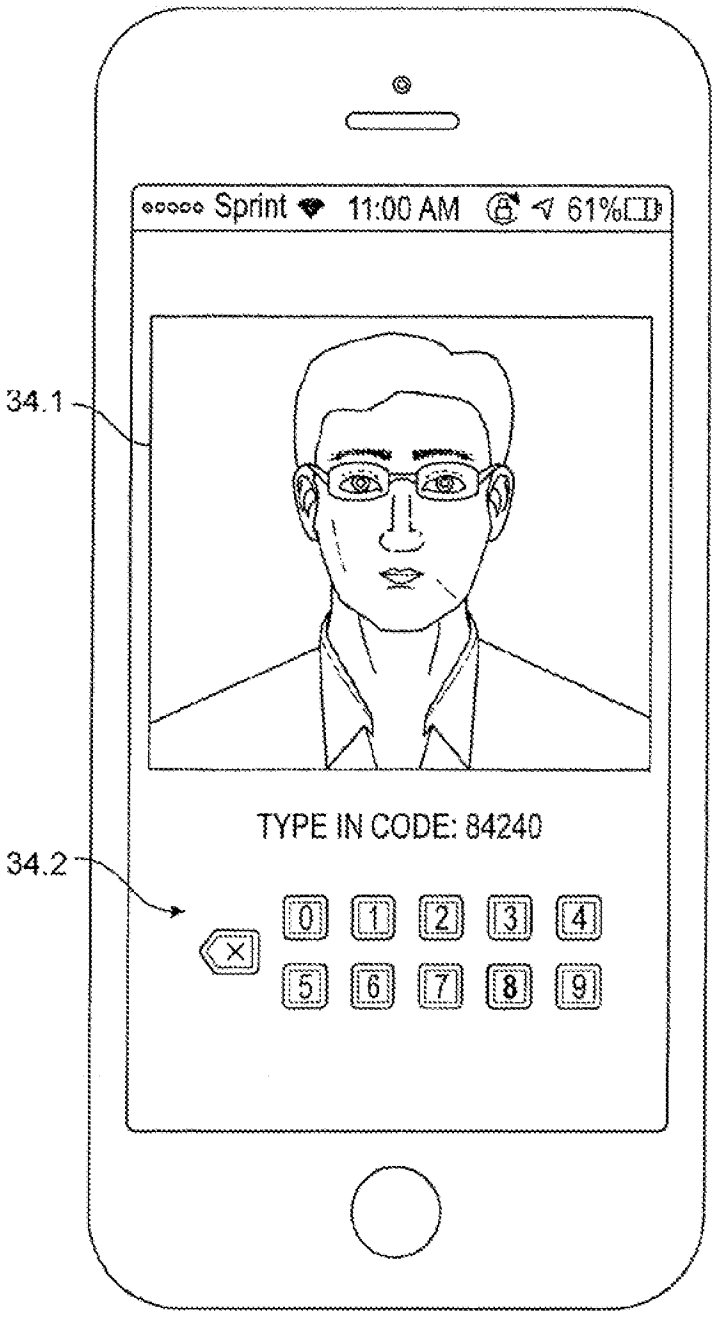



FIG. 34



BNSDOC:ID <WO_____2017062621A1_I_>

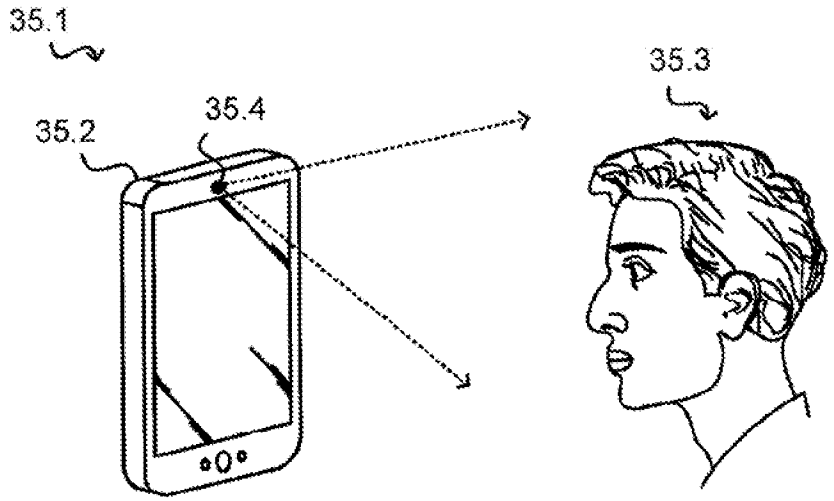



FIG. 35



SNSDOCID: <WO_____2017062621A1_L>

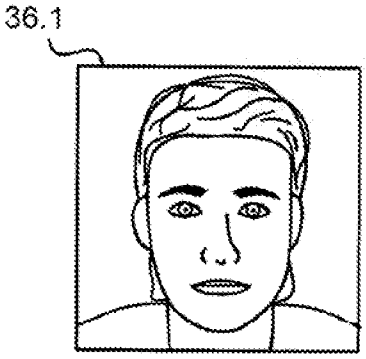



FIG. 36

AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
550 of 1413

BNSDOCID: <WO_____2017062621A1_I_>

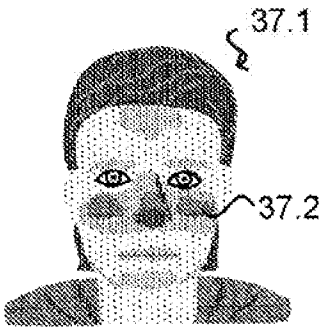



FIG. 37



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
551 of 1413

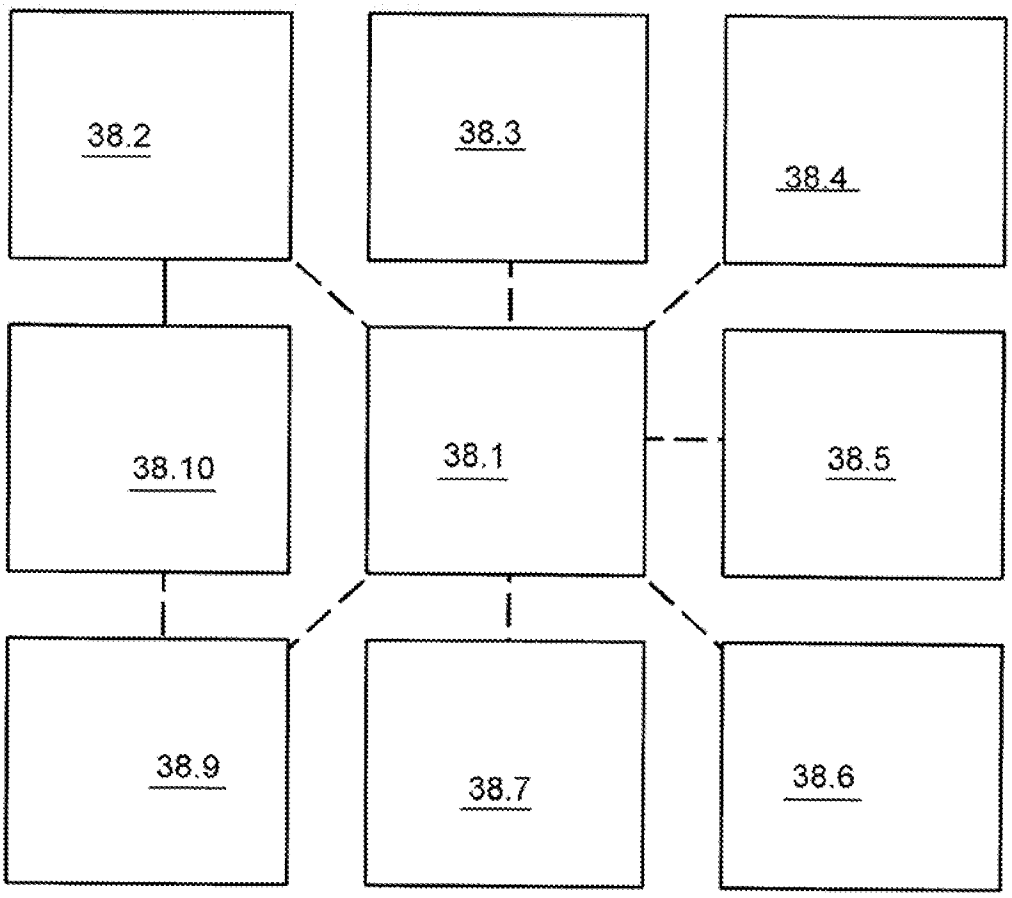
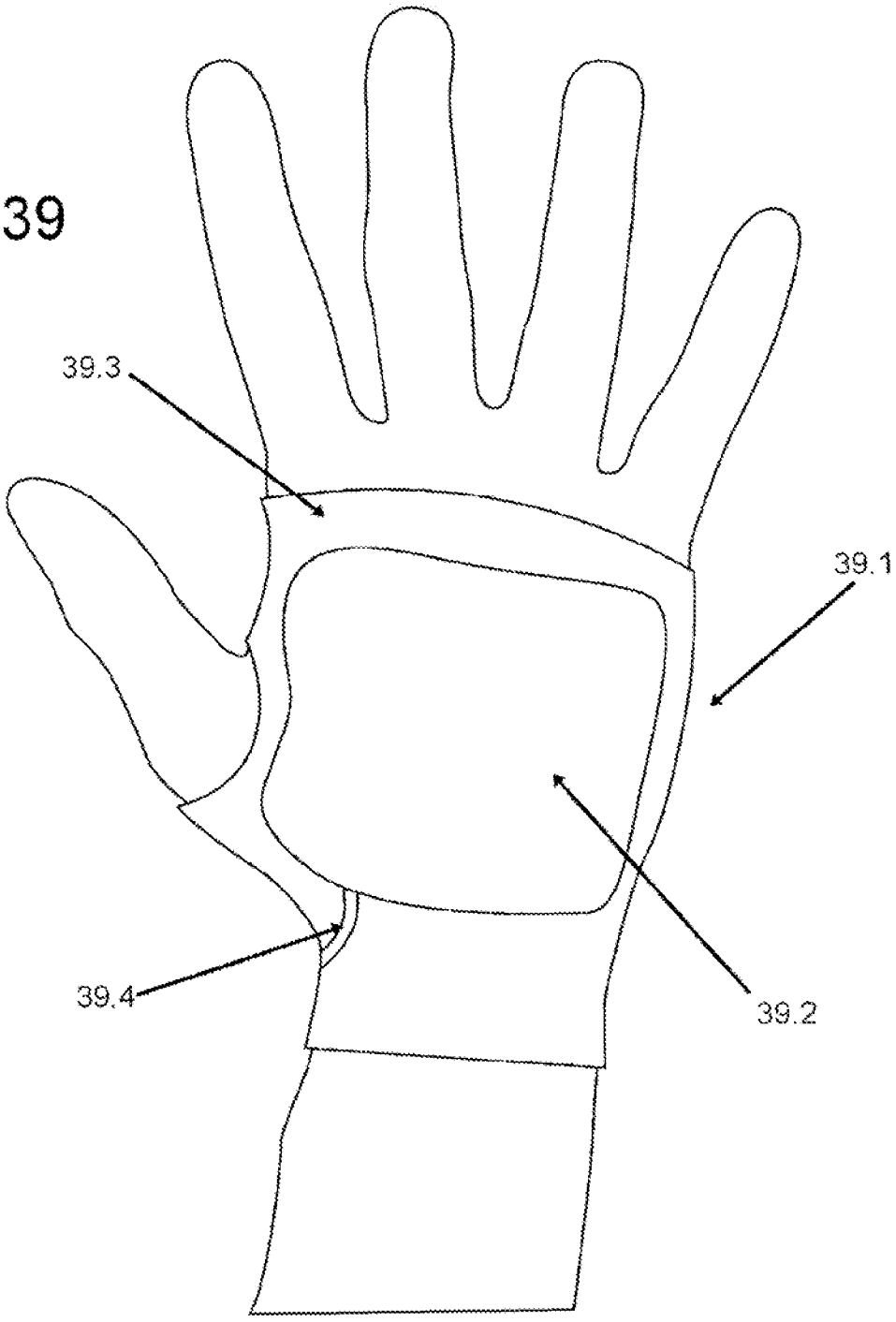



FIG. 38



BNSDOCID: <WO_____2017062621A1_1_>

FIG. 39






BNSDOCID: <WO_____2017062621A1_I_>

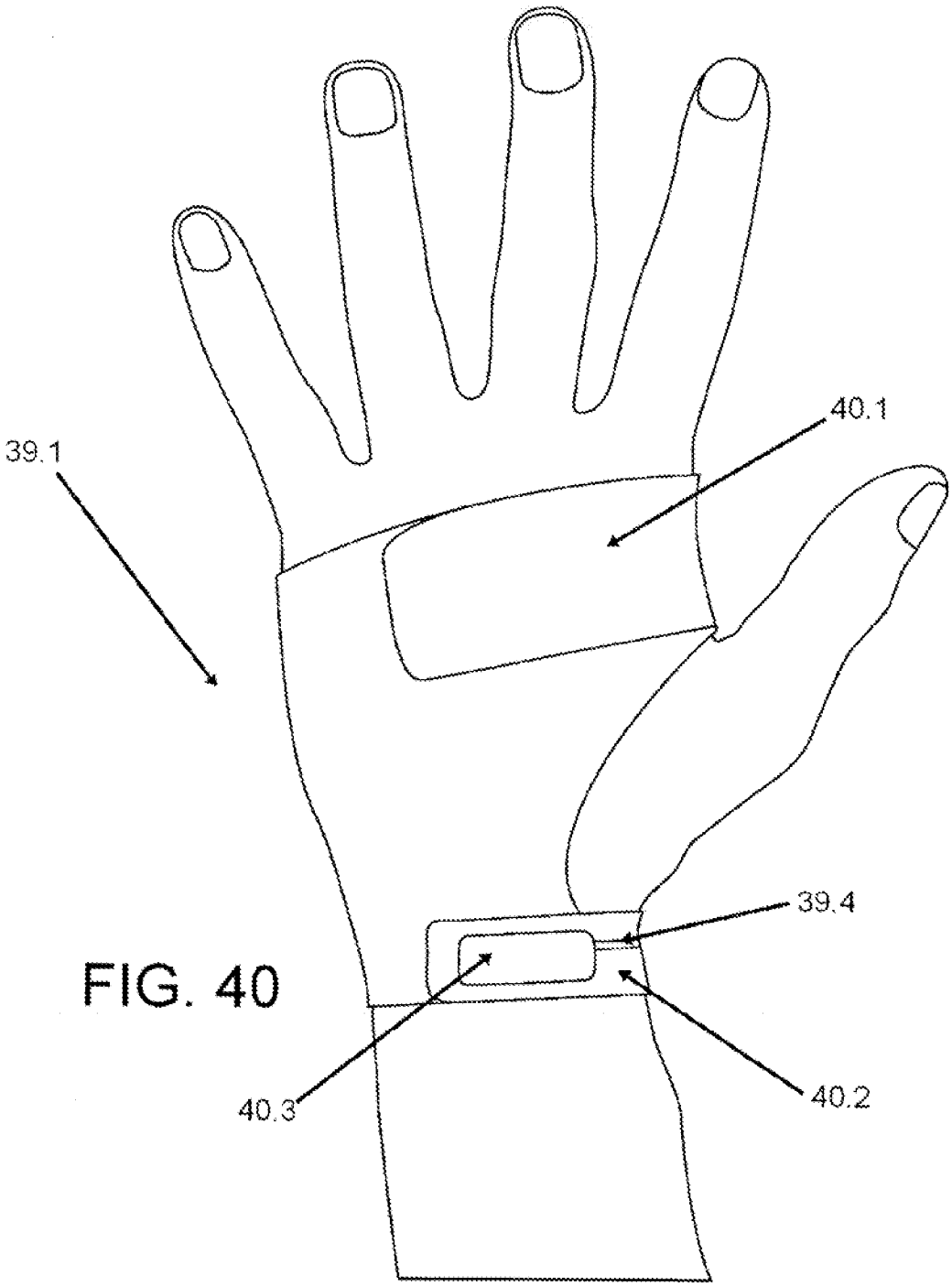



FIG. 40



BNSDOCID: <WO_____2017062621A1_i_>

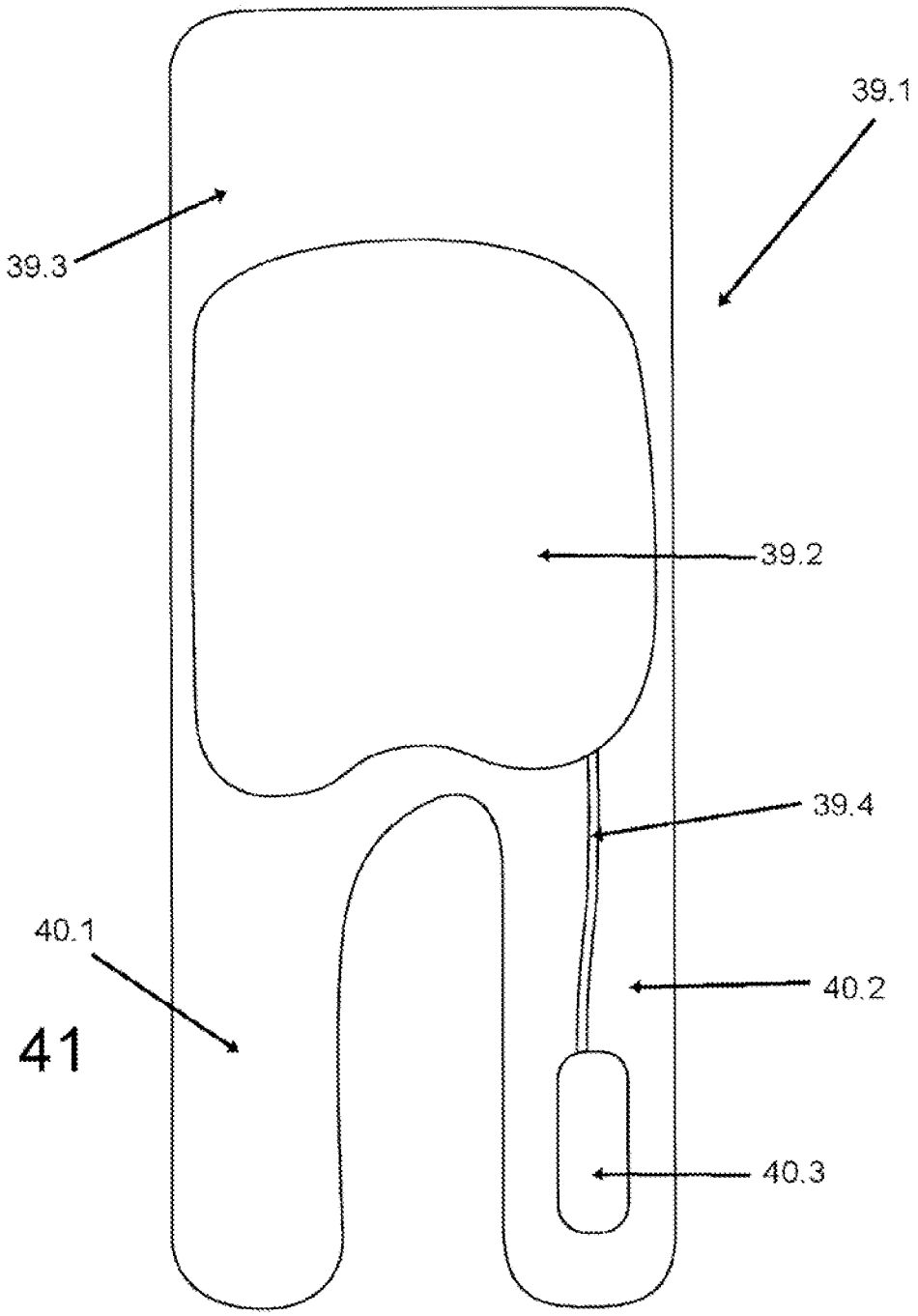



FIG. 41



ENSDOCID: <WO_____2017062621A1_L>

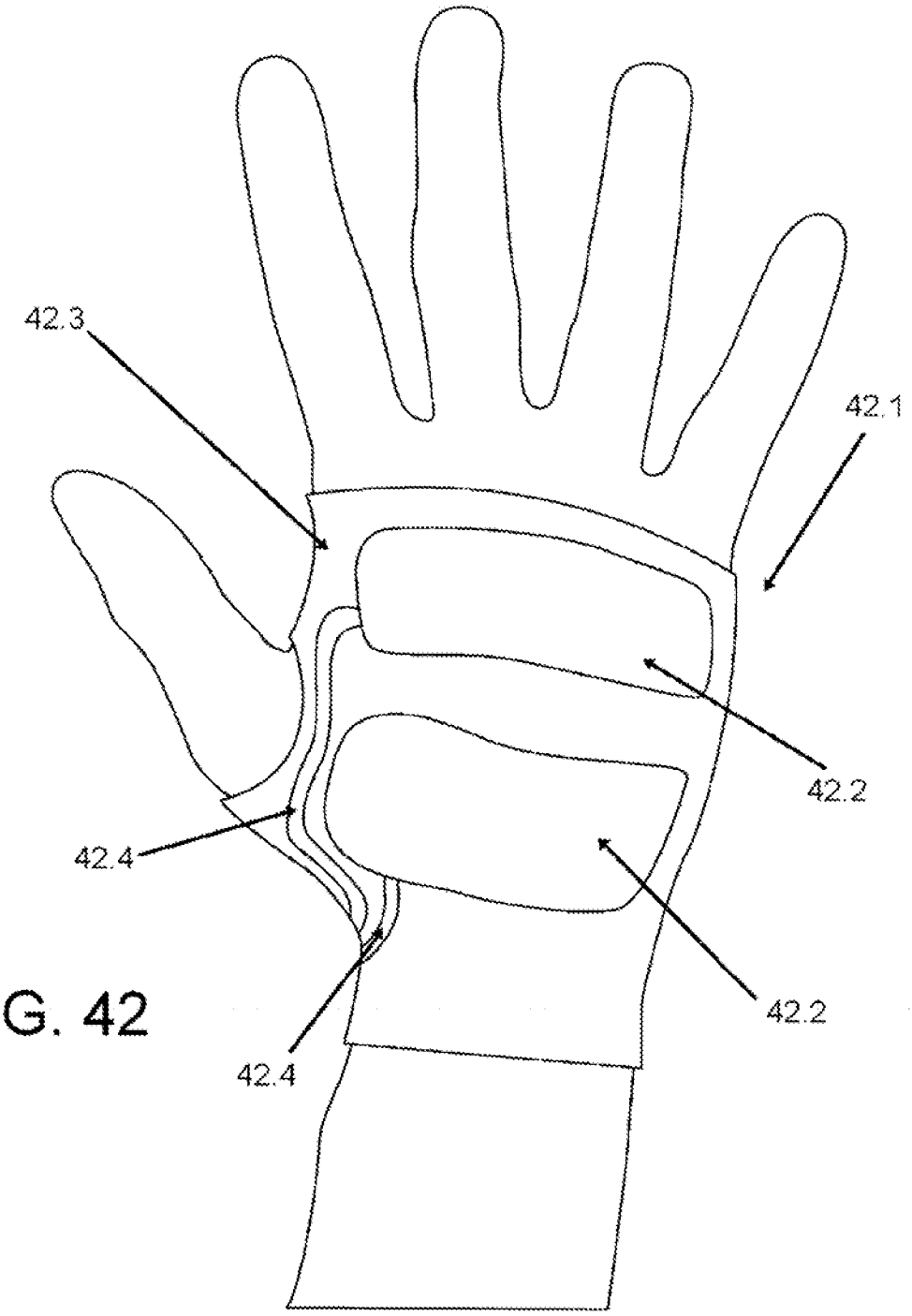



FIG. 42



ENSDOCID: <WO 2017062621A1 >

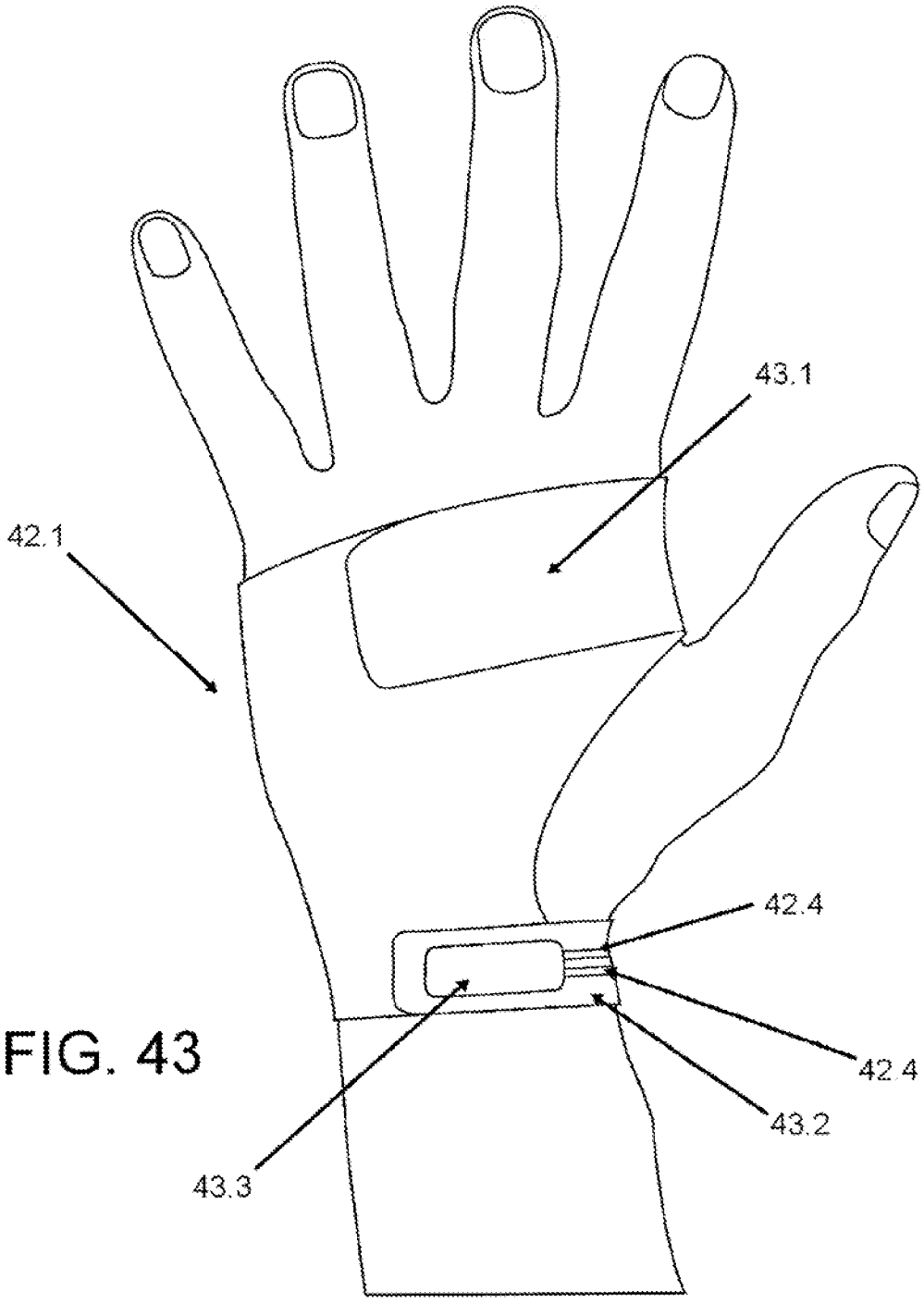



FIG. 43



BNSDOCID: <WO_____2017062621A1_I_>

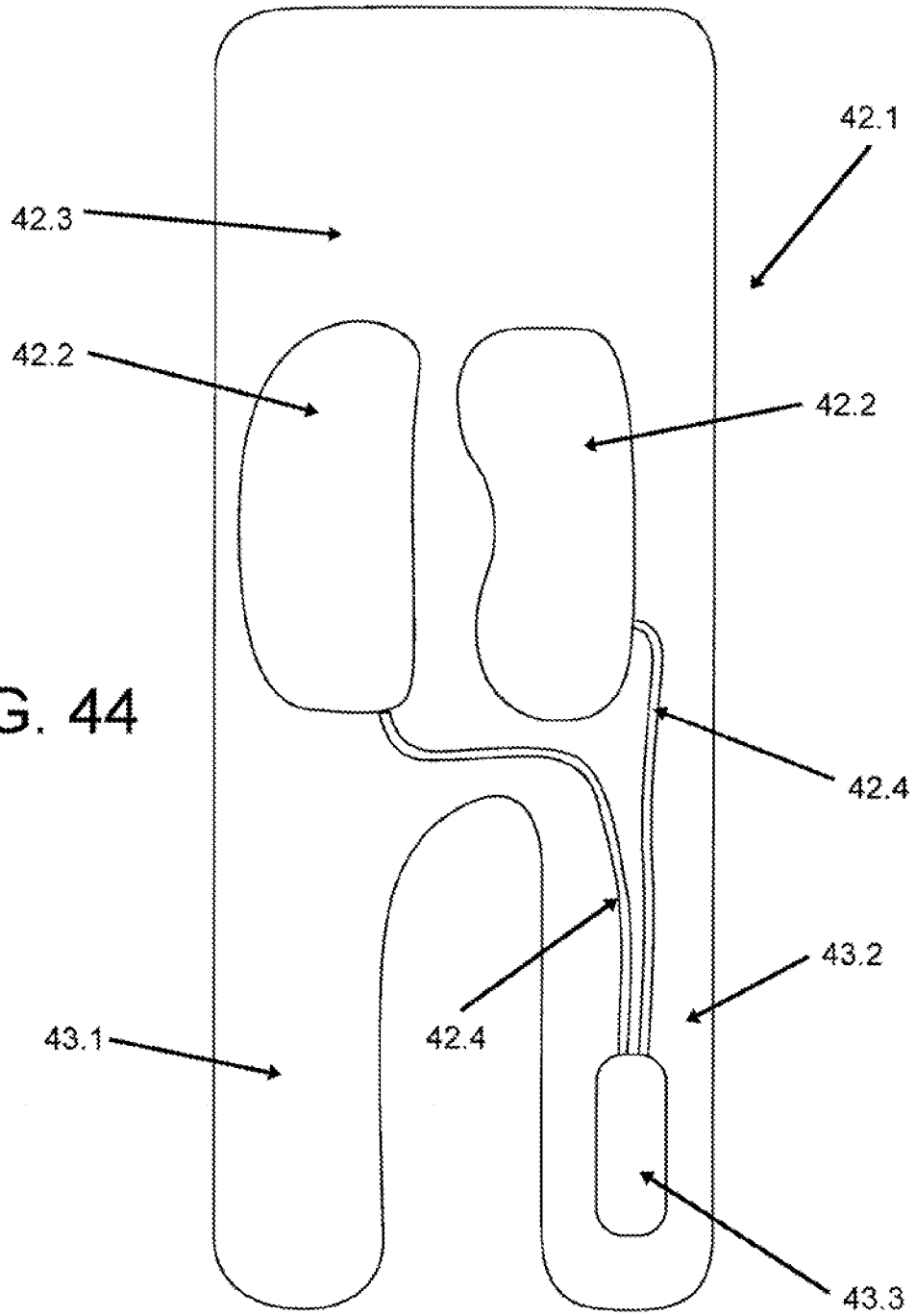



FIG. 44



BNSDOCID: <WO_____2017062621A1_I_>

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US16/65752

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - H04L 12/26 (2016.01)
CPC - H04L 67/22
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)
IPC(8) Classifications: H04L 12/26, 29/08; G06F 3/048, 19/00; H04W 4/02; A61B 5/021 (2016.01)
CPC Classifications: H04L 67/22, 67/10; G06F 3/0488, 3/04842; H04W 4/02; A63F 13/211; A61B 5/021

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, Other Countries (INPADOC), RU, AT, CH, TH, BR, PH); IEEE/IEEEXplore; Google/Google Scholar; IP.com; Keywords: smart watch, phone, motion, tracking, coordinates, database, cache, server, camera, video, power, battery, house, fitness, exercise, triangulate

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 9148483 B1 (FITBIT, INC.) 29 September 2015; abstract; column 4, lines 48-51; column 4 lines 55-61; column 12, lines 6-14; column 15, lines 15-17; column 15, lines 26-32; column 21, lines 40-44; column 23, lines 49-58; column 24, lines 5-18; column 24, lines 41-47; column 25, lines 10-16; column 26, lines 21-23; column 26, lines 41-43; column 28, lines 21-27 | 1-3, 6-8 |
| A | US 7353034 B2 (HANEY, R) 01 April 2008; entire document | 1-3, 6-8 |
| A | US 2011/0254760 A1 (LLOYD, S et al.) 20 October 2011; entire document | 1-3, 6-8 |

☐ 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 |
|---|---|
| 21 November 2016 (21.11.2016) | 15 DEC 2016 |
| Name and mailing address of the ISA/US<br>Mail Stop PCT, Attn: ISA/US, Commissioner for Patents<br>P.O. Box 1450, Alexandria, Virginia 22313-1450<br>Facsimile No. 571-273-8300 | Authorized officer<br>Shane Thomas<br>PCT Helpdesk: 571-272-4300<br>PCT OSP: 571-272-7774 |

Form PCT/ISA/210 (second sheet) (January 2015)



**AliveCor Exhibit 1002**
**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**
**559 of 1413**

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US16/55752

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 4, 5, 9, 10
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.



**AliveCor Exhibit 1002**
**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**
**560 of 1413**

8NSDOCID: <WO_____2017082821A1_I_>

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

**U.S. PATENTS**

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|

**U.S. PATENT APPLICATION PUBLICATIONS**

| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|

**FOREIGN PATENT DOCUMENTS**

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|

**NON-PATENT LITERATURE DOCUMENTS**

| Examiner Initials* | Cite No | 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[5] |
|---|---|---|---|
| | 1. | Advisory Action received for U. S. Patent Application No. 16/144,864, mailed on July 29, 2019, 6 pages. | |
| | 2. | Decision to Grant received for Danish Patent Application No. PA201870379, mailed on July 05, 2019, 2 pages. | |
| | 3. | Intention to Grant received for Danish Patent Application No. PA201870600, mailed on July 10, 2019, 2 pages. | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

| EXAMINER SIGNATURE | | | |
|---|---|---|---|
| Examiner Signature | | Date Considered | |

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.
[4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

## 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.

☒ The 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 | /Randy Omid/ | Date (YYYY-MM-DD) | 2019-08-01 |
| Name/Print | Randy Omid | Registration Number | 67,439 |

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 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.**

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 16143959 |
| **Filing Date:** | 27-Sep-2018 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Filer:** | Peter Jung-Hyon Yim/Ganesh Tripathi |
| **Attorney Docket Number:** | P38213US2/77770000489102 |

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:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| SUBMISSION- INFORMATION DISCLOSURE STMT | 1806 | 1 | 240 | 240 |
| | | **Total in USD ($)** | | **240** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 36754826 |
| **Application Number:** | 16143959 |
| **International Application Number:** | |
| **Confirmation Number:** | 6224 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Customer Number:** | 150004 |
| **Filer:** | Peter Jung-Hyon Yim/Ganesh Tripathi |
| **Filer Authorized By:** | Peter Jung-Hyon Yim |
| **Attorney Docket Number:** | P38213US2/77770000489102 |
| **Receipt Date:** | 01-AUG-2019 |
| **Filing Date:** | 27-SEP-2018 |
| **Time Stamp:** | 13:28:32 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | CARD |
| Payment was successfully received in RAM | $240 |
| RAM confirmation Number | E201981D29075744 |
| Deposit Account | |
| Authorized User | |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
566 of 1413

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | P38213US2_IDS.pdf | 100836<br>9a8863401a5fc1f803f94fef64a94879426cbe37 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied IDS fillable form | | | | | |
| 2 | Non Patent Literature | 16144864_ADAR_07_29_2019.pdf | 328400<br>5e376fbb563bc233ec14b68e66e6a38357f35971 | no | 6 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Non Patent Literature | PA201870379_DKDG_07_05_2019.pdf | 445839<br>e5c335f41188fe559c4a1e4dedddd2cd17c11ec0 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Non Patent Literature | PA201870600_DKIG_07_10_2019.pdf | 296168<br>eaa0099a2b7049685b6cb7ab895611a5483ea96a | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Fee Worksheet (SB06) | fee-info.pdf | 30617<br>33a9f5740d626fdfd8a559e52b6714d694c8bfb8 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 1201860 | | |

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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.**

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

| U.S. PATENTS | | | | | | |
|---|---|---|---|---|---|---|
| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |

| U.S. PATENT APPLICATION PUBLICATIONS | | | | | | |
|---|---|---|---|---|---|---|
| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |

| FOREIGN PATENT DOCUMENTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear | T[5] |

| NON-PATENT LITERATURE DOCUMENTS | | | |
|---|---|---|---|
| Examiner Initials* | Cite No | 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[5] |
| | 1. | Office Action received for Danish Patent Application No. PA201870601, mailed on June 25, 2019, 3 pages. | |
| | 2. | Office Action received for Danish Patent Application No. PA201870602, mailed on June 26, 2019, 3 pages. | |

| EXAMINER SIGNATURE | | | |
|---|---|---|---|
| Examiner Signature | | Date Considered | |

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.
[4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

## 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.

☒ The 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 | /Randy Omid/ | Date (YYYY-MM-DD) | 2019-07-24 |
| Name/Print | Randy Omid | Registration Number | 67,439 |

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 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.**

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 16143959 |
| **Filing Date:** | 27-Sep-2018 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Filer:** | Peter Jung-Hyon Yim/Ganesh Tripathi |
| **Attorney Docket Number:** | P38213US2/77770000489102 |

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:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| SUBMISSION- INFORMATION DISCLOSURE STMT | 1806 | 1 | 240 | 240 |
| | | **Total in USD ($)** | | **240** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 36681676 |
| **Application Number:** | 16143959 |
| **International Application Number:** | |
| **Confirmation Number:** | 6224 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Customer Number:** | 150004 |
| **Filer:** | Peter Jung-Hyon Yim/Ganesh Tripathi |
| **Filer Authorized By:** | Peter Jung-Hyon Yim |
| **Attorney Docket Number:** | P38213US2/77770000489102 |
| **Receipt Date:** | 24-JUL-2019 |
| **Filing Date:** | 27-SEP-2018 |
| **Time Stamp:** | 17:25:29 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | CARD |
| Payment was successfully received in RAM | $240 |
| RAM confirmation Number | 072519INTEFSW17262200 |
| Deposit Account | |
| Authorized User | |

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AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
573 of 1413

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | P38213US2_IDS.pdf | 97873<br>b9220350e9997575a56f7c28133fd580f54bd903 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied IDS fillable form | | | | | |
| 2 | Non Patent Literature | PA201870601_DKOA_06_25_2019.pdf | 1157975<br>6532a3ca4d9bc5d32383da30c178a5795b20568a | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Non Patent Literature | PA201870602_DKOA_06_26_2019.pdf | 1052650<br>3fa882695c438fd8be768df74a3031bfdd23756f | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Fee Worksheet (SB06) | fee-info.pdf | 30617<br>119060d7916f350678b2106aa19653749fdbf23d | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 2339115 | | |

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**New Applications Under 35 U.S.C. 111**

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**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.**

I hereby certify that this paper is being transmitted via the Office electronic filing system in accordance with 37 CFR § 1.6(a)(4).

Dated: July 17, 2019
Electronic Signature for Carina Morales: /Carina Morales/

Docket No.: P38213US2/77770000489102
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Patent Application of:
Christopher D. SOLI et al.

Application No.: 16/143,959

Confirmation No.: 6224

Filed: September 27, 2018

Art Unit: 3792

For: USER INTERFACES FOR HEALTH MONITORING

Examiner: LAU, MICHAEL J.

**AMENDMENT IN RESPONSE TO NON-FINAL OFFICE ACTION UNDER 37 C.F.R. 1.111**

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

Dear Commissioner:

## INTRODUCTORY COMMENTS

This is in response to the Non-final Office Action dated April 17, 2019, for which a response is due on July 17, 2019. Accordingly, this Amendment is timely filed. Reconsideration and allowance of the pending claims, as amended, in light of the remarks presented herein are respectfully requested.

**Amendments to the Claims** are reflected in the listing of claims, which begins on page 2 of this paper.

**Remarks/Arguments** begin on page 15 of this paper.



**AliveCor Exhibit 1002**
**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**
**576 of 1413**

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 16143959 |
| **Filing Date:** | 27-Sep-2018 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Filer:** | Randy Omid/Carina Morales |
| **Attorney Docket Number:** | P38213US2/77770000489102 |

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:** | | | | |
| CLAIMS IN EXCESS OF 20 | 1202 | 37 | 100 | 3700 |
| **Miscellaneous-Filing:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |

AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Extension-of-Time:** | | | | |
| **Miscellaneous:** | | | | |
| | | | **Total in USD ($)** | **3700** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 36612504 |
| **Application Number:** | 16143959 |
| **International Application Number:** | |
| **Confirmation Number:** | 6224 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Customer Number:** | 150004 |
| **Filer:** | Randy Omid/Carina Morales |
| **Filer Authorized By:** | Randy Omid |
| **Attorney Docket Number:** | P38213US2/77770000489102 |
| **Receipt Date:** | 17-JUL-2019 |
| **Filing Date:** | 27-SEP-2018 |
| **Time Stamp:** | 15:58:03 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | CARD |
| Payment was successfully received in RAM | $3700 |
| RAM confirmation Number | 071819INTEFSW15590800 |
| Deposit Account | 193140 |
| Authorized User | Carina Morales |

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37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
579 of 1413

37 CFR 1.19 (Document supply fees)

37 CFR 1.21 (Miscellaneous fees and charges)

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | P38213US2_Amendment.pdf | 967039<br>1d3d2dc4810c48a1aaf470d3f5dba7650d25e763 | yes | 27 |

| Multipart Description/PDF files in .zip description | | |
|---|---|---|
| **Document Description** | **Start** | **End** |
| Applicant Arguments/Remarks Made in an Amendment | 15 | 27 |
| Claims | 2 | 14 |
| Amendment/Req. Reconsideration-After Non-Final Reject | 1 | 1 |

**Warnings:**

**Information:**

| | | | | | |
|---|---|---|---|---|---|
| 2 | Fee Worksheet (SB06) | fee-info.pdf | 30302<br>06e7d61c0aaccd926b13efd9866987a8e9ac2e97 | no | 2 |

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**Information:**

| Total Files Size (in bytes): | 997341 |
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**New International Application Filed with the USPTO as a Receiving Office**

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## REMARKS

### I. Status of the Claims

Claims 1-20 were pending. By virtue of this Amendment, claims 21-57 have been added. The new claims are supported at least by Figures 8A-8S and paragraphs [0275]-[0327] of the Application as originally filed and as-filed claims 2-18.

Specifically, claim 21 is a new dependent device claim that depends from independent device claim 1. Claims 22-39 are new dependent non-transitory computer-readable storage medium ("CRM") claims that depend from independent CRM claim 19 and correspond to dependent device claims 2-18 and 21, respectively. Claims 40-57 are new dependent method claims that depend from independent method claim 20 and correspond to dependent device claims 2-18 and 21, respectively.

Thus, no new matter has been added. After entry of this Amendment, claims 1-57 will be pending. Applicant respectfully requests reconsideration of the claims based on the foregoing amendments and the following remarks.

### II. Interview Summary

Applicant thanks Examiner Lau and Supervisory Patent Examiner Layno for the courtesy of the telephonic interview conducted on July 12, 2019 with Applicant's representatives Randy Omid and Minsu Chung.

During the interview, the rejection under 35 U.S.C. § 103 of claim 1 was discussed in relation to cited references U.S. Pub. No. 2015/0099991 ("Yamaguchi") and U.S. Pub. No. 2018/0049696 ("Eom"). In particular, features of claim 1 concerning "a first input with the biometric sensor that satisfies first criteria," "in response to detecting that the first criteria are no longer met for a first period of time, resetting the indication of progress …," and "in response to detecting that the first criteria are no longer met for a second period of time that is longer than the first period of time, replacing display of the second user interface with the first user interface" was discussed in relation to the cited references.

The Examiners indicated that, based on the discussion with Applicant's representatives, further consideration is required before making a decision on the arguments presented. Of particular note,



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
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Applicant explained that "detecting that the first criteria are no longer met **for a first period of time**" and "detecting that the first criteria are no longer met **for a second period of time** that is longer than the first period of time" are features that concern the "**first input** with the biometric sensor"—claim 1 recites "detecting a first input with the biometric sensor **that satisfies first criteria**." (Emphasis added.) Applicant also explained that the "indication of progress" describes a feature that is displayed in "the second user interface" of claim 1 (e.g., a user interface element of "the second user interface)—"wherein the second user interface includes an indication of progress in recording the biometric information." Applicant notes that these features have been described in greater detail by new claims 21, 39, and 57, which are submitted herein.

No agreement was reached with respect to the allowability of the claims.

## III. Claim Rejections under 35 U.S.C. § 103 – Claims 1-2, 5, 19, and 20

Claims 1-2, 5, 19, and 20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Yamaguchi in view of Eom. Applicant respectfully traverses the rejection for at least the following reasons.

### A. Claim 1

Claim 1 recites, *inter alia*, "detecting a **first input** with the biometric sensor **that satisfies first criteria**" and "displaying, on the display, a second user interface that is different from the first user interface, wherein **the second user interface includes an indication of progress in recording the biometric information**." (Emphasis added.) In other words, claim 1 describes a "first input" that is detected by "the biometric sensor," where the "first input … satisfies first criteria." Claim 1 also describes an "indication of progress in recording the biometric information" that is displayed in "the second user interface."

For example, FIG. 8P of the Application (reproduced below) illustrates, in an exemplary embodiment, an example of the "first input" of claim 1—"user input 809." Specifically, the Application describes that "FIG. 8P illustrates first electronic device 800A displaying, on display 802, user interface 806 of the ECG application **while performing an ECG recording corresponding to a user input 809 on input device 804** (e.g., after an initial threshold time period (e.g., 5 seconds) has

passed from the initiation of the recording)." (Application as originally filed at [0298]; emphasis added.)

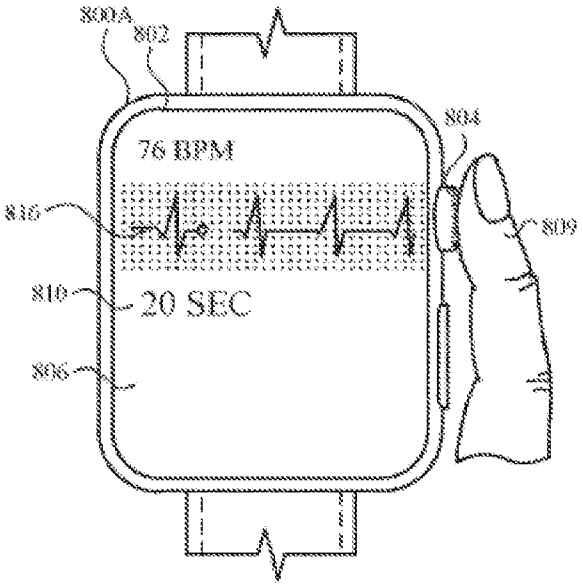



*FIG. 8P*

FIG. 8P also illustrates, in the exemplary embodiment, an example of the "indication of progress" of claim 1—"timer 810." Specifically, the Application describes that "**[a]s indicated by timer 810** (e.g., showing "20 seconds") in FIG. 8P, 10 seconds have passed since the initiation of the recording," where the recording is the "ECG recording corresponding to [] user input 809 on input device 804." (Application as originally filed at [0298]; emphasis added.) Thus, the "first input with the biometric sensor that satisfies first criteria" and the "indication of progress in recording the biometric information" displayed in "the second user interface" are separate features described in claim 1.

Claim 1 further recites, *inter alia*, "after recording at least a portion of the biometric information, **detecting, via the one or more input devices, that the first criteria are no longer met**," where:

- "**in response to detecting that the first criteria are no longer met for a first period of time, resetting the indication of progress in recording the biometric information** and maintaining display of the second user interface," and

- "**in response to detecting that the first criteria are no longer met for a second period of time that is longer than the first period of time**, replacing display of the second user interface with the first user interface."

(Emphasis added.)

In particular, with respect to "detecting that the first criteria are **no longer met for a first period of time**," the Application describes, with reference to FIG. 8Q (reproduced below), that "first electronic device 800A **loses detection of user input 809 on input device 804**. In some embodiments, in response to (e.g., immediately in response to or within a short period of time, such as 1 second) losing detection of the user input on input device 804, **first electronic device 800A resets the ECG recording** (e.g., terminates the previous recording and prepares to start a new recording), **as indicated by timer 810** (e.g., which now shows '30 seconds,' the full duration of a recording). In some embodiments, first electronic device 800A causes the remaining time indicated in timer 810 to 'rewind' back to (e.g., count back up to) the initial duration in response to losing detection of the user input on input device 804." (Application as originally filed at [0299]; emphasis added.)

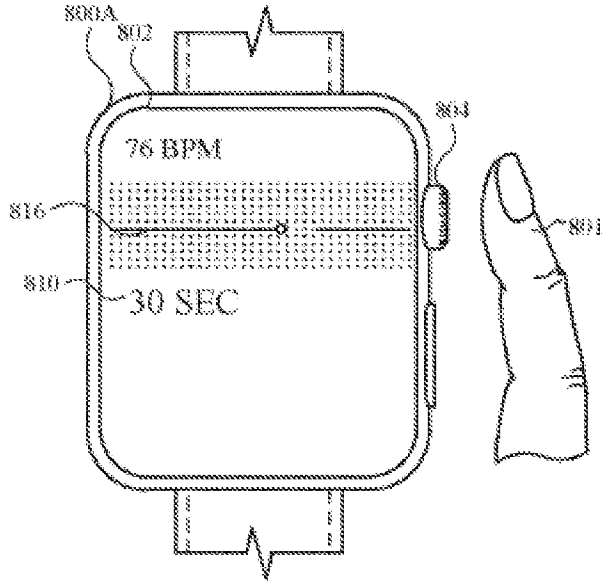



*FIG. 8Q*

As discussed during the telephonic interview, the cited references, Yamaguchi and Eom, fail to disclose or suggest the above-described features of claim 1. In particular, as agreed by the Examiners

during the telephonic interview, Eom is the more relevant reference with respective to the above-described features of claim 1. Yet, Eom is deficient for at least the following reasons.

Eom describes a smartwatch device that can be used to measure biometric information. Of particular note, Eom describes, with reference to the flowchart of FIG. 7, various screens that are displayed on the smartwatch device prior to, during, and after the measurement of the biometric information. Specifically, prior to and during measuring the biometric information, Eom describes displaying the following screens in order:

- (1) The "position screen" (step 730), where the position screen can be "position screen 810 as a text," as shown in FIG. 8A (reproduced below), or "position screen 820 as an image of a posture to be performed," as shown in FIG. 8B (reproduced below). (Eom at [0081].)

FIG. 8A

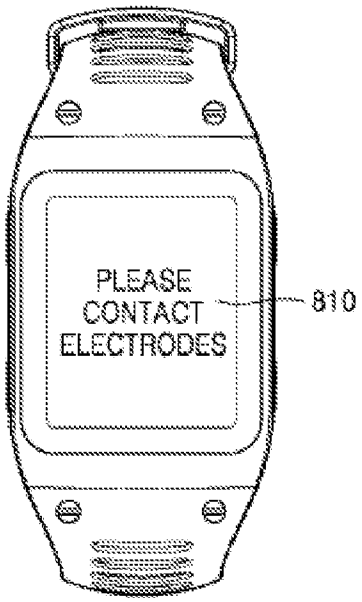
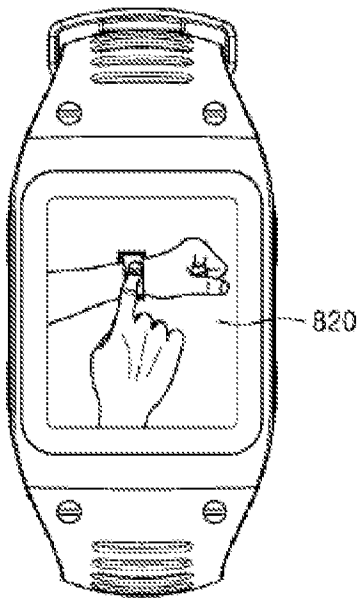
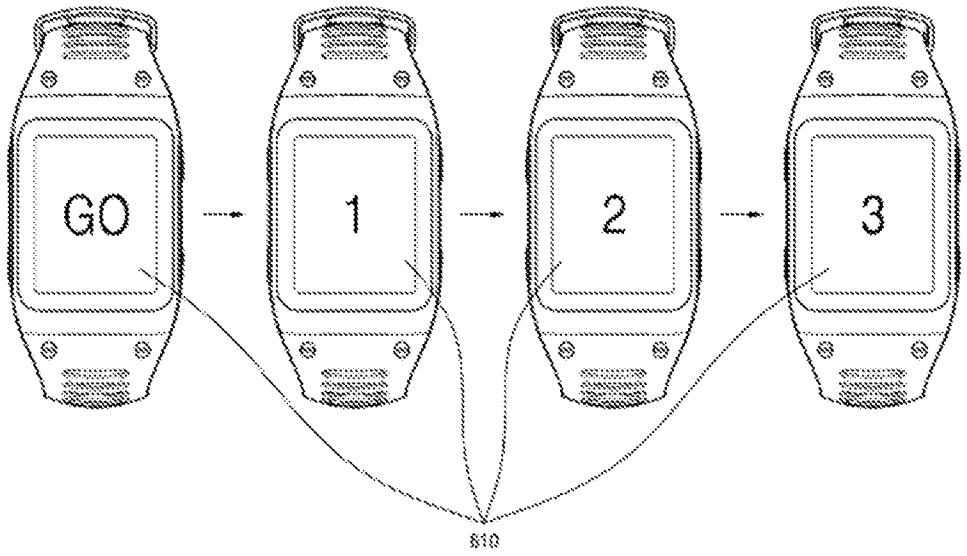



FIG. 8B



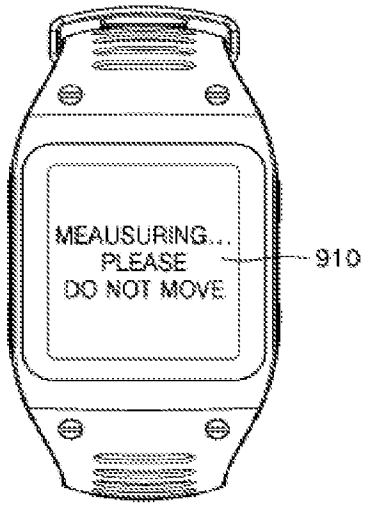

- (2) The "dynamic screen" (step S740), where the dynamic screen corresponds to a "dynamic screen 610 on which numbers change in the ascending order according to time," as shown in FIG. 6 (reproduced below). (Eom at [0074].)

FIG. 6




- (3) The "measurement screen" (step S750), where the measurement screen corresponds to a "measurement screen 910 … indicating that the bio information is being measured," as shown in FIG. 9 (reproduced below).

FIG. 9








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Then, during the measurement of biometric information, Eom describes that "[i]f the measurement fails (operation S760 - NO), the controller 160 may **output a failure notice** which indicates that the measurement has failed in operation S780." (Eom at [0085]; emphasis added.) Thus, Eom at most describes displaying a particular screen—a "failure notice"—if the measurement of the biometric information fails prior to completion. In particular, Eom fails to disclose or suggest detecting for two different types of events that can cause the measurement of the biometric information to fail prior to completion, let alone performing different steps in response to different types of failures.

Yet, as discussed above, claim 1 describes, "after recording at least a portion of the biometric information, detecting, via the one or more input devices, that the first criteria are no longer met," **either** (1) "resetting the indication of progress in recording the biometric information and maintaining display of the second user interface" "in response to detecting that the first criteria are no longer met for a first period of time"; **or** (2) "replacing display of the second user interface with the first user interface" "in response to detecting that the first criteria are no longer met for a second period of time that is longer than the first period of time." The linear process of Eom fails to disclose or suggest either of these limitations of claim 1, let alone both limitations. That is, outputting a failure notice "[i]f the measurement fails," as described in Eom, does not disclose or suggest "detecting that the first criteria are no longer met **for a first period of time**" and "detecting that the first criteria are no longer met **for a second period of time that is longer than the first period of time**," as described in claim 1. (Emphasis added.)

Further, even if it is assumed, *arguendo*, that Eom discloses both "detecting that the first criteria are no longer met for a first period of time" and "detecting that the first criteria are no longer met for a second period of time" (which Applicant does not concede), Eom still fails to disclose or suggest "**resetting the indication of progress in recording the biometric information** and maintaining display of the second user interface" "in response to detecting that the first criteria are no longer met for a first period of time," as described in claim 1. (Emphasis added.) As explained above, "[i]f the measurement fails (operation S760 - NO)," Eom merely describes "output[ing] a failure notice—Eom does not disclose displaying an "indication of progress in recording the biometric information," let alone "resetting the indication of progress."

For at least the reasons discussed above, the cited references fail to disclose or suggest all of the features of claim 1, and thus the rejection under 35 U.S.C. § 103 of claim 1 is deficient. Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. § 103 of claim 1 be withdrawn and that the claim be allowed.

**B. Claims 19 and 20**

Claims 19 and 20 recite features that correspond to that of claim 1. As discussed above, claim 1 is allowable. Thus, claims 19 and 20 are allowable for at least similar reasons as discussed with respect to claim 1.

Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. § 103 of claims 19 and 20 be withdrawn and that the claims be allowed.

**C. Claims 2 and 5**

Claims 2 and 5 depend from base claim 1. As discussed above, claim 1 is allowable. Thus, claims 2 and 5 are allowable for at least the reason that they depend from an allowable base claim.

Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. § 103 of claims 2 and 5 be withdrawn and that the claims be allowed.

**D. New Claim 21**

Claim 21 recites: "the first criteria being no longer met for the first period of time relates to the first input" and "the second criteria being no longer met for the second period of time relates to the first input." These limitations further emphasize that "detecting, via the one or more input devices, that the first criteria are no longer met," as recited in claim 1, relates to the "**first input**," for which claim 1 also recites "detecting a first input with the biometric sensor that satisfies first criteria." For example, with respect to these features, the Specification describes that "[t]he first electronic device (e.g., 800A) detects (910) a first input with the biometric sensor (e.g., 804) that satisfies first criteria (e.g., user contact with the biometric sensor, movement below a threshold, electrical interference below a threshold)," and that "[a]fter recording at least a portion of the biometric information, the first electronic device (e.g., 800A) detects (912), via the one or more input devices, that the first criteria are

no longer met (e.g., **user contact with the biometric sensor 804 is lost**)." (Application as originally filed at [0309]-[0311]; emphasis added.)

Claim 21 also recites: "resetting the indication of progress in recording the biometric information comprises resetting the indication of progress that is displayed in the second user interface." This limitation further emphasizes that the "indication of progress" is **displayed in** "the second user interface" (e.g., is a user interface element of "the second user interface"). For example, in an exemplary embodiment, the Application describes displaying a "timer 810" in a "user interface 806)" (e.g., as shown in FIGS. 8P-8R), where "timer 810 (e.g., a countdown timer of a predetermined amount of time, such as 30 seconds) that indicates the amount of time remaining to complete the ECG recording." (Application as originally field at [0282].)

As mentioned above in the Interview Summary, the Examiners agreed during the telephonic interview that the concept that "detecting that the first criteria are no longer met **for a first period of time**" and "detecting that the first criteria are no longer met **for a second period of time** that is longer than the first period of time" relates to the "**first input** with the biometric sensor," and is different from "resetting the indication of progress," is not disclosed by the cited references. The features of claim 21 incorporate this concept.

Accordingly, Applicant respectfully requests that claim 21 be allowed.

## IV. Claim Rejections under 35 U.S.C. § 103 – Claims 3 and 4

Claims 3 and 4 stand rejected under 35 U.S.C. § 103 as being unpatentable over Yamaguchi, in view of Eom, and further in view of U.S. Pub. No. 2017/0007159 ("Dieffenderfer"). Applicant respectfully traverses the rejection for at least the following reasons.

Claims 3 and 4 depend from base claim 1. As discussed above, claim 1 is allowable. Dieffenderfer fails to cure the deficiencies of Yamaguchi and Eom with respect to claim 1. Thus, claims 3 and 4 are allowable for at least the reason that they depend from an allowable base claim.

Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. § 103 of claims 3 and 4 be withdrawn and that the claims be allowed.

## V. Claim Rejections under 35 U.S.C. § 103 – Claim 6

Claim 6 stands rejected under 35 U.S.C. § 103 as being unpatentable over Yamaguchi, in view of Eom, and further in view of U.S. Pub. No. 2016/0196635 ("Cho"). Applicant respectfully traverses the rejection for at least the following reasons.

Claim 6 depends from base claim 1. As discussed above, claim 1 is allowable. Cho fails to cure the deficiencies of Yamaguchi and Eom with respect to claim 1. Thus, claim 6 is allowable for at least the reason that it depends from an allowable base claim.

Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. § 103 of claim 6 be withdrawn and that the claim be allowed.

## VI. Claim Rejections under 35 U.S.C. § 103 – Claims 7-9 and 11

Claims 7-9 and 11 stand rejected under 35 U.S.C. § 103 as being unpatentable over Yamaguchi, in view of Eom, and further in view of Cho and U.S. Pub. No. 2006/0149144 ("Lynn"). Applicant respectfully traverses the rejection for at least the following reasons.

Claims 7-9 and 11 depend from base claim 1. As discussed above, claim 1 is allowable. Cho and Lynn fail to cure the deficiencies of Yamaguchi and Eom with respect to claim 1. Thus, claims 7-9 and 11 are allowable for at least the reason that they depend from an allowable base claim.

Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. § 103 of claims 7-9 and 11 be withdrawn and that the claims be allowed.

## VII. Claim Rejections under 35 U.S.C. § 103 – Claims 10 and 18

Claims 10 and 18 stand rejected under 35 U.S.C. § 103 as being unpatentable over Yamaguchi, in view of Eom, and further in view of U.S. Pub. No. 2017/0202496 ("Ramanathan"). Applicant respectfully traverses the rejection for at least the following reasons.

Claims 10 and 18 depend from base claim 1. As discussed above, claim 1 is allowable. Ramanathan fails to cure the deficiencies of Yamaguchi and Eom with respect to claim 1. Thus, claims 10 and 18 are allowable for at least the reason that they depend from an allowable base claim.



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Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. § 103 of claims 10 and 18 be withdrawn and that the claims be allowed.

**VIII. Claim Rejections under 35 U.S.C. § 103 – Claims 12-14**

Claims 12-14 stand rejected under 35 U.S.C. § 103 as being unpatentable over Yamaguchi, in view of Eom, and further in view of Cho, Lynn, and U.S. Pub. No. 2017/0127997 ("Hyde"). Applicant respectfully traverses the rejection for at least the following reasons.

Claims 12-14 depend from base claim 1. As discussed above, claim 1 is allowable. Cho, Lynn and Hyde fail to cure the deficiencies of Yamaguchi and Eom with respect to claim 1. Thus, claims 12-14 are allowable for at least the reason that they depend from an allowable base claim.

Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. § 103 of claims 12-14 be withdrawn and that the claims be allowed.

**I. Claim Rejections under 35 U.S.C. § 103 – Claim 15**

Claim 15 stands rejected under 35 U.S.C. § 103 as being unpatentable over Yamaguchi, in view of Eom, and further in view of Cho, Lynn, and U.S. Pub. No. 2017/0172522 ("Insler"). Applicant respectfully traverses the rejection for at least the following reasons.

Claim 15 depends from base claim 1. As discussed above, claim 1 is allowable. Cho, Lynn, and Insler fail to cure the deficiencies of Yamaguchi and Eom with respect to claim 1. Thus, claim 15 is allowable for at least the reason that it depends from an allowable base claim.

Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. § 103 of claim 15 be withdrawn and that the claim be allowed.

**II. Claim Rejections under 35 U.S.C. § 103 – Claim 16**

Claim 16 stands rejected under 35 U.S.C. § 103 as being unpatentable over Yamaguchi, in view of Eom, and further in view of U.S. Pub. No. 2016/0235325 ("Chou"). Applicant respectfully traverses the rejection for at least the following reasons.



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Claim 16 depends from base claim 1. As discussed above, claim 1 is allowable. Chou fails to cure the deficiencies of Yamaguchi and Eom with respect to claim 1. Thus, claim 16 is allowable for at least the reason that it depends from an allowable base claim.

Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. § 103 of claim 16 be withdrawn and that the claim be allowed.

## III. Claim Rejections under 35 U.S.C. § 103 – Claim 17

Claim 17 stands rejected under 35 U.S.C. § 103 as being unpatentable over Yamaguchi, in view of Eom, and further in view of U.S. Pub. No. 2016/0058313 ("Sato"). Applicant respectfully traverses the rejection for at least the following reasons.

Claim 17 depends from base claim 1. As discussed above, claim 1 is allowable. Sato fails to cure the deficiencies of Yamaguchi and Eom with respect to claim 1. Thus, claim 17 is allowable for at least the reason that it depends from an allowable base claim.

Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. § 103 of claim 17 be withdrawn and that the claim be allowed.

## IV. New Claims 22-57

As noted above, claims 22-39 correspond to claims 2-18 and 21, respectively, and claims 40-57 correspond to claims 2-18 and 21, respectively. As discussed above, claims 2-18 and 21 are allowable. Thus, claims 22-57 are allowable for at least similar reasons as discussed with respect to claims 2-18 and 21.

Further, claims 22-39 depend from base claim 19 and claims 40-57 depend from base claim 20. As discussed above, claims 19 and 20 are allowable. Thus, claims 22-57 are also allowable for at least the reason that they depend from allowable base claims.

Accordingly, Applicant respectfully requests that claims 22-57 be allowed.

## CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark Office determines that an extension and/or other relief is required, Applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 193140** referencing **Docket No. P38213US2/77770000489102**. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

Dated: July 17, 2019

Respectfully submitted,

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## AMENDMENTS TO THE CLAIMS

*This listing of claims will replace all prior versions, and listing, of claims in the application:*

1. (Original) A first electronic device, comprising:

a display;

one or more input devices including a biometric sensor;

one or more processors; and

memory storing one or more programs configured to be executed by the one or more processors, the one or more programs including instructions for:

displaying, on the display, a first user interface indicating that the first electronic device is ready to detect biometric information;

detecting a first input with the biometric sensor that satisfies first criteria;

in response to detecting the first input with the biometric sensor:

starting to record biometric information detected by the biometric sensor; and

displaying, on the display, a second user interface that is different from the first user interface, wherein the second user interface includes an indication of progress in recording the biometric information;

after recording at least a portion of the biometric information, detecting, via the one or more input devices, that the first criteria are no longer met;

in response to detecting that the first criteria are no longer met for a first period of time, resetting the indication of progress in recording the biometric information and maintaining display of the second user interface; and

in response to detecting that the first criteria are no longer met for a second period of time that is longer than the first period of time, replacing display of the second user interface with the first user interface.

2. (Original) The first electronic device of claim 1, wherein the recorded biometric information includes an electrocardiogram recording derived from the biometric information detected by the biometric sensor.



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3. (Original) The first electronic device of claim 1, wherein the one or more programs further include instructions for:

prior to displaying the first user interface, displaying a homescreen that includes an application affordance corresponding to a health monitoring application;

detecting, via the one or more input devices, a user activation of the application affordance; and

in response to detecting the user activation of the application affordance, displaying, on the display, the first user interface.

4. (Original) The first electronic device of claim 3, wherein a notification requesting the first input on the biometric sensor is displayed in the first user interface after a predetermined amount of time has passed after detecting the user activation of the application affordance.

5. (Original) The first electronic device of claim 1, wherein the biometric sensor is a contact-based sensor, and wherein the first input with the biometric sensor satisfies the first criteria when a contact is detected on the biometric sensor.

6. (Original) The first electronic device of claim 1, wherein the first user interface includes a graphical animation indicating that the first electronic device is ready to detect biometric information, wherein the graphical animation is comprised of a plurality of moving objects forming a first shape.

7. (Original) The first electronic device of claim 6, wherein the one or more programs further include instructions for:

while displaying the second user interface and recording the biometric information, displaying, within the graphical animation that is in the second shape, a visual representation of the recorded biometric information, wherein the recorded biometric information is filtered and scaled such that the visual representation of the recorded biometric information can be displayed within the graphical animation.



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8. (Original) The first electronic device of claim 6, wherein the plurality of moving objects of the graphical animation transitions from the first shape to a second shape different from the first shape as the display transitions from the first user interface to the second user interface.

9. (Original) The first electronic device of claim 8, wherein the one or more programs further include instructions for:

further in response to detecting that the first criteria are no longer met for the first period of time, transitioning the plurality of moving objects of the graphical animation to an interstitial shape between the first shape and the second shape.

10. (Original) The first electronic device of claim 1, wherein the second user interface includes a graphical representation that corresponds to a visualization of the biometric information from the recorded biometric information and a timer indicating the amount of time remaining to complete the recording of the biometric information.

11. (Original) The first electronic device of claim 1, wherein the one or more programs further include instructions for:

while recording the biometric information, detecting, via the one or more input devices, that second criteria are met; and

in response to detecting that the second criteria are met, displaying, in the second user interface, a notification related to the second criteria.

12. (Original) The first electronic device of claim 11, wherein:

the second criteria is met when an amount of movement above a threshold is detected, and

the notification indicates that the amount of movement should be decreased.

13. (Original) The first electronic device of claim 11, wherein:

the second criteria is met when the amount of movement above the threshold is detected for at least a third period of time, and



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the notification indicates that the first electronic device should be moved to a resting position.

14. (Original) The first electronic device of claim 11, wherein:

the second criteria is met when a second input having a type that is different from the type of the first input is detected on a first input device, and

the notification indicates that the second input should not be repeated on the first input device.

15. (Original) The first electronic device of claim 11, wherein:

the second criteria is met when the first input is no longer detected by the biometric sensor when recording of the biometric information is not yet completed, and

the notification indicates that the first input should be maintained on the biometric sensor.

16. (Original) The first electronic device of claim 1, wherein the one or more programs further include instructions for:

after taking a first recording of first biometric information and a second recording of second biometric information different from the first biometric information, transmitting, to a second electronic device, the recorded first biometric information and the recorded second biometric information.

17. (Original) The first electronic device of claim 1, wherein the one or more programs further include instructions for:

detecting heart rate information for a predetermined amount of time;

in accordance with a determination that the detected heart rate information meets a first condition, displaying, on the display, a notification indicating a high heart rate;

detecting, via the one or more input devices, a user activation of the notification; and

in response to detecting the user activation of the notification, displaying, on the display, the first user interface.

18. (Original) The first electronic device of claim 1, wherein the indication of progress is a countdown timer.

19. (Original) A non-transitory computer-readable storage medium storing one or more programs configured to be executed by one or more processors of a first electronic device with a display and one or more input devices including a biometric sensor, the one or more programs including instructions for:

displaying, on the display, a first user interface indicating that the first electronic device is ready to detect biometric information;

detecting a first input with the biometric sensor that satisfies first criteria;

in response to detecting the first input with the biometric sensor:

starting to record biometric information detected by the biometric sensor; and

displaying, on the display, a second user interface that is different from the first user interface, wherein the second user interface includes an indication of progress in recording the biometric information;

after recording at least a portion of the biometric information, detecting, via the one or more input devices, that the first criteria are no longer met;

in response to detecting that the first criteria are no longer met for a first period of time, resetting the indication of progress in recording the biometric information and maintaining display of the second user interface; and

in response to detecting that the first criteria are no longer met for a second period of time that is longer than the first period of time, replacing display of the second user interface with the first user interface.

20. (Original) A method, comprising:

at a first electronic device with a display and one or more input devices including a biometric sensor:

displaying, on the display, a first user interface indicating that the first electronic device is ready to detect biometric information;

detecting a first input with the biometric sensor that satisfies first criteria;



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in response to detecting the first input with the biometric sensor:

starting to record biometric information detected by the biometric sensor; and

displaying, on the display, a second user interface that is different from the first user interface, wherein the second user interface includes an indication of progress in recording the biometric information;

after recording at least a portion of the biometric information, detecting, via the one or more input devices, that the first criteria are no longer met;

in response to detecting that the first criteria are no longer met for a first period of time, resetting the indication of progress in recording the biometric information and maintaining display of the second user interface; and

in response to detecting that the first criteria are no longer met for a second period of time that is longer than the first period of time, replacing display of the second user interface with the first user interface.

21. (New) The first electronic device of claim 1, wherein:

the first criteria being no longer met for the first period of time relates to the first input,

the second criteria being no longer met for the second period of time relates to the first input, and

resetting the indication of progress in recording the biometric information comprises resetting the indication of progress that is displayed in the second user interface.

22. (New) The non-transitory computer-readable storage medium of claim 19, wherein the recorded biometric information includes an electrocardiogram recording derived from the biometric information detected by the biometric sensor.

23. (New) The non-transitory computer-readable storage medium of claim 19, wherein the one or more programs further include instructions for:

prior to displaying the first user interface, displaying a homescreen that includes an application affordance corresponding to a health monitoring application;

detecting, via the one or more input devices, a user activation of the application affordance; and

in response to detecting the user activation of the application affordance, displaying, on the display, the first user interface.

24. (New) The non-transitory computer-readable storage medium of claim 23, wherein a notification requesting the first input on the biometric sensor is displayed in the first user interface after a predetermined amount of time has passed after detecting the user activation of the application affordance.

25. (New) The non-transitory computer-readable storage medium of claim 19, wherein the biometric sensor is a contact-based sensor, and wherein the first input with the biometric sensor satisfies the first criteria when a contact is detected on the biometric sensor.

26. (New) The non-transitory computer-readable storage medium of claim 19, wherein the first user interface includes a graphical animation indicating that the first electronic device is ready to detect biometric information, wherein the graphical animation is comprised of a plurality of moving objects forming a first shape.

27. (New) The non-transitory computer-readable storage medium of claim 26, wherein the one or more programs further include instructions for:

while displaying the second user interface and recording the biometric information, displaying, within the graphical animation that is in the second shape, a visual representation of the recorded biometric information, wherein the recorded biometric information is filtered and scaled such that the visual representation of the recorded biometric information can be displayed within the graphical animation.

28. (New) The non-transitory computer-readable storage medium of claim 26, wherein the plurality of moving objects of the graphical animation transitions from the first shape to a second shape



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different from the first shape as the display transitions from the first user interface to the second user interface.

29. (New) The non-transitory computer-readable storage medium of claim 28, wherein the one or more programs further include instructions for:

further in response to detecting that the first criteria are no longer met for the first period of time, transitioning the plurality of moving objects of the graphical animation to an interstitial shape between the first shape and the second shape.

30. (New) The non-transitory computer-readable storage medium of claim 19, wherein the second user interface includes a graphical representation that corresponds to a visualization of the biometric information from the recorded biometric information and a timer indicating the amount of time remaining to complete the recording of the biometric information.

31. (New) The non-transitory computer-readable storage medium of claim 19, wherein the one or more programs further include instructions for:

while recording the biometric information, detecting, via the one or more input devices, that second criteria are met; and

in response to detecting that the second criteria are met, displaying, in the second user interface, a notification related to the second criteria.

32. (New) The non-transitory computer-readable storage medium of claim 31, wherein:

the second criteria is met when an amount of movement above a threshold is detected, and

the notification indicates that the amount of movement should be decreased.

33. (New) The non-transitory computer-readable storage medium of claim 31, wherein:

the second criteria is met when the amount of movement above the threshold is detected for at least a third period of time, and

the notification indicates that the first electronic device should be moved to a resting position.



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34. (New) The non-transitory computer-readable storage medium of claim 31, wherein:

the second criteria is met when a second input having a type that is different from the type of the first input is detected on a first input device, and

the notification indicates that the second input should not be repeated on the first input device.

35. (New) The non-transitory computer-readable storage medium of claim 31, wherein:

the second criteria is met when the first input is no longer detected by the biometric sensor when recording of the biometric information is not yet completed, and

the notification indicates that the first input should be maintained on the biometric sensor.

36. (New) The non-transitory computer-readable storage medium of claim 19, wherein the one or more programs further include instructions for:

after taking a first recording of first biometric information and a second recording of second biometric information different from the first biometric information, transmitting, to a second electronic device, the recorded first biometric information and the recorded second biometric information.

37. (New) The non-transitory computer-readable storage medium of claim 19, wherein the one or more programs further include instructions for:

detecting heart rate information for a predetermined amount of time;

in accordance with a determination that the detected heart rate information meets a first condition, displaying, on the display, a notification indicating a high heart rate;

detecting, via the one or more input devices, a user activation of the notification; and

in response to detecting the user activation of the notification, displaying, on the display, the first user interface.

38. (New) The non-transitory computer-readable storage medium of claim 19, wherein the indication of progress is a countdown timer.



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39. (New) The non-transitory computer-readable storage medium of claim 19, wherein:

the first criteria being no longer met for the first period of time relates to the first input,

the second criteria being no longer met for the second period of time relates to the first input, and

resetting the indication of progress in recording the biometric information comprises resetting the indication of progress that is displayed in the second user interface.

40. (New) The method of claim 20, wherein the recorded biometric information includes an electrocardiogram recording derived from the biometric information detected by the biometric sensor.

41. (New) The method of claim 20, further comprising:

prior to displaying the first user interface, displaying a homescreen that includes an application affordance corresponding to a health monitoring application;

detecting, via the one or more input devices, a user activation of the application affordance; and

in response to detecting the user activation of the application affordance, displaying, on the display, the first user interface.

42. (New) The method of claim 41, wherein a notification requesting the first input on the biometric sensor is displayed in the first user interface after a predetermined amount of time has passed after detecting the user activation of the application affordance.

43. (New) The method of claim 20, wherein the biometric sensor is a contact-based sensor, and wherein the first input with the biometric sensor satisfies the first criteria when a contact is detected on the biometric sensor.

44. (New) The method of claim 20, wherein the first user interface includes a graphical animation indicating that the first electronic device is ready to detect biometric information, wherein the graphical animation is comprised of a plurality of moving objects forming a first shape.



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45. (New) The method of claim 44, further comprising:

while displaying the second user interface and recording the biometric information, displaying, within the graphical animation that is in the second shape, a visual representation of the recorded biometric information, wherein the recorded biometric information is filtered and scaled such that the visual representation of the recorded biometric information can be displayed within the graphical animation.

46. (New) The method of claim 44, wherein the plurality of moving objects of the graphical animation transitions from the first shape to a second shape different from the first shape as the display transitions from the first user interface to the second user interface.

47. (New) The method of claim 46, further comprising:

further in response to detecting that the first criteria are no longer met for the first period of time, transitioning the plurality of moving objects of the graphical animation to an interstitial shape between the first shape and the second shape.

48. (New) The method of claim 20, wherein the second user interface includes a graphical representation that corresponds to a visualization of the biometric information from the recorded biometric information and a timer indicating the amount of time remaining to complete the recording of the biometric information.

49. (New) The method of claim 20, further comprising:

while recording the biometric information, detecting, via the one or more input devices, that second criteria are met; and

in response to detecting that the second criteria are met, displaying, in the second user interface, a notification related to the second criteria.

50. (New) The method of claim 49, wherein:



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**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**
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the second criteria is met when an amount of movement above a threshold is detected, and

the notification indicates that the amount of movement should be decreased.

51. (New) The method of claim 49, wherein:

the second criteria is met when the amount of movement above the threshold is detected for at least a third period of time, and

the notification indicates that the first electronic device should be moved to a resting position.

52. (New) The method of claim 49, wherein:

the second criteria is met when a second input having a type that is different from the type of the first input is detected on a first input device, and

the notification indicates that the second input should not be repeated on the first input device.

53. (New) The method of claim 49, wherein:

the second criteria is met when the first input is no longer detected by the biometric sensor when recording of the biometric information is not yet completed, and

the notification indicates that the first input should be maintained on the biometric sensor.

54. (New) The method of claim 20, further comprising:

after taking a first recording of first biometric information and a second recording of second biometric information different from the first biometric information, transmitting, to a second electronic device, the recorded first biometric information and the recorded second biometric information.

55. (New) The method of claim 20, further comprising:

detecting heart rate information for a predetermined amount of time;

in accordance with a determination that the detected heart rate information meets a first condition, displaying, on the display, a notification indicating a high heart rate;

detecting, via the one or more input devices, a user activation of the notification; and



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in response to detecting the user activation of the notification, displaying, on the display, the first user interface.

56. (New) The method of claim 20, wherein the indication of progress is a countdown timer.

57. (New) The method of claim 20, wherein:

the first criteria being no longer met for the first period of time relates to the first input,

the second criteria being no longer met for the second period of time relates to the first input, and

resetting the indication of progress in recording the biometric information comprises resetting the indication of progress that is displayed in the second user interface.



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**607 of 1413**

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

| PATENT APPLICATION FEE DETERMINATION RECORD<br>Substitute for Form PTO-875 | Application or Docket Number<br>16/143,959 | Filing Date<br>09/27/2018 | ☐ To be Mailed |
|---|---|---|---|

**ENTITY:** ☑ LARGE ☐ SMALL ☐ MICRO

## APPLICATION AS FILED - PART I

| FOR | (Column 1)<br>NUMBER FILED | (Column 2)<br>NUMBER EXTRA | | RATE ($) | FEE ($) |
|---|---|---|---|---|---|
| ☐ BASIC FEE<br>(37 CFR 1.16(a), (b), or (c)) | N/A | N/A | | N/A | |
| ☐ SEARCH FEE<br>(37 CFR 1.16(k), (i), or (m)) | N/A | N/A | | N/A | |
| ☐ EXAMINATION FEE<br>(37 CFR 1.16(o), (p), or (q)) | N/A | N/A | | N/A | |
| TOTAL CLAIMS<br>(37 CFR 1.16(i)) | minus 20 = | * | | x $100 = | |
| INDEPENDENT CLAIMS<br>(37 CFR 1.16(h)) | minus 3 = | * | | x $460 = | |
| ☐ 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). | | | | |
| ☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) | | | | | |
| * If the difference in column 1 is less than zero, enter "0" in column 2. | | | | TOTAL | |

## APPLICATION AS AMENDED - PART II

| | | (Column 1) | | (Column 2) | (Column 3) | | | |
|---|---|---|---|---|---|---|---|---|
| AMENDMENT | 07/17/2019 | CLAIMS REMAINING AFTER AMENDMENT | | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | | RATE ($) | ADDITIONAL FEE ($) |
| | Total<br>(37 CFR 1.16(i)) | * 57 | Minus | ** 20 | = 37 | | x $100 = | 3700 |
| | Independent<br>(37 CFR 1.16(h)) | * 3 | Minus | *** 3 | = 0 | | x $460 = | 0 |
| | ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | |
| | ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | |
| | | | | | | | TOTAL ADD'L FEE | 3700 |

| | | (Column 1) | | (Column 2) | (Column 3) | | | |
|---|---|---|---|---|---|---|---|---|
| AMENDMENT | | CLAIMS REMAINING AFTER AMENDMENT | | HIGHEST NUMBER PREVIOUSLY PAID FOR | PRESENT EXTRA | | RATE ($) | ADDITIONAL FEE ($) |
| | Total<br>(37 CFR 1.16(i)) | * | Minus | ** | = | | x $0 = | |
| | Independent<br>(37 CFR 1.16(h)) | * | Minus | *** | = | | x $0 = | |
| | ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | |
| | ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | |
| | | | | | | | TOTAL ADD'L FEE | |

| | |
|---|---|
| * If the entry in column 1 is less than the entry in column 2, write "0" in column 3. | LIE |
| ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". | /LASHAWN R MORGAN/ |
| *** 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 number found in the appropriate box in column 1. | |

This collection of information is required by 37 CFR 1.16. 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 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.*

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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 16/143,959 | 09/27/2018 | Christopher D. SOLI | P38213US2/77770000489102 | 6224 |

150004 7590 07/17/2019

DENTONS US LLP - Apple
4655 Executive Dr
Suite 700
San Diego, CA 92121

| EXAMINER |
|---|
| LAU, MICHAEL J |

| ART UNIT | PAPER NUMBER |
|---|---|
| 3792 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 07/17/2019 | 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):

dentons_PAIR@firsttofile.com
patents.us@dentons.com

| *Applicant-Initiated Interview Summary* | **Application No.** 16/143,959 | **Applicant(s)** SOLI et al. | |
|---|---|---|---|
| | **Examiner** MICHAEL J LAU | **Art Unit** 3792 | **AIA (FITF) Status** Yes |

All participants (applicant, applicants representative, PTO personnel):

(1) MICHAEL J. LAU.

(2) Randy Omid.

(3) Carl Layno.

(4) Minsu Chung.

Date of Interview: 12 July 2019.

Type: ☑ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☑ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☑103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 1.

Identification of prior art discussed: Yamaguchi 2015/0099991 and Eom 2018/0049696.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Clarified that the first and second periods of time are separate from the recording progress time. Both parties agreed amendments to make the clarification would overcome the prior art..

**Applicant recordation instructions:** The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

**Examiner recordation instructions**: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☑ Attachment

| /MICHAEL J LAU/<br>Examiner, Art Unit 3792 | /CARL H LAYNO/<br>Supervisory Patent Examiner, Art Unit 3792 |
|---|---|



**AliveCor Exhibit 1002**
**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**
**610 of 1413**

# Summary of Record of Interview Requirements

**Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record**
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

**Title 37 Code of Federal Regulations (CFR) 1.133 Interviews**
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

---

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiners responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicants correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,-
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicants record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

**Examiner to Check for Accuracy**

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiners version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, Interview Record OK on the paper recording the substance of the interview along with the date and the examiners initials.

# INTERVIEW AGENDA

*Via Email*

Dear Examiner Lau:

Applicant confirms the telephonic interview for the above mentioned application on July 12, 2019 at 4:00 PM EDT with Applicant's representatives Randy Omid and Minsu Chung. During the interview, Applicant would like to discuss the § 103 rejection of claim 1 based on cited references U.S. Pub. No. 2015/0099991 ("Yamaguchi") and U.S. Pub. No. 2018/0049696 ("Eom").

Specifically, Applicant would like to discuss how the cited references, and in particular the Eom reference, fails to disclose or suggest "in response to detecting that the first criteria are no longer met for a first period of time, resetting the indication of progress in recording the biometric information and maintaining display of the second user interface" and "in response to detecting that the first criteria are no longer met for a second period of time that is longer than the first period of time, replacing display of the second user interface with the first user interface," as recited in claim 1. (Emphasis added.)

Dated: July 11, 2019

Respectfully submitted,

Electronic signature: /Randy Omid/
Randy Omid
Registration No.: 67,439

DENTONS US LLP
One Market Plaza
Spear Tower, 24th Floor
San Francisco, CA 94105
(415) 267-4179

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

**U.S. PATENTS**

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|

**U.S. PATENT APPLICATION PUBLICATIONS**

| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1. | 20170274267 | A1 | 2017-09-28 | Blahnik, Jay C. | |

**FOREIGN PATENT DOCUMENTS**

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|

**NON-PATENT LITERATURE DOCUMENTS**

| Examiner Initials* | Cite No | 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[5] |
|---|---|---|---|
| | 1. | Final Office Action received for U.S. Patent Application No. 16/144,849, mailed on June 07, 2019, 29 pages. | |
| | 2. | Final Office Action received for U.S. Patent Application No. 16/144,864, mailed on May 17, 2019, 24 pages. | |
| | 3. | Intention to Grant received for Danish Patent Application No. PA201870379, mailed on May 02, 2019, 2 pages. | |
| | 4. | Non Final Office Action Received for U.S. Patent Application No. 16/144,864, mailed on December 18, 2018, 19 pages. | |
| | 5. | Non-Final Office Action received for U.S. Patent Application No. 16/144,849, mailed on December 31, 2018, 28 pages. | |
| | 6. | Office Action received for Danish Patent Application No. PA201870378, mailed on February 25, 2019, 3 pages. | |
| | 7. | Office Action received for Danish Patent Application No. PA201870379, mailed on February 28, 2019, 3 pages. | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

| | | | |
|---|---|---|---|
| | 8. | Office Action received for Danish Patent Application No. PA201870380, mailed on March 27, 2019, 4 pages. | |
| | 9. | Office Action received for Danish Patent Application No. PA201870380, mailed on September 11, 2018, 9 pages. | |
| | 10. | Search Report and Opinion received for Danish Patent Application No. PA201870378, mailed on September 10, 2018, 9 pages. | |
| | 11. | Search Report and Opinion received for Danish Patent Application No. PA201870379, mailed on September 14, 2018, 9 pages. | |

| **EXAMINER SIGNATURE** | | | |
|---|---|---|---|
| Examiner Signature | | Date Considered | |

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.
[4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

## 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.

☒ The 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 | /Randy Omid/ | Date (YYYY-MM-DD) | 2019-07-16 |
| Name/Print | Randy Omid | Registration Number | 67,439 |

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 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.**

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 16143959 |
| **Filing Date:** | 27-Sep-2018 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Filer:** | Peter Jung-Hyon Yim/Swarnava Chakraborty |
| **Attorney Docket Number:** | P38213US2/77770000489102 |

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:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| SUBMISSION- INFORMATION DISCLOSURE STMT | 1806 | 1 | 240 | 240 |
| | | **Total in USD ($)** | | **240** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 36590990 |
| **Application Number:** | 16143959 |
| **International Application Number:** | |
| **Confirmation Number:** | 6224 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Customer Number:** | 150004 |
| **Filer:** | Peter Jung-Hyon Yim/Swarnava Chakraborty |
| **Filer Authorized By:** | Peter Jung-Hyon Yim |
| **Attorney Docket Number:** | P38213US2/77770000489102 |
| **Receipt Date:** | 16-JUL-2019 |
| **Filing Date:** | 27-SEP-2018 |
| **Time Stamp:** | 02:41:17 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | CARD |
| Payment was successfully received in RAM | $240 |
| RAM confirmation Number | 071619INTEFSW02421300 |
| Deposit Account | |
| Authorized User | |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

**AliveCor Exhibit 1002**
**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**
**618 of 1413**

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | P38213US2_IDS.pdf | 102780<br>05f4c3ccd3d48616f1b35355157063d3625941ce | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied IDS fillable form | | | | | |
| 2 | Non Patent Literature | 16144849_FOA_06_07_2019.pdf | 1074015<br>9fd2f99516b7e9f02acd9691c8543c58dfb36e79 | no | 29 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Non Patent Literature | 16144864_FOA_05_17_2019.pdf | 1103544<br>3d4e37b4f3d4b2a69a91661a4f23fc591acb3dba | no | 24 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Non Patent Literature | PA201870379_DKIG_05_02_2019.pdf | 511357<br>e2e14ef92ae2243b5cdc380b971d80cd5e050400 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Non Patent Literature | 16144864_NFOA_12_18_2018.pdf | 882925<br>7c306c092f6a9343819a949ae9fb59d9b9fb488d | no | 19 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 6 | Non Patent Literature | 16144849_NFOA_12_31_2018.pdf | 1096555<br>34beb1ae808d4034cefdc8afbdc7c360aab2864 | no | 28 |
| **Warnings:** | | | | | |

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| **Information:** | | | | | |
| 7 | Non Patent Literature | PA201870378_DKOA_02_25_2019.pdf | 857023<br>e57d32b07b4d1899b73fa7c870af57099f9774db | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 8 | Non Patent Literature | PA201870379_DKOA_02_28_2019.pdf | 157353<br>71b80e17b8f2be99bc0b15d6c61fbe3c0ca92ccd | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 9 | Non Patent Literature | PA201870380_DKOA_03_27_2019.pdf | 834453<br>ec876ccb74127c5398f1d1ce61b1ee9e9c6308d3 | no | 4 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 10 | Non Patent Literature | PA201870380_DKOA_09_11_2018.pdf | 2644304<br>50a48bd87f521d3a35053bd595e9d220179dcf08 | no | 9 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 11 | Non Patent Literature | PA201870378_DKSR_09_10_2018.pdf | 2329036<br>25e250d3376818252e854808d48f363a135888a9 | no | 9 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 12 | Non Patent Literature | PA201870379_DKSR_09_14_2018.pdf | 2676135<br>c4cc46fbe5045012e288ce2285c431c691d4c281 | no | 9 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 13 | Fee Worksheet (SB06) | fee-info.pdf | 30936<br>b70aee39d1f95fed5fbf44c4d60c137a8df2dee4 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | | **Total Files Size (in bytes):** | 14300416 | |

**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.**

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

**U.S. PATENTS**

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1. | 5642731 | A | 1997-07-01 | Kehr, Bruce A. | |
| | 2. | 9026927 | B2 | 2015-05-05 | Brumback et al. | |
| | 3. | 10175781 | B2 | 2019-01-08 | Karagozler et al. | |

**U.S. PATENT APPLICATION PUBLICATIONS**

| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1. | 20090210078 | A1 | 2009-08-20 | Crowley, Michael J. | |
| | 2. | 20150142689 | A1 | 2015-05-21 | Squires, Blake | |
| | 3. | 20150347711 | A1 | 2015-12-03 | Soli et al. | |
| | 4. | 20160299769 | A1 | 2016-10-13 | Hunter et al. | |
| | 5. | 20170243508 | A1 | 2017-08-24 | Cheng et al. | |
| | 6. | 20180001184 | A1 | 2018-01-04 | Tran et al. | |

**FOREIGN PATENT DOCUMENTS**

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|

**NON-PATENT LITERATURE DOCUMENTS**

| Examiner Initials* | Cite No | 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[5] |
|---|---|---|---|
| | 1. | "Multi-Set Bar Chart", The Data Visualization Catalogue, Available Online at: https://datavizcatalogue.com/methods/multiset_barchart.html, February 08, 2014, 3 pages. | |
| | 2. | Non-Final Office Action received for U.S. Patent Application No. 16/143,997, mailed on May 21, 2019, 15 pages. | |
| | 3. | Office Action received for Australian Patent Application No. 2019100222, mailed on May 24, 2019, 6 pages. | |
| | 4. | Office Action received for Danish Patent Application No. PA201870600, mailed on May 08, 2019, 3 pages. | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

| | | | |
|---|---|---|---|
| | 5. | EVERGREEN et al., "Bar Chart", Better Evaluation, Available Online at: https://www.betterevaluation.org/en/evaluation-options/BarChart, October 31, 2014, 8 pages. | |

| EXAMINER SIGNATURE | | | |
|---|---|---|---|
| Examiner Signature | | Date Considered | |

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.
[4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

## 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.

☒ The 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 | /Randy Omid/ | Date (YYYY-MM-DD) | 2019-06-14 |
| Name/Print | Randy Omid | Registration Number | 67,439 |

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 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.**

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 16143959 |
| **Filing Date:** | 27-Sep-2018 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Filer:** | Peter Jung-Hyon Yim/Swarnava Chakraborty |
| **Attorney Docket Number:** | P38213US2/77770000489102 |

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:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| SUBMISSION- INFORMATION DISCLOSURE STMT | 1806 | 1 | 240 | 240 |
| | | **Total in USD ($)** | | **240** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 36297869 |
| **Application Number:** | 16143959 |
| **International Application Number:** | |
| **Confirmation Number:** | 6224 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Customer Number:** | 150004 |
| **Filer:** | Peter Jung-Hyon Yim/Swarnava Chakraborty |
| **Filer Authorized By:** | Peter Jung-Hyon Yim |
| **Attorney Docket Number:** | P38213US2/77770000489102 |
| **Receipt Date:** | 14-JUN-2019 |
| **Filing Date:** | 27-SEP-2018 |
| **Time Stamp:** | 01:12:52 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | CARD |
| Payment was successfully received in RAM | $240 |
| RAM confirmation Number | 061419INTEFSW01132800 |
| Deposit Account | |
| Authorized User | |

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AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
627 of 1413

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | P38213US2_IDS.pdf | 101137<br>66b7977b1fa20d243744006c4f7eb94b33fcf14e | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied IDS fillable form | | | | | |
| 2 | Non Patent Literature | MultiSetBarChart_2014_3.pdf | 716299<br>c0dd7f7ccc80150bd78661c23cc98326e10d43fa | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Non Patent Literature | 16143997_NFOA_05_21_2019.pdf | 576230<br>2eed74ccab8486ee8472ebeac7f6c7da140a6a9e | no | 15 |
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| **Information:** | | | | | |
| 4 | Non Patent Literature | 2019100222_AUOA_05_24_2019.pdf | 1519559<br>faa3819b338a9bb5bc9585676cfa62268a8bbdcf | no | 6 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Non Patent Literature | PA201870600_DKOA_05_08_2019.pdf | 1034376<br>95c0563c3a6d4fdf7d6a2d69f57a867438854906 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 6 | Non Patent Literature | EVERGREEN_2014_8.pdf | 2595494<br>70d7718b62b288629d89789567d4b7758e0aacb | no | 8 |
| **Warnings:** | | | | | |

| Information: | | | | | |
|---|---|---|---|---|---|
| 7 | Fee Worksheet (SB06) | fee-info.pdf | 30937<br>7f040924717e113d77f90175a727c8ab580cb0a3 | no | 2 |
| Warnings: | | | | | |
| Information: | | | | | |
| | | Total Files Size (in bytes): | 6574032 | | |

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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.**

**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**
**(Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| **Application Number** | 16/143,959 |
| **Filing Date** | 2018-09-27 |
| **First Named Inventor** | Christopher D. SOLI |
| **Art Unit** | 3792 |
| **Examiner Name** | M. J. Lau |
| **Attorney Docket Number** | P38213US2/77770000489102 |

**U.S. PATENTS**

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|

**U.S. PATENT APPLICATION PUBLICATIONS**

| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1. | 20080058626 | A1 | 2008-03-06 | Miyata et al. | |
| | 2. | 20120029303 | A1 | 2012-02-02 | Shaya, Fawzi | |
| | 3. | 20120038651 | A1 | 2012-02-16 | Case et al. | |
| | 4. | 20130065569 | A1 | 2013-03-14 | Leipzig et al. | |
| | 5. | 20150216448 | A1 | 2015-08-06 | Lotan et al. | |
| | 6. | 20160301794 | A1 | 2016-10-13 | Schlakman et al. | |

**FOREIGN PATENT DOCUMENTS**

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|

**NON-PATENT LITERATURE DOCUMENTS**

| Examiner Initials* | Cite No | 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[5] |
|---|---|---|---|
| | 1. | Non-Final Office Action received for U.S. Patent Application No. 16/143,909, mailed on April 19, 2019, 16 pages. | |

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 16/143,959 |
| | Filing Date | 2018-09-27 |
| | First Named Inventor | Christopher D. SOLI |
| | Art Unit | 3792 |
| | Examiner Name | M. J. Lau |
| | Attorney Docket Number | P38213US2/77770000489102 |

| EXAMINER SIGNATURE | | | |
|---|---|---|---|
| Examiner Signature | | Date Considered | |

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.
[4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | Application Number | 16/143,959 |
| | Filing Date | 2018-09-27 |
| | First Named Inventor | Christopher D. SOLI |
| | Art Unit | 3792 |
| | Examiner Name | M. J. Lau |
| | Attorney Docket Number | P38213US2/77770000489102 |

## 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.

☒ The 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 | /Randy Omid/ | Date (YYYY-MM-DD) | 2019-05-16 |
|---|---|---|---|
| Name/Print | Randy Omid | Registration Number | 67,439 |

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 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.**



**AliveCor Exhibit 1002**
**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**
**632 of 1413**

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 16143959 |
| **Filing Date:** | 27-Sep-2018 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Filer:** | Peter Jung-Hyon Yim/Swarnava Chakraborty |
| **Attorney Docket Number:** | P38213US2/77770000489102 |

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:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| SUBMISSION- INFORMATION DISCLOSURE STMT | 1806 | 1 | 240 | 240 |
| | | **Total in USD ($)** | | **240** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 36030949 |
| **Application Number:** | 16143959 |
| **International Application Number:** | |
| **Confirmation Number:** | 6224 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Customer Number:** | 150004 |
| **Filer:** | Peter Jung-Hyon Yim/Swarnava Chakraborty |
| **Filer Authorized By:** | Peter Jung-Hyon Yim |
| **Attorney Docket Number:** | P38213US2/77770000489102 |
| **Receipt Date:** | 16-MAY-2019 |
| **Filing Date:** | 27-SEP-2018 |
| **Time Stamp:** | 12:48:12 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | CARD |
| Payment was successfully received in RAM | $240 |
| RAM confirmation Number | 051619INTEFSW12485600 |
| Deposit Account | |
| Authorized User | |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
635 of 1413

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | P38213US2_IDS.pdf | 104404<br>4748fb48ca9fa4b32b1845c8a06e0f66e49bd7e1 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied IDS fillable form | | | | | |
| 2 | Non Patent Literature | 16143909_NFOA_04_19_2019.pdf | 2109268<br>f6376044903fb33e0cc9715259e2e947cec0b575 | no | 16 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Fee Worksheet (SB06) | fee-info.pdf | 30936<br>6a3c7dab189d64b1762851d15ba96f9ab45b5e5a | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 2244608 | | |

**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.**

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

**U.S. PATENTS**

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|

**U.S. PATENT APPLICATION PUBLICATIONS**

| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1. | 20140143678 | A1 | 2014-05-22 | Mistry et al. | |

**FOREIGN PATENT DOCUMENTS**

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|

**NON-PATENT LITERATURE DOCUMENTS**

| Examiner Initials* | Cite No | 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[5] |
|---|---|---|---|
| | 1. | Non-Final Office Action received for U.S. Patent Application No. 16/144,030, mailed on April 12, 2019, 8 pages. | |
| | 2. | "Visual Pace Alarm app", Available Online at: https://apps.garmin.com/en-US/apps/3940f3a2-4847-4078-a911-d77422966c82, October 19, 2016, 1 page. | |
| | 3. | TEUNMO, "Data field: Visual Pace Alarm", Garmin Forum; Available online at: https://forums.garmin.com/forum/developers/connect-iq/connect-iq-showcase/115996-data-field-visual-pace-alarm, November 17, 2015, 10 pages. | |

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

| EXAMINER SIGNATURE | | | |
|---|---|---|---|
| Examiner Signature | | Date Considered | |

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.
[4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

## 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.

☒ The 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 | /Randy Omid/ | Date (YYYY-MM-DD) | 2019-04-23 |
| Name/Print | Randy Omid | Registration Number | 67,439 |

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 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.**

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 16143959 |
| **Filing Date:** | 27-Sep-2018 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Filer:** | Peter Jung-Hyon Yim/Swarnava Chakraborty |
| **Attorney Docket Number:** | P38213US2/77770000489102 |

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:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| SUBMISSION- INFORMATION DISCLOSURE STMT | 1806 | 1 | 240 | 240 |
| | | **Total in USD ($)** | | **240** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 35797504 |
| **Application Number:** | 16143959 |
| **International Application Number:** | |
| **Confirmation Number:** | 6224 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Customer Number:** | 150004 |
| **Filer:** | Peter Jung-Hyon Yim/Swarnava Chakraborty |
| **Filer Authorized By:** | Peter Jung-Hyon Yim |
| **Attorney Docket Number:** | P38213US2/77770000489102 |
| **Receipt Date:** | 23-APR-2019 |
| **Filing Date:** | 27-SEP-2018 |
| **Time Stamp:** | 02:27:30 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | CARD |
| Payment was successfully received in RAM | $240 |
| RAM confirmation Number | 042319INTEFSW02284800 |
| Deposit Account | |
| Authorized User | |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
642 of 1413

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Information Disclosure Statement (IDS) Form (SB08) | P38213US2_IDS.pdf | 101456<br>dfbdcd0926394cf0eb4fd0568f71a3133bc3d325 | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| This is not an USPTO supplied IDS fillable form | | | | | |
| 2 | Non Patent Literature | 16144030_NFOA_04_12_2019.pdf | 316752<br>8b71cd9efd47f76323b186b37feb80b18f0be6b3 | no | 8 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Non Patent Literature | VisualPaceAlarm_2016_1.pdf | 395316<br>221316b25350bbe24ad7464cf8c39fc423c546b6 | no | 1 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Non Patent Literature | TEUNMO_2015_10.pdf | 1015596<br>c1e1314704f695ee267f62bfb26b1c0961c47d9e | no | 10 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Fee Worksheet (SB06) | fee-info.pdf | 30936<br>21944592478c5e0b82d483ccae2dbe520c5c833c | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 1860056 | | |

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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**

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UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
**United States Patent and Trademark Office**
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 16/143,959 | 09/27/2018 | Christopher D. SOLI | P38213US2/77770000489102 | 6224 |

150004 7590 04/17/2019

DENTONS US LLP - Apple
4655 Executive Dr
Suite 700
San Diego, CA 92121

| EXAMINER | |
|---|---|
| LAU, MICHAEL J | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 3792 | |

| NOTIFICATION DATE | DELIVERY MODE |
|---|---|
| 04/17/2019 | 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):

dentons_PAIR@firsttofile.com
patents.us@dentons.com

| Office Action Summary | Application No. 16/143,959 | Applicant(s) SOLI et al. | |
|---|---|---|---|
| | Examiner MICHAEL J LAU | Art Unit 3792 | AIA (FITF) 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 27 September 2018.

☐ 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 27 September 2018 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: _____.

**AliveCor Exhibit 1002**
**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**

## DETAILED ACTION

### *Notice of Pre-AIA or AIA Status*

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

### *Specification*

2. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

### *Claim Rejections - 35 USC § 103*

3. 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.

4. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103 are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claim 1-2, 5, 19, and 20 are rejected under 35 U.S.C. 103 as being unpatentable over Yamaguchi (US 2015/0099991 A1) in view of Eom (US 2018/0049696 A1).

7. Regarding claim 1, 19, and 20, Yamaguchi discloses a first electronic device (Fig. 1, portable device 2), comprising: a display (Para. 38); one or more input devices including a biometric sensor (Fig. 1, sensor set 4); one or more processors; and memory storing one or more programs configured to be executed by the one or more processors (Para. 42, cpu 20), the one or more programs including instructions for: displaying, on the display (Claim 11), a first user interface indicating that the first electronic device is ready to detect biometric information (Fig. 3, Para. 55-59); detecting a first input with the biometric sensor that satisfies first criteria (Fig. 3, Para. 70-74, 87); in response to detecting the first input with the biometric sensor (H1): starting to record biometric information detected by the biometric sensor (Para. 11); and displaying, on the display, a second user interface that is different from the first user interface, wherein the second user interface includes an indication of progress in recording the biometric information (Fig. 5); but does not disclose after recording at least a portion of the biometric information, detecting, via the one or more input devices, that the first criteria are no longer met; in response to detecting that the first criteria are no longer met for a first period of time, resetting the indication of progress in recording the biometric information and maintaining display of the second user interface; and in response to detecting that the first criteria are no longer met for a second period of time that is longer than the first period of time, replacing display of the second user interface with the first user interface.

8. Eom teaches a similar device that shows a first measurement screen that indicates that biometric information is being measured (Para. 83) and returns to the screen to start measurement again when there is no longer a measurable signal (Para. 83-85).

9. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have combined the device of Yamaguchi with the teachings of Eom to provide a more dynamic display and feedback for signal detection.

10. Regarding claim 2, the recorded biometric information includes an electrocardiogram recording derived from the biometric information detected by the biometric sensor (Eom, Para. 45).

11. Regarding claim 5, the combined invention of Yamaguchi and Eom biometric sensor is a contact-based sensor, and wherein the first input with the biometric sensor satisfies the first criteria when a contact is detected on the biometric sensor (Eom, Para. 45-46).

12. Method claim 20 is drawn to the method of using the corresponding apparatus claimed in claim 1. Therefore method claim 20 correspond to apparatus claim 1 and is rejected for the same reasons ofobviousness as used above.

13. Claims 3 and 4 are rejected under 35 U.S.C. 103 as being unpatentable over Yamaguchi (US 2015/0099991 A1) in view of Eom (US 2018/0049696 A1), further in view of Dieffenderfer (US 2017/0007159 A1).

14. Regarding claim 3, the combined invention of Yamaguchi and Eom discloses the device of claim 1 and voice activation, but does not disclose the one or more programs further include instructions for: prior to displaying the first user interface, displaying a homescreen that includes an application affordance corresponding to a health monitoring application; detecting, via the one or more input devices, a user activation of the application affordance; and in response to detecting the user activation of the application affordance, displaying, on the display, the first user interface.

15. Diefferenderfer teaches a home screen for a pulmonary analysis application (Fig. 56).

16. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have combined the device of Yamaguchi and Eom with the teachings of Dieffenderfer to provide navigation and access to different features (Para. 56).

17. Regarding claim 4, the combined invention of Yamaguchi, Eom, and Dieffenderfer discloses a notification requesting the first input on the biometric sensor is displayed in the first user interface after a predetermined amount of time has passed after detecting the user activation of the application affordance (Yamaguchi, Para. 90).

18. Claims 6 are rejected under 35 U.S.C. 103 as being unpatentable over Yamaguchi (US 2015/0099991 A1) in view of Eom (US 2018/0049696 A1), further in view of Cho (US 2016/0196635 A1).

19. Regarding claim 6, the combined invention of Yamaguchi and Eom discloses the invention of claim 1, but did not disclose the first user interface includes a graphical animation indicating that the first electronic device is ready to detect biometric information, wherein the graphical animation is comprised of a plurality of moving objects forming a first shape.

20. Cho teaches a heart shaped blink indicator that indicates a biometric information measurement state (Para. 121, Fig. 3A).

21. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have combined the device of Yamaguchi and Eom with the teachings of Cho to create a heart shaped object to show relevance to the information being measured. While the prior art does not specifically mention multiple objects making the shape, one of ordinary skill can use multiple objects to suit aesthetic tastes.

22. Claims 7-9, and 11 are rejected under 35 U.S.C. 103 as being unpatentable over Yamaguchi (US 2015/0099991 A1) in view of Eom (US 2018/0049696 A1), further in view of Cho (US 2016/0196635 A1), further in view of Lynn (2006/0149144 A1).

23. Regarding claim 7, the combined invention of Yamaguchi, Eom, and Cho discloses the device of claim 6, but does not disclose the one or more programs further include instructions for: while displaying the second user interface and recording the biometric information, displaying, within the graphical animation that is in the second shape, a visual representation of the recorded biometric information, wherein the recorded biometric information is filtered and scaled such that the visual representation of the recorded biometric information can be displayed within the graphical animation.

24. Lynn teaches a 2-D and 3-D representations that start out as one object that transitions into a visual representation of the filtered recorded biometric information (Fig. 2a-b and 6a-e, Para. 79).

25. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have combined the device of Yamaguchi, Eom, and Cho with the teachings of Lynn to give comprehensive organization and analysis of interactive complexity along and between pluralities of time series (Lynn, Para. 50). One of ordinary skill could apply the object animation as taught by Lynn to animate a heart rhythm over a time period.

26. Regarding claim 8, the combined invention of Yamaguchi, Eom, Cho, and Lynn discloses plurality of moving objects of the graphical animation transitions from the first shape to a second shape different from the first shape as the display transitions from the first user interface to the second user interface (Lynn, Fig. 2a-b, Para 101).

27. Regarding claim 9, the combined invention of Yamaguchi, Eom, Cho, and Lynn discloses the one or more programs further include instructions for: further in response to detecting that the first criteria are no longer met for the first period of time, transitioning the plurality of moving objects of the graphical animation to an interstitial shape between the first shape and the second shape (Eom, Para.

85, failure message). While the combination does not specifically disclose an interstitial shape between the first and second shapes, one of ordinary skill can modify a failure message or connection lost message to be an intermediate shape to match aesthetic preferences.

28. Regarding claim 11, the combined invention of Yamaguchi, Eom, Cho, and Lynn discloses the one or more programs further include instructions for: while recording the biometric information, detecting, via the one or more input devices, that second criteria are met; and in response to detecting that the second criteria are met, displaying, in the second user interface, a notification related to the second criteria (Lynn, Para. 101).

29. Claims 10 and 18 are rejected under 35 U.S.C. 103 as being unpatentable over Yamaguchi (US 2015/0099991 A1) in view of Eom (US 2018/0049696 A1), further in view of Ramanathan (US 2017/0202496 A1).

30. Regarding claim 10, the combined invention of Yamaguchi and Eom discloses the invention of claim 1 and a visual representation of the recorded biometric information (Yamaguchi, Fig. 5), but does not disclose a timer indicating the amount of time remaining to complete the recording of the biometric information.

31. Ramanathan teaches a countdown timer that indicates the time for reading a pulse (Para. 65).

32. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have combined the device of Yamaguchi and Eom with the teachings of Ramanathan to give a visual cue to the user to hold still to reduce motion artifacts and improve the recorded signal output.

33. Regarding claim 18, the combined invention of Yamaguchi, Eom and Ramanathan discloses a countdown timer (Ramanathan, Para. 65).

34. Claims 12-14 are rejected under 35 U.S.C. 103 as being unpatentable over Yamaguchi (US 2015/0099991 A1) in view of Eom (US 2018/0049696 A1), further in view of Cho (US 2016/0196635 A1), further in view of Lynn (2006/0149144 A1), further in view of Hyde (US 2017/0127997 A1).

35. Regarding claim 12, the combined invention of Yamaguchi, Eom, Chou, and Lynn discloses the invention of claim 11 and a notification to decrease movement while recording, but does not disclose notification being based on thresholds.

36. Hyde teaches a device that monitors pregnancy that tracks movement and provides a notification to stop motion when movement crosses thresholds (Para. 84).

37. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have combined the device of Yamaguchi, Eom, Cho, and Lynn with the teachings of Hyde to reduce motion artifacts.

38. Regarding claim 13, the combined invention of Yamaguchi, Eom, Chou, Lynn, and Hyde discloses the second criteria is met when the amount of movement above the threshold is detected for at least a third period of time (Hyde, Para. 84), and the notification indicates that the first electronic device should be moved to a resting position (Eom, Fig. 9).

39. Regarding claim 14, the combined invention of Yamaguchi, Eom, Chou, Lynn, and Hyde discloses the second criteria is met when a second input having a type that is different from the type of the first input is detected on a first input device (motion data), and the notification indicates that the second input should not be repeated on the first input device (Eom, Fig. 9). It would be obvious to one of ordinary skill to display some notification to not repeat an input so to prevent errors in executing the measuring/recording program.

40. Claim 15 is rejected under 35 U.S.C. 103 as being unpatentable over Yamaguchi (US 2015/0099991 A1) in view of Eom (US 2018/0049696 A1), further in view of Cho (US 2016/0196635 A1), further in view of Lynn (2006/0149144 A1), further in view of Insler (US 2017/0172522 A1).

41. Regarding claim 15, the combined invention of Yamaguchi, Eom, Chou, and Lynn discloses the invention of claim 11, but does not disclose the second criteria is met when the first input is no longer detected by the biometric sensor when recording of the biometric information is not yet completed, and the notification indicates that the first input should be maintained on the biometric sensor.

42. Insler teaches an alert and a measurement continuation if a threshold is crossed (Para. 16).

43. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have combined the device of Yamaguchi, Eom, Cho, and Lynn with the teachings of Insler to keep watch in case of a progression of an abnormal parameter into an emergency.

44. Claim 16 is rejected under 35 U.S.C. 103 as being unpatentable over Yamaguchi (US 2015/0099991 A1) in view of Eom (US 2018/0049696 A1), further in view of Chou (US 2016/0235325 A1).

45. Regarding claim 16, the combined invention of Yamaguchi and Eom discloses the invention of claim 1, but does not disclose the one or more programs further include instructions for: after taking a first recording of first biometric information and a second recording of second biometric information different from the first biometric information, transmitting, to a second electronic device, the recorded first biometric information and the recorded second biometric information.

46. Chou teaches a similar device that stores information that can be given to an external computer via wireless or wired connection (Para. 37).

47. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have combined the device of Yamaguchi and Eom with the teachings of Chou to provide a convenient way to bring the measurements/results to a doctor (Chou, Para. 37).

48. Claim 17 is rejected under 35 U.S.C. 103 as being unpatentable over Yamaguchi (US 2015/0099991 A1) in view of Eom (US 2018/0049696 A1), further in view of Sato (US 2016/0058313 A1).

49. Regarding claim 17, the combined invention of claim 1, but does not disclose the one or more programs further include instructions for: detecting heart rate information for a predetermined amount of time; in accordance with a determination that the detected heart rate information meets a first condition, displaying, on the display, a notification indicating a high heart rate; detecting, via the one or more input devices, a user activation of the notification; and in response to detecting the user activation of the notification, displaying, on the display, the first user interface.

50. Sato teaches a device that detects heart rate information and user sets a heart rate threshold with an alert when the heart rate is too high (Para. 21-23, 149)

51. It would have been obvious to one of ordinary skill in the art before the effective filing date of the claimed invention to have combined the device of Yamaguchi and Eom with the teachings of Sato to manually tailor heart rate values and increase the notification effectiveness of reaching heart rate targets.

***Conclusion***

52. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 20150185967 A1, US 20100062905 A1, US 20160058336 A1, US 20170053542 A1, US 9813642 B1, US 20160109961 A1 US 20120283587 A1, US 20160174857 A1, US 20170300186 A1, US 20170086693 A1, US 20170075551 A1, US 20150288944 A1, US 20140266776 A1, US 20100017489 A1, US 8321006 B1, US 20050010117 A1, US 20170188841 A1, US 20170303844 A1, US 20150081210 A.

53. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL J LAU whose telephone number is (571)272-2317. The examiner can normally be reached on 8-5:30 PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Carl Layno** can be reached on **(571) 272-4949**. 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.

/MICHAEL J LAU/
Examiner, Art Unit 3792

/CARL H LAYNO/
Supervisory Patent Examiner, Art Unit 3792

| Notice of References Cited | Application/Control No. 16/143,959 | Applicant(s)/Patent Under Reexamination SOLI et al. | |
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**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**
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**AliveCor, Inc. v. Apple Inc.**
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| | MICHAEL J LAU | 3792 |

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**CLAIMS**

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

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| Search Notes | Application/Control No. | Applicant(s)/Patent Under Reexamination |
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| | MICHAEL J LAU | 3792 |

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| 600 | 301 | 04/10/2019 | ML |

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

| Search Notes | | |
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| inventor search on palm, prior art search on east | 04/10/2019 | ML |

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## EAST Search History

## EAST Search History (Prior Art)

| Ref # | Hits | Search Query | DBs | Default Operator | Plurals | Time Stamp |
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| L2 | 28 | (US-20150185967-$ or US-20100062905-$ or US-20160058336-$ or US-20170053542-$ or US-20160109961-$ or US-20160196635-$ or US-20120283587-$ or US-20160174857-$ or US-20170300186-$ or US-20180049696-$ or US-20170086693-$ or US-20170202496-$ or US-20170075551-$ or US-20180011686-$ or US-20150288944-$ or US-20140266776-$ or US-20160058313-$ or US-20100017489-$ or US-20060149144-$ or US-20050010117-$ or US-20170188841-$ or US-20170303844-$ or US-20150081210-$ or US-20160235325-$ or US-20150099991-$ or US-20170007159-$).did. or (US-9813642-$ or US-8321006-$).did. | US-PGPUB; USPAT | OR | OFF | 2019/04/10 13:55 |
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| L12 | 1 | L10 and (button$1 or input$1) with progress | US-PGPUB; USPAT | OR | OFF | 2019/04/10 14:26 |
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| L19 | 0 | A61B5/742-745.cpc. and @pd<"20180312" and (warn$4 or alert$4 or notif$7 or messag$4) with threshold with maintain$4 with contact$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/10 14:46 |
| L20 | 363 | A61B5/742-745.cpc. and @pd<"20180312" and (warn$4 or alert$4 or notif$7 or messag$4) with threshold with (maintain$4 or continu$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/10 14:46 |
| L21 | 6 | A61B5/742-745.cpc. and @pd<"20180312" and (warn$4 or alert$4 or notif$7 or messag$4) with threshold with (maintain$4 or continu$4) near3 measur$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/10 14:49 |
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| | | (maintain$4 or continu$4) near3 measur$4 | | | | |
| L23 | 30 | (US-20150185967-$ or US-20100062905-$ or US-20160058336-$ or US-20170053542-$ or US-20160109961-$ or US-20160196635-$ or US-20120283587-$ or US-20160174857-$ or US-20170300186-$ or US-20180049696-$ or US-20170086693-$ or US-20170202496-$ or US-20170075551-$ or US-20180011686-$ or US-20150288944-$ or US-20140266776-$ or US-20160058313-$ or US-20100017489-$ or US-20060149144-$ or US-20050010117-$ or US-20170188841-$ or US-20170303844-$ or US-20150081210-$ or US-20160235325-$ or US-20150099991-$ or US-20170007159-$).did. or (US-20170127997-$ or US-20170172522-$).did. or (US-9813642-$ or US-8321006-$).did. | US-PGPUB; USPAT | OR | OFF | 2019/04/10 15:15 |
| L24 | 27 | L23 and communicat$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/10 15:16 |
| L25 | 25 | L23 and communicat$4 with (external or computer) | US-PGPUB; USPAT | OR | OFF | 2019/04/10 15:19 |
| S1 | 3 | ("20100076331" \| "20160292373" \| "20170032168").PN. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 16:44 |
| S2 | 12 | ("20130114100" \| "20140081118" \| "20140240349" \| "20160301761" \| "20170000359" \| "20170274149" \| "20180000426" \| "20180049696" \| "20190025995" \| "20190034049" \| "20190034050" \| "9801562").PN. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 16:44 |
| S3 | 22 | ("20040017300" \| "20060152372" \| "20080200312" \| "20100010832" \| "20110098928" \| "20110245623" \| "20120317167" \| "20130231947" \| "20140142403" \| "20140240122" \| "20140336796" \| "20150217163" \| "20150220883" \| "20160062582" \| "20160235374" \| "20170053542" \| "20170300186" \| "20170357520" \| "20180064356" \| "20180329584" \| "9712629" \| "9813642").PN. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 16:45 |
| S4 | 12 | ("20050079905" \| "20080300110" \| "20110066051" \| "20110307821" \| "20130110264" \| "20130115583" \| "20130332286" \| "20140275852" \| "20160058336" \| "20160058337" \| "20170237694" \| "8784115").PN. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 16:45 |
| S5 | 44 | (soli near3 christopher).in. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:24 |
| S6 | 4361 | 600/301.ccls. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:25 |
| S7 | 0 | A61B5/02,0404.ccls. | US- | OR | OFF | 2019/03/15 |

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|---|---|---|---|---|---|---|
| | | | PGPUB; USPAT | | | 17:26 |
| S8 | 2601 | A61B5/02,0404.cpc.. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:26 |
| S9 | 2601 | A61B5/02,0404.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:26 |
| S10 | 2755 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:27 |
| S11 | 0 | G0F1/163.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:27 |
| S12 | 6379 | G06F1/163.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:27 |
| S13 | 25570 | G06F3/017,0485.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:27 |
| S14 | 2755 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:28 |
| S15 | 1264 | G06T13/80 | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:28 |
| S16 | 2465 | G06T13/80.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:28 |
| S17 | 230715 | G06F3/0$.cpc. and @pd<"20180312" | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:29 |
| S18 | 30 | S17 and workout same start same list | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:30 |
| S19 | 14 | S17 and workout same quick with start | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:32 |
| S20 | 3 | S17 and workout same quick with start same (menu$1 or list$1 or option$1) | US-PGPUB; USPAT | OR | OFF | 2019/03/15 17:34 |
| S21 | 0 | "2016058336".pn. | US-PGPUB; USPAT | OR | OFF | 2019/03/26 17:54 |
| S22 | 1 | "20160058336".pn. | US-PGPUB; USPAT | OR | OFF | 2019/03/26 17:55 |
| S23 | 2613 | A61B5/02,0404.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:02 |
| S24 | 2772 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:02 |
| S25 | 6433 | G06F1/163.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:02 |
| S26 | 25703 | G06F3/017,0485.cpc. | US- | OR | OFF | 2019/03/26 |

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| | | | PGPUB; USPAT | | | 18:02 |
| S27 | 2772 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:02 |
| S28 | 2470 | G06T13/80.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:02 |
| S29 | 38031 | S23 or S24 or S25 or S26 or S27 or S28 | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:02 |
| S30 | 32084 | S29 and @pd<"20180312" | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:03 |
| S31 | 8771 | S30 and second same first same interface$1 | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:03 |
| S32 | 448 | S30 and second same first same interface$1 same record$4 | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:03 |
| S33 | 0 | S30 and second same first same interface$1 same record$4 near5 progress$4 | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:04 |
| S34 | 3 | S30 and second same first same interface$1 same record$4 same progress$4 | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:09 |
| S35 | 0 | S30 and second with interface$1 same first with interface$1 same record$4 same progress$4 | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:10 |
| S36 | 3 | S30 and second with interface$1 and first with interface$1 same record$4 same progress$4 | US-PGPUB; USPAT | OR | OFF | 2019/03/26 18:11 |
| S37 | 49 | ("20100076331" \| "20160292373" \| "20170032168" \| "20130114100" \| "20140081118" \| "20140240349" \| "20160301761" \| "20170000359" \| "20170274149" \| "20180000426" \| "20180049696" \| "20190025995" \| "20190034049" \| "20190034050" \| "9801562" \| "20040017300" \| "20060152372" \| "20080200312" \| "20100010832" \| "20110098928" \| "20110245623" \| "20120317167" \| "20130231947" \| "20140142403" \| "20140240122" \| "20140336796" \| "20150217163" \| "20150220883" \| "20160062582" \| "20160235374" \| "20170053542" \| "20170300186" \| "20170357520" \| "20180064356" \| "20180329584" \| "9712629" \| "9813642" \| "20050079905" \| "20080300110" \| "20110066051" \| "20110307821" \| "20130110264" \| "20130115583" \| "20130332286" \| "20140275852" \| "20160058336" \| "20160058337" \| "20170237694" \| "8784115").PN. | US-PGPUB; USPAT | OR | OFF | 2019/04/01 12:52 |
| S38 | 24 | S37 and shape$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:14 |

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|---|---|---|---|---|---|---|
| S39 | 4 | S37 and shape$1 near3 chang$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:14 |
| S40 | 2618 | A61B5/02,0404.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:22 |
| S41 | 2776 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:22 |
| S42 | 6445 | G06F1/163.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:22 |
| S43 | 25749 | G06F3/017,0485.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:22 |
| S44 | 2776 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:22 |
| S45 | 2477 | G06T13/80.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:22 |
| S46 | 38105 | S40 or S41 or S42 or S43 or S44 or S45 | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:22 |
| S47 | 75 | S46 and @pd<"20180312" and chang$4 near3 shape$1 same threshold$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:22 |
| S48 | 55 | S46 and @pd<"20180312" and chang$4 near3 shape$1 same threshold$1 same (display$1 or image$1 or animation$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:22 |
| S49 | 3 | S46 and @pd<"20180312" and chang$4 near3 shape$1 same threshold$1 same (display$1 or image$1 or animation$1) same (wave$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:23 |
| S50 | 7 | S46 and @pd<"20180312" and chang$4 near3 shape$1 same threshold$1 same (display$1 or image$1 or animation$1) same (graph$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:25 |
| S51 | 0 | S46 and @pd<"20180312" and chang$4 near3 shape$1 same threshold$1 same (display$1 or image$1 or animation$1) same transition$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:26 |
| S52 | 2 | S46 and @pd<"20180312" and transition$3 near3 shape$1 same threshold$1 same (display$1 or image$1 or animation$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:27 |
| S53 | 15 | S46 and @pd<"20180312" and transition$3 near3 shape$1 same (display$1 or image$1 or animation$1) same heart$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/01 13:54 |
| S54 | 42230 | S40 or S41 or S42 or S43 or S44 or S45 or 600/301.ccls. | US-PGPUB; USPAT | OR | OFF | 2019/04/01 14:15 |
| S55 | 15 | (S46 or 600/301.ccls.)and @pd<"20180312" and transition$3 near3 shape$1 same (display$1 or image$1 or animation$1) same heart$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/01 14:15 |
| S56 | 8064 | (S46 or 600/301.ccls.)and | US- | OR | OFF | 2019/04/01 |

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|---|---|---|---|---|---|---|
| | | @pd<"20180312" and chang$4near3 shape$1 same (display$1 or image$1 or animation$1) same heart$1 | PGPUB; USPAT | | | 14:16 |
| S57 | 130 | (S46 or 600/301.ccls.)and @pd<"20180312" and chang$4 near3 shape$1 same (display$1 or image$1 or animation$1) same heart$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/01 14:16 |
| S58 | 1 | (S46 or 600/301.ccls.)and @pd<"20180312" and chang$4 near3 shape$1 same (display$1 or image$1 or animation$1) same heart$1 same (threshold$1 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/01 14:16 |
| S59 | 41 | (A61B5/$.cpc. or G06F9/$.cpc. or G06F1/$.cpc. or G06T13/$.cpc. or 600/301.ccls.)and @pd<"20180312" and chang$4 near3 shape$1 same (display$1 or image$1 or animation$1) same heart$1 same (threshold$1 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/01 14:20 |
| S60 | 15 | (A61B5/$.cpc. or G06F9/$.cpc. or G06F1/$.cpc. or G06T13/$.cpc. or 600/301.ccls.)and @pd<"20180312" and chang$4 near3 shape$1 same (display$1 or image$1 or animation$1) same heart$1 with (threshold$1 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/01 14:36 |
| S61 | 41 | (A61B5/$.cpc. or G06F9/$.cpc. or G06F1/$.cpc. or G06T13/$.cpc. or 600/301.ccls.)and @pd<"20180312" and (chang$4 or transition$4 or morph$4) near3 shape$1 same (display$1 or image$1 or animation$1) same heart$1 with (threshold$1 or detect$4 or measur$5) | US-PGPUB; USPAT | OR | OFF | 2019/04/01 14:53 |
| S62 | 71 | (A61B5/$.cpc. or G06F9/$.cpc. or G06F1/$.cpc. or G06T13/$.cpc. or 600/301.ccls.)and @pd<"20180312" and (chang$4 or transition$4 or morph$4) near3 shape$1 same (display$1 or image$1 or animation$1) same heart$1 with (threshold$1 or detect$4 or measur$5 or read$4 or process$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:20 |
| S63 | 2619 | A61B5/02,0404.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:45 |
| S64 | 2779 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:45 |
| S65 | 6462 | G06F1/163.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:45 |
| S66 | 25789 | G06F3/017,0485.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:45 |
| S67 | 2779 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:45 |
| S68 | 2481 | G06T13/80.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:45 |
| S69 | 38165 | S63 or S64 or S65 or S66 or S67 or S68 | US- | OR | OFF | 2019/04/02 |

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| | | | PGPUB; USPAT | | | 10:45 |
| S70 | 32084 | S69 and @pd< "20180312" | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:45 |
| S71 | 32084 | S70 | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:45 |
| S72 | 2448 | S70 and (electrocardiogram or ecg or ekg) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:46 |
| S73 | 1281 | S70 and (electrocardiogram or ecg or ekg) and threshold | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:46 |
| S74 | 1073 | S70 and (electrocardiogram or ecg or ekg) and threshold$1 and (shape$1 or image$1 or animation$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:47 |
| S75 | 569 | S70 and (electrocardiogram or ecg or ekg) and threshold$1 and (shape$1 or image$1 or animation$1) same interface$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:48 |
| S76 | 121 | S70 and (electrocardiogram or ecg or ekg) and threshold$1 and (shape$1 or image$1 or animation$1) same interface$1 with (chang$3 or switch$3 or transition$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:48 |
| S77 | 86 | S70 and (electrocardiogram or ecg or ekg) and threshold$1 and (shape$1 or image$1 or animation$1) same interface$1 with (chang$3 or switch$3 or transition$4) same (display$1 or screen$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:50 |
| S78 | 1 | S70 and (electrocardiogram or ecg or ekg) and threshold$1 and (shape$1 or image$1 or animation$1) same interface$1 with (chang$3 or switch$3 or transition$4) same (display$1 or screen$1) same waveform$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/02 10:51 |
| S79 | 259 | S70 and (electrocardiogram or ecg or ekg) and waveform same display | US-PGPUB; USPAT | OR | OFF | 2019/04/02 11:02 |
| S80 | 5 | S70 and (electrocardiogram or ecg or ekg) and waveform same display same (shape$1 or image$1) near3 (chang$4 or transition$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 11:03 |
| S81 | 5 | S70 and (electrocardiogram or ecg or ekg) and waveform same display same (shape$1 or image$1) near3 (chang$4 or transition$4 or return$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 11:12 |
| S82 | 2135 | fitbit | US-PGPUB; USPAT | OR | OFF | 2019/04/02 11:13 |
| S83 | 13 | G06T13/80.cpc. and @pd< "20180312" and threshold same shape$1 same (chang$4 or return$4 or transition$4 or morph$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 11:15 |
| S84 | 1 | G06T13/80.cpc. and @pd< "20180312" and threshold same shape$1 same (chang$4 or return$4 or transition$4 or morph$4) same detect$5 | US-PGPUB; USPAT | OR | OFF | 2019/04/02 11:15 |
| S85 | 789 | G06T13/80.cpc. and @pd< "20180312" | US- | OR | OFF | 2019/04/02 |

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| | | and (threshold$1 or criteria) | PGPUB; USPAT | | | 11:39 |
| S86 | 282 | G06T13/80.cpc. and @pd<"20180312" and progress$4 with (indicat$4 or animat$4 or shape$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 11:54 |
| S87 | 40 | G06T13/80.cpc. and @pd<"20180312" and progress$4 with (indicat$4 or animat$4 or shape$1) same (measur$4 or monitor$4 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 11:55 |
| S88 | 3 | G06T13/80.cpc. and @pd<"20180312" and progress$4 with (indicat$4 or animat$4 or shape$1) same (measur$4 or monitor$4 or detect$4) same (return$4 or revert$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 11:58 |
| S89 | 0 | G06T13/80.cpc. and @pd<"20180312" and progress$4 with (indicat$4 or animat$4 or shape$1) same (measur$4 or monitor$4 or detect$4) same (previous) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 11:58 |
| S90 | 40 | G06T13/80.cpc. and @pd<"20180312" and progress$4 with (indicat$4 or animat$4 or shape$1) same (measur$4 or monitor$4 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 13:20 |
| S91 | 40 | G06T13/80.cpc. and @pd<"20180312" and progress$4 with (indicat$4 or animat$4 or shape$1) same (measur$4 or monitor$4 or detect$4 or switch$4 near3 back) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 13:25 |
| S92 | 50 | G06T13/$.cpc. and @pd<"20180312" and (time or period$1 or duration$1) same (threshold or criteria) same (revert$3 or switch$3) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 13:31 |
| S93 | 116 | G06T13/$.cpc. and @pd<"20180312" and (time or period$1 or duration$1) same (threshold or criteria) same (revert$3 or switch$3 or return$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 15:28 |
| S94 | 1034 | G06T$.cpc. and @pd<"20180312" and (time or period$1 or duration$1) same (threshold or criteria) same (revert$3 or switch$3) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 15:43 |
| S95 | 147 | G06T$.cpc. and @pd<"20180312" and (time or period$1 or duration$1) same (threshold or criteria) same (revert$3 or switch$3) and (heart or rhythm or ekg or ecg or electrocardiogram) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 15:43 |
| S96 | 7 | G06T$.cpc. and @pd<"20180312" and (time or period$1 or duration$1) same (threshold or criteria) same (revert$3 or switch$3) and (heart or rhythm or ekg or ecg or electrocardiogram) same (proximity or contact) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:15 |
| S97 | 15 | G06T$.cpc. and @pd<"20180312" and (time or period$1 or duration$1) same (threshold or criteria) same (revert$3 or switch$3) same (proximity or contact) and (heart or rhythm or ekg or ecg or electrocardiogram) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:16 |
| S98 | 2619 | A61B5/02,0404.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:21 |

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| S99 | 2779 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:21 |
| S100 | 6462 | G06F1/163.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:21 |
| S101 | 25789 | G06F3/017,0485.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:21 |
| S102 | 2779 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:21 |
| S103 | 2481 | G06T13/80.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:21 |
| S104 | 38165 | S98 or S99 or S100 or S101 or S102 or S103 | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:21 |
| S105 | 25776 | S104 and @pd<"20180312" and (mode$1 or setting$1 or image$1 or shape$1 or animation$1) same (display$1 or screen$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:21 |
| S106 | 1067 | S104 and @pd<"20180312" and (mode$1 or setting$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1) same (display$1 or screen$1) same (heart or rhythm$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:26 |
| S107 | 221 | S104 and @pd<"20180312" and (mode$1 or setting$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1) same (display$1 or screen$1) same (heart or rhythm$1) same (transition$3 or revert$3 or chang$3) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:27 |
| S108 | 177 | S104 and @pd<"20180312" and (mode$1 or setting$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1) with (transition$3 or revert$3 or chang$3 or switch$3) same (display$1 or screen$1) same (heart or rhythm$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:28 |
| S109 | 13 | S104 and @pd<"20180312" and (mode$1 or setting$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1) with (transition$3 or revert$3 or chang$3 or switch$3) same (display$1 or screen$1) same (heart or rhythm$1) same (criteria or criterion or threshold$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:29 |
| S110 | 15 | S104 and @pd<"20180312" and (mode$1 or setting$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1) with (transition$3 or revert$3 or chang$3 or switch$3) same (display$1 or screen$1) same (heart or rhythm$1 or ecg or electrocardiogram$1 or ekg) same (criteria or criterion or threshold$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:29 |
| S111 | 96 | A61B5/$.cpc. and @pd<"20180312" and (time or period$1 or duration$1) same (threshold or criteria) same (revert$3 or switch$3) same (proximity or contact) and (heart or rhythm or ekg or ecg or electrocardiogram) | US-PGPUB; USPAT | OR | OFF | 2019/04/02 16:31 |

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|---|---|---|---|---|---|---|
| S112 | 11103 | A61B5/742-745.cpc. and @pd<"20180312" | US-PGPUB; USPAT | OR | OFF | 2019/04/05 15:56 |
| S113 | 18 | A61B5/742-745.cpc. and @pd<"20180312" and (time or period$1 or duration$1) same (threshold or criteria) same (revert$3 or switch$3) same (proximity or contact) and (heart or rhythm or ekg or ecg or electrocardiogram) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:01 |
| S114 | 22 | S112 and (mode$1 or setting$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1) with (transition$3 or revert$3 or chang$3 or switch$3) same (display$1 or screen$1) same (heart or rhythm$1 or ecg or electrocardiogram$1 or ekg) same (criteria or criterion or threshold$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:06 |
| S115 | 20 | S112 and (mode$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1) with (transition$3 or revert$3 or chang$3 or switch$3) same (display$1 or screen$1) same (heart or rhythm$1 or ecg or electrocardiogram$1 or ekg) same (criteria or criterion or threshold$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:28 |
| S116 | 56 | S112 and (mode$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1 or indicat$4) with (transition$3 or revert$3 or chang$3 or switch$3) same (display$1 or screen$1) same (heart or rhythm$1 or ecg or electrocardiogram$1 or ekg) same (criteria or criterion or threshold$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:28 |
| S117 | 7 | S112 and (mode$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1 or indicat$4) with (transition$3 or revert$3 or chang$3 or switch$3) with (detect$4) same (display$1 or screen$1) same (heart or rhythm$1 or ecg or electrocardiogram$1 or ekg) same (criteria or criterion or threshold$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:29 |
| S118 | 0 | S112 and (mode$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1 or indicat$4) with (transition$3 or revert$3 or chang$3 or switch$3) with (prior or previous) with (detect$4) same (display$1 or screen$1) same (heart or rhythm$1 or ecg or electrocardiogram$1 or ekg) same (criteria or criterion or threshold$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:33 |
| S119 | 12 | ("20130114100" \| "20140081118" \| "20140240349" \| "20160301761" \| "20170000359" \| "20170274149" \| "20180000426" \| "20180049696" \| "20190025995" \| "20190034049" \| "20190034050" \| "9801562").PN. | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:35 |
| S120 | 22 | ("20040017300" \| "20060152372" \| "20080200312" \| "20100010832" \| "20110098928" \| "20110245623" \| "20120317167" \| "20130231947" \| "20140142403" \| "20140240122" \| | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:35 |

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|---|---|---|---|---|---|---|
| | | "20140336796" \| "20150217163" \| "20150220883" \| "20160062582" \| "20160235374" \| "20170053542" \| "20170300186" \| "20170357520" \| "20180064356" \| "20180329584" \| "9712629" \| "9813642").PN. | | | | |
| S121 | 12 | ("20050079905" \| "20080300110" \| "20110066051" \| "20110307821" \| "20130110264" \| "20130115583" \| "20130332286" \| "20140275852" \| "20160058336" \| "20160058337" \| "20170237694" \| "8784115").PN. | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:35 |
| S122 | 46 | S119 or S120 or S121 | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:35 |
| S123 | 8 | S122 and (mode$1 or setting$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1) with (transition$3 or revert$3 or chang$3 or switch$3) same (display$1 or screen$1) same (criteria or criterion or threshold$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:36 |
| S124 | 1 | S122 and (mode$1 or setting$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1) with (transition$3 or revert$3 or chang$3 or switch$3)with (prior or previous) same (display$1 or screen$1) same (criteria or criterion or threshold$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:39 |
| S125 | 2 | S112 and (mode$1 or setting$1 or image$1 or shape$1 or animation$1 or menu$1 or interface$1) with (transition$3 or revert$3 or chang$3 or switch$3)with (prior or previous) same (display$1 or screen$1) same (criteria or criterion or threshold$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:44 |
| S126 | 812 | S112 and contact$3 with detect$4 same (image$1 or mode$1 or animation$1 or interface$1 or shape$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:50 |
| S127 | 0 | S112 and contact$3 with detect$4 same (image$1 or mode$1 or animation$1 or interface$1 or shape$1) same (revert$5) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:52 |
| S128 | 258 | S112 and contact$3 with detect$4 same (image$1 or mode$1 or animation$1 or interface$1 or shape$1) same (revert$5 or prior or previous) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:52 |
| S129 | 2 | S112 and contact$3 with detect$4 with(image$1 or mode$1 or animation$1 or interface$1 or shape$1) same (revert$5 or prior or previous) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:53 |
| S130 | 2 | S112 and contact$3 with detect$4 with (image$1 or mode$1 or animation$1 or interface$1 or shape$1) same (revert$5 or prior or previous) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:53 |
| S131 | 16044 | A61B5/74$.cpc. and @pd<"20180312" | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:55 |
| S132 | 4 | S131 and contact$3 with detect$4 with (image$1 or mode$1 or animation$1 or interface$1 or shape$1) same (revert$5 or prior or previous) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:55 |

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|---|---|---|---|---|---|---|
| S133 | 132 | S131 and contact$3 with detect$4 with (image$1 or mode$1 or animation$1 or interface$1 or shape$1) same signal | US-PGPUB; USPAT | OR | OFF | 2019/04/05 16:58 |
| S134 | 13 | S131 and contact$3 with detect$4 with (image$1 or mode$1 or animation$1 or interface$1 or shape$1) same signal same waveform | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:00 |
| S135 | 1108 | A61B5/742-745.cpc. and @pd<"20180312" and waveform same heart | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:02 |
| S136 | 140 | A61B5/742-745.cpc. and @pd<"20180312" and waveform same heart same threshold | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:02 |
| S137 | 89 | A61B5/742-745.cpc. and @pd<"20180312" and waveform same heart same threshold same (display$1 or interface$1 or indicat$3 or menu$1 or shape$1 or image$1 or avatar$1 or picture$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:03 |
| S138 | 641 | A61B5/742-745.cpc. and @pd<"20180312" and progress same detect$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:06 |
| S139 | 107 | A61B5/742-745.cpc. and @pd<"20180312" and progress same detect$4 same (return$4 or ((switch$4 or chang$4) adj back) or previous or prior) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:09 |
| S140 | 30 | A61B5/742-745.cpc. and @pd<"20180312" and progress with detect$4 same (return$4 or ((switch$4 or chang$4) adj back) or previous or prior) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:09 |
| S141 | 30 | A61B5/742-745.cpc. and @pd<"20180312" and progress with detect$4 same (return$4 or ((switch$4 or chang$4) adj back) or previous or prior) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:10 |
| S142 | 210 | A61B5/742-745.cpc. and @pd<"20180312" and previous near3 screen | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:13 |
| S143 | 6 | A61B5/742-745.cpc. and @pd<"20180312" and previous near3 screen with progress | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:13 |
| S144 | 1244 | A61B5/742-745.cpc. and @pd<"20180312" and previous same detect$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:14 |
| S145 | 97 | A61B5/742-745.cpc. and @pd<"20180312" and previous with (screen$4 or image$1 or interface$1 or shape$4) same detect$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:15 |
| S146 | 32 | A61B5/742-745.cpc. and @pd<"20180312" and previous with (screen$4 or image$1 or interface$1 or shape$4) with detect$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:17 |
| S147 | 41 | G06T13/80.cpc. and @pd<"20180312" and previous with (screen$4 or image$1 or interface$1 or shape$4) with detect$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:20 |
| S148 | 46 | S122 and (interface$1 or page$1 or image$1 or shape$1 or screen$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/05 17:20 |
| S149 | 33 | S122 and (interface$1 or page$1 or | US- | OR | OFF | 2019/04/05 |

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|---|---|---|---|---|---|---|
| | | image$1 or shape$1 or screen$1) same (detect$4) | PGPUB; USPAT | | | 17:33 |
| S150 | 12 | ("20130114100" \| "20140081118" \| "20140240349" \| "20160301761" \| "20170000359" \| "20170274149" \| "20180000426" \| "20180049696" \| "20190025995" \| "20190034049" \| "20190034050" \| "9801562").PN. | US-PGPUB; USPAT | OR | OFF | 2019/04/08 10:50 |
| S151 | 22 | ("20040017300" \| "20060152372" \| "20080200312" \| "20100010832" \| "20110098928" \| "20110245623" \| "20120317167" \| "20130231947" \| "20140142403" \| "20140240122" \| "20140336796" \| "20150217163" \| "20150220883" \| "20160062582" \| "20160235374" \| "20170053542" \| "20170300186" \| "20170357520" \| "20180064356" \| "20180329584" \| "9712629" \| "9813642").PN. | US-PGPUB; USPAT | OR | OFF | 2019/04/08 10:50 |
| S152 | 12 | ("20050079905" \| "20080300110" \| "20110066051" \| "20110307821" \| "20130110264" \| "20130115583" \| "20130332286" \| "20140275852" \| "20160058336" \| "20160058337" \| "20170237694" \| "8784115").PN. | US-PGPUB; USPAT | OR | OFF | 2019/04/08 10:50 |
| S153 | 46 | S150 or S151 or S152 | US-PGPUB; USPAT | OR | OFF | 2019/04/08 10:50 |
| S154 | 2 | S153 and (interface$1 or page$1 or image$1 or shape$1 or screen$1) same (detect$4) same count$1down | US-PGPUB; USPAT | OR | OFF | 2019/04/08 10:50 |
| S155 | 0 | S153 and (electrocardiogram or ecg) same (detect$4) same count$1down | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:00 |
| S156 | 0 | S153 and (electrocardiogram or ecg or heart) same (detect$4) same count$1down | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:01 |
| S157 | 0 | A61B5/742-745.cpc. and @pd<"20180312" and previous with (screen$4 or image$1 or interface$1 or shape$4) with detect$4 same count$1down | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:01 |
| S158 | 0 | A61B5/742-745.cpc. and @pd<"20180312" and previous with (screen$4 or image$1 or interface$1 or shape$4) with detect$4 same (count$1down or countdown) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:03 |
| S159 | 5 | A61B5/742-745.cpc. and @pd<"20180312" and previous with (screen$4 or image$1 or interface$1 or shape$4) same (count$1down or countdown) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:04 |
| S160 | 93 | A61B5/742-745.cpc. and @pd<"20180312" and (screen$4 or image$1 or interface$1 or shape$4) same (count$1down or countdown) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:11 |
| S161 | 7 | A61B5/742-745.cpc. and @pd<"20180312" and (screen$4 or image$1 or interface$1 or shape$4) same (count$1down or countdown) same | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:13 |

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| | | (electrocardiogram or ecg or ekg or waveform or heart) | | | | |
| S162 | 861 | A61B5/742-745.cpc. and @pd<"20180312" and detect$4 same home | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:33 |
| S163 | 318 | A61B5/742-745.cpc. and @pd<"20180312" and detect$4 same (home or home$1screen) same (ecg or ekg or electrocardiogram or wave$1form$1 or heart) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:34 |
| S164 | 68 | A61B5/742-745.cpc. and @pd<"20180312" and detect$4 same (home or home$1screen) same (ecg or ekg or electrocardiogram or wave$1form$1 or heart) same (chang$4 or switch$4 or trigger$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:35 |
| S165 | 0 | A61B5/742-745.cpc. and @pd<"20180312" and detect$4 same (home$1screen) same (ecg or ekg or electrocardiogram or wave$1form$1 or heart) same (chang$4 or switch$4 or trigger$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:36 |
| S166 | 0 | A61B5/742-745.cpc. and @pd<"20180312" and detect$4 same (home$1screen) same (ecg or ekg or electrocardiogram or wave$1form$1 or heart) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:36 |
| S167 | 0 | A61B5/742-745.cpc. and @pd<"20180312" and (home$1screen) same (ecg or ekg or electrocardiogram or wave$1form$1 or heart) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:36 |
| S168 | 5 | A61B5/742-745.cpc. and @pd<"20180312" and (home$1screen) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:36 |
| S169 | 2626 | A61B5/02,0404.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:37 |
| S170 | 2800 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:37 |
| S171 | 6499 | G06F1/163.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:37 |
| S172 | 25830 | G06F3/017,0485.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:37 |
| S173 | 2800 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:37 |
| S174 | 2487 | G06T13/80.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:37 |
| S175 | 38266 | S169 or S170 or S171 or S172 or S173 or S174 | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:37 |
| S176 | 51 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (home$1screen) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:37 |

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|---|---|---|---|---|---|---|
| S177 | 2 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (home$1screen) same automatic$5 | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:44 |
| S178 | 0 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (home$1screen) same threshold$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:45 |
| S179 | 2 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (home$1screen) and (waveform or ecg or ekg or electrocardiogram or heart) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:46 |
| S180 | 1 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (home$1screen) same(waveform or ecg or ekg or electrocardiogram or heart) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:46 |
| S181 | 4705482 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (screen or interface or app) same(waveform or ecg or ekg or electrocardiogram or heart) pre$1determined | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:57 |
| S182 | 5071 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (screen or interface or app) same(waveform or ecg or ekg or electrocardiogram or heart) pre$1determinedsame | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:57 |
| S183 | 328 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (screen or interface or app) same(waveform or ecg or ekg or electrocardiogram or heart) same pre$1determined | US-PGPUB; USPAT | OR | OFF | 2019/04/08 11:57 |
| S184 | 98 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (screen or interface or app) same(waveform or ecg or ekg or electrocardiogram or heart) same pre$1determined near5 time | US-PGPUB; USPAT | OR | OFF | 2019/04/08 12:00 |
| S185 | 18 | (US-20150185967-$ or US-20100062905-$ or US-20160058336-$ or US-20170053542-$ or US-20160109961-$ or US-20160196635-$ or US-20120283587-$ or US-20160174857-$ or US-20170300186-$ or US-20180049696-$ or US-20170086693-$ or US-20170202496-$ or US-20170075551-$ or US-20180011686-$ or US-20150288944-$ or US-20140266776-$ or US-20160058313-$).did. or (US-9813642-$).did. | US-PGPUB; USPAT | OR | OFF | 2019/04/08 14:28 |
| S186 | 12 | S185 and (contact or touch) near3 sensor$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/08 14:29 |
| S187 | 26777 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (shapes or objects) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 14:36 |
| S188 | 2936 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and mov$4 near3 (shapes or objects) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 14:36 |
| S189 | 414 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and mov$4 near3 (shapes or objects) and heart | US-PGPUB; USPAT | OR | OFF | 2019/04/08 14:36 |
| S190 | 27 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and mov$4 near3 | US-PGPUB; | OR | OFF | 2019/04/08 14:37 |

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| | | (shapes or objects) same heart | USPAT | | | |
| S191 | 54 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (mov$4 or animat$4) near3 (shapes or objects) same heart | US-PGPUB; USPAT | OR | OFF | 2019/04/08 14:39 |
| S192 | 45 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (mov$4 or animat$4) near3 (shapes or objects) with (heart or wave$1 or waveform$1 or wave$1form or rhythm) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 14:51 |
| S193 | 22 | (US-20150185967-$ or US-20100062905-$ or US-20160058336-$ or US-20170053542-$ or US-20160109961-$ or US-20160196635-$ or US-20120283587-$ or US-20160174857-$ or US-20170300186-$ or US-20180049696-$ or US-20170086693-$ or US-20170202496-$ or US-20170075551-$ or US-20180011686-$ or US-20150288944-$ or US-20140266776-$ or US-20160058313-$ or US-20100017489-$ or US-20060149144-$ or US-20050010117-$).did. or (US-9813642-$ or US-8321006-$).did. | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:22 |
| S194 | 13 | S193 and (alert$4 or notif$7) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:23 |
| S195 | 11 | S193 and (motion or movement or activity) near3 sens$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:46 |
| S196 | 0 | S193 and (motion or movement or activity) near3 sens$4 with (reduc$4 or decreas$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:47 |
| S197 | 7 | S193 and (motion or movement or activity) with (reduc$4 or decreas$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:48 |
| S198 | 5 | S193 and (motion or movement or activity) with (reduc$4 or decreas$4) same (sens$4 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:48 |
| S199 | 8 | S193 and (motion or movement or activity or less) with (reduc$4 or decreas$4) same (sens$4 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:48 |
| S200 | 5 | S193 and (motion or movement or activity) with (reduc$4 or decreas$4 or less) same (sens$4 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:49 |
| S201 | 3 | S193 and (motion or movement or activity) near5 (reduc$4 or decreas$4 or less) same (sens$4 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:50 |
| S202 | 2900 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (motion or movement or activity) near5 (reduc$4 or decreas$4 or less) same (sens$4 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:51 |
| S203 | 11 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (motion or movement or activity) near5 (reduc$4 or decreas$4 or less) with (recommend$5 or advis$4) same (sens$4 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:52 |
| S204 | 8 | (A61B5/742-745.cpc. or S175) and | US- | OR | OFF | 2019/04/08 |

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|---|---|---|---|---|---|---|
| | | @pd<"20180312" and (motion or movement or activity) near5 (reduc$4 or decreas$4) with (recommend$5 or advis$4) same (sens$4 or detect$4) | PGPUB; USPAT | | | 16:53 |
| S205 | 57 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (motion or movement or activity) near5 (reduc$4 or decreas$4) with (recommend$5 or advis$4 or alert$4 or notif$7) same (sens$4 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:56 |
| S206 | 33 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (motion or movement or activity) near5 (reduc$4 or decreas$4) near5 (recommend$5 or advis$4 or alert$4 or notif$7) same (sens$4 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:56 |
| S207 | 555 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (motion or movement or activity) with threshold with (reduc$4 or decrease$4 or stop$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 16:59 |
| S208 | 387937 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (motion or movement or activity) neart5 (reduc$4 or decrease$4 or stop$4) with threshold | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:00 |
| S209 | 282 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (motion or movement or activity) near5 (reduc$4 or decrease$4 or stop$4) with threshold | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:00 |
| S210 | 32 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and measur$5 with (activit$4 or accelerometer$1 or motion or movement) with sensor with (stop)\ | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:06 |
| S211 | 32 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and measur$5 with (activit$4 or accelerometer$1 or motion or movement) with sensor with (stop) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:06 |
| S212 | 10 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and measur$5 with (activit$4 or accelerometer$1 or motion or movement) with sensor with (reduce with (movement or motion)) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:07 |
| S213 | 73 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (instruct$4 or alert$4 or order$4 or notif$4 or tell$4) near3 (reduc$4 or stop$4 or decreas$4) near5 movement | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:09 |
| S214 | 83 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (instruct$4 or alert$4 or order$4 or notif$4 or tell$4) near3 (reduc$4 or stop$4 or decreas$4) near5 mov$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:09 |
| S215 | 0 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (instruct$4 or alert$4 or order$4 or notif$4 or tell$4) near3 (reduc$4 or stop$4 or decreas$4) near5 mov$4 with (measur$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:13 |
| S216 | 0 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (instruct$4 or alert$4 or order$4 or notif$4 or tell$4) near3 (reduc$4 or stop$4 or decreas$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:13 |

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|---|---|---|---|---|---|---|
| | | near5 mov$4 with (measur$5) | | | | |
| S217 | 3 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (instruct$4 or alert$4 or order$4 or notif$4 or tell$4) near3 (reduc$4 or stop$4 or decreas$4) near5 mov$4 same (heart or ekg or ecg or electrocardiogram or rhythm or wave$1form) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:14 |
| S218 | 25 | (US-20150185967-$ or US-20100062905-$ or US-20160058336-$ or US-20170053542-$ or US-20160109961-$ or US-20160196635-$ or US-20120283587-$ or US-20160174857-$ or US-20170300186-$ or US-20180049696-$ or US-20170086693-$ or US-20170202496-$ or US-20170075551-$ or US-20180011686-$ or US-20150288944-$ or US-20140266776-$ or US-20160058313-$ or US-20100017489-$ or US-20060149144-$ or US-20050010117-$ or US-20170188841-$ or US-20170303844-$ or US-20150081210-$).did. or (US-9813642-$ or US-8321006-$).did. | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:30 |
| S219 | 2 | S218 and (button$1 or input$1 or press$4) same wait | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:31 |
| S220 | 5 | S218 and (button$1 or input$1 or press$4) same progress | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:33 |
| S221 | 784 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (button$1 or press$4 or input$1) with wait | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:35 |
| S222 | 23 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (button$1 or press$4 or input$1) with wait with (measur$5 or progress) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:35 |
| S223 | 60 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and maintain with contact$4 same (ecg or ekg or electrocardiogram or heart or rhythm) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:45 |
| S224 | 34 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and maintain near3 contact$4 same (ecg or ekg or electrocardiogram or heart or rhythm) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:45 |
| S225 | 40 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (alert$4 or notif$4 or warn$4 or order4 or tell$4) with contact with (ecg or ekg or electrocardiogram or heart or rhythm) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:47 |
| S226 | 11 | (A61B5/742-745.cpc. or S175) and @pd<"20180312" and (alert$4 or notif$4 or warn$4 or order4 or tell$4) near3 contact with (ecg or ekg or electrocardiogram or heart or rhythm) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:53 |
| S227 | 26 | (US-20150185967-$ or US-20100062905-$ or US-20160058336-$ or US-20170053542-$ or US-20160109961-$ or US-20160196635-$ or US-20120283587-$ or US-20160174857-$ or US-20170300186-$ or US-20180049696-$ or | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:57 |

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|---|---|---|---|---|---|---|
| | | US-20170086693-$ or US-20170202496-$ or US-20170075551-$ or US-20180011686-$ or US-20150288944-$ or US-20140266776-$ or US-20160058313-$ or US-20100017489-$ or US-20060149144-$ or US-20050010117-$ or US-20170188841-$ or US-20170303844-$ or US-20150081210-$ or US-20160235325-$).did. or (US-9813642-$ or US-8321006-$).did. | | | | |
| S228 | 18 | S227 and activat$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:59 |
| S229 | 3 | S227 and activat$4 with heart adj rate$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/08 17:59 |
| S230 | 0 | S227 and activat$4 with heart adj rate$1 near3 (high or fast) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 18:01 |
| S231 | 26 | S227 andheart adj rate$1 near3 (high or fast) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 18:01 |
| S232 | 1 | S227 and heart adj rate$1 near3 (high or fast) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 18:01 |
| S233 | 18 | S227 and heart adj rate$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/08 18:07 |
| S234 | 5 | S227 and heart adj rate$1 same (notification$4 or alert$4 or message$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/08 18:07 |
| S235 | 26 | (US-20150185967-$ or US-20100062905-$ or US-20160058336-$ or US-20170053542-$ or US-20160109961-$ or US-20160196635-$ or US-20120283587-$ or US-20160174857-$ or US-20170300186-$ or US-20180049696-$ or US-20170086693-$ or US-20170202496-$ or US-20170075551-$ or US-20180011686-$ or US-20150288944-$ or US-20140266776-$ or US-20160058313-$ or US-20100017489-$ or US-20060149144-$ or US-20050010117-$ or US-20170188841-$ or US-20170303844-$ or US-20150081210-$ or US-20160235325-$).did. or (US-9813642-$ or US-8321006-$).did. | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:30 |
| S236 | 15 | S235 and threshold | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:34 |
| S237 | 8 | S235 and threshold same (heart near3 rate$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:40 |
| S238 | 0 | S235 and threshold same (heart near3 rate$1) same (accelerometer) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:43 |
| S239 | 2 | S235 and threshold same (heart near3 rate$1) same (touch or contact) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:43 |

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|---|---|---|---|---|---|---|
| S240 | 15 | S235 and threshold | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:44 |
| S241 | 12 | S235 and threshold same (measur$5 or detect$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:46 |
| S242 | 6 | S235 and threshold same (measur$5 or detect$4) same (begin$5 or start$5) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:47 |
| S243 | 5 | S235 and threshold same (measur$5 or detect$4) with (begin$5 or start$5) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:49 |
| S244 | 1 | S235 and threshold same (measur$5 or detect$4) with (begin$5 or start$5) same (heart near3 rate) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:53 |
| S245 | 2628 | A61B5/02,0404.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:54 |
| S246 | 2805 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:54 |
| S247 | 6514 | G06F1/163.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:54 |
| S248 | 25872 | G06F3/017,0485.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:54 |
| S249 | 2805 | G06F9/453.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:54 |
| S250 | 2490 | G06T13/80.cpc. | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:54 |
| S251 | 38328 | S245 or S246 or S247 or S248 or S249 or S250 | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:54 |
| S252 | 166 | (A61B5/742-745.cpc. or S251) and @pd<"20180312" and threshold same (measur$5 or detect$4) with (begin$5 or start$5) same (heart near3 rate) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:54 |
| S253 | 20 | (A61B5/742-745.cpc. or S251) and @pd<"20180312" and threshold with (measur$5 or detect$4) with (begin$5 or start$5) with (heart near3 rate) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 10:57 |
| S254 | 15 | A61B5/742-745.cpc. and @pd<"20180312" and threshold with (measur$5 or detect$4) with (begin$5 or start$5) with (heart near3 rate) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 11:05 |
| S255 | 2 | A61B5/742-745.cpc. and @pd<"20180312" and threshold with (measur$5 or detect$4) with (begin$5 or start$5) same (chang$4 or switch$4) with (screen$1 or interface$1 or app$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 11:06 |
| S256 | 5 | A61B5/742-745.cpc. and @pd<"20180312" and threshold with (measur$5 or detect$4) with (begin$5 or start$5) same (chang$4 or switch$4) with (screen$1 or interface$1 or app$1 or | US-PGPUB; USPAT | OR | OFF | 2019/04/09 11:06 |

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|---|---|---|---|---|---|---|
| | | page$1 or menu$1 or window$1) | | | | |
| S257 | 6 | A61B5/742-745.cpc. and @pd<"20180312" and threshold with (measur$5 or detect$4) with (begin$5 or start$5) same (chang$4 or switch$4) with (screen$1 or interface$1 or app$1 or page$1 or menu$1 or window$1 or shape$1 or image$1 or animation$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 11:09 |
| S258 | 6 | A61B5/742-745.cpc. and @pd<"20180312" and threshold with (measur$5) with (begin$5 or start$5) same (chang$4 or switch$4) with (screen$1 or interface$1 or app$1 or page$1 or menu$1 or window$1 or shape$1 or image$1 or animation$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 11:19 |
| S259 | 7 | A61B5/742-745.cpc. and @pd<"20180312" and threshold with (measur$5) with (begin$5 or start$5) with heart near3 rate | US-PGPUB; USPAT | OR | OFF | 2019/04/09 11:23 |
| S260 | 2 | A61B5/742-745.cpc. and @pd<"20180312" and home-screen | US-PGPUB; USPAT | OR | OFF | 2019/04/09 15:11 |
| S261 | 23909 | A61B5/742-745.cpc. and @pd<"20180312" and home$1screen or home$1page | US-PGPUB; USPAT | OR | OFF | 2019/04/09 15:11 |
| S263 | 0 | A61B5/742-745.cpc. and @pd<"20180312" and (home$1screen or home$1page) same heart | US-PGPUB; USPAT | OR | OFF | 2019/04/09 15:12 |
| S264 | 88 | A61B5/742-745.cpc. and @pd<"20180312" and (home$1screen or home$1page) | US-PGPUB; USPAT | OR | OFF | 2019/04/09 17:05 |
| S265 | 1 | "20150099991".pn. and sensor | US-PGPUB; USPAT | OR | OFF | 2019/04/10 10:29 |
| S266 | 613 | A61B5/742-745.cpc. and @pd<"20180312" and ecg same (object$1 or shape$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/10 10:45 |
| S267 | 1684 | A61B5/742-745.cpc. and @pd<"20180312" and (ecg or electrocardiogram or ekg or heart) same (object$1 or shape$1) | US-PGPUB; USPAT | OR | OFF | 2019/04/10 10:46 |
| S268 | 137 | A61B5/742-745.cpc. and @pd<"20180312" and (ecg or electrocardiogram or ekg or heart) with (object$1 or shape$1) with (transition$3 or animat$4 or chang$4 or morph$4) | US-PGPUB; USPAT | OR | OFF | 2019/04/10 10:47 |
| S269 | 0 | A61B5/742-745.cpc. and @pd<"20180312" and notification with heart near3 shape$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/10 10:52 |
| S270 | 0 | A61B5/742-745.cpc. and @pd<"20180312" and (alert$1 or notif$7 or messag$1) with heart near3 shape$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/10 10:53 |
| S271 | 265 | A61B5/742-745.cpc. and @pd<"20180312" and heart near3 shape$1 | US-PGPUB; USPAT | OR | OFF | 2019/04/10 10:53 |
| S272 | 18 | A61B5/742-745.cpc. and @pd<"20180312" and heart near3 shape$1 with display | US-PGPUB; USPAT | OR | OFF | 2019/04/10 10:53 |

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|---|---|---|---|---|---|---|
| S273 | 38 | A61B5/742-745.cpc. and @pd<"20180312" and (intermediate or interstitial) with shape | US-PGPUB; USPAT | OR | OFF | 2019/04/10 11:21 |
| S274 | 0 | A61B5/742-745.cpc. and @pd<"20180312" and (intermediate or interstitial) with shape same animat$4 | US-PGPUB; USPAT | OR | OFF | 2019/04/10 11:21 |
| S275 | 0 | A61B5/742-745.cpc. and @pd<"20180312" and (intermediate or interstitial) with shape same heart | US-PGPUB; USPAT | OR | OFF | 2019/04/10 11:22 |
| S276 | 17 | A61B5/742-745.cpc. and @pd<"20180312" and (intermediate or interstitial) with (shape$1 or object$1) same display | US-PGPUB; USPAT | OR | OFF | 2019/04/10 11:23 |

**EAST Search History (Interference)**

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**4/ 10/ 2019 4:23:13 PM**
**C:\ Users\ mlau2\ Documents\ EAST\ Workspaces\ 16143959.wsp**

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| SERIAL NUMBER | FILING or 371(c) DATE<br>RULE | CLASS | GROUP ART UNIT | ATTORNEY DOCKET NO. |
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| 16/143,959 | 09/27/2018 | 600 | 3792 | P38213US2/777700004891102 |

**APPLICANTS**

Apple Inc., Cupertino, CA;

**INVENTORS**

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Gary Ian BUTCHER, San Jose, CA;
Roxanne BRITTAIN, Berkeley, CA;

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

This appln claims benefit of 62/657,870 04/15/2018
and claims benefit of 62/657,881 04/15/2018
and claims benefit of 62/643,699 03/15/2018
and claims benefit of 62/641,994 03/12/2018

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

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

10/18/2018

| Foreign Priority claimed ❑ Yes ☑ No<br>35 USC 119(a-d) conditions met ❑ Yes ☑ No<br>Verified and Acknowledged /MICHAEL J LAU/ Examiner's Signature | ❑ Met after Allowance<br>Initials | STATE OR COUNTRY | SHEETS DRAWINGS | TOTAL CLAIMS | INDEPENDENT CLAIMS |
|---|---|---|---|---|---|
| | | CA | 76 | 20 | 3 |

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**TITLE**

USER INTERFACES FOR HEALTH MONITORING

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Field

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**INFORMATION DISCLOSURE STATEMENT BY APPLICANT**
**(Not for submission under 37 CFR 1.99)**

| | |
|---|---|
| **Application Number** | 16/143,959 |
| **Filing Date** | 2018-09-27 |
| **First Named Inventor** | Christopher D. SOLI |
| **Art Unit** | 3792 |
| **Examiner Name** | B.N. NGANGA |
| **Attorney Docket Number** | P38213US2/77770000489102 |

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Field

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99) | | |
|---|---|---|
| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | G. Jackson |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

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IPR2024-00095, U.S. Patent No. 10,568,533
687 of 1413

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Field

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| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | G. Jackson |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

| EXAMINER SIGNATURE | | | |
|---|---|---|---|
| Examiner Signature | /MICHAEL J LAU/ | Date Considered | 04/10/2019 |

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| | | | |
|---|---|---|---|
| Signature | /Randy Omid/ | Date (YYYY-MM-DD) | 2018-12-20 |
| Name/Print | Randy Omid | Registration Number | 67439 |

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| | | | |
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| Signature | /Randy Omid/ | Date (YYYY-MM-DD) | 2019-02-04 |
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| | **Art Unit** | 3792 |
| | **Examiner Name** | B. N. Nganga |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

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| | 3. | Office Action received for Danish Patent Application No. PA201870601, mailed on December 13, 2018, 8 pages. | |
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| | **Application Number** | 16/143,959 |
| | **Filing Date** | 2018-09-27 |
| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

| EXAMINER SIGNATURE | | | |
|---|---|---|---|
| Examiner Signature | /MICHAEL J LAU/ | Date Considered | 04/10/2019 |

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document.
[4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.



AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533

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

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Field

PTO/SB/08a (03-15)
Approved for use through 07/31/2016. OMB 0651-0031
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| | Art Unit | 3792 |
| | Examiner Name | M. J. Lau |
| | Attorney Docket Number | P38213US2/77770000489102 |

## 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.

☐ The 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 | /Randy Omid/ | Date (YYYY-MM-DD) | 2019-03-07 |
| Name/Print | Randy Omid | Registration Number | 67,439 |

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 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.**



**AliveCor Exhibit 1002**
**AliveCor, Inc. v. Apple Inc.**
**IPR2024-00095, U.S. Patent No. 10,568,533**

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

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| | **First Named Inventor** | Christopher D. SOLI |
| | **Art Unit** | 3792 |
| | **Examiner Name** | M. J. Lau |
| | **Attorney Docket Number** | P38213US2/77770000489102 |

**U.S. PATENTS**

| Examiner Initial* | Cite No | Patent Number | Kind Code[1] | Issue Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|

**U.S. PATENT APPLICATION PUBLICATIONS**

| Examiner Initial* | Cite No | Publication Number | Kind Code[1] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear |
|---|---|---|---|---|---|---|
| | 1. | 20100076331 | A1 | 2010-03-25 | Chan et al. | |
| | 2. | 20160292373 | A1 | 2016-10-06 | Spors et al. | |
| | 3. | 20170032168 | A1 | 2017-02-02 | Kim, Jong H. | |

**FOREIGN PATENT DOCUMENTS**

| Examiner Initial* | Cite No | Foreign Document Number[3] | Country Code[2] | Kind Code[4] | Publication Date | Name of Patentee or Applicant of cited Document | Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear | T[5] |
|---|---|---|---|---|---|---|---|---|
| | 1. | 3042606 | EP | A1 | 2016-07-13 | Samsung Electronics Co. Ltd. | | |
| | 2. | 2017/090810 | WO | A1 | 2017-06-01 | LG Electronics Inc. | | |

**NON-PATENT LITERATURE DOCUMENTS**

| Examiner Initials* | Cite No | 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[5] |
|---|---|---|---|
| | 1. | Search Report and Opinion received for Danish Patent Application No. PA201870600, mailed on January 31, 2019, 8 pages. | |

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| | **Examiner Name** | M. J. Lau |
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Approved for use through 07/31/2016. OMB 0651-0031
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| Signature | /Randy Omid/ | Date (YYYY-MM-DD) | 2019-03-07 |
| Name/Print | Randy Omid | Registration Number | 67,439 |

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# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 35352760 |
| **Application Number:** | 16143959 |
| **International Application Number:** | |
| **Confirmation Number:** | 6224 |
| **Title of Invention:** | USER INTERFACES FOR HEALTH MONITORING |
| **First Named Inventor/Applicant Name:** | Christopher D. SOLI |
| **Customer Number:** | 150004 |
| **Filer:** | Randy Omid/Ganesh Tripathi |
| **Filer Authorized By:** | Randy Omid |
| **Attorney Docket Number:** | P38213US2/77770000489102 |
| **Receipt Date:** | 07-MAR-2019 |
| **Filing Date:** | 27-SEP-2018 |
| **Time Stamp:** | 13:33:56 |
| **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 | Foreign Reference | EP_3042606_A1.pdf | 13898395<br>2935dff76f75b04980491725c34353db4c9b abf2 | no | 50 |

**Warnings:**

AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533

| | | | | | |
|---|---|---|---|---|---|
| **Information:** | | | | | |
| 2 | Foreign Reference | WO_2017090810_A1.pdf | 3063533<br>a4ea225e2254f00a83a0922b9d3de16e8423f34e | no | 61 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Non Patent Literature | PA201870600_DKSR_01_31_2019.pdf | 2217907<br>17d60435d6bd040d2f811bfd514896d9a423db03 | no | 8 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Information Disclosure Statement (IDS) Form (SB08) | P38213US2_IDS.pdf | 173054<br>12629b446430f34f9624d4a0e640c4478ed226c5 | no | 3 |
| **Warnings:** | | | | | |
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| This is not an USPTO supplied IDS fillable form | | | | | |
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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.**

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 042 606 A1

# (12) EUROPEAN PATENT APPLICATION

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***A61B 5/024*** *(2006.01)* ***A61B 5/00*** *(2006.01)*

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**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
**BA ME**
Designated Validation States:
**MA MD**

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**16.01.2015 US 201562104319 P**
**17.02.2015 KR 20150024528**

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## (54) METHOD AND ELECTRONIC DEVICE TO DISPLAY MEASURED HEALTH RELATED INFORMATION

(57) An electronic device and information display method are provided. The electronic device includes a memory (130) configured to store at least one object, a display (160) configured to output a screen associated with the at least one object, and a processor (120) configured to functionally connect with the memory and the display. The processor controls to display a first object (bar graph 610), associated with collected sensing information related to a human body (e.g. heart rate), among objects stored in the memory, at a size on the display and to display a second object (e.g. a range of heart beat values 612) on the first object based on the sensing information. The processor modifies a size and region of the second object and a displayed motion of the second object according to accumulated sensing information and controls to output the modified second object on the first object (i.e. the information that is displayed changes according to the measured heart beat values). Furthermore the present heart beat value can be shown on the bar graph (614).

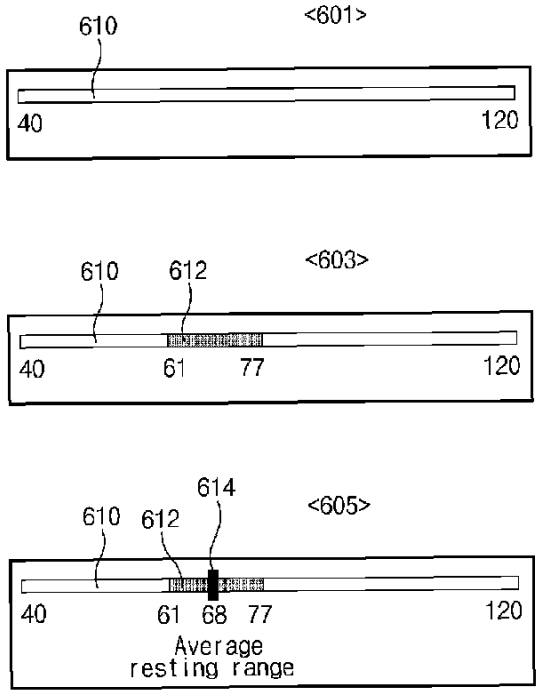



FIG. 6A

EP 3 042 606 A1

AliveCor Exhibit 1002
AliveCor, Inc. v. Apple Inc.
IPR2024-00095, U.S. Patent No. 10,568,533
704 of 1413

Printed by Jouve, 75001 PARIS (FR)

## Description

PRIORITY

**[0001]** This application claims priority to a U.S. Provisional application filed on January 6, 2015 in the U.S. Patent and Trademark Office and assigned Serial number 62/100,267, and a U.S. Provisional application filed on January 16, 2015 in the U.S. Patent and Trademark Office and assigned Serial number 62/104,319, and a Korean patent application filed on February 17, 2015 in the Korean Intellectual Property Office and assigned Serial number 10-2015-0024528.

BACKGROUND OF THE INVENTION

1. Field of the Invention

**[0002]** The present disclosure relates to adaptively displaying information.

2. Background of the Invention

**[0003]** In general, each of electronic devices may store applications for supporting at least one function. Also, each of the electronic devices may store information, generated in response to executing the applications, in its memory. Also, each of the electronic devices may display the information stored in the memory on its display.

**[0004]** In the related art, each of electronic devices passively displays information stored in its memory irrespective to situations or intention of users in a process of displaying information. Therefore, in a process of recognizing information, visibility of users is degraded or the degree of understanding of users is lowered.

**[0005]** The above information is presented as background information only to assist with an understanding of the present disclosure. No determination has been made, and no assertion is made, as to whether any of the above might be applicable as prior art with regard to the present disclosure.

SUMMARY OF THE INVENTION

**[0006]** Aspects of the present disclosure are to address at least the above-mentioned problems and/or disadvantages and to provide at least the advantages described below. Accordingly, an aspect of the present disclosure is to provide an antenna module for preventing an antenna pattern from being damaged by disposing a pattern protection structure at the periphery of the antenna pattern, and an electronic device including the same.

**[0007]** In accordance with an aspect of the present disclosure, an electronic device is provided. The electronic device includes a memory configured to store at least one object, a display configured to output a screen associated with the at least one object, and a processor configured to functionally connect with the memory and the display. The processor controls to display a first object, associated with collected sensing information related to a human body, among objects stored in the memory and to display a second object on the first object based on the sensing information. The processor modifies a size and region of the second object and a displayed motion of the second object according to accumulated sensing information and controls to output the modified second object on the first object.

**[0008]** In accordance with another aspect of the present disclosure, a method of displaying information in an electronic device is provided. The method includes displaying a first object, associated with collected sensing information related to a human body among objects stored in a memory, at a size on a display, and displaying a second object on the first object based on the sensing information. The displaying of the second object includes outputting the second object, in which a size and region of the second object corresponding to an accumulated numeric value of the sensing information are modified and in which a displayed motion of the second object is modified, on the first object.

**[0009]** In accordance with another aspect of the present disclosure, an electronic device is provided. The electronic device includes a local-area communication module configured to establish a local-area communication channel with an external electronic device, a memory configured to store sensing information received through the local-area communication module and at least one object to be output in connection with the sensing information, and a processor configured to control to display a first object corresponding to a first range value based on the stored sensing information. The processor controls to output at least one of a second object, corresponding to a second range value corresponding to the collected sensing information, which is displayed in a form which is gradually changed from a position in the first object or a third object corresponding to a single value in the first range value.

**[0010]** Other aspects, advantages, and salient features of the disclosure will become apparent to those skilled in the art from the following detailed description, which, taken in conjunction with the annexed drawings, discloses various embodiments of the present disclosure.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0011]** The above and other aspects, features, and advantages of certain embodiments of the present disclosure will be more apparent from the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a block diagram illustrating a configuration of an electronic device according to various embodiments of the present disclosure;

FIG. 2 is a flowchart illustrating an operation method of an electronic device according to various embodiments of the present disclosure;

FIG. 3A is a drawing illustrating a screen interface associated with preparing for measuring biometric information according to various embodiments of the present disclosure;

FIG. 3B is a drawing illustrating a screen interface associated with measuring biometric information according to various embodiments of the present disclosure;

FIG. 3C is a drawing illustrating a screen interface associated with displaying the result of measuring biometric information according to various embodiments of the present disclosure;

FIG. 4 is a flowchart illustrating a method for collecting biometric sensing information according to various embodiments of the present disclosure;

FIG. 5A is a drawing illustrating a screen interface associated with preparing for measuring pulse oximeter oxygen saturation (SpO2) according to various embodiments of the present disclosure;

FIG. 5B is a drawing illustrating a screen interface associated with measuring SpO2 and outputting the result of measuring SpO2 according to various embodiments of the present disclosure;

FIG. 6A is a drawing illustrating a form of displaying a progress bar according to various embodiments of the present disclosure;

FIG. 6B is a drawing illustrating a form of displaying a progress bar according to various embodiments of the present disclosure;

FIG. 6C is a drawing illustrating a form of displaying a progress bar according to various embodiments of the present disclosure;

FIG. 7 is a flowchart illustrating an information display method using a progress bar according to various embodiments of the present disclosure;

FIG. 8 is a drawing illustrating an information display method in a plurality of regions according to various embodiments of the present disclosure;

FIG. 9 is a drawing illustrating an information display method in a plurality of regions according to various embodiments of the present disclosure;

FIG. 10 is a drawing illustrating a map-based information display method according to various embodiments of the present disclosure;

FIG. 11 is a flowchart illustrating an animation processing method using physical attributes according to various embodiments of the present disclosure;

FIG. 12 is a drawing illustrating the displaying of deep sleeping degree related information according to various embodiments of the present disclosure;

FIG. 13 is a drawing illustrating the displaying of animation information according to biometric information according to various embodiments of the present disclosure; and

FIG. 14 is a block diagram illustrating a configuration of an electronic device according to various embodiments of the present disclosure.

**[0012]** Throughout the drawings, it should be noted that like reference numbers are used to depict the same or similar elements, features, and structures.

## DETAILED DESCRIPTION OF EMBODIMENTS OF THE PRESENT INVENTION

**[0013]** The following description with reference to the accompanying drawings is provided to assist in a comprehensive understanding of various embodiments of the present disclosure as defined by the claims and their equivalents. It includes various specific details to assist in that understanding but these are to be regarded as merely exemplary. Accordingly, those of ordinary skill in the art will recognize that various changes and modifications of the various embodiments described herein can be made without departing from the scope of the present disclosure. In addition, descriptions of well-known functions and constructions may be omitted for clarity and conciseness.

**[0014]** The terms and words used in the following description and claims are not limited to the bibliographical meanings, but, are merely used by the inventor to enable a clear and consistent understanding of the present disclosure. Accordingly, it should be apparent to those skilled in the art that the following description of various embodiments of the present

disclosure is provided for illustration purpose only and not for the purpose of limiting the present disclosure as defined by the appended claims and their equivalents.

**[0015]** It is to be understood that the singular forms "a," "an," and "the" include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to "a component surface" includes reference to one or more of such surfaces.

**[0016]** In the present disclosure, the expressions "have", "may have", "include" and "comprise", or "may include" and "may comprise" used herein indicate existence of corresponding features (e.g., elements such as numeric values, functions, operations, or components) but do not exclude presence of additional features.

**[0017]** In the present disclosure, the expressions "A or B", "at least one of A or/and B", or "one or more of A or/and B", and the like used herein may include any and all combinations of one or more of the associated listed items. For example, the term "A or B", "at least one of A and B", or "at least one of A or B" may refer to all of the case (1) where at least one A is included, the case (2) where at least one B is included, or the case (3) where both of at least one A and at least one B are included.

**[0018]** The expressions such as "1st", "2nd", "first", or "second", and the like used in various embodiments of the present disclosure may refer to various elements irrespective of the order and/or priority of the corresponding elements, but do not limit the corresponding elements. The expressions may be used to distinguish one element from another element. For instance, both "a first user device" and "a second user device" indicate different user devices from each other irrespective of the order and/or priority of the corresponding elements. For example, a first component may be referred to as a second component and vice versa without departing from the present disclosure.

**[0019]** It will be understood that when an element (e.g., a first element) is referred to as being "(operatively or communicatively) coupled with/to" or "connected to" another element (e.g., a second element), it can be directly coupled with/to or connected to the other element or an intervening element (e.g., a third element) may be present. In contrast, when an element (e.g., a first element) is referred to as being "directly coupled with/to" or "directly connected to" another element (e.g., a second element), it should be understood that there are no intervening element (e.g., a third element).

**[0020]** Depending on the situation, the expression "configured to" used herein may be used as, for example, the expression "suitable for", "having the capacity to", "designed to", "adapted to", "made to", or "capable of'. The term "configured to" must not be limited to mean only "specifically designed to". Instead, the expression "a device configured to" may mean that the device is "capable of" operating together with another device or other components. For example, a "processor configured to perform A, B, and C" may mean a generic-purpose processor (e.g., a central processing unit (CPU) or an application processor (AP)) which may perform corresponding operations by executing one or more software programs which stores a dedicated processor (e.g., an embedded processor) for performing a corresponding operation.

**[0021]** Unless otherwise defined herein, all the terms used herein, which include technical or scientific terms, may have the same meaning that is generally understood by a person skilled in the art. It will be further understood that terms, which are defined in a dictionary and commonly used, should also be interpreted as is customary in the relevant related art and not in an idealized or overly formal detect unless expressly so defined herein in various embodiments of the present disclosure. In some cases, even if terms are terms which are defined in the specification, they may not be interpreted to exclude various embodiments of the present disclosure.

**[0022]** Electronic devices according to various embodiments of the present disclosure may include at least one of, for example, smart phones, tablet personal computers (PCs), mobile phones, video telephones, electronic book readers, desktop PCs, laptop PCs, netbook computers, workstations, servers, personal digital assistants (PDAs), portable multimedia players (PMPs), Motion Picture Experts Group phase 1 or phase 2 (MPEG-1 or MPEG-2) audio layer III (MP3) players, mobile medical devices, cameras, or wearable devices (e.g., smart glasses, head-mounted-devices (HMDs), an electronic apparel, electronic bracelets, electronic necklaces, electronic appcessories, electronic tattoos, smart mirrors, or smart watches).

**[0023]** According to various embodiments of the present disclosure, the electronic devices may be smart home appliances. The smart home appliances may include at least one of, for example, televisions (TVs), digital versatile disc (DVD) players, audios, refrigerators, air conditioners, cleaners, ovens, microwave ovens, washing machines, air cleaners, set-top boxes, home automation control panels, security control panels, TV boxes (e.g., Samsung HomeSyncTM, Apple TVTM, or Google TVTM), game consoles (e.g., XboxTM and PlayStationTM), electronic dictionaries, electronic keys, camcorders, or electronic picture frames.

**[0024]** According to various embodiments of the present disclosure, the electronic devices may include at least one of various medical devices (e.g., various portable medical measurement devices (e.g., blood glucose meters, heart rate meters, blood pressure meters, or thermometers, and the like), a magnetic resonance angiography (MRA), a magnetic resonance imaging (MRI), a computed tomography (CT), scanners, or ultrasonic devices, and the like), navigation devices, global positioning system (GPS) receivers, event data recorders (EDRs), flight data recorders (FDRs), vehicle infotainment devices, electronic equipment for vessels (e.g., navigation systems, gyrocompasses, and the like), avionics, security devices, head units for vehicles, industrial or home robots, automatic teller's machines (ATMs), points of sales

(POSs), or internet of things (e.g., light bulbs, various sensors, electric or gas meters, sprinkler devices, fire alarms, thermostats, street lamps, toasters, exercise equipment, hot water tanks, heaters, boilers, and the like).

**[0025]** According to various embodiments of the present disclosure, the electronic devices may include at least one of parts of furniture or buildings/structures, electronic boards, electronic signature receiving devices, projectors, or various measuring instruments (e.g., water meters, electricity meters, gas meters, or wave meters, and the like). The electronic devices according to various embodiments of the present disclosure may be one or more combinations of the above-mentioned devices. The electronic devices according to various embodiments of the present disclosure may be flexible electronic devices. Also, electronic devices according to various embodiments of the present disclosure are not limited to the above-mentioned devices, and may include new electronic devices according to technology development.

**[0026]** Hereinafter, electronic devices according to various embodiments of the present disclosure will be described with reference to the accompanying drawings. The term "user" used herein may refer to a person who uses an electronic device or may refer to a device (e.g., an artificial electronic device) that uses an electronic device.

**[0027]** FIG. 1 is a block diagram illustrating a configuration of an electronic device according to various embodiments of the present disclosure.

**[0028]** Referring to FIG. 1, an electronic device 100 according to various embodiments of the present disclosure may include a bus 110, a memory 130, an input device 140, an output device 150, a display 160, a graphics processing module 190, and a processor 120. In addition, the electronic device 100 may further include a physics engine module 180 or a communication interface 170.

**[0029]** The electronic device 100 may activate an application stored in the memory 130 and may operate at least one sensor. The electronic device 100 may output function information obtained through the at least one sensor to the display 160. In this operation, the electronic device 100 may analyze sensing information and state information of a user according to a predetermined condition and may dynamically output the analyzed result to suite a situation of the user. For example, the electronic device 100 may analyze sensing information (or sensor information) using various predetermined conditions and may calculate a display element in response to each of the analyzed results. In outputting the display element, the electronic device 100 may output at least one of an order of outputting the display element, an output position of the display element, a display form of the display element, or a change of the display element in a different way in response to state information of the user.

**[0030]** The bus 110 may transmit a signal between the components (e.g., the processor 120 to the graphics processing module 190). For example, the bus 110 may transmit sensing information collected by at least one sensor included in the input device 140 to the processor 120. The processor 120 may transmit the sensing information and user information to the graphics processing module 190 through the bus 110.

**[0031]** The memory 130 may include a volatile memory and/or a non-volatile memory. The memory 130 may store, for example, instructions or data associated with at least another component of the electronic device 100. According to an embodiment of the present disclosure, the memory 130 may store software and/or a program. The program may include a kernel, a middleware, an application interface (e.g., an application programming interface), or an application. At least a part of the kernel, the middleware, or the application interface may be referred to as an operating system (OS). The above-mentioned memory 130 may store sensing information collected by a sensor and user information entered by the user. The user information may include information (e.g., health, age, height, weight, biometric pattern information such as a blood pressure or a heart rate, and the like) generated through previously collected sensing information.

**[0032]** The input device 140 may perform an operation of receiving information entered by the user of the electronic device 100 or sensing information sensed through a sensor. The input device 140 may receive information input by an input operation (e.g., an operation of pushing a touch sensor, a button, and a key and an operation of writing with a stylus pen). According to an embodiment of the present disclosure, input contents collected by the input device 140 may include input information corresponding to managing a health care goal (e.g., one or more of an exercise level, a loss in weight, and the number of times of exercises for each exercise type) the user wants to achieve, a schedule, a telephone number, and the like.

**[0033]** According to an embodiment of the present disclosure, the input device 140 may sense an input signal (e.g., an input position, an input gesture, handwriting information, or a button input) through a touch sensor, a key input sensor, or a stylus pen. According to an embodiment of the present disclosure, the input device 140 may sense an impact, a vibration, a knock operation, and the like through an impact sensor and a vibration sensor (e.g., an acceleration sensor, a microphone, a pressure sensor). According to various embodiments of the present disclosure, the input device 140 may recognize a signal, for example, a connection sensing signal with a wired and wireless device.

**[0034]** The above-mentioned input device 140 may include at least one sensor for measuring a state of the electronic device 100, a state of the user, or a state of a surrounding environment associated with him or her. For example, the input device 140 may include at least one of a motion sensor, an environment sensor, a position sensor, or a biometric information sensor. The motion sensor may sense one or more of motion, a pose, or an orientation of the electronic device 100 or the user. The motion sensor may include at least one of an inertial sensor, a gyroscope/accelerometer, a proximity sensor, a gyroscope sensor, a magnetic sensor, an optical sensor, a red, green, blue (RGB) camera, an

infrared (IR) camera, a Kinect sensor, a pressure sensor, a directional radio signal detector, an IR light emitting diode (LED), or a touch sensor. The processor 120 may sense a pose or motion of the electronic device 100 using the motion sensor and may determine an orientation of the display 160 of the electronic device 100. The processor 120 may determine an alignment orientation (e.g., a horizontal mode/vertical mode and a portrait/landscape mode) of time information to be displayed on the display 160 and may display the determined time information.

**[0035]** The environment sensor may measure an environment state around the electronic device 100 or the user. The environment sensor may include at least one of an illumination sensor, a gas sensor, a fine dust sensor, an atmospheric pressure sensor, a hygrometer, a thermometer, an ultraviolet (UV) sensor, a microphone, a radioactivity meter, an ozone meter, or a time sensor. The position sensor may include at least one of a GPS/global navigation satellite system (GNSS) sensor, a radio positioning sensor (e.g., one or more of a cell-identification (ID) sensor, a time of arrival (ToA) sensor, a time difference of arrival (TDoA) sensor, and an angle of arrival (AOA) sensor) based on wireless communication, or an indoor positioning sensor (e.g., a Wi-Fi fingerprint sensor, a near field communication (NFC) sensor, a radio frequency ID (RFID) sensor, a pedometer, a camera, an image marker reader, an image code reader, an IR sensor, an ultrasonic sensor, an ultra wide band (UWB) sensor) to determine a location of the electronic device 100 or the user. The position sensor may include a barometer to sense an altitude or a change of an altitude.

**[0036]** The biometer information sensor for measuring a health condition or an emotional state of the user may include at least one of a pedometer, a blood pressure meter, a blood glucose meter, a photoplethysmography (PPG) sensor, an electrocardiogram (ECG) sensor, an electromyography (EMG) sensor, an electroencephalogram (EEG) sensor, a blood volume pulse (BVP) sensor, a pulse oximeter oxygen saturation (SpO2) sensor, a galvanic skin response (GSR) sensor, a skin conductivity (SC) sensor, a body fat analyzer, a body temperature sensor, a skin temperature sensor, a peak flow meter, or a gas sensor. The biometric information sensor may include at least one of an iris sensor, a face recognizer, a hand shape recognizer, a hand blood vessel recognizer, a voice recognizer, a handwritten signature recognizer, a camera, an IR camera, a touch sensor, or a microphone, each of which recognizes a biometric characteristics for each person.

**[0037]** The biometric information sensor may collect raw data (e.g., a biometric signal) which includes sensing information associated with at least one of, for example, a blood pressure, a blood flow, a heart rate (e.g., a heart rate monitor (HRM) and heart rate variability (HRV)), a body temperature, a breathing rate, oxygen saturation, a cardiopulmonary sound, a blood glucose, a waist size, height, weight, a body fat, an amount of calorie consumed, a brainwave, a voice, skin resistance, EMG, ECG, a gait, an ultrasonic image, a sleeping state, a look (face), pupil dilatation, or eye blinking.

**[0038]** The processor 120 may extract biometric characteristic information by analyzing the at least one sensing information, collected by the biometric information sensor, separately or by combining the at least one sensing information. For example, the processor 120 may analyze a pulse wave signal obtained through an HRV sensor to obtain primary biometric characteristic information such as an average heart rate and a heart rate distribution chart. Also, the processor 120 may process the collected biometric characteristic information to obtain secondary biometric characteristic information such as a stress state and a blood vessel aging degree, which is determined according to a complex factor.

**[0039]** The processor 120 may output a user biometric signal collected by the biometric information sensor. Alternatively, the processor 120 may output biometric characteristic information obtained by analyzing a biometric signal. The above-mentioned processor 120 may include a processor (or a microcomputer and the like) independently configured to operate at least one sensor. A device including the biometric information sensor may be, for example, a portable phone in which an ECG sensor is embedded, a watch in which a PPG sensor is embedded, and the like. A biometric information sensor, a sensor hub, or the processor 120 included in the electronic device 100 may analyze and operate biometric characteristic information.

**[0040]** According to various embodiments of the present disclosure, the electronic device 100 in which a sensor is embedded may transmit a biometric signal to a remote device (e.g., a wearable device, an accessory device, a smartphone, a home appliance, and the like) or a server device through a wired or wireless network. Also, a processor of the remote device or the server device which receives the biometric signal may process the biometric signal to generate biometric characteristic information.

**[0041]** According to various embodiments of the present disclosure, a device in which a sensor is embedded may generate primary biometric characteristic information and may transmit the generated primary biometric characteristic information to the remote device or the server device. The remote device or the server device may generate secondary biometric characteristic information according to the received primary biometric characteristic information. The biometric characteristic information may be displayed on at least one of the electronic device 100 or the remote device or server device.

**[0042]** According to various embodiments of the present disclosure, a plurality of sensors may be operated in a complex way. For example, an acceleration sensor may simultaneously measure motion of the user and the number of steps of the user. In an embodiment of the present disclosure, a PPG sensor may be used as a biometric information sensor which senses biometric information such as a heart rate and stress and may be used as a proximity sensor according to the quantity of received light. In an embodiment of the present disclosure, an ECG sensor may recognize an emotion,

a heart rate, and HRV through ECG analysis and may be used for authenticating the user.

**[0043]** In an embodiment of the present disclosure, a sensor may be in an always-on state in a state where the electronic device 100 is powered on. In an embodiment of the present disclosure, a sensor may be driven according to an input (e.g., a key input, a button input, a graphical user interface (GUI) input, gesture recognition) of the user. According to various embodiments of the present disclosure, the sensor may be embedded in the electronic device 100, and may be embedded in another electronic device or may be installed in an external environment (e.g., the interior of a building, the exterior of a building, a predetermined building, a base station, and the like).

**[0044]** The output device 150 may provide information such that the user may recognize contents processed by the graphics processing module 190. For example, the output device 150 may include the display 160, an audio device, and a haptic device of the electronic device 100. The output device 150 may provide output information (e.g., an animation, an audio, a voice, tactile feedback, and force feedback) to the user through an image, a sound, and a vibration.

**[0045]** The display 160 may include, for example, a liquid crystal display (LCD), an LED display, an organic LED (OLED) display, a microelectromechanical systems (MEMS) display, or an electronic paper display. The display 160 may display, for example, various contents (e.g., text, images, videos, icons, or symbols, and the like) to the user. The display 160 may include a touch screen, and may receive, for example, touch, gesture, proximity, or a hovering input using an electronic pen or a part of a body of the user.

**[0046]** The graphics processing module 190 may include at least one of a renderer unit 191 or an animation unit 193. All of the renderer unit 191 and the animation unit 193 may be included in the processor 120 or may be included in one or more separate processors.

**[0047]** The renderer unit 191 may provide its output to the output device 150. To display a generated three-dimensional (3D) graphic on the display 160, the renderer unit 191 may convert the 3D graphic into a two-dimensional (2D) graphic to suite attributes (e.g., a resolution, a refresh rate, a color model, and the like) of the display 160. Alternatively, the renderer unit 191 may generate only a region to be displayed on the display 160 from an original image and may transmit the generated region to the output device 150 (e.g., a display buffer).

**[0048]** The animation unit 193 may be responsible for a function for providing an effect to an object provided to the output device 150. According to an embodiment of the present disclosure, the animation unit 193 may generate a change rate, a change range, a change speed, a change effect, and the like of a UI for providing information corresponding to a statistical data calculation value, for example, an analyzed value (e.g., a maximum value, a minimum value, an average value, a median value, frequency, dispersion, a standard deviation, and the like) of sensing information measured by the input device 140.

**[0049]** According to an embodiment of the present disclosure, the animation unit 193 may provide an effect to a specific object included in a UI of the user provided to the output device 150 to have the same ratio of the left to right of the specific object or such that the left and right of the specific object is changed to a constant form. The specific object included in the UI of the user may be a pie-chart, a bar graph, a progress bar, and the like.

**[0050]** According to an embodiment of the present disclosure, the animation unit 193 may calculate attributes for object modification. The attributes for object modification may include at least one or more of position attributes (e.g., a top, a left, and a bottom), size attributes (e.g., width and height), box attributes (e.g., a margin and padding), border attributes (e.g., a border-width, a border-radius, and a border-color), color attributes (e.g., a color and a background-color), transparency attributes (e.g., opacity), or transform attributes (e.g., transform).

**[0051]** According to an embodiment of the present disclosure, the object modification may include at least one or more of image modification for adjusting pixels and transparency on a progress bar/circuit display region to be displayed on the display 160, image combination for synthesizing pixels of an indicator portion and a progress bar/circuit portion, which are overlapped with each other on the entire progress, according to a minimum value and a maximum value of input data, or masking for performing different calculation for each region on an image.

**[0052]** The processor 120 may include, for example, at least one processor. The at least one processor may include one or more of a CPU, an AP, and a communication processor (CP). The processor 120 may perform, for example, calculation or data processing about control and/or communication of at least another component of the electronic device 100.

**[0053]** The processor 120 may control a function of the electronic device 100 according to a user input or sensing information which is received in the input device 140. For example, to display information, associated with a state of the electronic device 100, a state of the user, or a state of a surrounding environment associated with the electronic device 100 or the user, to the user, the processor 120 may process calculation associated with information (e.g., sensing information) received through the input device 140 or biometric characteristic information. Also, the processor 120 may store the processed result in the memory 130 and may generate output information to be displayed to the user through the output device 150 using information (e.g., user related information, user input information, and the like) stored in the memory 130.

**[0054]** According to an embodiment of the present disclosure, the processor 120 may perform preprocessing (e.g., one or more of de-noising, segmentation, signal standardization, and feature extraction) of a motion signal or a biometric

signal received through a motion sensor a biometric information sensor. The processor 120 may recognize a physical condition, an emotional state, a motion type or an exercise level of the user through signal analysis (e.g. one or more of artificial intelligence, a decision tree, pattern recognition, and user activity recognition).

**[0055]** The physics engine module 180 may calculate a physical characteristic in connection with the graphics processing module 190. According to an embodiment of the present disclosure, the physics engine module 180 may interwork with the animation unit 193. According to an embodiment of the present disclosure, the physics engine module 180 may be included in the graphics processing module 190. The physics engine module 180 may perform a function of calculating physics computation according to a movement path of an object, when the object is provided on a screen of the electronic device 100. The physics computation may include at least one or more of gravity, velocity, acceleration, a frictional force, a gravitational force, or an elastic force.

**[0056]** The communication interface 170 may establish, for example, the electronic device 100 and an external device. For example, the communication interface 170 may connect to a network through wireless communication or wired communication and may communicate with the external device. The wireless communication may use, for example, at least one of long term evolution (LTE), LTE-advanced (LTE-A), code division multiple access (CDMA), wideband CDMA (WCDMA), universal mobile telecommunications system (UMTS), wireless broadband (WiBro), or global system for mobile communications (GSM), and the like as a cellular communication protocol. The wired communication may include at least one of, for example, universal serial bus (USB) communication, high definition multimedia interface (HDMI) communication, recommended standard 232 (RS-232) communication, or plain old telephone service (POTS) communication, and the like. The network may include a telecommunications network, for example, at least one of a computer network (e.g., a local area network (LAN) or a wide area network (WAN)), the Internet, or a telephone network.

**[0057]** The communication interface 170 may establish a communication channel with an external electronic device and the like. The communication interface 170 may receive a biometric signal from the external electronic device or may transmit a biometric signal to the external electronic device, in response to control of the processor 120.

**[0058]** As described above, according to various embodiments of the present disclosure, the electronic device may include a memory configured to store at least one object, a display configured to output a screen associated with the object, and a processor configured to electrically connect with the memory and the display. The processor may display a first object, associated with collected sensing information related human body among objects stored in the memory, at a predetermined size on the display and may display a second object on the first object in connection with the sensing information. The processor may modify a size and region of the second object and a form of displayed motion of the second object according to accumulation of the sensing information and may control the display to output the modified second object on the first object.

**[0059]** According to various embodiments of the present disclosure, the processor may display a range value according to the accumulation of the values of the sensing information and may gradually change a predetermined numeric value from the predetermined numeric value to become the range value.

**[0060]** According to various embodiments of the present disclosure, the processor may change the numeric value and may display a start value and an end value of the range value. The processor may adjust a display change speed of the numeric value such that a change of a numeric value which reaches the start value of the range value and a change of a numeric value which reaches the end value of the range value are actually completed at the same time.

**[0061]** According to various embodiments of the present disclosure, the processor may convert the sensing information into a constant numeric value and may modify and display the second object while mapping the numeric value to the second object.

**[0062]** As described above, according to various embodiments of the present disclosure, the electronic device may include a memory configured to store at least one object and a processor configured to control a display to display a first object corresponding to a region of a predetermined size associated with collected sensing information among objects stored in the memory and to display a second object, corresponding to a region of a predetermined size, on the first object in connection with the sensing information. The processor may control a size and region of the second object, displayed on the first object, and a form of motion of the second object in a different way in response to the sensing information.

**[0063]** According to various embodiments of the present disclosure, the processor may control the display to display a third object, corresponding to a predetermined representative value obtained from the sensing information, on the first object or the second object.

**[0064]** According to various embodiments of the present disclosure, the processor may control the display to display a representative value corresponding to the third object on a region adjacent to a position where the third object is displayed.

**[0065]** According to various embodiments of the present disclosure, the processor may control the displaying and the modifying and displaying of the second object relative to a position on which the third object will be displayed.

**[0066]** According to various embodiments of the present disclosure, the processor may adjust a display speed of a partially modified region of the second object such that a time when the modifying and displaying of the second object



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is completed relative to the third object.

**[0067]** According to various embodiments of the present disclosure, the processor may control the display to display a range value of sensing information associated with the first object on a region adjacent to the first object or may control the display to display a range value of sensing information associated with the second object on a region adjacent to the second object.

**[0068]** According to various embodiments of the present disclosure, the processor may gradually change a predetermined value from the predetermined value to become the range value in the process of displaying the range value of the sensing information.

**[0069]** According to various embodiments of the present disclosure, the processor may adjust a display change speed of the range value such that the displaying of a start value of the range value and the displaying of an end value of the range value are completed at the same time.

**[0070]** According to various embodiments of the present disclosure, the processor may collect physical characteristic information associated with a state of the electronic device or a state of a human body which provides the sensing information.

**[0071]** According to various embodiments of the present disclosure, the processor may modify a display state of at least one of the first object, the second object, or a third object according to the physical characteristic information.

**[0072]** As described above, according to various embodiments of the present disclosure, the electronic device may include a local-area communication module configured to establish a local-area communication channel with an external electronic device (e.g., a wearable electronic device which may collect and transmit predetermined sensing information), a memory configured to store sensing information received through the local-area communication module and at least one object to be output in connection with the sensing information, and a processor configured to control a display to display a first object corresponding to a predetermined first range value in connection with the stored sensing information. The processor may output at least one of a second object, corresponding to a second range value corresponding to the collected sensing information, which is displayed as a form which is gradually changed from a predetermined position in the first object or a third object corresponding to a single value in the first range value.

**[0073]** FIG. 2 is a flowchart illustrating an operation method of an electronic device according to various embodiments of the present disclosure.

**[0074]** Referring to FIG. 2, in the operation method of the electronic device, in operation 201, an electronic device 100 of FIG. 1 may receive a user input or may collect sensing information, and may calculate statistical data. According to an embodiment of the present disclosure, the electronic device 100 may collect user state information, including a situation around the electronic device 100, through various sensors. The user state information may include an input operation (e.g., a goal the user wants to achieve or schedule information of the user, and the like) for using the electronic device 100. For example, the user state information may include information about motion, an exercise, emotion, and a physical condition of the user and situation information around the user, such as a position, a surrounding noise level, weather, temperature and humidity, altitude, and the like of the user. According to an embodiment of the present disclosure, the user state information may include a statistic (e.g., at least one of a maximum value, a minimum value, a standard deviation, an average value, a representative value, or a median value) obtained through statistical processing of a plurality of information sensed by sensors.

**[0075]** In operation 203, the electronic device 100 may determine an object to display the statistical data and object attributes (or a display modification characteristic of the object). According to an embodiment of the present disclosure, the electronic device 100 may select an object suitable for the user state information. The object may include at least one of a predetermined shape, a predetermined pattern, or a graphic type (e.g., a bar chart, a pie chart, a progress bar, a circular arc, a box chart, or a stem-leaf chart). According to an embodiment of the present disclosure, the object attributes may include at least one or more of position attributes (e.g., a top, a left, and a bottom), size attributes (e.g., width and height), box attributes (e.g., a margin and padding), border attributes (e.g., a border-width, a border-radius, and a border-color), color attributes (e.g., a color and a background-color), transparency attributes (e.g., opacity), or transform attributes (e.g., transform).

**[0076]** In operation 205, the electronic device 100 may determine an object modification form (e.g., an object region, transparency, image combination, and the like) according to the determined attributes. For example, the electronic device 100 may determine at least one of a modification rate, a change range, a change speed, or a change effect of a UI corresponding to a statistical value (e.g., a maximum value, a minimum value, an average value, a median value, and the like) of sensing information, measured by an input device 140 of FIG. 1, for being applied to the object to improve an information transmission effect to the object after selecting the object.

**[0077]** In operation 207, the electronic device 100 may determine an object providing method corresponding to the object attributes. According to an embodiment of the present disclosure, the electronic device 100 may determine an animation type for outputting an object. Alternatively, the electronic device 100 may determine a motion effect associated with outputting an object. Alternatively, the electronic device 100 may determine a movement route of an object. In this regard, the electronic device 100 may provide physical attributes in connection with the motion effect or the movement

route. The physical attributes may include at least one or more of gravity, velocity, acceleration, a fractional force, a gravitational force, and the like obtained from sensors. In addition, the electronic device 100 may determine a form such as a sound or a vibration to be provided together according to the object attributes.

**[0078]** In operation 209, the electronic device 100 may output the object according to the object modification form and the object providing method. According to an embodiment of the present disclosure, if a selected object is a progress bar, the electronic device 100 may adjust a width of a left and right change by applying an object modification form of a maximum value and a minimum value and may apply an object modification form of an average value, a median value, and a representative value. A modification rate may be applied to provide an effect in which a time when a progress bar is increased for expressing a maximum value and a minimum value is spread left and right relative to a time when an average value is expressed.

**[0079]** If a range of a left and right change is not symmetric relative to a time when a progress bar is changed, the electronic device 100 may change a change speed of a progress bar such that a time which arrives at a predetermined left end point is identical to a time which arrives at a predetermined right end point on a display 160 of FIG. 1. For example, the electronic device 100 may adjust a left change speed and a right change speed of a progress bar according to object attributes to be applied to the progress bar.

**[0080]** As described above, according to various embodiments of the present disclosure, the information display method may include displaying a first object, associated with collected sensing information related human body among objects stored in the memory, at a predetermined size on the display and displaying a second object on the first object in connection with the sensing information. The displaying of the second object may include outputting a second object, in which a size and region of the second object corresponding to an accumulated numeric value of the sensing information is modified and in which a form of displayed motion of the second object is modified, on the first object.

**[0081]** According to various embodiments of the present disclosure, the information display method may further include gradually changing a predetermined numeric value from the predetermined numeric value to become a range value in a process of displaying the range value of the sensing information with a numeral.

**[0082]** According to various embodiments of the present disclosure, the information display method may further include adjusting and displaying a change speed of the numeric value such that a change of a numeric value corresponding to a start value of the range value and a change of a numeric value corresponding to an end value of the range value are actually completed at the same time.

**[0083]** As described above, according to various embodiments of the present disclosure, the information display method may include displaying a first object corresponding to a region of a predetermined size associated with collected sensing information and displaying a size and region of a second object, displayed on the first object, a form of motion of the second object in a different way in response to the sensing information.

**[0084]** According to various embodiments of the present disclosure, the information display method may further include displaying a third object, corresponding to a predetermined representative value obtained from the sensing information, on the first object or the second object.

**[0085]** According to various embodiments of the present disclosure, the information display method may further include displaying the representative value, corresponding to the third object, on a region adjacent to a position where the third object is displayed.

**[0086]** According to various embodiments of the present disclosure, the displaying of the size and region of the second region and the form of the motion of the second object in the different way may include displaying the second object and modifying and displaying the second object relative to a position where the third object will be displayed.

**[0087]** According to various embodiments of the present disclosure, the displaying of the size and region of the second region and the form of the motion of the second object in the different way may include adjusting and displaying a display speed of a partially modified region of the second object such that a time when the modifying and displaying of the second object is completed is identical relative to the third object.

**[0088]** According to various embodiments of the present disclosure, the information display method may include at least one of displaying a range value of sensing information, associated with the first object, on a region adjacent to the first object and displaying a range value of sensing information, associated with the second object, on a region adjacent to the second object.

**[0089]** According to various embodiments of the present disclosure, the information display method may further include gradually changing a predetermined value from the predetermined value to become a range value in a process of displaying the range value of the sensing information.

**[0090]** According to various embodiments of the present disclosure, the information display method may further include adjusting and displaying a display change speed of the range value such that displaying of a start value of the range value and displaying of an end value of the range value are completed at the same time.

**[0091]** According to various embodiments of the present disclosure, the information display method may further include collecting physical characteristic information associated with a state of the electronic device or a state of a human body which provides the sensing information.

**[0092]** According to various embodiments of the present disclosure, the information display method may further include modifying a display state of at least one of the first object, the second object, or a third object according to the physical characteristic information.

**[0093]** FIG. 3A is a drawing illustrating a screen interface associated with preparing for measuring biometric information according to various embodiments of the present disclosure.

**[0094]** Referring to FIG. 3A, state 301 may be associated with an initial screen of a biometric information display function of an electronic device 100 of FIG. 1. The electronic device 100 may activate a heartbeat application by a user input (e.g., one or more of a touch, a voice instruction, and a key input) or a certain condition (e.g., a condition in which a finger is in contact with a PPG sensor). Therefore, the electronic device 100 may display a GUI for heartbeat measurement, displayed on a display 160 of the electronic device 100, on a screen 310 of state 301. Herein, if there is previously measured heartbeat information, the electronic device 100 may display one or more of biometric information and a measurement time, which are finally measured, on a screen 320 of state 301. According to various embodiments of the present disclosure, if a user pushes a displayed virtual button (e.g., a measure GUI), the electronic device 100 may operate a biometric sensor.

**[0095]** If the biometric sensor is operated, the electronic device 100 may additionally perform a process of determining whether a corresponding condition is a normal measurement condition. Also, the electronic device 100 may determine a kind of the corresponding condition and may provide different guides according to a situation. For example, in state 303 or 305, the electronic device 100 may provide a guide according to a situation. According to an embodiment of the present disclosure, if it is impossible to be measured because a human body (e.g., a finger) of a user is not in normal contact with the biometric sensor or because the human body is not close to a predetermined position, in state 303, the electronic device 100 may display guide information for guiding the user to bring his or her body with the biometric sensor.

**[0096]** According to an embodiment of the present disclosure, the electronic device 100 may determine a biometric contact state. For example, although the human body is in contact with the biometric sensor, if it is impossible to measure the human body because the human body is close to the biometric sensor in a pressure state of a predetermined level or more, in state 305, the electronic device 100 may display guide information for guiding the user not to press the biometric sensor excessively. In connection with determining the contact state, the electronic device may operate a sensor which measures heartbeat information.

**[0097]** According to various embodiments of the present disclosure, the electronic device 100 may operate a PPG sensor which determines an object using one or more of an amount of a received IR optical signal reflected after an IR optical signal is irradiated to an object and a pattern of the IR optical signal. For example, when an object is closer to the PPG sensor, an amount of a received IR optical signal is more increased. Therefore, an amount of received light in case that an object is not in contact with the PPG sensor may be less decreased than that in case that the object is in contact with the PPG sensor. If strength of a signal is lower than a certain value (e.g., a maximum amount of the received light or 40% of a maximum signal level which may be measured), the electronic device 100 may determine a current state as a non-contact state or an incomplete contact state.

**[0098]** According to various embodiments of the present disclosure, the PPG sensor may classify a signal component into an alternating current (AC) signal component and a direct current (DC) signal component according to an amount of received light. A DC signal level may have correlation with strength of a received signal, and the AC signal component may have correlation with variance (e.g., difference between an amount of received light according to dilation of a blood vessel and an amount of received light according to constriction of a blood vessel) of the received signal. For example, if it is difficult to dilate and constrict a blood vessel because a human body is excessively close to the PPG sensor, a high DC signal level may be sensed, but a small variance amount (a change of signal strength) of the AC signal component may be sensed. Therefore, if the high DC signal level may be sensed, but if the small variance amount of the AC signal component may be sensed, the electronic device 100 may output a predetermined user guide (e.g., an image message, a voice message, haptic feedback, and the like). According to various embodiments of the present disclosure, a waveform displayed in state 303 or 305 may be a predetermined waveform image or a predetermined animation.

**[0099]** As described above, according to various embodiments of the present disclosure, the electronic device may include a memory configured to store at least one object and a processor configured to control a display to display a first object corresponding to a region of a predetermined size associated with collected sensing information among objects stored in the memory and to display a second object, corresponding to a region of a predetermined size, on the first object in connection with the sensing information. The processor may control the display to output contents of the second object displayed on the first object in a different way in response to a collection state (e.g., a state where sensing information may be collected or a state where sensing information may not be collected) of the sensing information.

**[0100]** According to various embodiments of the present disclosure, if there is history of collecting previous sensing information in a process of outputting the first object, the processor may control the display to output contents associated with the previous sensing information. If there is no previous sensing information, the processor may control the display to output predetermined contents.

**[0101]** FIG. 3B is a drawing illustrating a screen interface associated with preparing for measuring biometric information

according to various embodiments of the present disclosure.

**[0102]** Referring to FIG. 3B, an electronic device 100 of FIG. 1 may display a biometric information measurement state (e.g., measuring indication, a heart-shaped blink, and the like) together with an animation of a waveform image.

**[0103]** If initial measurement is started or if an abnormal biometric signal is measured, the electronic device 100 may display a screen in state 307. A biometric sensor, such as a PPG sensor or an ECG sensor, may have a need for an analysis time or a stabilization time for sensor initialization for determining a noise generation condition or a signal amplification range in sensor calibration or measurement, although a human body is normally in contact with the biometric sensor in initial measurement. Therefore, the electronic device 100 may display a predetermined waveform as an animation during a sensor initialization time. According to various embodiments of the present disclosure, if a human body is changed from a normal contact state from an abnormal contact state (e.g., if the human body is in non-contact with or in incomplete contact with the biometric sensor) while a normal waveform is measured, the electronic device 100 may display a screen in state 307. In this operation, if the human body is in the abnormal contact state during a certain time (e.g., five seconds), the electronic device 100 may detect a type of the abnormal contact state and may return the abnormal contact state to state 303 or 305 of FIG. 3A according to the detected result.

**[0104]** If a normal waveform is measured, in state 309 or 311, the electronic device 100 may output a waveform corresponding to the normal waveform. For example, state 309 may indicate that the measurement of the normal waveform is started after state 307 is ended. According to an embodiment of the present disclosure, the electronic device 100 may display the normal waveform by reflecting a change of the normal waveform in real time according to a change of a heartbeat, a change of an HRV value, and the like when outputting the normal waveform. Therefore, the electronic device 100 may change and display one or more of a shape or interval of a heartbeat pattern, the number of expression of the heartbeat pattern, an expression speed of the heartbeat pattern, and an expression color of the heartbeat pattern. For example, the electronic device 100 may display a waveform to which variance of a biometric signal is reflected according to the measurement of the normal waveform in state 311.

**[0105]** A noise of a heartbeat signal or an ECG signal sensed using PPG or ECG may be removed through a preprocessing procedure (e.g., a DC value may be compensated according to an envelope detection algorithm and acceleration-based motion detection and a high frequency and a low frequency may be removed by a high pass filter and a low pass filter, respectively). The electronic device 100 may divide a biometric signal, in which a noise is removed through a preprocessing procedure, for each period of each waveform and may normalize the magnitude of increased and decreased widths of a signal in a waveform of each period to suite a certain size region. Accordingly, the electronic device 100 may display a waveform to be displayed on a display 160 in a range of a more uniform signal level.

**[0106]** In state 313, the electronic device 100 may display a progress rate of processing received biometric signal information (e.g., analyzing statistics of a heart rate, calculating HRV, calculating vascular compliance, and calculating and analyzing an acceleration pulse wave) during a biometric information measurement time. In this case, a waveform may be a waveform associated with a currently measured biometric signal. Alternatively, the waveform may be patterned information obtained from a waveform, the number of expressions, and the like associated with characteristics of the entire waveform. Alternatively, the waveform may be a predetermined image which has no connection with biometric information. Therefore, the electronic device 100 may maintain dynamic information recognition, while reducing a calculation burden in a process of displaying biometric information.

**[0107]** As described above, according to various embodiments of the present disclosure, the electronic device may include a memory configured to store at least one object and a processor configured to control a display to display a first object corresponding to a region of a predetermined size associated with collected sensing information among objects stored in the memory and to display a second object, corresponding to a region of a predetermined size, on the first object in connection with the sensing information. The processor may control the display to output the second object in which an image form is changed in response to a change of collected sensing information.

**[0108]** According to various embodiments of the present disclosure, the processor may control the display to output guide information, for guiding that sensing information may not be collected or may not be collected as a predetermined form, as the second object.

**[0109]** According to various embodiments of the present disclosure, if sensing information is collected by a predetermined quantity, the processor may control the display to output guide information, for guiding analysis for the collected sensing information, as the second object.

**[0110]** According to various embodiments of the present disclosure, the processor may control the display to output a predetermined waveform as the second output while the guide information is output.

**[0111]** FIG. 3C is a drawing illustrating a screen interface associated with displaying the result of measuring biometric information according to various embodiments of the present disclosure.

**[0112]** Referring to FIG. 3C, if measurement of normal biometric information is completed, an electronic device 100 of FIG. 1 may display a corresponding measurement result. According to an embodiment of the present disclosure, in state 315 and state 317 or 319, the electronic device 100 may process a result of measured biometric information and may display the processed information through a display 160 of FIG. 1.

**[0113]** According to an embodiment of the present disclosure, in state 319, the electronic device 100 may display a measurement value range (a measured maximum heart rate and a measured minimum heart rate) and an average heart rate during a measurement period of a user on a progress bar. In this operation, the electronic device 100 may display an animation effect in which one or more of a measurement value range or a progress bar are expanded left and right. The electronic device 100 may display a mark corresponding to an average heart rate on a progress bar. Also, the electronic device 100 may output numeral information corresponding to an average heart rate. Also, the electronic device 100 may display information for selecting a heart rate measurement state (e.g., a general state, after and before exercise state, and a resting state). The user may measure a heart rate after setting state selection information. According to various embodiments of the present disclosure, the electronic device 100 may automatically determine information about a current heartbeat measurement state (e.g., before exercise state, after exercise state, and a resting state) according to situation information such as motion or a schedule of the user. The selected or determined heartbeat measurement state information may be associated with measured heartbeat information and may be classified or displayed.

**[0114]** According to various embodiments of the present disclosure, the electronic device 100 may display proper contents together according to current biometric information or previously measured biometric information of the user. For example, referring to FIG. 3B, in states 307, 309, 311, and 313, the electronic device 100 may display predetermined guide information (e.g., information about contents that a low heart rate in a resting state is because an exercise fitness level is high) according to current or previous state information (e.g., information showing a progress in which a heart rate is reduced or a progress in which a heart rate is gradually reduced according to a previously measured history).

**[0115]** In connection with supporting the above-mentioned functions, the electronic device 100 may store a biometric information measurement history (e.g., a heart rate, an exercise level, an exercise time, weight, a body mass index (BMI)) of a specific user in a memory 130 of FIG. 1. The electronic device 100 may determine a progress of a biometric information measurement value or factors which have an influence on the biometric information measurement value according to the stored information. The electronic device 100 may provide various contents (e.g., the guide information) according to the determined factors. According to various embodiments of the present disclosure, the electronic device 100 may provide a proper content (e.g., exercise recommendation, food recommendation, an advertisement, a related article, health care schedule information of a user who has a similar disorder or exercise history, and the like) according to corresponding biometric information and a previous history.

**[0116]** As described above, according to various embodiments of the present disclosure, the electronic device may include a memory configured to store at least one object and a processor configured to control a display to display a first object corresponding to a region of a predetermined size associated with collected sensing information among objects stored in the memory and to display a second object, corresponding to a result of analyzing the sensing information, on the first object. The processor may control the display to output a displayed position, size, and color of the second object, indicated in a constant range, in a different way according to the analysis result value.

**[0117]** According to various embodiments of the present disclosure, the processor may control the display to output a third object, corresponding to a single value as the sensing information analysis value, on the second object.

**[0118]** According to various embodiments of the present disclosure, the sensing information may be heart rate information. The processor may control the display to output at least one menu item associated with a heart rate measurement environment. The processor may control the display to output guide information of other contents for a heart rate information state according to a heart rate measurement environment set in response to the selection of the menu item.

**[0119]** FIG. 4 is a flowchart illustrating a method for collecting biometric sensing information according to various embodiments of the present disclosure.

**[0120]** Referring to FIG. 4, in the method for collecting biometric sensing information, in operation 402, an electronic device 100 of FIG. 1 may detect a contact state (e.g., biometric contact with a PPG sensor or biometric contact with ECG electrodes). In this regard, the electronic device 100 may activate an application associated with measuring biometric information. Also, the electronic device 100 may activate a sensor associated with measuring biometric information. The electronic device 100 may detect a contact state according to sensing information collected through the sensor.

**[0121]** In operation 403, the electronic device 100 may verify whether a current state is a measurable state. For example, the electronic device 100 may verify whether sensing information within a predetermined range which meets a predetermined condition (e.g., a condition which maintains a state where a finger of a user is close within a constant range of a sensor or is in contact with the sensor) is collected. If the current state is a measurement impossible state (e.g., if the current state is a state where sensing information departing from a predetermined range is collected during a predetermined time), in operation 405, the electronic device 100 may provide guide information according to a contact state. For example, the electronic device 100 may output guide information for guiding the user to place his or her finger on a correct position of a sensor or guide information for guiding him or her to reduce pressure of his or her finger, which is excessively pressed.

**[0122]** If the current state is the measurable state (e.g., a state where sensing information of a predetermined range is collected during a predetermined time), in operation 407, the electronic device 100 may perform measurement. For example, the electronic device 100 may collect sensing information within a valid range. In operation 409, the electronic

device 100 may display a measured state. For example, the electronic device 100 may output state information about whether normal sensing information (e.g., sensing information within a predetermined range) is currently collected or state information about whether abnormal sensing information (e.g., sensing information departing from the predetermined range) is currently collected. The electronic device 100 may output at least one of elapsed time information indicating whether sensing information is measured for a while or duration information indicating whether sensing information is measured for a while, or may output the entire measurement time information and the like. According to various embodiments of the present disclosure, the electronic device 100 may output a predetermined waveform in a measurement start portion. After sensing information is measured, if the sensing information is collected by predetermined amplitude, the electronic device 100 may output a real-time waveform corresponding to the corresponding sensing information.

**[0123]** In operation 411, the electronic device 100 may output the measured result. For example, the electronic device 100 may output at least one of collected sensing information, statistical data information of sensing information, previous history information, accumulated and calculated information, or guide information corresponding to the information. Also, the electronic device 100 may output information for selecting a measurement situation. If the measurement situation is selected, the electronic device 100 may output guide information corresponding to a corresponding state.

**[0124]** According to various embodiments of the present disclosure, at least one of a measurement ready operation, a measurement operation, or a measured result display operation may be performed by a wearable electronic device. Alternatively, the wearable electronic device may perform a measurement ready function, a measurement function, and a measured result transmission function. In this regard, the wearable electronic device may perform the measurement ready operation. If a measured result is collected, the wearable electronic device may transmit collected sensing information to an electronic device in which a local-area communication channel is established. Each of the wearable electronic device and the electronic device may include a local-area communication module for establishing the local-area communication channel.

**[0125]** FIG. 5A is a drawing illustrating a screen interface associated with preparing for measuring SpO2 according to various embodiments of the present disclosure.

**[0126]** Referring to FIG. 5A, in states 501, 503, and 505, an electronic device 100 of FIG. 1 may output a screen associated with preparing for measuring SpO2 using a PPG sensor. If measuring SpO2, the electronic device 100 may determine whether the measurement is normally performed using a sensed heartbeat signal. The electronic device 100 may generate and output a heartbeat waveform image, associated with a feature of a heartbeat signal, using the feature of the heartbeat signal.

**[0127]** If an event for transmitting a request for measuring SpO2 occurs, the electronic device 100 may activate an application associated with measuring SpO2. In this operation, the electronic device 100 may output screens 510 and 520 corresponding to activation of the application or a sensor associated with measuring SpO2 in state 501. According to an embodiment of the present disclosure, if there is no previously measured history, the electronic device 100 may output the screen 510. If there is a previously measured history, the electronic device 100 may output the screen 520 associated with the previously measured history (e.g., one or more of a previously measured result or a previously measured time).

**[0128]** The electronic device 100 may output guide information associated with performing an operation of a user to measure SpO2 in state 503 or 505. For example, the electronic device 100 may output a screen of state 503 for providing a correct finger position or may output a screen of state 505 for requesting the user to keep a predetermined pressure state.

**[0129]** FIG. 5B is a drawing illustrating a screen interface associated with measuring SpO2 and outputting the result of measuring SpO2 according to various embodiments of the present disclosure.

**[0130]** Referring to FIG. 5B, in state 507, 509, or 511, an electronic device 100 of FIG. 1 may display measured sensing information and result information about the measured sensing information. According to an embodiment of the present disclosure, in state 511, the electronic device 100 may display measured SpO2 using a numeral and a marker on a progress bar. The progress bar may be classified as a poor region, a normal region, or a good region. The electronic device 100 may provide a support such that a user may easily recognize qualitative evaluation of a measured result by determining a position of the marker in response to a sensing information result.

**[0131]** Measured biometric information may be displayed in various methods. According to an embodiment of the present disclosure, the electronic device 100 may provide a selection menu for allowing the user to select a method for displaying one or more statistics associated with biometric information. For example, the selection menu may include at least one of a progress bar, a pie graph, a vertical bar graph, audio feedback, or haptic feedback.

**[0132]** In connection with outputting a progress bar, the electronic device 100 may calculate a first range value (e.g., a maximum value in the entire region and a minimum value in the entire region) for displaying the entire range value of the progress bar, one or more second range values (e.g., a maximum value for each region and a minimum value for each region) for displaying a range value of a partial region of the progress bar, and a representative value for displaying a representative marker according to collected sensing information.

**[0133]** A range and a unit of the first range value may be changed according to a biometric information value to be

measured. For example, the first range value may be set to a certain range (e.g., at least one of a valid measurement range in a heart rate sensor or a range set by the user, a range by default settings of the electronic device 100, or a heart rate possible range of a person, in case of heartbeat). Alternatively, the first range value may be set according to the user or user state information (e.g., a range of maximum heartbeat information to minimum heartbeat information among previous records of a specific user, a range of a minimum heart rate to a maximum heart rate according to a set exercise goal, a range of a minimum heart rate to a maximum heart rate according to an exercise or resting state, and the like). According to various embodiments of the present disclosure, in case of a body temperature sensor or a skin temperature sensor, the first range value may include at least one of, for example, a valid measurement range, a body temperature range of a person, or a certain range. In case of a humidity sensor, the first range value may be a humidity measurement possible range (e.g., a range of 10% to 100%). In case of a blood glucose sensor, the first range value may include at least one of a valid measurement range or a glucose range of a person.

**[0134]** The second range value may be a value calculated according to a range of specific values extracted from two or more biometric signal information which are currently measuring or are previously measured. For example, in case of heartbeat, the second range value may include at least one of a range by a maximum heart rate and a minimum heart rate extracted from heart rate information sampled during measurement, an average ±3% standard deviation range, a 95% confidence interval, a normal heartbeat range, a goal heart rate range, or a range of a 25th percentile to a 75th percentile. In case of the human body sensor or the skin temperature sensor, the second range value may include at least one of a maximum/minimum value range of a measured temperature or a normal body temperature range. In case of the humidity sensor, the second range value may include a maximum/minimum range of measured humidity and a reference humidity range (e.g., at least one of a maximum/minimum humidity range of day of a corresponding area through a weather center server or an average maximum and minimum humidity range determined through previously measured one or more humidity measurement histories of the electronic device 100). In case of the blood glucose sensor, the second range value may include at least one of a maximum/minimum range and a normal glucose range according to previously measured blood glucose information.

**[0135]** The representative value may include one or more values which may represent biometric signal information. For example, the representative value may include at least one of a single value, an average value, a median value, a 50th percentile, a mode, an expected value, a maximum value, a minimum value, skewness, dispersion, or standard deviation. The representative value may be obtained according to previously measured biometric information or may be obtained from a set of biometric information which is being measured.

**[0136]** In state 511, the electronic device 100 may display an interval (e.g., an interval where a representative value marker corresponding to a representative value is disposed) of 95% to 100% of a progress bar as an animation. For example, a bar-shaped image having a constant color may be gradually expanded and displayed relative to a representative value marker in an empty progress bar. The bar-shaped image may be gradually changed in shape from, for example, a point where the representative value marker is displayed and may be expanded in only an interval of 95% to 100%.

**[0137]** FIG. 6A is a drawing illustrating a form of displaying a progress bar according to various embodiments of the present disclosure.

**[0138]** Referring to FIG. 6A, in displaying a progress bar, an electronic device 100 of FIG. 1 may display a variety of information according to an object to display a result of measuring biometric information. For example, in state 601, the electronic device 100 may set a first range value (e.g., a range value of 0 to 200) for displaying a progress bar after measuring heartbeat. According to an embodiment of the present disclosure, the first range value displayed on a display 160 of FIG. 1 may be determined at a time when a first object 610 corresponding to the first range value is output. For example, the first range value (e.g., the range value of 0 to 200) which is initially set may be a first range value (e.g., a range value of 40 to 120) changed according to attributes (e.g., resolution, a displayable color candidate, a supportable font size, and the like) of the display 160.

**[0139]** The electronic device 100 may detect a plurality of heartbeat waveforms from a heartbeat signal while measuring heartbeat. In this case, the electronic device 100 may determine a heart rate and HRV per unit time according to peak signals of the plurality of heartbeat waveforms. Therefore, the electronic device 100 may calculate various statistics for the plurality of waveforms and may determine a second range value and a representative value according to the various statistics. According to an embodiment of the present disclosure, in state 603, the electronic device 100 may output a second object 612 corresponding to a second range value which includes a minimum heart rate (e.g., 61) per unit time (e.g., one minutes) and a maximum heart rate (e.g., 77) per unit time which are detected during a heartbeat measurement interval of one time. According to an embodiment of the present disclosure, the heartbeat measurement interval of one time may include states 309 to 313 of FIG. 3B. According to an embodiment of the present disclosure, the heartbeat measurement interval of one time may be a certain time (e.g., one or more of a time several times of a unit time and the generated number of certain heartbeat P-waves). According to various embodiments of the present disclosure, the heartbeat measurement interval of one time should not need to meet the unit time. For example, the heartbeat measurement interval of one time may be obtained by estimating a heart rate per unit time according to a measured result

during a time interval which is shorter than the unit time, although heartbeat of one time is measured during a time which is shorter than the unit time.

**[0140]** The electronic device 100 may display the first object 610 of a progress bar shape corresponding to the first range value, may display the second object 612 corresponding to the second range value, and may display a third object 614 corresponding to a representative value marker. For example, in state 605, the electronic device 100 may output the third object 614 corresponding to a representative value (e.g., an average value 68) on a constant position in the second object 612 corresponding to the second range value. In this operation, numeral information (e.g., 68) corresponding to the representative value may be displayed.

**[0141]** In connection with outputting the first object 610, the second object 612, and the third object 614, the electronic device 100 may determine object attributes of a progress bar to be displayed through a graphics processing module 190 of FIG. 1 using the first range value. The electronic device 100 may generate and display an object according to the determined attributes. The first object 610 corresponding to the progress bar may be displayed with a first color, a first pattern, and a first shape. The electronic device 100 may display the first object 610 having the first range value (e.g., the range value of 40 to 120) with respect to a progress bar to be displayed.

**[0142]** According to an embodiment of the present disclosure, the electronic device 100 may display the second object 612, corresponding to a partial region according to the second range value, on the displayed first object 610. The second object 612 may be displayed on a display 160 of FIG. 1 with a second color, a second pattern, and a second shape. For example, the second range value may be 61 to 77 and may be an interval which includes a minimum heart rate and a maximum heart rate sensed while normal heartbeat is measured.

**[0143]** According to an embodiment of the present disclosure, the third object 614 may be displayed together with the first object 610 or the second object 612. According to an embodiment of the present disclosure, a representative value may be displayed near the third object 614.

**[0144]** According to an embodiment of the present disclosure, when displaying the first object 610, the second object 612, and the third object 614, the electronic device 100 may set different object attributes (e.g., combinations of one or more of a color, a pattern, a shape, a size, a figure, a font, and transparency). According to an embodiment of the present disclosure, when displaying the first object 610, the second object 612, and the third object 614, the electronic device 100 may use different object attributes. According to an embodiment of the present disclosure, the electronic device 100 may display the first range value and the second range value on regions adjacent to related objects (e.g., the first object 610 and the second object 612) and may display a representative value on another region (e.g., in a heart region of state 319 of FIG. 3) which is not adjacent to the related objects.

**[0145]** As described above, in a process of outputting a result of collecting biometric information, the electronic device 100 may select an object corresponding to information (e.g., a type of biometric information) to be output and may analyze a characteristic of the information to be output. The electronic device 100 may determine attributes of the object according to the analyzed information and may determine a modification form of the object according to the determined object attributes. Also, the electronic device 100 may determine a screen effect such as an animation suitable for the modification form of the object. Therefore, the electronic device 100 may provide a support to output information of a form for being recognized by a user in response to a type of user related information, a current state, and the like.

**[0146]** FIG. 6B is a drawing illustrating a form of displaying a progress bar according to various embodiments of the present disclosure.

**[0147]** Referring to FIG. 6B, in state 607, an electronic device 100 of FIG. 1 may display a 4th object 620 (e.g., a progress bar). In this process, the electronic device 100 may display an initial object 621 corresponding to a predetermined representative value. The representative value of the initial object 621 may be, for example, 71. Also, in state 609, the electronic device 100 may display a 5th object 622 corresponding to a second range value relative to the initial object 621. Also, in state 611, the electronic device 100 may control a display 160 of FIG. 1 to display a part of the 5th object 622 relative to a position where the initial object 621 is displayed, may gradually increase the part of the 5th object 622 at a size corresponding to the second range value, and may control the display 160 to display a 6th object 623. Herein, a first range value corresponding to the 4th object 620 may be a range value of 40 to 120, and the second range value corresponding to the 5th object 622 may be a range value of 64 to 74. A representative value corresponding to the 6th object 623 may be 71.

**[0148]** According to various embodiments of the present disclosure, the electronic device 100 may determine a position for an average value (a representative value) on the 4th object 620 (e.g., a progress bar) indicating the entire measurement range using statistics obtained through the measurement of biometric information. If the position of the average value is determined, the electronic device 100 may display a value corresponding to a maximum or minimum range of biometric information measured left or right relative to the determined position.

**[0149]** To display a maximum value or a minimum value, the electronic device 100 may process the 5th object 622 corresponding to a constant region of the left and right relative to the average value to be changed (e.g., an image, a color, transparency, a shadow, and the like indicating a range of a region) to the maximum value or the minimum value.

**[0150]** According to an embodiment of the present disclosure, a speed at which the 5th object 622 is filled may be

determined relative to a distance from the average value to the maximum value and the minimum value. Herein, since the distance from the average value to the maximum value and the minimum value differs whenever measured, the electronic device 100 may process a speed at which the 5th object 622 is filled in a different way according to situations. For example, in state 605 of FIG. 6A, if a representative value is located in the center of a second object 612 (e.g., if an average value is identical to a median value), change speeds for changing an object form to the end of the second object 612 in the left and right relative to the position of the representative value may be set to be identical to each other. Accordingly, a form in which the second object 612 is changed on a third object 614 may be symmetric.

**[0151]** According to various embodiments of the present disclosure, if a position of a representative value (e.g., a heartbeat average value) is leaned to one side of the 5th object 622, speeds at which the initial object 621 is filled, which are started from a point of the initial object 621 corresponding to the representative value, may differ from each other. For example, the electronic device 100 may process the 5th object 622 such that the drawing of the 5th object 622 is ended in the actually same or similar time by differing in left and right change speeds of the 5th object 622 in consideration of left and right rates. Therefore, the electronic device 100 may process a form in which a part of the 5th object 622 is output and a form in which the other part of the 5th object 622 is output in a different way relative to the initial object 621. In this regard, the electronic device 100 may perform calculation (e.g., calculation of a speed processed in an animation unit 193 of a graphics processing module 190 of FIG. 1) associated with outputting the 5th object.

**[0152]** According to various embodiments of the present disclosure, attributes (e.g., a color, a pattern, transparency, and a shadow) of the initial object 621 may be identical to those of the 5th object 622 or the 6th object 623.

**[0153]** According to various embodiments of the present disclosure, the electronic device 100 may apply physical quantities obtained through a physics engine module 180 of FIG. 1 when displaying the second object 612 or the 5th object 622. For example, the electronic device 100 may apply a fluid pressure, an air pressure, or a magnetic force for each of left and right directions of the second object 612 or the 5th object 622 in a different way relative to the initial object 621 (or the third object 614) using the obtained physical quantities. Therefore, the electronic device 100 may process portions of the second object 612 or the 5th object 622 to differ in a speed or a form in which the portions of the second object 612 or the 5th object 622 are displayed.

**[0154]** FIG. 6C is a drawing illustrating a form of displaying a progress bar according to various embodiments of the present disclosure.

**[0155]** Referring to FIG. 6C, in state 613, an electronic device 100 of FIG. 1 may display a 7th object 630 (e.g., a progress bar) and may output a start object 631 corresponding to a second range value initially obtained at a constant point. In state 615, the electronic device 100 may display an 8th object 632 (a partial region) corresponding to a changed second range value on the 7th object 630. In this case, the electronic device 100 may first display a part of the 8th object 632 and may output the 8th object 632 in a form which is changed in response to an elapsed time. In state 617, the electronic device 100 may output a 9th object 633 on a constant point of the 8th object 632.

**[0156]** According to various embodiments of the present disclosure, a first range value may be set to an initial value in a start point of measuring biometric information and may be continuously changed according to an update situation of objects. For example, in states 613 to 617, a start value of first range values of the 7th object 630 may be 10, and the start value may be changed to 27 and 40 by being gradually changed. Alternatively, the first range value may be finally displayed as 40 by being increased by a constant unit (e.g., 1 or 2, and the like). Similarly, an end value among the first range values of the 7th object 630 may be initially 70 and may be changed to 83 and 120 by being gradually changed. The end value may be finally displayed as 120 by being increased by a constant unit (e.g., 3 or 4, and the like).

**[0157]** According to an embodiment of the present disclosure, if a size of the 8th object 632, displayed on a display 160 of FIG. 1, corresponding to the second range value is less than or equal to a certain size, the electronic device 100 may display only one of a minimum value or a maximum value of a region in connection with the 8th object 632.

**[0158]** According to an embodiment of the present disclosure, a region where the 8th object 632 is displayed may show an animation effect which is expanded or reduced according to a change of the first range value of the displayed 7th object 630. For example, as an interval of the first range value is changed, the 8th object 632 may be changed according to form or numeral information or a rate change of the 7th object 630.

**[0159]** According to an embodiment of the present disclosure, a range of the 8th object 632 may be determined by combining standard deviation with an average value other than a maximum/minimum value. According to an embodiment of the present disclosure, colors and patterns of the 7th object 630 and the 8th object 632 may be changed to distinguish the 7th object 630 (e.g., the progress bar) indicating the entire measurement range from the 8th object 632 (e.g., a progress bar) indicating a value in which a user state is measured.

**[0160]** As described above, according to various embodiments of the present disclosure, the electronic device may include a memory configured to store at least one object and a processor configured to control a display to display a background screen object associated with measuring a heart rate among objects stored in the memory and to display a progress bar, corresponding to a predetermined first range value to display heart rate information, and a second object, corresponding to a second range value of heart rate information collected on the progress bar, on the first object. The processor may control the display to output the second object on a position of the first object, which is determined

according to a ratio of the first range value to the second range value.

**[0161]** According to various embodiments of the present disclosure, the processor may control the display to display the second object in a form which is gradually expanded from a predetermined point of the second object, corresponding to a single value calculated from the collected heart rate information.

**[0162]** According to various embodiments of the present disclosure, the processor may control the display to display a third object, corresponding to the single value, on the second object.

**[0163]** According to various embodiments of the present disclosure, the processor may control the display to output numeral information corresponding to the first range value, numeral information corresponding to the second range value, and numeral information corresponding to the single value.

**[0164]** According to various embodiments of the present disclosure, the processor may control the display such that the numeral information is displayed as corresponding information by being changed every unit (e.g., 1) from a predetermined value (e.g., 0).

**[0165]** According to various embodiments of the present disclosure, the processor may adjust a change speed of the numeral information such that a time when the change is completed is identical to each other.

**[0166]** FIG. 7 is a flowchart illustrating an information display method using a progress bar according to various embodiments of the present disclosure.

**[0167]** Referring to FIG. 7, in the information display method using the progress bar, an electronic device 100 of FIG. 1 may activate a predetermined function (e.g., a function of measuring biometric information, and the like). According to an embodiment of the present disclosure, the electronic device 100 may collect biometric information according to a function operation. If the collection of the biometric information is completed, or if biometric information of a predetermined degree is collected, in operation 701, the electronic device 100 may set a progress bar display region value. For example, the electronic device 100 may set the progress bar display region value according to the entire magnitude of the collected biometric information. According to an embodiment of the present disclosure, the electronic device 100 may set a region value of a certain size, including a maximum value and a minimum value of measured heartbeat, to a progress bar display region value.

**[0168]** In operation 703, the electronic device 100 may set a partial display region value on a progress bar. According to an embodiment of the present disclosure, the electronic device 100 may set a range (e.g., a range of a maximum value to a minimum value), which may include the entire collected biometric information, to the partial display region value. Alternatively, the electronic device 100 may set a range, which exclude a maximum value and a minimum value and includes the remaining values among the collected biometric information, to the partial display region value.

**[0169]** In operation 705, the electronic device 100 may set a representative value. For example, the electronic device 100 may set an average value or a median value of collected biometric information to the representative value.

**[0170]** In operation 707, the electronic device 100 may display a progress bar and a first range value. For example, the electronic device 100 may output a progress bar having a predetermined size and color on a predetermined position. The electronic device 100 may display the first range value on one side of the progress bar. In this operation, the electronic device 100 may output the first range value as an animation. According to an embodiment of the present disclosure, if the first range value is a range value of 40 to 120, the electronic device 100 may change and display the corresponding values from a predetermined numeral. For example, the electronic device 100 may first output 0 and may then output 1, 2, ... 39, and 40 on a position where 40 of the first range value will be output. Also, the electronic device 100 may first output 0 and may then output 1, 2, ... 119, and 120 on a position where 120 of the first range value will be output. The electronic device 100 may process a speed at which a numeral is changed in a different way such that a time when the outputting of 40 is completed is identical to a time when the outputting of 120 is completed. For example, the electronic device 100 may process a numeral change speed for outputting 120 to be three times faster than a numeral change speed for outputting 40. Therefore, the electronic device 100 may process a start value and an end value of a range such that a change completion time of the start value of the range is identical to a change completion time of the end value of the range and may display the start value and the end value of the range at a time when the change completion time of the start value is identical to the change completion time of the end value.

**[0171]** According to various embodiments of the present disclosure, the progress bar may be output as in a form in which a size or length is gradually changed from a constant position. For example, after an object of a constant size, corresponding to the progress bar, is output on a constant point of a display 160 of FIG. 1, it is displayed such that a size or length of the object is gradually increased to become a predetermined size.

**[0172]** In operation 709, the electronic device 100 may display a second range value on the progress bar. In this operation, the electronic device 100 may process an animation. For example, the electronic device 100 may calculate a size of an object corresponding to the second range value in proportion to a size of the progress bar. Also, the electronic device 100 may calculate a position of the second range value relative to the first range value of the progress bar. The electronic device 100 may output the object corresponding to the second range value on a position corresponding to the second range value of the progress bar. In this operation, the electronic device 100 may process the object to be gradually changed from one point of the progress bar to become a predetermined size. A numeric value corresponding

to the second range value may be written on a region adjacent to the object. As a size of the object is changed, positions of a start value and an end value of the second range value may be changed. For example, a start value and an end value may be simultaneously displayed on a start point where the object is displayed. Therefore, the start value and the end value of the second range value may be overlapped and displayed on the start point. While a size or length of the object is gradually changed, the start value and the end value of the second range value may be moved and displayed according to a form in which the object is changed. As the change of the object is completed, if the object has the predetermined size, the start value and the end value of the second range value may be fixed and displayed. Herein, while numeric values of the start value and the end value are changed, the start value and the end value of the second range value may be displayed. According to various embodiments of the present disclosure, the start value and the end value of the second range value may have the same value as each other on a start point where the object is displayed. As the size of the object is changed, the start value and the end value of the second range value may be changed. For example, if the start value of the second range value is 60, if the end value is 70, and if an object is displayed on a 65 point, the start value and the end value of the second range value may be first output as 65 to be identical to each other. Thereafter, the start value of the second range value may be changed to 65, 64, 63, ... 60. The end value of the second range value may be changed to 65, 66, 67, ... 70. According to various embodiments of the present disclosure, the start value and the end value of the second range value may overlapped and displayed as 60 and 70 on the 65 point, respectively. While display positions of the start value 60 and the end value 70 of the second range value are changed as a size of the object is changed, the start value and the end value of the second range value may be displayed on positions adjacent to edge regions of the object. A start point where the object is displayed may be, for example, a position corresponding to a representative value on a progress bar.

**[0173]** In operation 711, the electronic device 100 may display a representative value marker and a representative value. For example, the electronic device 100 may output the representative value marker on the object corresponding to the second range value. The electronic device 100 may output the representative value on a region adjacent to the representative value marker.

**[0174]** According to various embodiments of the present disclosure, the electronic device 100 may output the first range value at the same time as a time when the second range value is displayed. Also, the electronic device 100 may perform an operation such that a time when a change of the first range value is completed is identical to a time when displaying of the second range value is completed. In this regard, the electronic device 100 may adjust a change speed of a start value and an end value of the first range value and a change speed of the start value and the end value of the second range value in a different way and may display the representative value marker and the representative value at a time when a change of an object, corresponding to the first range value and the second range value, is completed. According to an embodiment of the present disclosure, the electronic device 100 may process a time when the representative value marker and the representative value are displayed such that displaying of the first range value and a change of the object, corresponding to the second range value, and the second range value are completed.

**[0175]** FIG. 8 is a drawing illustrating an information display method in a plurality of regions according to various embodiments of the present disclosure.

**[0176]** Referring to FIG. 8, an electronic device 100 of FIG. 1 may output a first progress bar 810, including a plurality of sub-objects 811 to 813, on a screen 801. The screen 801 may display, for example, a result of measuring SpO2 using the first progress bar 810 according to an embodiment of the present disclosure. A first range corresponding to the first progress bar 810 may be a range of 70% to 100% and may include the three sub-objects 811 to 813. The first sub-object 811 of the sub-objects 811 to 813 may mean that SpO2 is low. The second sub-object 812 of the sub-objects 811 to 813 may mean that SpO2 is normal, and the third sub-object 813 of the sub-objects 811 to 813 may mean that SpO2 is good. Also, a SpO2 representative value of a measured result may be 98% and may be displayed on the third sub-object 813. As described above, the first progress bar 810 may be drawn with a thick line segment or figure having round opposite ends. The sub-objects 811 to 813 may correspond to divided regions of the first progress bar 810. A representative value marker 820 may be displayed in response to a corresponding sub-object (e.g., the third sub-object 813). According to an embodiment of the present disclosure, attributes of the third sub-object 813 on which the representative value marker 820 is displayed may be changed on a representative value. For example, a way of displaying the third sub-object 813 may be a way of being gradually changed relative to the representative value marker 820. Alternatively, the way of displaying the third sub-object 813 may be a way of filling a constant region of the first progress bar 810 with a predetermined color relative to a point where the representative value marker 820 is displayed. Alternatively, the way of displaying the third sub-object 813 may be a way of gradually filling the third sub-object 813 with a predetermined color from an edge of the third sub-object 813 to a point where the representative value marker 820 is displayed.

**[0177]** According to an embodiment of the present disclosure, the electronic device 100 may display a result of measuring UV on a screen 803. Herein, a first range of a second progress bar 830 may be a range of a low level to a high level and may be configured with five sub-objects. Herein, a representative value object 840 may be disposed on a moderate region in response to the measured result. According to an embodiment of the present disclosure, before the representative value object 840 is displayed, the moderate region to display the representative value object 840 may

have a form which is gradually changed through an animation effect from the representative value object 840 which is a start point.

**[0178]** According to various embodiments of the present disclosure, the electronic device 100 may display a pie graph, a bar graph, and the like as objects, which are replaced with a progress bar, or as added objects. In case of the pie graph, a filled range may be changed relative to a start point. According to an embodiment of the present disclosure, the start point may be simultaneously or successively provided to a user using a different color or a different pattern.

**[0179]** FIG. 9 is a drawing illustrating an information display method in a plurality of regions according to various embodiments of the present disclosure.

**[0180]** Referring to FIG. 9, an electronic device 100 of FIG. 1 may output a circular progress bar, a pie chart having an empty middle, or various arc-shaped objects. According to an embodiment of the present disclosure, the electronic device 100 may output a circular progress bar 910, which displays an exercise level (or an exercise execution time) and an exercise type, on a screen 901. The exercise level or the exercise type may be input or sensed through a user input or a motion sensor and a biometric sensor. For example, a goal exercise level, which is set by a user or is automatically set according to biometric information of him or her, may be 85 minutes per day. In this case, a first range may be set (e.g., a range of 0 minute to 85 minutes) in response to the goal exercise level. Also, if there no exercise level, a representative value may be 0.

**[0181]** The electronic device 100 may display an exercise type and an exercise time, which are input by the user or are recognized through sensing information, on a screen 903. For example, the electronic device 100 may display a state where the total exercise time of 78 minutes (e.g., walking of 25 minutes, running of 23 minutes, other exercises of 30 minutes) is achieved and 92% is achieved to a goal exercise level. In this case, the electronic device 100 may output a second object 920. The second object 920 may include 3 sub-regions (e.g., a walking sub-region, a running sub-region, and the other sub-region). The second object 920 may be configured according to a rate such that a rate of the walking sub-region is 29.4%, a rate of the running sub-region is 27.1%, and a rate of the other sub-region is 35.3%. The sub-regions of the second object 920 may be successively disposed according each rate on the circular progress bar 910.

**[0182]** A representative value may be 92%, and a representative value marker 930 may be disposed on a start point or an end point of a region, where the second object 920 is displayed, using attributes (e.g., a gray tone) which are distinguished from the circular progress bar 910 and the second object 920. Numeral information corresponding to the representative value may be displayed on a region adjacent to a position where the representative value marker 930 is displayed.

**[0183]** According to an embodiment of the present disclosure, the electronic device 100 may visually display biometric information through an animation effect. If a result of measuring an exercise level through a motion sensor is calculated, the electronic device 100 may calculate rates of the second object 920 and may display an end region of the second object using predetermined animation attributes. For example, the electronic device 100 may display the second object 920 to increase a region of the second object 920 through an animation effect from the representative value marker 930 displayed on the circular progress bar 910 to a previously calculated display region of the second object 920 and to fill the inside of the second object 920 with a predetermined color or effect. Alternatively, the electronic device 100 may successively display the second object 920 per sub-region. According to various embodiments of the present disclosure, the animation effect may be applied to only a corresponding sub-region according to an updated exercise type among the sub-regions of the second object 920.

**[0184]** According to an embodiment of the present disclosure, a measured exercise level may exceed a goal exercise level. In this case, the electronic device 100 may change the first range corresponding to the circular progress bar 910 to the measured exercise level. For example, if the sum of a second range exceeds the first range, the first range may be changed to one or more of the second range or the sum of the second range.

**[0185]** According to various embodiments of the present disclosure, the electronic device 100 may display three second objects 955 (e.g., breakfast, lunch, and refreshments) on a circular progress bar 950 on a screen 905. Images, such as a size or a form, of the second objects 955 may be changed according to input information. Also, the electronic device 100 may output a separate linear progress bar 953. The linear progress bar 953 may indicate predetermined balance (e.g., balance between vegetable intake and meat intake or balance among carbohydrate intake, protein intake, and fat intake) according to kinds of intake foods

**[0186]** According to various embodiments of the present disclosure, the electronic device 100 may output an arc progress bar 970 corresponding to time on a screen 907. The arc progress bar 970 may be generated in response to a sleeping hour range 971 accommodated to a user. The electronic device 100 may display a second object corresponding to a real sleeping start hour and a real sleeping end hour. The electronic device 100 may output a representative value object 972 corresponding to a qualitative evaluation (e.g., fair) according to the total sleeping hour (e.g., 7.5 hours) or a goal sleeping hour to an amount of achievement. The electronic device 100 may output a numeral information object 973 corresponding to a sleeping start and a sleeping end. The electronic device 100 may output a sleeping quality object 974 corresponding to a sleeping pattern or a sleeping depth for one week.

**[0187]** According to various embodiments of the present disclosure, in connection with outputting the above-mentioned

progress bar and dynamically displaying the second object on the progress bar, the electronic device 100 may display the second object in real time using previously measured accumulation results while biometric information is measured. Alternatively, the electronic device 100 may display the second object according to an accumulated result measured after the measurement of biometric information is completed.

**[0188]** FIG. 10 is a drawing illustrating a map-based information display method according to various embodiments of the present disclosure.

**[0189]** Referring to FIG. 10, an electronic device 100 of FIG. 1 may output a route object 1010 on a map. The route object 1010 may be generated according to location information collected according to a movement of a user or information set to move by him or her. The route object 1010 may include second objects 1020 (e.g., a 1km unit). In this case, the electronic device 100 may determine its position using a position sensor and may display a representative value marker 1030, which uses current position information as a representative value, for an accumulated movement distance on a route or a current position.

**[0190]** The representative value marker 1030 may be displayed in response to the occurrence of a predetermined event. At a time when the representative value marker 1030 is displayed, the second object 1020 where the representative value marker 1030 is located may be displayed as an animation. For example, the second object 1020 (e.g., between No. 6 and No. 7) where the representative value marker 1030 is located may be displayed in a form which is gradually increased relative to the representative value marker 1030. Also, a color of the second object 1020 where the representative value marker 1030 is located may differ from those of other objects. Alternatively, the second object 1020 where the representative value marker 1030 is located may be changed according to a movement speed of the electronic device 100. Additionally or alternatively, each of the second objects 1020 may have a predetermined color according to a movement speed of the electronic device 100.

**[0191]** According to various embodiments of the present disclosure, to display a progress bar or a second object as an animation on a display 160 of FIG. 1, the electronic device 100 may perform physical calculation using a physics engine module 180 of FIG. 1. For example, to display an animation clockwise in a position where a representative value marker is displayed, the electronic device 100 may set a fluid pressure in the representative value marker and may set a low end of the display 160 in a gravity direction. Therefore, the animation may express an effect in which it is increased in speed from a start point to a progress bar point corresponding to a low end of a screen and is gradually decreased in speed if the bottom is passed.

**[0192]** According to various embodiments of the present disclosure, information provided through an object may include information measured through a sensor of the electronic device 100 or temperature, humidity, insolation, rainfall, a UV index, and the like which are transmitted through a network, other than state information of the user.

**[0193]** FIG. 11 is a flowchart illustrating an animation processing method using physical attributes according to various embodiments of the present disclosure.

**[0194]** Referring to FIG. 11, in connection with the animation processing method, in operation 1101, an electronic device 100 of FIG. 1 may set a goal in response to a user input or scheduled information. In operation 1103, the electronic device 100 may activate a predetermined sensor and may measure biometric information according to the predetermined sensor. In operation 1105, the electronic device 100 may verify a goal achievement state.

**[0195]** In operation 1107, the electronic device 100 may determine an object according to the goal achievement state. For example, the electronic device 100 may determine an object to be output in a different way according to whether a user achieves the goal or does not achieve the goal.

**[0196]** In operation 1109, the electronic device 100 may calculate an object modification value according to characteristics of the measured biometric information. For example, the electronic device 100 may determine physical characteristics (e.g., gravity, fluid pressure, and the like) to be applied in response to a type of the biometric information. Also, the electronic device 100 may determine that any animation effect is applied in response to a type of biometric information.

**[0197]** In operation 1111, the electronic device 100 may verify its state. For example, the electronic device 100 may verify whether it currently takes any pose. In operation 1113, the electronic device 100 may display a predetermined animation by applying physical characteristics determined according to its current state to an object to be output.

**[0198]** FIG. 12 is a drawing illustrating the displaying of deep sleeping degree related information according to various embodiments of the present disclosure.

**[0199]** Referring to FIG. 12, an electronic device 100 of FIG. 1 may display a movement form of a first object 1210 through states 1201 to 1215. In this case, the electronic device 100 may output a movement of the first object 1210 according to a physical characteristic. In this regard, the electronic device 100 may collect sensing information associated with the physical characteristic, for example, a gravity characteristic. As shown in FIG. 12, the electronic device 100 may display a movement of the first object 1210 according to the collected sensing information. In connection with FIG. 12, for example, the first object 1210 may have a form which is actually or approximately vertically disposed. The electronic device 100 may display a movement of the first object 1210 to which a gravity characteristic according to the vertical disposal is applied. Alternatively, the electronic device 100 may collect biometric information about a pose state

(e.g., a standing state) of a user and may display a movement of the first object 1210 to which a gravity characteristic according to the collected biometric information is applied.

**[0200]** In addition, in state 1203, if the first object 1210 is moved to a constant size or more, the electronic device 100 may display a second object 1220. The second object 1220 may modified and displayed in response to a movement distance of the first object 1210. Alternatively, if the second object 1220 is moved to a constant distance or more, it may be displayed once. The second object 1220 may output, for example, achieved goal level information (e.g., information indicating that a sleeping degree of three successive days is achieved as a good state).

**[0201]** In connection with the above-mentioned display and control, the electronic device 100 may calculate a trajectory and a speed of a parachute according to exercise strength or an air volume and may control motion of an object (e.g., a sheep which uses a parachute) according to the calculated trajectory and speed, using a physics engine. In this case, the electronic device 100 may provide various types of animation effects according to a state of the electronic device 100 or a physiological state of a user by setting physical attributes according to the physiological state of him or her through measurement of biometric information.

**[0202]** In connection with FIG. 12, biometric information of the user measured by the electronic device 100 may be a sleeping hour or a deep sleeping degree. The electronic device 100 may determine a start and end of sleep through a user input or one or more of a motion sensor, a respiration sensor, an EEG sensor, and a breath sensor (or a microphone) and may measure an hour when the user sleeps. The electronic device 100 may determine quality (rapid eye movement (REM) sleep, light sleep, and the like) of sleep through the EEG sensor and the respiration sensor.

**[0203]** The user may set a goal of specific biometric information. For example, the user may enter a sleeping start hour and a sleeping end hour through a user interface of the electronic device 100 and may store the sleeping start hour and the sleeping end hour in a memory 130 of FIG. 1. If biometric information (e.g., an amount of sleep) is measured through the electronic device 100 or another sensor or a remote electronic device functionally connected with the electronic device 100, the electronic device 100 may collect the measured biometric information.

**[0204]** A processor 120 of the electronic device 100 may determine whether biometric information of the user meets a set goal according to the measured biometric information and may verify a goal achievement state. In this regard, the electronic device 100 may verify a plurality of conditions in connection with outputting the first object 1210. For example, in case of an amount of sleep, if all of a set sleeping hour and a set sleeping end hour are met (e.g., if a set event is performed within 15 minutes before and after a set time), the electronic device 100 may determine the target achievement state as a good state. Alternatively, if only one of the sleeping start hour or the sleeping end time is met and if a certain sleeping hour (e.g., six hours) is met, the electronic device 100 may determine the goal achievement state as a normal state (or a fair state). Alternatively, if a predetermined sleeping hour is not met or all of the sleeping start time and the sleeping end time are not met, the electronic device 100 may determine the goal achievement state as a bad state. The goal achievement state may include sleep related information (e.g., a sleeping star hour, a sleeping end hour, and the total sleeping hour).

**[0205]** The electronic device 100 may determine an object to be displayed on a display 160 of FIG. 1 and may determine an object display form according to the goal achievement state. For example, if it is determined that achieved goal attributes are associated with sleep, an object associated with sleep may be selected. For example, the object may include graphic elements corresponding to information such as sleep, an exercise time, an exercise level, nutrition, an exercise speed, and an exercise route. An object which has a predetermined correlation among a plurality of objects may be selected in connection with the goal achievement state. For example, as shown in FIG. 12, the first object 1210 may be selected.

**[0206]** If the object is determined, a display form of the corresponding object may be determined. For example, the electronic device 100 may display a sheep such that the sheep which uses a parachute is swung and falls to the ground on a sleeping degree related animation of FIG. 12. To display this, the electronic device 100 may set a gravity direction to a low end of a shield icon and may calculate a falling speed of the first object 1210. For example, the electronic device 100 may collect settings such as acceleration of gravity associated with the first object 1210, an air resistance coefficient of a virtual parachute, a weight of a virtual sheep, a weight of a virtual parachute, a width and period of a virtual pendulum movement (e.g., a cord length and a swing angle of a parachute, a foot length and a swing angle for calculating swing of a sheep, and the like). According to an embodiment of the present disclosure, this setting of the object may be preset. Alternatively, the settings of the object may be measured or may be set using one or more of biometric information entered by the user.

**[0207]** According to an embodiment of the present disclosure, the electronic device 100 may set the object in connection with a sleeping hour of the user and a falling hour. For example, when a sleeping hour is longer or quality of sleep is better (e.g., determination through a motion degree during a sleeping period or depth of sleep, and the like), the electronic device 100 may change air resistance, weight of an object, and a value of acceleration of gravity to reduce a falling speed. Alternatively, when a sleeping hour is shorter, the electronic device 100 may broaden a swing angle to emphasize a speed and form at which a sheep is swung to be shown faster and better and may display a cord length of a parachute to be shortened. Alternatively, if a sleeping hour is short, the electronic device 100 may set a level of an air volume to

be high in inverse proportion to the sleeping hour or may automatically change a swing angle or a cord length of a parachute which has correlation with the sleeping time.

**[0208]** For example, swing of a sheep which uses a parachute may be obtained through Equation 1 below.

$$T = 2\pi\sqrt{\frac{l}{g}} \quad \ldots \text{Equation 1}$$

**[0209]** Herein, g may be set acceleration of gravity, 1 may be a length of a parachute, and T may be a period of a pendulum movement.

**[0210]** The displaying and setting of the object may be applied to the second object (e.g., a ribbon). For example, a numeral displayed on the ribbon may display that a goal is achieved for three successive days. A speed at which the ribbon is drawn, elasticity (e.g., a modification speed) of the ribbon, and the like may be changed according to the number of successive goal achievement days.

**[0211]** If an object and the displaying and setting of the object are determined, a state of the electronic device 100 may be verified and a direction to which physical attributes are applied may be determined. A display setting direction of the object may be changed according to a pose or orientation of the electronic device 100, attributes (e.g., the number of horizontal pixels and the number of vertical pixels) of the display 160, and the like. For example, the electronic device 100 may change a region and a size to be displayed on an animation according to setting of a horizontal mode and a vertical mode.

**[0212]** According to various embodiments of the present disclosure, if biometric information is quality of sleep, as shown in FIG. 12, a shield, a sheep which uses a parachute, or a ribbon as an object associated with sleep may be selected as an object indicating sleep of the user. As a result of the quality of sleep of the user, the electronic device 100 may output various types of shield images, various types of sheep using parachutes, and various types of ribbons. Level information corresponding to the quality of sleep of the user may be displayed on the ribbon. In a process of displaying the ribbon to cover a shield image, an effect that a force for tying the ribbon is applied may be provided. According to an embodiment of the present disclosure, a direction in which a sheep which uses a parachute is moved may be changed in response to result values of sensors, mounted in the electronic device 100, which may measure gravity, a frictional force, speed, acceleration, and the like.

**[0213]** According to various embodiments of the present disclosure, the electronic device 100 may change a visual effect provided to the user by reflecting a deep sleeping degree to a shape and motion of a sheep.

**[0214]** According to various embodiments of the present disclosure, if a deep sleeping degree is high, the electronic device 100 may display a numeral of a deep sleeping level indicating a ribbon in a different way. Also, the electronic device 100 may provide an effect of recognizing a deep sleeping degree as a changed amount of a moved object by changing strength of tying a ribbon.

**[0215]** According to various embodiments of the present disclosure, the electronic device 100 may change a motion degree and direction of a sheep which uses a moved parachute by reflecting environment information around the user. If an air volume is strong, the electronic device 100 may strengthen a swing degree of a sheep which uses a parachute.

**[0216]** As described above, according to various embodiments of the present disclosure, the electronic device may include a memory configured to store at least one object to be output in connection with a sleeping state and a processor configured to control a display to display a background screen object associated with the sleeping state among objects stored in the memory and to display a second object associated with an amount of sleep. The processor may control the display to output at least one of a position, a size, a motion form, or a speed of the second object in a different way according to relation between a set goal value and an amount of sleep in connection with the sleeping state.

**[0217]** The processor may determine at least one physical characteristic in connection with a state of a human body associated with a state of the electronic device or the sleeping state and may control the display to change a display effect of the second object according to the physical characteristic.

**[0218]** FIG. 13 is a drawing illustrating the displaying of animation information according to biometric information according to various embodiments of the present disclosure.

**[0219]** Referring to FIG. 13, according to an embodiment of the present disclosure, a certain heart rate and certain duration may be set as a goal. If the heart rate or more is maintained during the certain duration or more by a heart rate sensor and a timer, an electronic device 100 of FIG. 1 may determine that the goal is achieved. If a goal heart rate is maintained during a certain time, the electronic device 100 may determine that the goal is achieved and may select a certain object (e.g., an animation element of FIG. 13) in connection with a heart rate in which the goal is achieved.

**[0220]** According to an embodiment of the present disclosure, the electronic device 100 may select a first object 1310 (e.g., a shield) as shown in state 1301, a second object 1320 (e.g., a road) as shown in state 1303, and a third object 1330 (e.g., a flag) as shown in state 1305, to start a measured heart rate of a user. To indicate the measured heart rate

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of the user, the electronic device 100 may display the second object 1320 from a specific point on the first object 1310. If the displaying of the second object 1320 is completed, the electronic device 100 may display the third object 1330 on a specific point on the second object 1320. In this case, the electronic device 100 may provide an effect of swinging a flagpole left and right in connection with displaying the third object 1330 and may display the flagpole to stop the swinging after a constant time elapses.

**[0221]** According to various embodiments of the present disclosure, if a measured heart rate is a constant level or more, the electronic device 100 may strengthen a degree in which a flag is swung left and right to indicate that heartbeat of the user is fast.

**[0222]** According to various embodiments of the present disclosure, if stress, hastiness, and the like of the user are extracted from a measured heart rate, the electronic device 100 may change the swing of the third object 1330 and a speed at which the second object 1320 is drawn according to an emotional state of the user.

**[0223]** As described above, according to various embodiments of the present disclosure, the electronic device 100 may provide a UI, which interacts with the user, to the user in real time using a sensor mounted on the electronic device 100 and surrounding information of the user and state information of the user such as a setting and input method of the user and may provide various effects. The electronic device 100 may improve visibility and readability to the user and may provide a more engaging user experience.

**[0224]** FIG. 14 is a block diagram illustrating a configuration of an electronic device according to various embodiments of the present disclosure.

**[0225]** Referring to FIG. 14, an electronic device 1401 may include, for example, all or a part of an electronic device 101 shown in FIG. 1. The electronic device 1401 may include one or more APs 1410, a communication module 1420, a subscriber identification module (SIM) card 1424, a memory 1430, a sensor module 1440, an input device 1450, a display 1460, an interface 1470, an audio module 1480, a camera module 1491, a power management module 1495, a battery 1496, an indicator 1497, and a motor 1498.

**[0226]** The AP 1410 may drive, for example, an OS or an application program to control a plurality of hardware or software components connected thereto and may process and compute a variety of data. The AP 1410 may be implemented with, for example, a system on chip (SoC). According to an embodiment of the present disclosure, the AP 1410 may further include a graphics processing unit (GPU) (not shown) and/or an image signal processor. The AP 1410 may include at least some (e.g., a cellular module 1421) of the components shown in FIG. 14. The AP 1410 may load instructions or data received from at least one of other components (e.g., a non-volatile memory) to a volatile memory to process the data and may store various data in a non-volatile memory.

**[0227]** The communication module 1420 may have the same or similar configuration as or to that of a communication interface 170 of FIG. 1. The communication module 1420 may include, for example, the cellular module 1421, a Wi-Fi module 1423, a Bluetooth (BT) module 1425, a GPS module 1427, an NFC module 1428, and an RF module 1429.

**[0228]** The cellular module 1421 may provide, for example, a voice call service, a video call service, a text message service, or an Internet service, and the like through a communication network. According to an embodiment of the present disclosure, the cellular module 1421 may identify and authenticate the electronic device 1401 in a communication network using a SIM (e.g., the SIM card 1424). According to an embodiment of the present disclosure, the cellular module 1421 may perform at least a part of functions which may be provided by the AP 1410. According to an embodiment of the present disclosure, the cellular module 1421 may include a CP.

**[0229]** The Wi-Fi module 1423, the BT module 1425, the GPS module 1427, or the NFC module 1428 may include, for example, a processor for processing data transmitted and received through the corresponding module. According to various embodiments of the present disclosure, at least a part (e.g., two or more) of the cellular module 1421, the Wi-Fi module 1423, the BT module 1425, the GPS module 1427, or the NFC module 1428 may be included in one integrated chip (IC) or one IC package.

**[0230]** The RF module 1429 may transmit and receive, for example, a communication signal (e.g., an RF signal). Though not shown, the RF module 1429 may include, for example, a transceiver, a power amplifier module (PAM), a frequency filter, or a low noise amplifier (LNA), or an antenna, and the like. According to an embodiment of the present disclosure, at least one of the cellular module 1421, the Wi-Fi module 1423, the BT module 1425, the GPS module 1427, or the NFC module 1428 may transmit and receive an RF signal through a separate RF module.

**[0231]** The SIM card 1424 may include, for example, a card which includes a SIM and/or an embedded SIM. The SIM card 1424 may include unique identification information (e.g., an integrated circuit card identifier (ICCID)) or subscriber information (e.g., an international mobile subscriber identity (IMSI)).

**[0232]** The memory 1430 (e.g., a memory 130 of FIG. 1) may include, for example, an embedded memory 1432 or an external memory 1434. The embedded memory 1432 may include at least one of, for example, a volatile memory (e.g., a dynamic random access memory (DRAM), a static RAM (SRAM), a synchronous DRAM (SDRAM), and the like), or a non-volatile memory (e.g., a one-time programmable read only memory (OTPROM), a PROM, an erasable and programmable ROM (EPROM), an electrically erasable and programmable ROM (EEPROM), a mask ROM, a flash ROM, a flash memory (e.g., a NAND flash memory or a NOR flash memory, and the like), a hard drive, or a solid state

drive (SSD)).

**[0233]** The external memory 1434 may further include a flash drive, for example, a compact flash (CF), a secure digital (SD), a micro-SD, a mini-SD, an extreme digital (xD), or a memory stick, and the like. The external memory 1434 may functionally and/or physically connect with the electronic device 1401 through various interfaces.

**[0234]** The sensor module 1440 may measure, for example, a physical quantity or may detect an operation state of the electronic device 1401, and may convert the measured or detected information to an electric signal. The sensor module 1440 may include at least one of, for example, a gesture sensor 1440A, a gyro sensor 1440B, an atmospheric pressure sensor 1440C, a magnetic sensor 1440D, an acceleration sensor 1440E, a grip sensor 1440F, a proximity sensor 1440G, a color sensor 1440H (e.g., RGB sensor), a biosensor 1440I, a temperature/humidity sensor 1440J, an illumination sensor 1440K, or a UV sensor 1440M. Additionally or alternatively, the sensor module 1440 may further include, for example, an e-nose sensor (not shown), an EMG sensor (not shown), an EEG sensor (not shown), an ECG sensor (not shown), an IR sensor (not shown), an iris sensor (not shown), and/or a fingerprint sensor (not shown), and the like. The sensor module 1440 may further include a control circuit for controlling at least one or more sensors included therein. According to various embodiments of the present disclosure, the electronic device 1401 may further include a processor configured to control the sensor module 1440, as a part of the AP 1410 or to be independent of the AP 1410. While the AP 1410 is in a sleep state, the electronic device 1410 may control the sensor module 1440.

**[0235]** The input device 1450 may include, for example, a touch panel 1452, a (digital) pen sensor 1454, a key 1456, or an ultrasonic input device 1458. The touch panel 1452 may recognize a touch input using at least one of, for example, a capacitive detecting method, a resistive detecting method, an IR detecting method, or an ultrasonic detecting method. Also, the touch panel 1452 may further include a control circuit. The touch panel 1452 may further include a tactile layer and may provide a tactile reaction to a user.

**[0236]** The (digital) pen sensor 1454 may be, for example a part of a touch panel or may include a separate sheet for recognition. The key 1456 may include, for example, a physical button, an optical key, or a keypad. The ultrasonic input device 1458 may allow the electronic device 1401 to detect a sound wave using a microphone (e.g., a microphone 1488) and to verify data through an input tool generating an ultrasonic signal.

**[0237]** The display module 1460 (e.g., a display 160 of FIG. 1) may include a panel 1462, a hologram device 1464, or a projector 1466. The panel 1462 may include the same or similar configuration as or to that of the display 160. The panel 1462 may be implemented to be, for example, flexible, transparent, or wearable. The panel 1462 and the touch panel 1452 may be integrated into one module. The hologram device 1464 may show a stereoscopic image in a space using interference of light. The projector 1466 may project light onto a screen to display an image. The screen may be positioned, for example, inside or outside the electronic device 1401. According to an embodiment of the present disclosure, the display 1460 may further include a control circuit for controlling the panel 1462, the hologram device 1464, or the projector 1466.

**[0238]** The interface 1470 may include, for example, an HDMI 1472, a USB 1474, an optical interface 1476, or a D-subminiature 1478. The interface 1470 may be included in, for example, a communication interface 170 shown in FIG. 1. Additionally or alternatively, the interface 1470 may include, for example, a mobile high definition link (MHL) interface, an SD card/multimedia card (MMC) interface, or an infrared data association (IrDA) standard interface.

**[0239]** The audio module 1480 may convert a sound and an electric signal in dual directions. At least a part of components of the audio module 1480 may be included in, for example, an input device 140 or an output device 150 shown in FIG. 1. The audio module 1480 may process sound information input or output through, for example, a speaker 1482, a receiver 1484, an earphone 1486, or the microphone 1488, and the like.

**[0240]** The camera module 1491 may be a device which captures a still picture and a moving picture. According to an embodiment of the present disclosure, the camera module 1491 may include one or more image sensors (not shown) (e.g., a front sensor or a rear sensor), a lens (not shown), an image signal processor (ISP) (not shown), or a flash (not shown) (e.g., an LED or a xenon lamp).

**[0241]** The power management module 1495 may manage, for example, power of the electronic device 1401. According to an embodiment of the present disclosure, though not shown, the power management module 1495 may include a power management integrated circuit (PMIC), a charger IC or a battery or fuel gauge. The PMIC may have a wired charging method and/or a wireless charging method. The wireless charging method may include, for example, a magnetic resonance method, a magnetic induction method, or an electromagnetic method, and the like. An additional circuit for wireless charging, for example, a coil loop, a resonance circuit, or a rectifier, and the like may be further provided. The battery gauge may measure, for example, the remaining capacity of the battery 1496 and voltage, current, or temperature thereof while the battery 1496 is charged. The battery 1496 may include, for example, a rechargeable battery or a solar battery.

**[0242]** The indicator 1497 may display a specific state of the electronic device 1401 or a part (e.g., the AP 1410) thereof, for example, a booting state, a message state, or a charging state, and the like. The motor 1498 may convert an electric signal into mechanical vibration and may generate vibration or a haptic effect, and the like. Though not shown, the electronic device 1401 may include a processing unit (e.g., a GPU) for supporting a mobile TV. The processing unit

for supporting the mobile TV may process media data according to standards, for example, a digital multimedia broadcasting (DMB) standard, a digital video broadcasting (DVB) standard, or a media flow standard, and the like.

**[0243]** Each of the above-mentioned elements of the electronic device according to various embodiments of the present disclosure may be configured with one or more components, and names of the corresponding elements may be changed according to the type of the electronic device. The electronic device according to various embodiments of the present disclosure may include at least one of the above-mentioned elements, some elements may be omitted from the electronic device, or other additional elements may be further included in the electronic device. Also, some of the elements of the electronic device according to various embodiments of the present disclosure may be combined with each other to form one entity, thereby making it possible to perform the functions of the corresponding elements in the same manner as before the combination.

**[0244]** The terminology "module" used herein may mean, for example, a unit including one of hardware, software, and firmware or two or more combinations thereof. The terminology "module" may be interchangeably used with, for example, terminologies "unit", "logic", "logical block", "component", or "circuit", and the like. The "module" may be a minimum unit of an integrated component or a part thereof. The "module" may be a minimum unit performing one or more functions or a part thereof. The "module" may be mechanically or electronically implemented. For example, the "module" may include at least one of an application-specific IC (ASIC) chip, field-programmable gate arrays (FPGAs), or a programmable-logic device, which is well known or will be developed in the future, for performing certain operations.

**[0245]** According to various embodiments of the present disclosure, at least a part of the electronic device (e.g., modules or the functions) or the method (e.g., operations) may be implemented with, for example, instructions stored in a computer-readable storage media which has a program module. When the instructions are executed by a processor, one or more processors may perform functions corresponding to the instructions. The computer-readable storage media may be, for example, the memory.

**[0246]** The computer-readable storage media may include a hard disc, a floppy disk, magnetic media (e.g., a magnetic tape), optical media (e.g., a compact disc ROM (CD-ROM), a DVD), magneto-optical media (e.g., a floptical disk), and a hardware device (e.g., a ROM, a RAM, or a flash memory, and the like), and the like. Also, the program instructions may include not only mechanical codes compiled by a compiler but also high-level language codes which may be executed by a computer using an interpreter and the like. The above-mentioned hardware device may be configured to operate as one or more software modules to perform operations according to various embodiments of the present disclosure, and vice versa.

**[0247]** Modules or program modules according to various embodiments of the present disclosure may include at least one or more of the above-mentioned components, some of the above-mentioned components may be omitted, or other additional components may be further included. Operations executed by modules, program modules, or other elements according to various embodiments of the present disclosure may be executed by a successive method, a parallel method, a repeated method, or a heuristic method. Also, some operations may be executed in a different order or may be omitted, and other operations may be added.

**[0248]** According to various embodiments of the present disclosure, the electronic device may enhance visibility of information and the degree of understanding of information according to displaying information in a more dynamic way and displaying information to be adaptive to a situation.

**[0249]** While the present disclosure has been shown and described with reference to various embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the scope of the present disclosure as defined by the appended claims and their equivalents.

## Claims

1. An electronic device comprising:

   a memory configured to store at least one object;
   a display configured to output a screen associated with the at least one object; and
   a processor configured to functionally connect with the memory and the display,
   wherein the processor controls to display a first object, associated with collected sensing information related to a human body, among objects stored in the memory, at a size on the display and to display a second object on the first object in connection with the sensing information, and
   wherein the processor modifies a size and region of the second object and a displayed motion of the second object according to accumulated sensing information and controls to output the modified second object on the first object.

2. The electronic device of claim 1, wherein the processor controls to display a third object, corresponding to a repre-

sentative value obtained from the sensing information, on the first object or the second object.

3. The electronic device of claim 2, wherein the processor controls to display a representative value, corresponding to the third object, on a region adjacent to a position where the third object is displayed; or wherein the processor controls the modifying or displaying of the second object relative to a position to display the third object.

4. The electronic device of claim 2, wherein the processor adjusts a display speed of a modified region of the second object such that a time when the second object is modified and displayed is identical relative to the third object.

5. The electronic device of claim 2,
wherein the processor controls to display a range value of sensing information associated with the first object on a region adjacent to the first object,
wherein the processor controls to display a range value of sensing information associated with the second object on a region adjacent to the second object.
wherein the processor displays a range value, according to the accumulated sensing information, with a numeral and gradually changes a numeric value from the numeral to become the range value.

6. The electronic device of claim 5,
wherein the processor changes the numeric value and displays a start value of the range value and an end value of the range value, and
wherein the processor adjusts a display change speed of the numeric value such that a change of a start numeric value which reaches the start value and a change of an end numeric value which reaches the end value are completed at a same time.

7. The electronic device of claim 1, wherein the processor collects physical characteristic information associated with a state of the electronic device or a state of the human body which provides the sensing information and modifies a display state of at least one of the first object, the second object, and a third object according to the physical characteristic information; or wherein the processor converts the sensing information into a constant numeric value, and modifies and displays the second object while mapping the numeric value to the second object.

8. A method of displaying information in an electronic device, the method comprising:

displaying a first object, associated with collected sensing information related to a human body among objects stored in a memory, at a size on a display; and
displaying a second object on the first object based on the sensing information,
wherein the displaying of the second object comprises:

outputting the second object, in which a size and region of the second object corresponding to an accumulated numeric value of the sensing information are modified and in which a displayed motion of the second object is modified, on the first object.

9. The method of claim 8, further comprising:

displaying a third object, corresponding to a representative value obtained from the sensing information, on the first object or the second object.

10. The method of claim 9, further comprising:

displaying a representative value, corresponding to the third object, on a region adjacent to a position where the third object is displayed.

11. The method of claim 9, wherein the displaying of the third object comprises:

modifying and displaying the second object relative to a position to display the third object; or
adjusting and displaying a display speed of a modified region of the second object such that a time when the second object is modified and displayed is identical relative to the third object.

12. The method of claim 9, further comprising:



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at least one of displaying a range value of sensing information associated with the first object on a region adjacent to the first object and displaying a range value of sensing information associated with the second object on a region adjacent to the second object.

**13.** The method of claim 12, further comprising:

gradually changing a numeric value from the numeric value to become the range value in a process of displaying the range value of the sensing information with a numeral; or
adjusting and displaying a display change speed of a numeric value such that a change of a start numeric value corresponding to a start value of the range value and a change of an end numeric value corresponding to an end value of the range value are completed at a same time.

**14.** The method of claim 9, further comprising:

collecting physical characteristic information associated with a state of the electronic device or a state of the human body which provides the sensing information and;
modifying a display state of at least one of the first object, the second object, and a third object according to the physical characteristic information.

**15.** An electronic device comprising:

a local-area communication module configured to establish a local-area communication channel with an external electronic device;
a memory configured to store sensing information received through the local-area communication module and at least one object to be output based on the sensing information; and
a processor configured to control to display a first object corresponding to a first range value in connection with the stored sensing information,
wherein the processor controls to output at least one of a second object, corresponding to a second range value corresponding to the collected sensing information, which is displayed in a form which is gradually changed from a position in the first object or a third object corresponding to a single value in the first range value.



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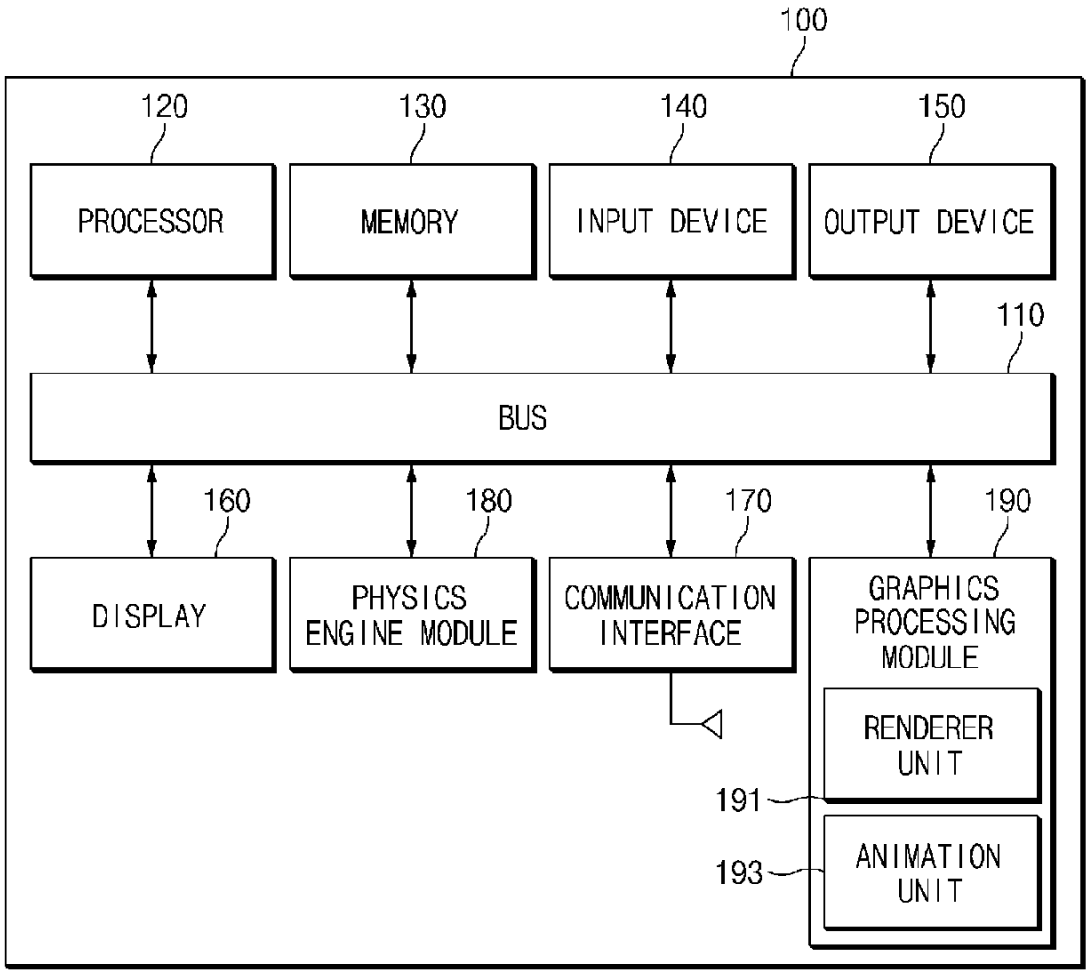



FIG.1



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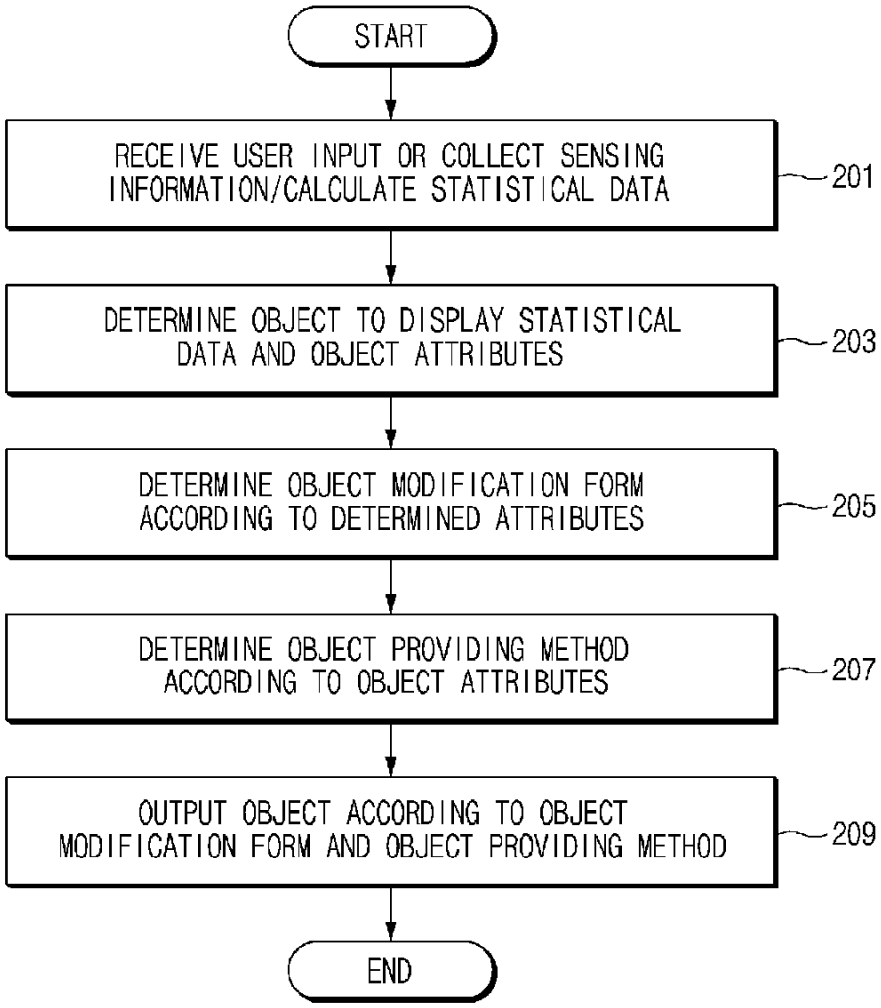



FIG.2



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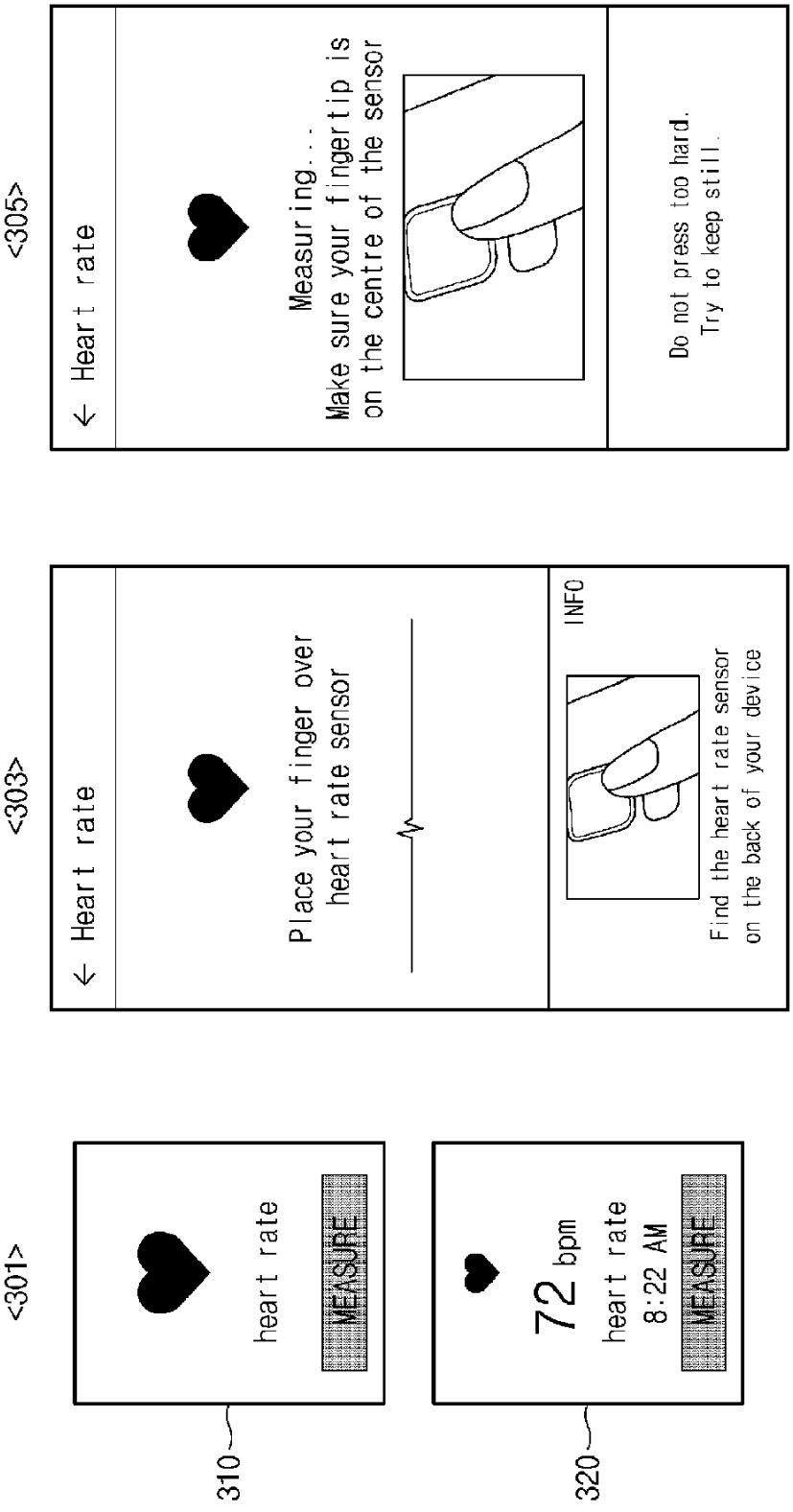



FIG.3A



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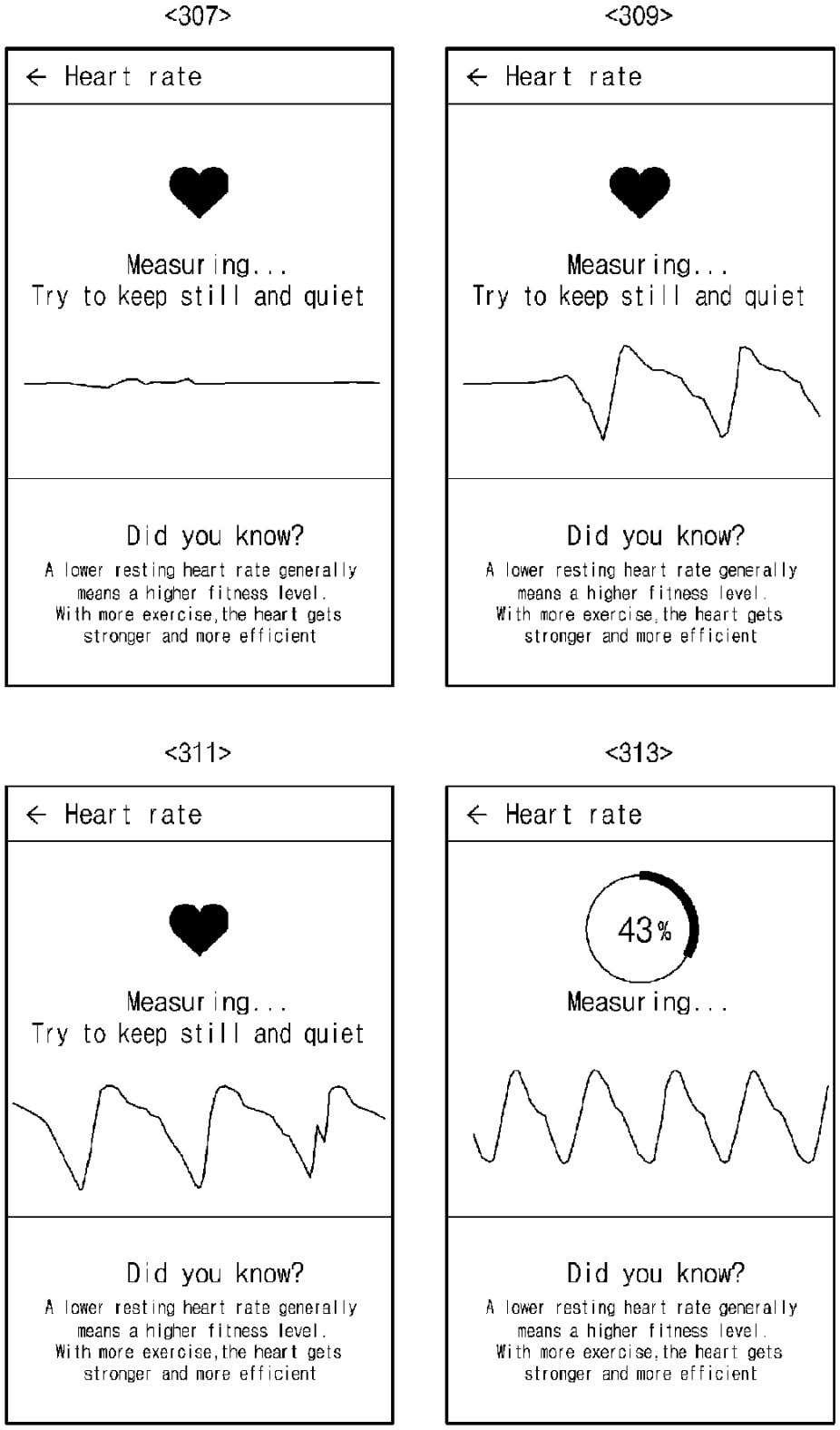



FIG.3B



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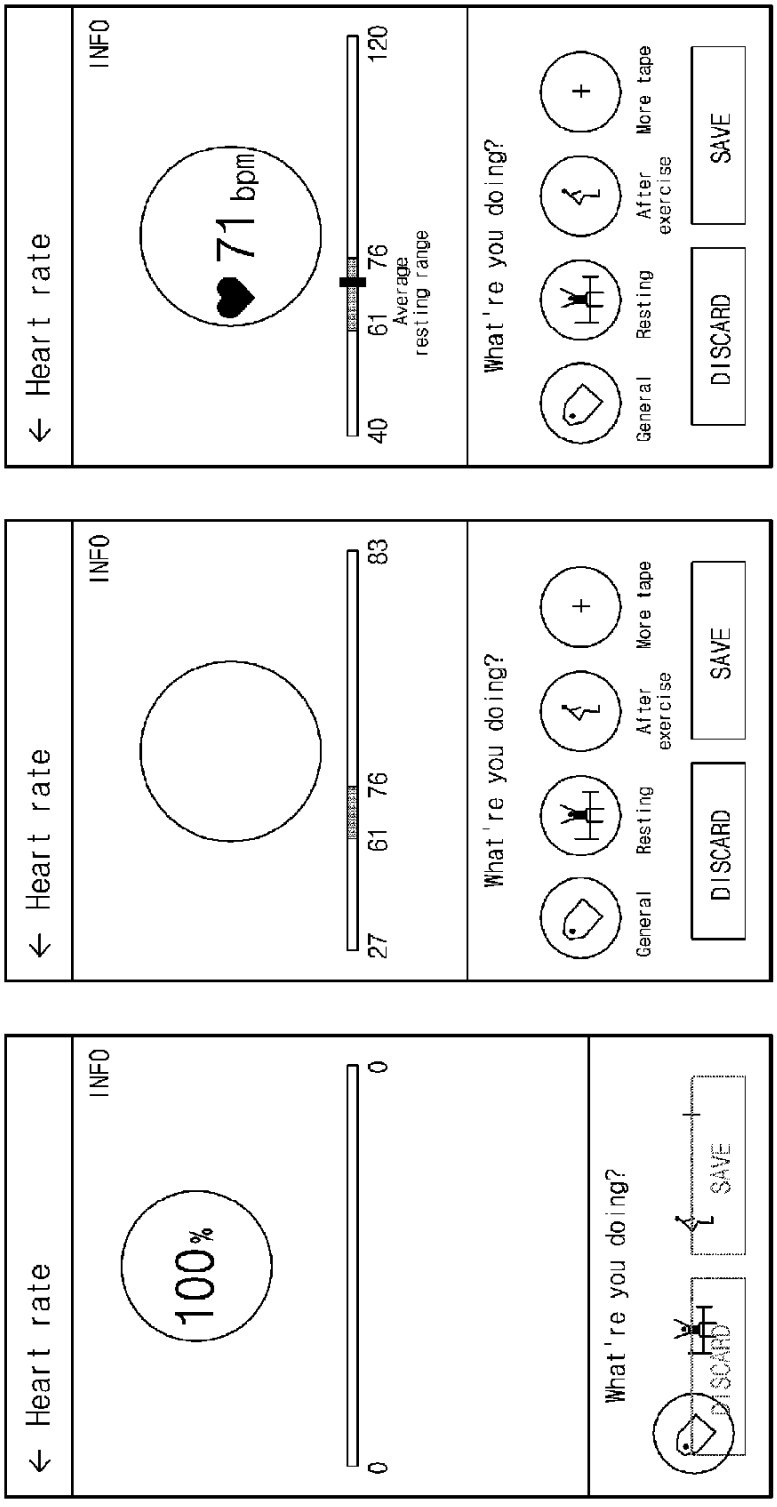



FIG.3C



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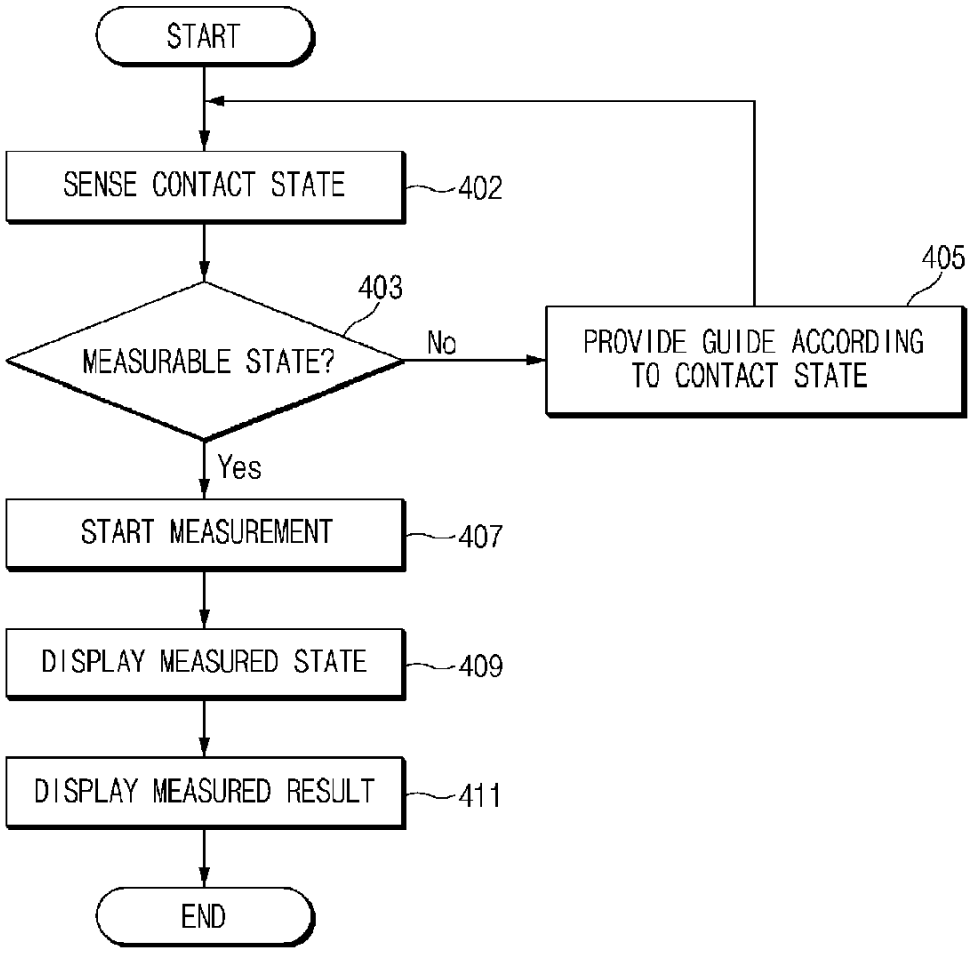



FIG.4



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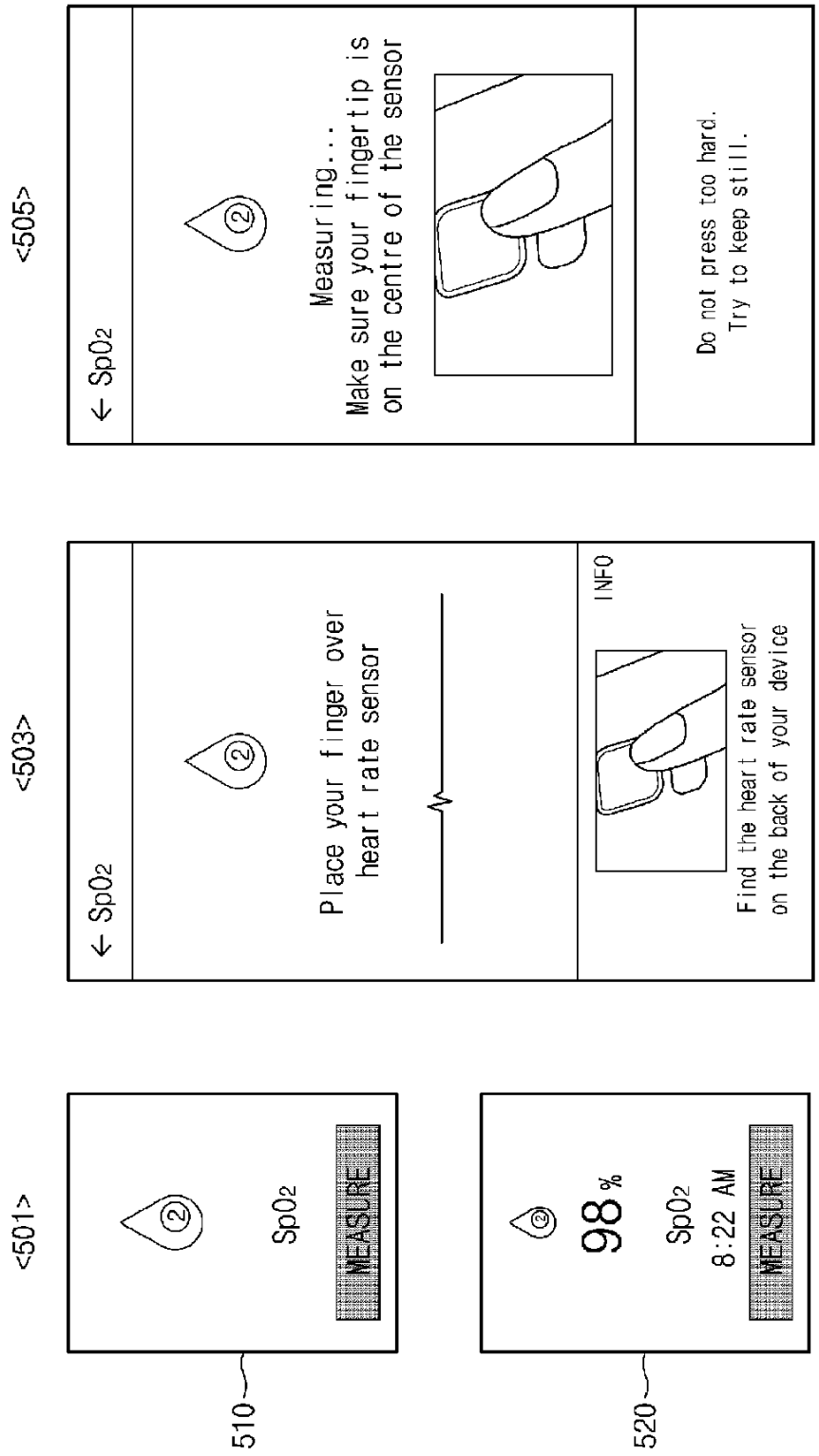



FIG. 5A



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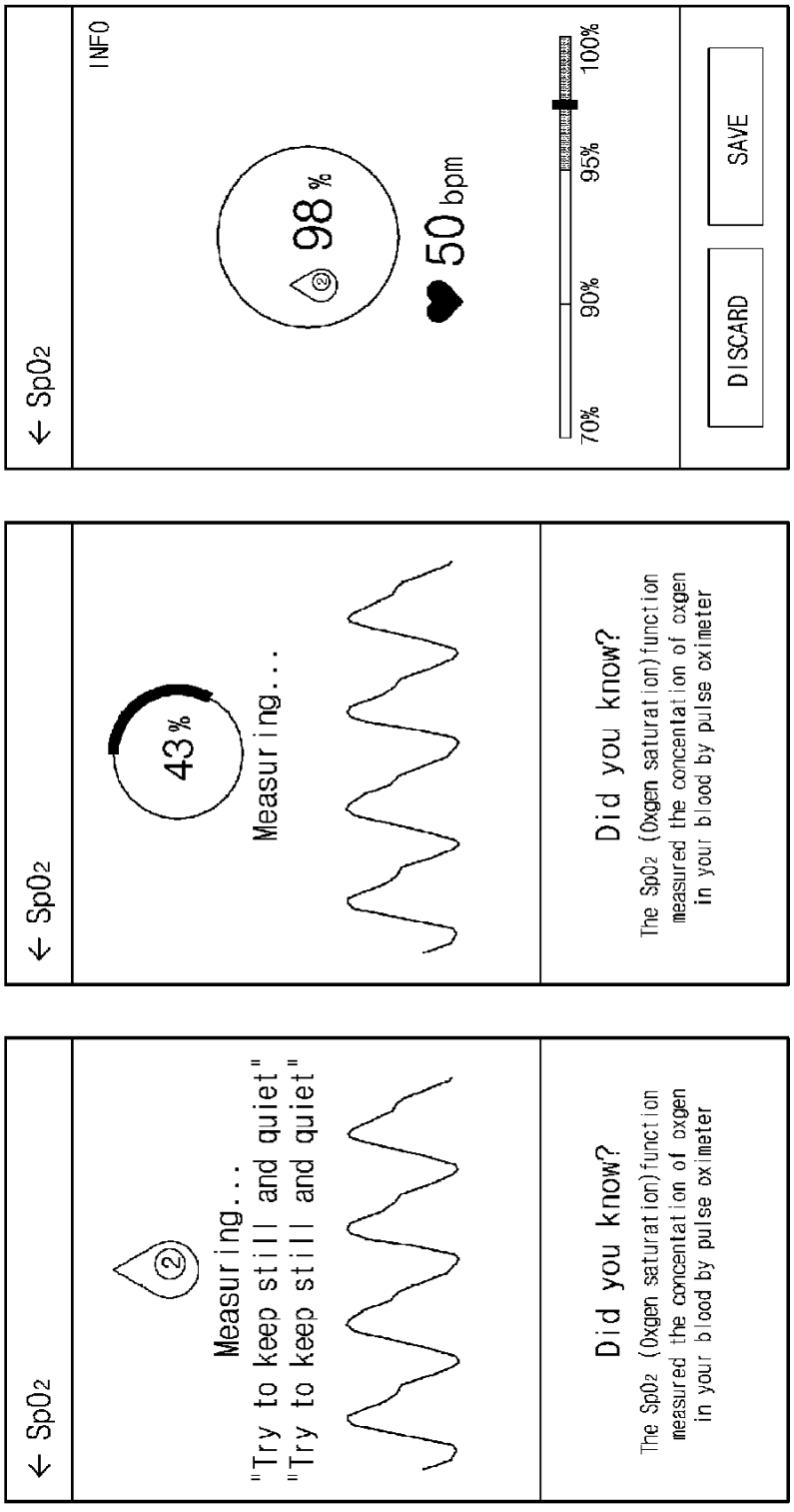



FIG.5B



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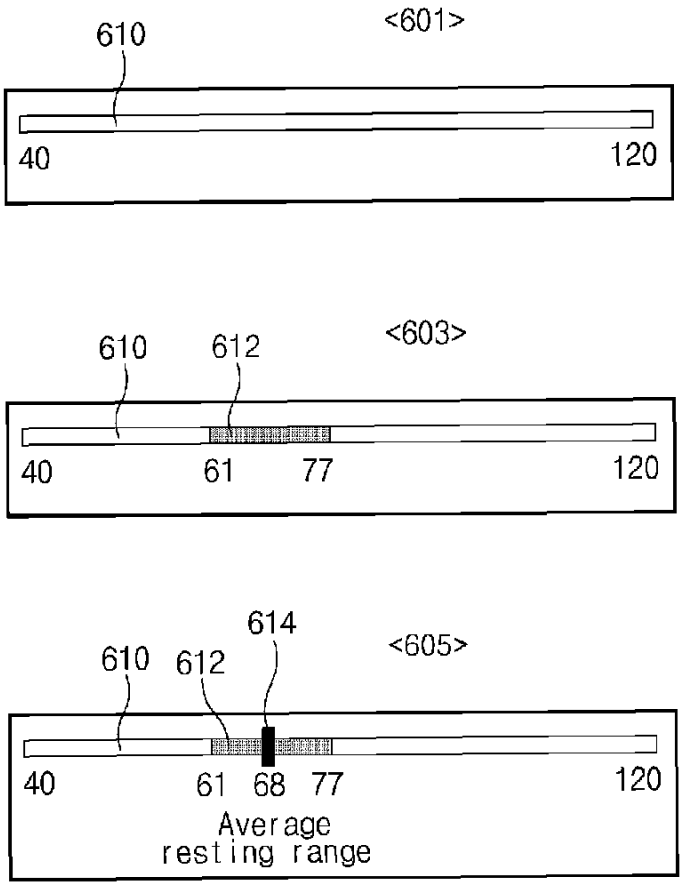



FIG.6A



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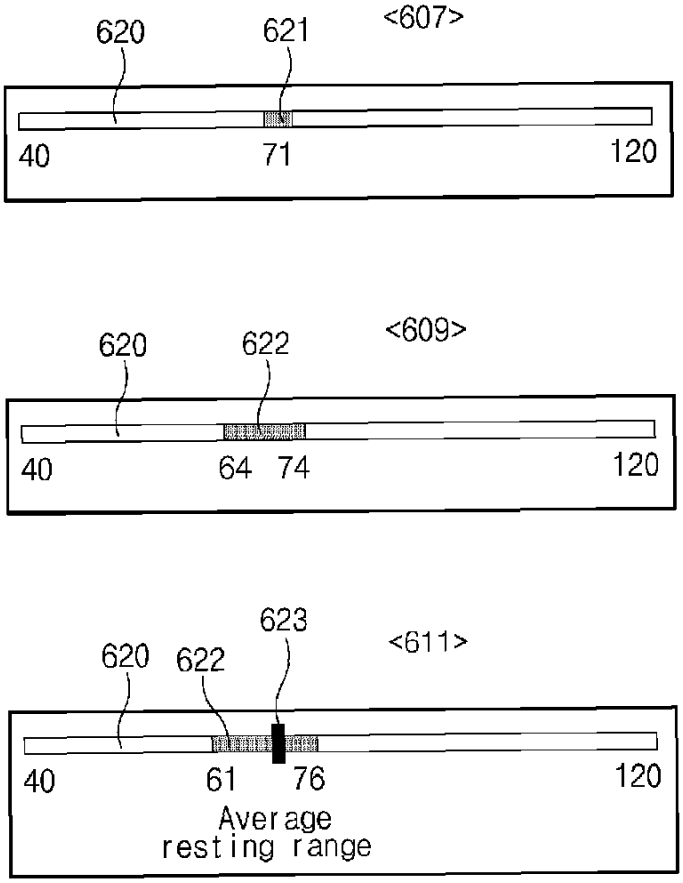



FIG.6B



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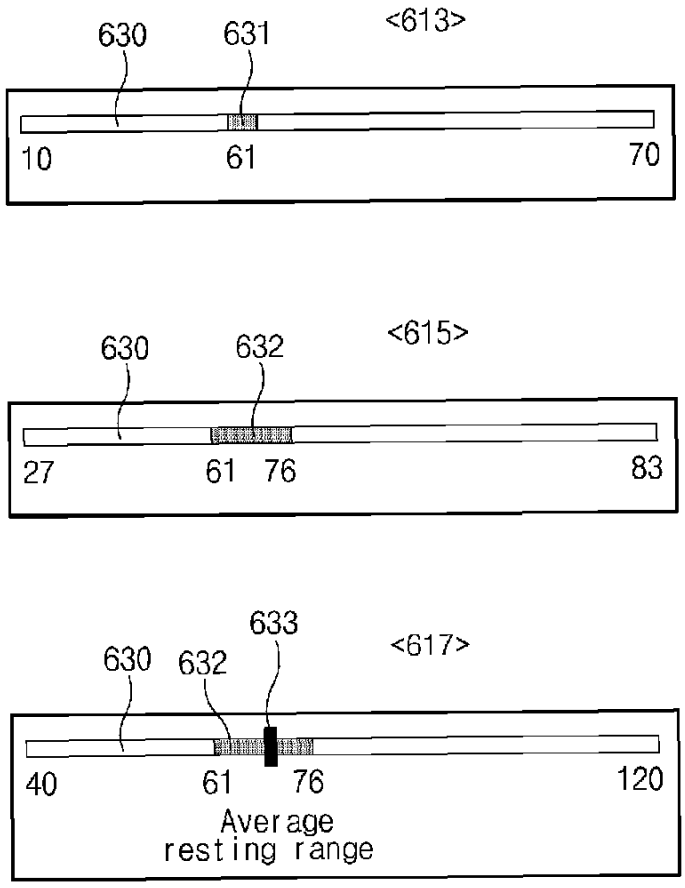



FIG.6C



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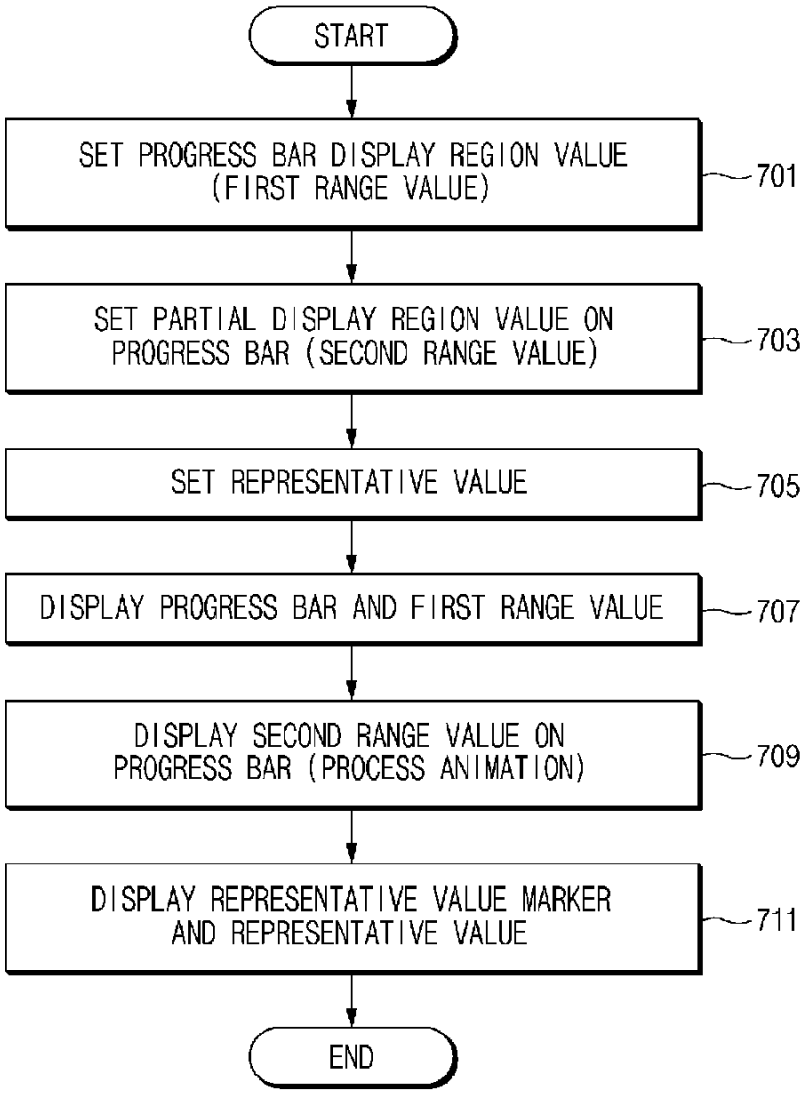



FIG.7



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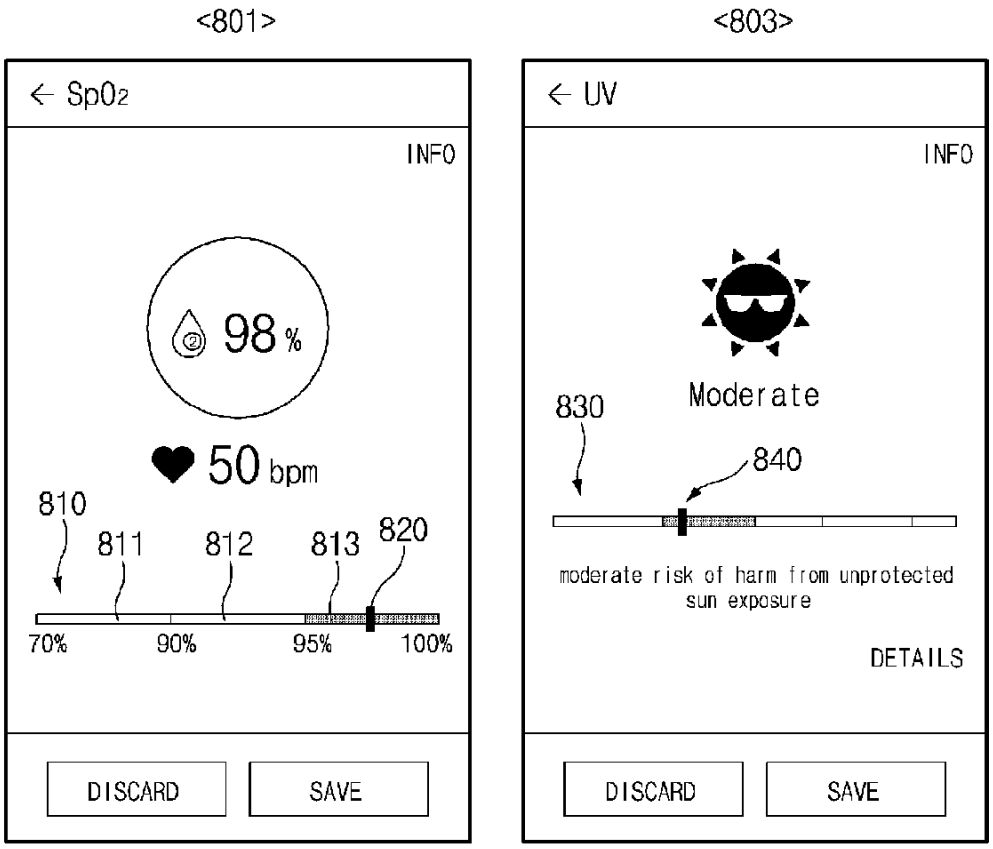



FIG.8



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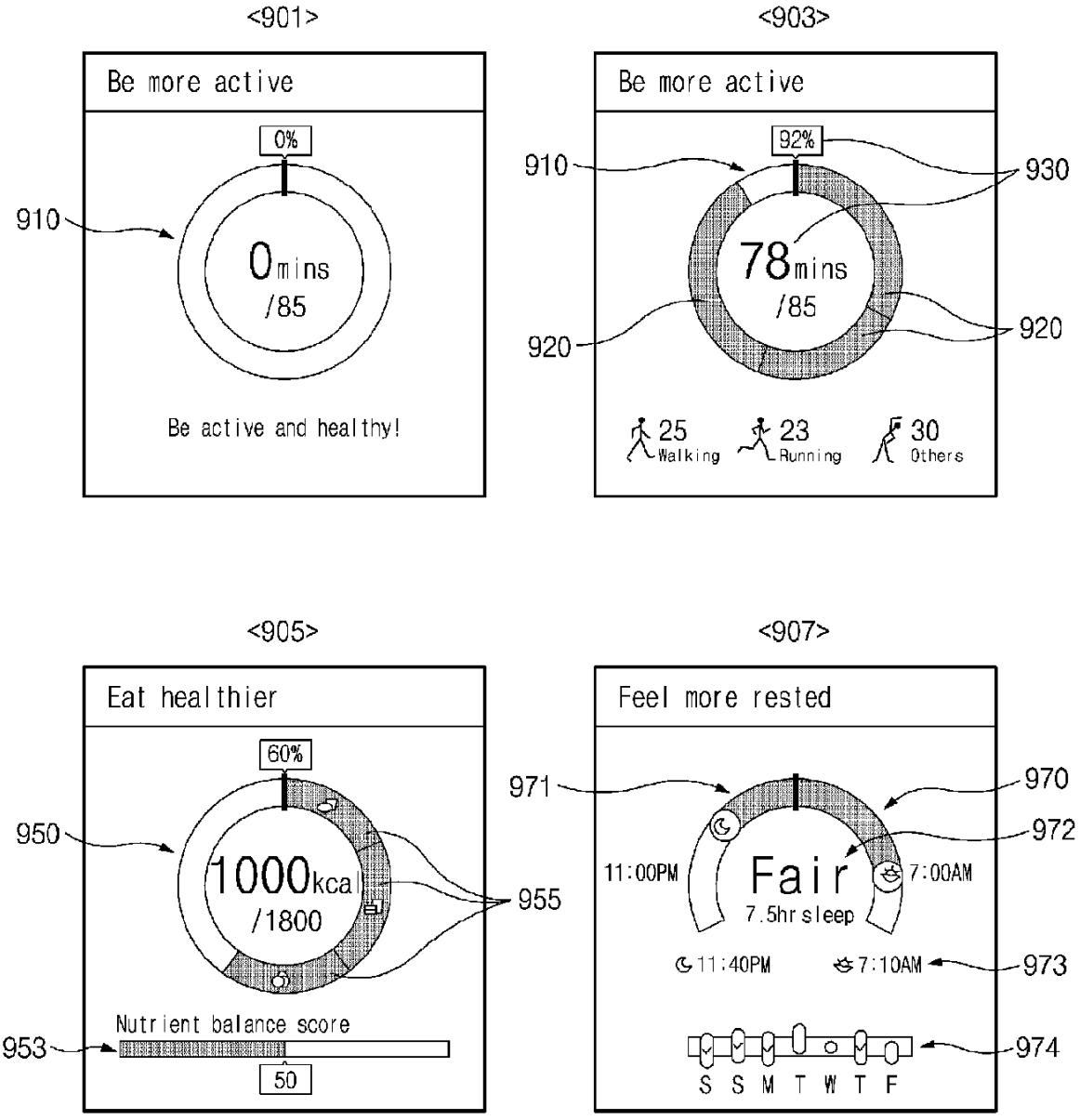

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Be more active
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910
0mins
/85
Be active and healthy!
<903>
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930
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972
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Fair
7:00AM
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11:40PM
7:10AM
973
974
S S M T W T F

FIG.9

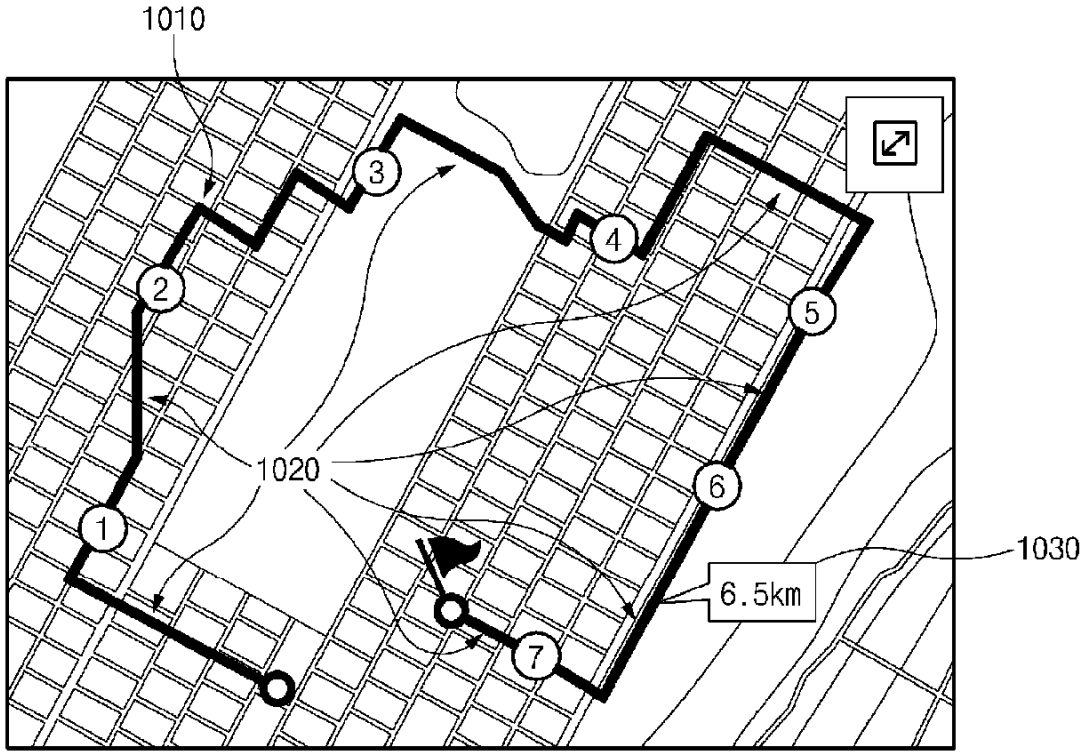



FIG.10

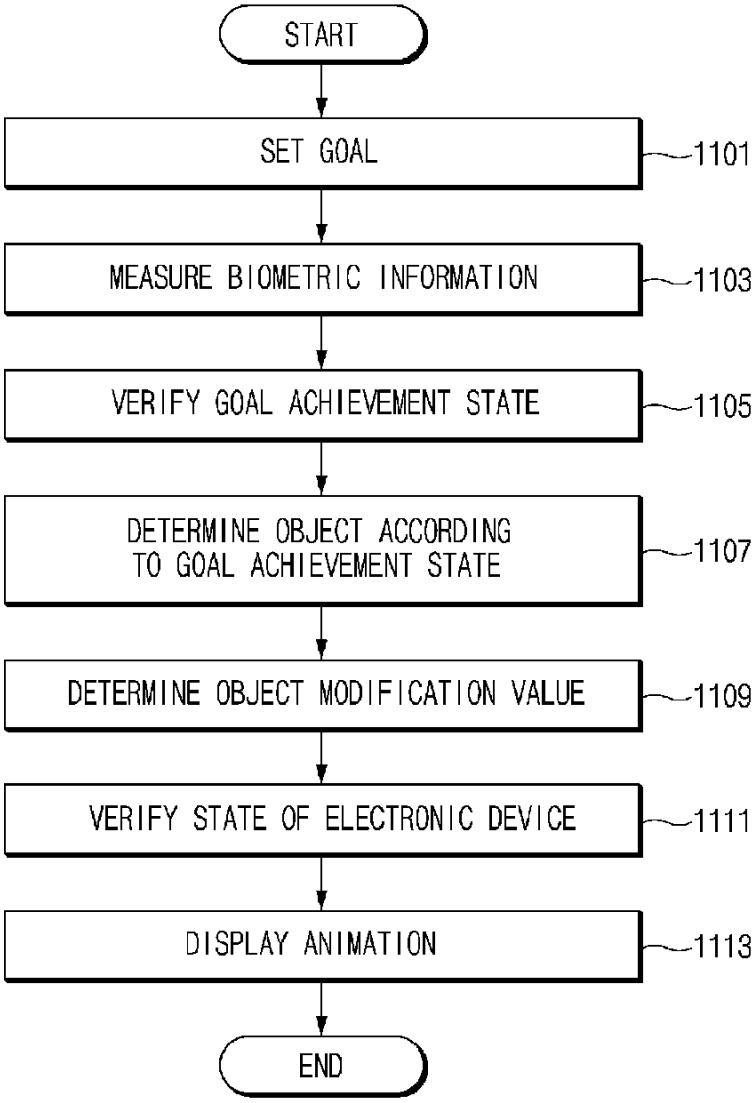



FIG.11



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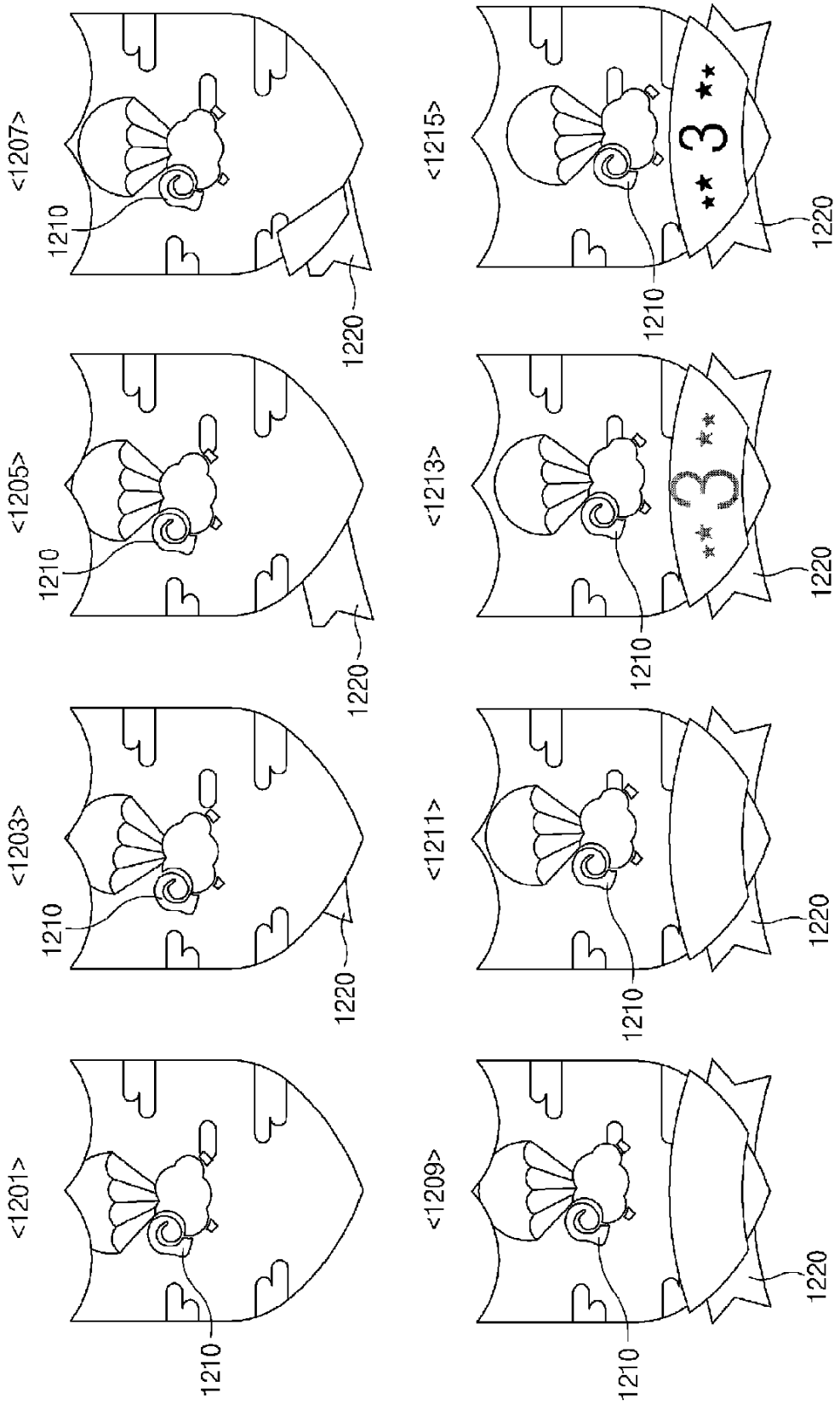



FIG. 12



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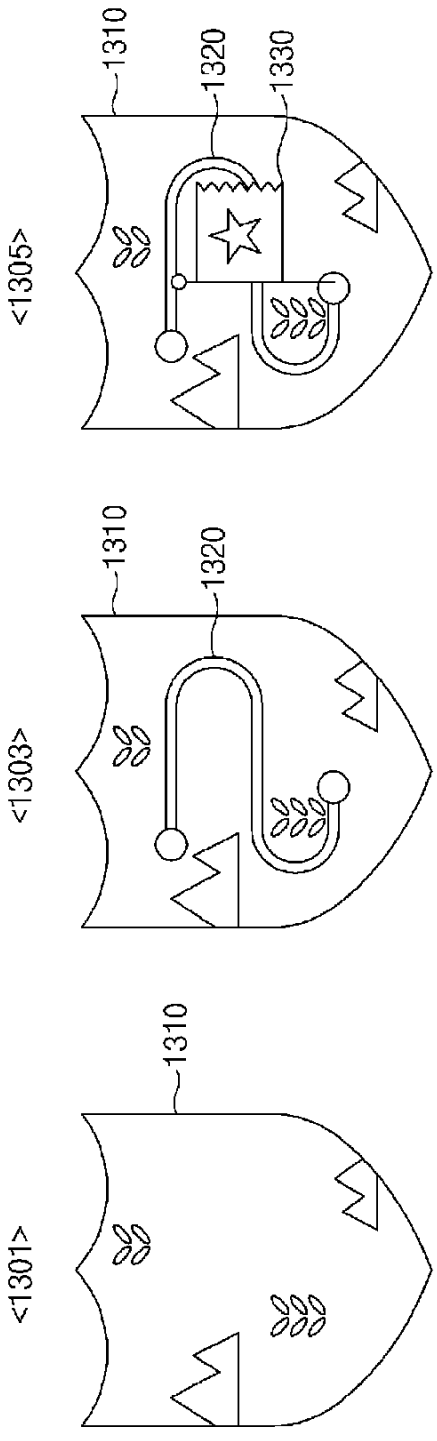



FIG. 13



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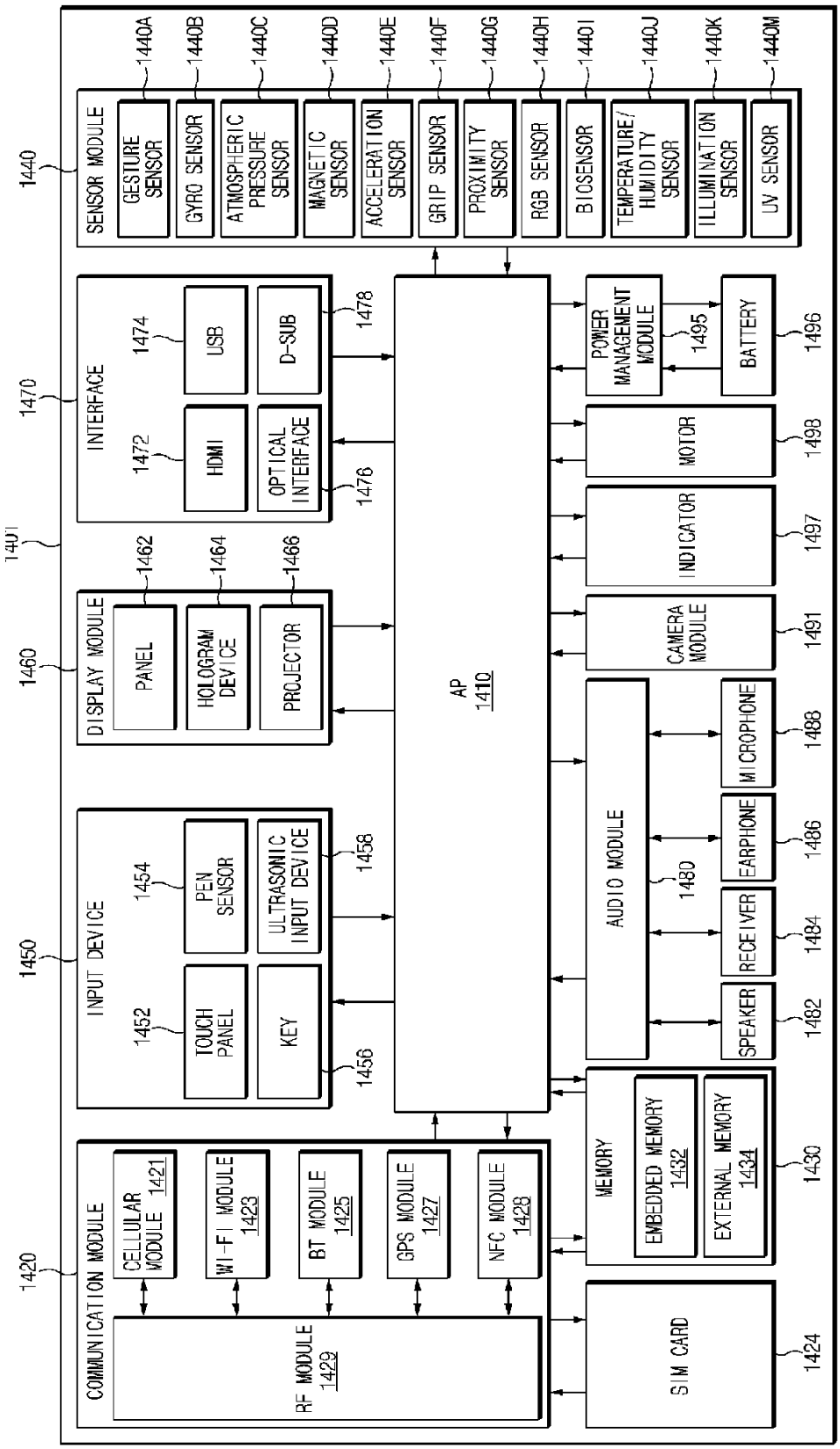



Fig. 14



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# EUROPEAN SEARCH REPORT

Application Number
EP 16 15 0316

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A61B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 4 May 2016 | Nash, Michael |

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X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)



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04-05-2016

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(12) 특허협력조약에 의하여 공개된 국제출원

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국제사무국

(43) 국제공개일
2017 년 6 월 1 일 (01.06.2017)

WIPO | PCT

(10) 국제공개번호
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*A61B 5/00* (2006.01) *G06F 1/32* (2006.01)
*A61B 5/11* (2006.01) *G06F 3/041* (2006.01)
*G06F 1/16* (2006.01)

(21) 국제출원번호: PCT/KR2015/013155

(22) 국제출원일: 2015 년 12 월 3 일 (03.12.2015)

(25) 출원언어: 한국어

(26) 공개언어: 한국어

(30) 우선권정보:
10-2015-0166027 2015 년 11 월 26 일 (26.11.2015) KR

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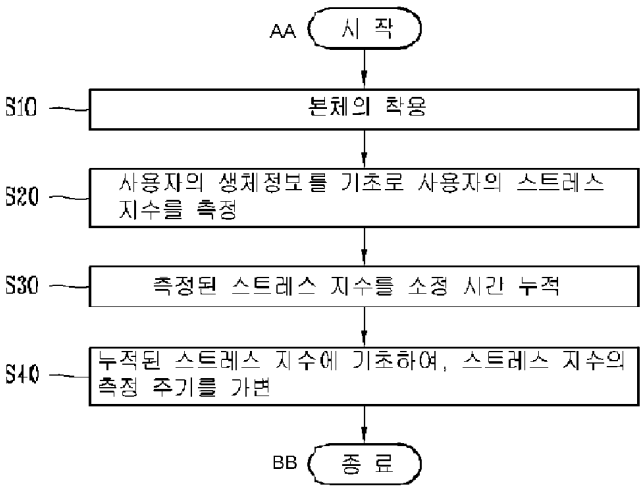
(81) 지정국 (별도의 표시가 없는 한, 가능한 모든 종류의 국내 권리의 보호를 위하여): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) 지정국 (별도의 표시가 없는 한, 가능한 모든 종류의 역내 권리의 보호를 위하여): ARIPO (BW, GH, GM,

[다음 쪽 계속]

(54) **Title**: WEARABLE DEVICE AND OPERATING METHOD THEREFOR

(54) **발명의 명칭** : 웨어러블 디바이스 및 그것의 동작방법




S10 ... Wear main body
S20 ... Measure stress index of user on basis of user's bio-information
S30 ... Accumulate measured stress index for predetermined time
S40 ... Vary measurement period of stress index on basis of accumulated stress index
AA ... Start
BB ... End

(57) **Abstract**: A wearable device and a control method therefor are disclosed. Examples of the present invention comprise: a measuring unit for measuring a stress index of a user on the basis of the user's bio-information to be sensed according to the wearing of a wearable device main body; and a control unit for accumulating the measured stress index for a predetermined time, and varying a measurement period of the stress index on the basis of the accumulated stress index. According to the examples of the present invention, stress can be regularly measured with low power, and a measurement period or a measurement mode of a stress index can be flexibly varied in consideration of the user's activity amount and stress index.

(57) **요약서**: 웨어러블 디바이스 및 그것의 제어방법이 개시된다. 본 발명의 실시 예들은, 웨어러블 디바이스 본체의 착용에 따라 감지되는 사용자의 생체정보를 기초로 사용자의 스트레스지수를 측정하는 측정부와, 측정된 스트레스 지수를 소정 시간 누적하고, 누적된 스트레스 지수에 기초하여 스트레스지수의 측정 주기를 가변하는 제어부를 포함하여 이루어진다. 이에 의하면, 저전력으로 상시 스트레스를 측정할 수 있고, 사용자의 활동량, 스트레스지수를 고려하여 스트레스지수의 측정 주기나 측정 모드를 유연하게 가변할 수 있다.

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KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), 유라시아 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 유럽 (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**공개**:

— 국제조사보고서와 함께 (조약 제 21 조(3))

# 명세서

## 발명의 명칭: 웨어러블 디바이스 및 그것의 동작방법

### 기술분야

[1] 본 발명은 사용자의 생체신호를 감지하는 것이 가능한 웨어러블 디바이스 및 그것의 동작방법에 관한 것이다.

### 배경기술

[2] 단말기는 이동 가능여부에 따라 이동 단말기(mobile/portable terminal) 및 고정 단말기(stationary terminal)으로 나뉠 수 있다. 다시 이동 단말기는 사용자의 직접 휴대 가능 여부에 따라 휴대(형) 단말기(handheld terminal) 및 거치형 단말기(vehicle mounted terminal)로 나뉠 수 있다.

[3] 이동 단말기의 기능은 다양화 되고 있다. 예를 들면, 데이터와 음성통신, 카메라를 통한 사진촬영 및 비디오 촬영, 음성녹음, 스피커 시스템을 통한 음악파일 재생 그리고 디스플레이부에 이미지나 비디오를 출력하는 기능이 있다. 일부 단말기는 전자게임 플레이 기능이 추가되거나, 멀티미디어 플레이어 기능을 수행한다. 특히 최근의 이동 단말기는 방송과 비디오나 텔레비전 프로그램과 같은 시각적 컨텐츠를 제공하는 멀티캐스트 신호를 수신할 수 있다. 이와 같은 단말기(terminal)는 기능이 다양화됨에 따라 예를 들어, 사진이나 동영상의 촬영, 음악이나 동영상 파일의 재생, 게임, 방송의 수신 등의 복합적인 기능들을 갖춘 멀티미디어 기기(Multimedia player) 형태로 구현되고 있다.

[4] 이러한 단말기의 기능 지지 및 증대를 위해, 단말기의 구조적인 부분 및/또는 소프트웨어적인 부분을 개량하는 것이 고려될 수 있다. 예를 들어, 이동 단말기는 사용자가 주로 손에 쥐고 사용하는 차원을 넘어서, 신체에 착용할 수 있는 웨어러블 디바이스(wearable device)로 확장될 수 있다.

[5] 이와 같은 웨어러블 디바이스는 사용자의 사용 목적이나 의도에 따라 신체의 다양한 위치에 장착되어 사용될 수 있으며, 구비된 센서들을 이용하여 사용자의 움직임이나 생체신호를 감지할 수 있고, 그에 따라 다양한 기능을 수행할 수 있다.

[6] 예를 들어, 웨어러블 디바이스를 이용하여 감지된 생체정보를 기초로 사용자의 스트레스 지수를 산출할 수 있고, 그에 따라 사용자의 스트레스를 관리하는 것이 가능하다.

### 발명의 상세한 설명

### 기술적 과제

[7] 본 발명의 일 목적은, 사용자의 스트레스 상태를 상시 감시하되, 상황에 따라 스트레스 지수의 측정 주기를 가변하는 것이 가능한 웨어러블 디바이스 및 그것의 동작방법을 제공하는데 있다.

[8] 또한, 본 발명의 또 다른 목적은, 사용자의 스트레스 상태를 상시 감시하여,

증가된 스트레스를 빠르고 효율적으로 감소시킬 수 있도록 개인 맞춤형 서비스를 제공하는 것이 가능한 웨어러블 디바이스 및 그것의 동작방법을 제공하는데 있다.

[9] 또한, 본 발명의 또 다른 목적은, 현재 상황을 고려하여 스트레스 상태를 판단하고, 사용자의 상태와 현재 상황에 적절한 방식으로 또한 사용자에게 친숙한 UI로 스트레스 해소 서비스를 제공하는 것이 가능한 웨어러블 디바이스 및 그것의 동작방법을 제공하는데 있다.

## 과제 해결 수단

[10] 상기한 목적 중 적어도 하나를 해결하기 위해, 본 발명의 일 측면에 따른 웨어러블 디바이스는, 웨어러블 디바이스 본체와; 본체의 착용에 따라 감지되는 사용자의 생체정보를 기초로 사용자의 스트레스지수를 측정하는 측정부와; 측정된 스트레스 지수를 소정 시간 누적하고, 누적된 스트레스 지수에 기초하여 스트레스지수의 측정 주기를 가변하는 제어부를 포함하여 이루어진다.

[11] 또한, 일 실시 예에서, 상기 제어부는, 누적된 스트레스지수가 기준범위내에서 모니터링되면 스트레스지수의 측정 주기를 기준값보다 길게 하고, 누적된 스트레스지수가 기준범위를 벗어난 것이 모니터링되면 스트레스지수의 측정 주기를 기준값보다 짧게 제어하는 것을 특징으로 한다.

[12] 또한, 일 실시 예에서, 상기 제어부는, 누적된 스트레스지수를 본체의 위치 정보와 연관시켜 위치별 스트레스지표를 생성하는 것을 특징으로 한다.

[13] 또한, 일 실시 예에서, 상기 제어부는, 스트레스지수의 측정시, 본체의 위치 정보에 대응되는 스트레스지표를 기준으로 스트레스 상태를 판단하는 것을 특징으로 한다.

[14] 또한, 일 실시 예에서, 상기 제어부는, 본체의 현재 위치 정보에 대응되는 스트레스지표에 근거하여, 스트레스지수의 측정 주기를 변경하는 것을 특징으로 한다.

[15] 또한, 일 실시 예에서, 상기 제어부는, 본체의 현재 위치 정보에 대응되는 스트레스지표를 선택하고, 선택된 스트레스지표의 베이스가 기준값 이하이면 스트레스지수의 측정 주기를 기준치보다 길게 하고, 선택된 스트레스지표의 베이스가 기준값을 초과하면 스크레스지수의 측정 주기를 기준치보다 짧게 제어하는 것을 특징으로 한다.

[16] 또한, 일 실시 예에서, 상기 제어부는, 본체의 착용에 따라 감지되는 사용자의 움직임 정보를 획득하고, 획득된 움직임 정보에 기초하여 스트레스지수의 측정 모드에 진입하는 것을 특징으로 한다.

[17] 또한, 일 실시 예에서, 상기 측정 모드는, 사용자의 생체정보를 감지하기 위해 활성화되는 센서의 종류 및 개수, 생체정보의 분석방식 중 적어도 하나를 달리하는 복수의 동작 모드를 포함하는 것을 특징으로 한다.

[18] 또한, 일 실시 예에서, 상기 제어부는, 상기 획득된 움직임 정보에 대응되는

사용자의 활동량을 산출하고, 산출된 활동량을 기초로 상기 복수의 동작 모드 중 어느 하나를 실행하여 스트레스 지수를 측정하는 것을 특징으로 한다.

[19] 또한, 일 실시 예에서, 상기 복수의 동작 모드는 저전력 모드 및 정밀 모드를 포함하고, 상기 제어부는, 기준 시간 동안 산출된 활동량이 소정값 이하이면 상기 저전력 모드로 스트레스지수를 측정하고, 상기 저전력 모드에서 기준범위의 임계값을 벗어나는 스트레스지수가 감지되거나 또는 산출된 활동량이 임계치를 초과하는 상태가 소정 시간 지속되면, 상기 정밀 모드로 변경하여 스트레스지수를 측정하는 것을 특징으로 한다.

[20] 또한, 일 실시 예에서, 상기 웨어러블 디바이스는 터치스크린과; 증가된 스트레스지수가 기준범위내로 완화되는 구간에서의 상황 정보를 수집하여 저장하는 저장부;를 더 포함한다. 또한, 상기 제어부는, 측정된 스트레스지수가 기준범위의 임계값을 벗어나면, 본체의 위치 정보를 기준으로 상기 저장부에 저장된 상황 정보 중 적어도 하나를 추출하고, 추출된 상황 정보와 관련된 스트레스 해소 정보를 상기 터치스크린에 출력하는 것을 특징으로 한다.

[21] 또한, 일 실시 예에서, 상기 상황 정보는 본체의 위치 정보 및 시간 정보 중 적어도 하나와 연관되어 저장되는 것을 특징으로 한다.

[22] 또한, 일 실시 예에서, 측정된 스트레스지수가 기준범위의 임계값을 벗어나면, 스트레스 상태를 알려주는 알림 아이콘이 터치 스크린에 출력되고, 상기 알림 아이콘에 터치입력이 가해지면, 상기 추출된 상황 정보와 관련된 스트레스 해소 정보를 제공하기 위한 애플리케이션의 아이콘이 상기 터치 스크린에 출력되는 것을 특징으로 한다.

[23] 또한, 일 실시 예에서,상기 알림 아이콘은, 상기 터치 스크린에 터치입력이 가해지거나 또는 상기 본체가 기설정된 시간 또는 기설정된 위치에 진입한 것이 감지된 경우에 출력되는 것을 특징으로 한다.

[24] 또한, 일 실시 예에서,상기 애플리케이션의 아이콘은, 측정된 스트레스지수, 본체의 현재 위치 정보, 및 사용자의 선호도 중 적어도 하나에 기초하여 디스플레이되는 것을 특징으로 한다.

[25] 또한, 일 실시 예에서,상기 제어부는, 상기 알림 아이콘의 출력시 대응되는 알람을 출력하고, 상기 알람은 측정된 스트레스지수가 기준범위의 임계값을 벗어난 정도에 따라 강도가 달라지는 것을 특징으로 한다.

[26] 또한, 일 실시 예에서,상기 스트레스 해소 정보는, 상기 측정된 스트레스지수를 기초로 생성된 심호흡 주기를 따라하도록 유도하는 프롬프트를 포함하는 것을 특징으로 한다.

[27] 또한, 일 실시 예에서,상기 제어부는, 상기 스트레스 해소 정보가 출력되는 동안 스트레스지수를 측정하고, 증가된 스트레스지수가 기준범위내로 감소되는 것을 모니터링하여, 대응되는 상황 정보를 업데이트하는 것을 특징으로 한다.

[28] 본 발명의 또 다른 측면에 따른 웨어러블 디바이스의 동작방법은, 본체의 착용을 감지하는 단계와; 사용자의 생체정보를 기초로 사용자의

스트레스지수를 측정하는 단계와; 측정된 스트레스지수를 소정 시간 누적하는 단계와; 그리고, 누적된 스트레스지수에 기초하여 스트레스지수의 측정 주기를 가변하는 단계를 포함하여 이루어진다.

[29] 또한, 일 실시 예에서, 상기 스트레스지수의 측정 주기를 가변하는 단계는, 누적된 스트레스지수가 기준범위내에서 모니터링되면 스트레스지수의 측정 주기를 기준값보다 길게 하고, 누적된 스트레스지수가 기준범위를 벗어난 것이 모니터링되면 스트레스지수의 측정 주기를 기준값보다 짧게 측정 주기를 변경하는 단계를 포함하는 것을 특징으로 한다.

[30] 또한, 일 실시 예에서, 상기 스트레스지수의 측정 주기를 가변하는 단계는, 누적된 스트레스지수를 본체의 위치 정보와 연관시켜 위치별 스트레스지표를 생성하는 단계와; 본체의 현재 위치 정보에 대응되는 스트레스지표에 기초하여, 스트레스지수의 측정 주기를 변경하는 단계를 더 포함하는 것을 특징으로 한다.

[31] 또한, 일 실시 예에서, 증가된 스트레스지수가 기준범위내로 완화되는 구간에서의 상황 정보를 수집하여 저장하는 단계와; 측정된 스트레스지수가 기준범위의 임계값을 벗어나면, 본체의 위치 정보를 기준으로 저장된 상황 정보 중 적어도 하나를 추출하는 단계와; 추출된 상황 정보와 관련된 스트레스 해소 정보를 출력하는 단계를 더 포함하는 것을 특징으로 한다.

## 발명의 효과

[32] 본 발명에 따른 웨어러블 디바이스 및 그 제어 방법의 효과에 대해 설명하면 다음과 같다.

[33] 본 발명의 실시 예들 중 적어도 하나에 의하면, 저전력으로 상시 스트레스를 측정할 수 있고, 사용자의 활동량, 스트레스지수, 현재 위치 등의 다양한 상황을 고려하여 스트레스지수의 측정 주기나 측정 모드를 유연하게 가변할 수 있으므로, 스트레스지수의 측정 신뢰도 향상과 전력 소모 감소를 동시에 만족시킬 수 있다.

[34] 또한, 스트레스 발생시, 현재 상황에서 활용하기에 보다 적합한 스트레스 해소 정보를 선별적으로 제공할 수 있다. 또한, 그러한 스트레스 해소 정보를 현재 사용자에게 친숙한 UI를 사용하여 제공한다. 그에 따라, 증가된 스트레스를 빠르고 효율적으로 감소시키는데 도움을 주며, 사용자 개인에 특화된 서비스를 제공할 수 있다.

[35] 본 발명의 적용 가능성의 추가적인 범위는 이하의 상세한 설명으로부터 명백해질 것이다. 그러나 본 발명의 사상 및 범위 내에서 다양한 변경 및 수정은 당업자에게 명확하게 이해될 수 있으므로, 상세한 설명 및 본 발명의 바람직한 실시 예와 같은 특정 실시 예는 단지 예시로 주어진 것으로 이해되어야 한다.

## 도면의 간단한 설명

[36] 도 1a는 본 발명과 관련된 웨어러블 디바이스를 설명하기 위한 블록도이다.

[37] 도 1b는 본 발명과 관련된 웨어러블 디바이스가 동작가능한 시스템을 설명하기

위한 도면이다.

[38] 도 2는 본 발명과 관련된 웨어러블 디바이스의 일 예로, 와치형 웨어러블 디바이스의 일 예를 보인 사시도이다.

[39] 도 3은 본 발명의 실시 예에 따른 웨어러블 디바이스에서 구현되는 동작을 설명하기 위한 대표 흐름도이다.

[40] 도 4a 내지 도 4d는 본 발명의 실시 예에 따라, 사용자의 생체정보를 이용하여 스트레스지수를 측정하는 방법과 관련된 도면들이다.

[41] 도 5는 본 발명의 실시 예에 따라, 사용자의 활동 패턴을 기초로 스트레스지수의 측정 주기를 가변하는 방법을 설명하기 위한 그래프이다.

[42] 도 6은 본 발명의 실시 예에 따라, 측정 위치별로 스트레스지수의 측정 주기를 가변하는 방법을 설명하기 위한 도면이다.

[43] 도 7a 및 도 7b는 본 발명의 실시 예에 따라, 움직임 정보와 스트레스지수를 기초로 스트레스지수의 측정 모드를 변경하는 방법을 보여주는 개념도들이다.

[44] 도 8은 내지 도 13은 본 발명의 실시 예에 따라, 스트레스 상태와 스트레스 해소 서비스를 제공하는 방법의 다양한 예시들을 설명하기 위한 개념도들이다.

## 발명의 실시를 위한 형태

[45] 이하, 첨부된 도면을 참조하여 본 명세서에 개시된 실시 예를 상세히 설명하되, 도면 부호에 관계없이 동일하거나 유사한 구성요소는 동일한 참조 번호를 부여하고 이에 대한 중복되는 설명은 생략하기로 한다. 이하의 설명에서 사용되는 구성요소에 대한 접미사 "모듈" 및 "부"는 명세서 작성의 용이함만이 고려되어 부여되거나 혼용되는 것으로서, 그 자체로 서로 구별되는 의미 또는 역할을 갖는 것은 아니다. 또한, 본 명세서에 개시된 실시 예를 설명함에 있어서 관련된 공지 기술에 대한 구체적인 설명이 본 명세서에 개시된 실시 예의 요지를 흐릴 수 있다고 판단되는 경우 그 상세한 설명을 생략한다. 또한, 첨부된 도면은 본 명세서에 개시된 실시 예를 쉽게 이해할 수 있도록 하기 위한 것일 뿐, 첨부된 도면에 의해 본 명세서에 개시된 기술적 사상이 제한되지 않으며, 본 발명의 사상 및 기술 범위에 포함되는 모든 변경, 균등물 내지 대체물을 포함하는 것으로 이해되어야 한다.

[46] 본 명세서에서 설명되는 이동 단말기에는 휴대폰, 스마트 폰(smart phone), 노트북 컴퓨터(laptop computer), 디지털방송용 단말기, PDA(personal digital assistants), PMP(portable multimedia player), 네비게이션, 슬레이트 PC(slate PC), 태블릿 PC(tablet PC), 울트라북(ultrabook), 웨어러블 디바이스(wearable device, 예를 들어, 워치형 단말기 (smartwatch), 글래스형 단말기 (smart glass), HMD(head mounted display)) 등이 포함될 수 있다.

[47] 그러나, 본 명세서에 기재된 실시 예에 따른 구성은 이동 단말기에만 적용 가능한 경우를 제외하면, 디지털 TV, 데스크탑 컴퓨터, 디지털 사이니지 등과 같은 고정 단말기에도 적용될 수도 있음을 본 기술분야의 당업자라면 쉽게 알 수

있을 것이다.

[48] 한편, 이동 단말기는 사용자가 주로 손에 쥐고 사용하는 차원을 넘어서, 신체에 착용할 수 있는 웨어러블 디바이스(wearable device)로 확장될 수 있다. 이러한 웨어러블 디바이스에는 스마트 워치(smart watch), 스마트 글래스(smart glass), HMD(head mounted display) 등이 있다. 이하, 웨어러블 디바이스로 확장된 이동 단말기의 예들에 대하여 설명하기로 한다.

[49] 웨어러블 디바이스는 다른 이동 단말기(100)와 데이터를 상호 교환(또는 연동) 가능하게 이루어질 수 있다. 근거리 통신 모듈(114)은, 이동 단말기(100) 주변에 통신 가능한 웨어러블 디바이스를 감지(또는 인식)할 수 있다. 나아가, 제어부(180)는 감지된 웨어러블 디바이스가 이동 단말기(100)와 통신하도록 인증된 디바이스인 경우, 이동 단말기(100)에서 처리되는 데이터의 적어도 일부를, 근거리 통신 모듈(114)을 통하여 웨어러블 디바이스로 전송할 수 있다. 따라서, 사용자는 이동 단말기(100)에서 처리되는 데이터를 웨어러블 디바이스를 통하여 이용할 수 있다. 예를 들어, 이동 단말기(100)에 전화가 수신된 경우 웨어러블 디바이스를 통해 전화 통화를 수행하거나, 이동 단말기(100)에 메시지가 수신된 경우 웨어러블 디바이스를 통해 상기 수신된 메시지를 확인하는 것이 가능하다.

[50] 도 1a는 본 발명과 관련된 웨어러블 디바이스를 설명하기 위한 블록도이다.

[51] 상기 웨어러블 디바이스(100)는 무선 통신부(110), 입력부(120), 감지부(140), 출력부(150), 인터페이스부(160), 메모리(170), 제어부(180) 및 전원 공급부(190) 등을 포함할 수 있다. 도 1a에 도시된 구성요소들은 웨어러블 디바이스를 구현하는데 있어서 필수적인 것은 아니어서, 본 명세서 상에서 설명되는 웨어러블 디바이스는 위에서 열거된 구성요소들 보다 많거나, 또는 적은 구성요소들을 가질 수 있다.

[52] 보다 구체적으로, 상기 구성요소들 중 무선 통신부(110)는, 웨어러블 디바이스(100)와 무선 통신 시스템 사이, 웨어러블 디바이스(100)와 다른 웨어러블 디바이스(100) 사이, 또는 웨어러블 디바이스(100)와 외부서버 사이의 무선 통신을 가능하게 하는 하나 이상의 모듈을 포함할 수 있다. 또한, 상기 무선 통신부(110)는, 웨어러블 디바이스(100)를 하나 이상의 네트워크에 연결하는 하나 이상의 모듈을 포함할 수 있다.

[53] 이러한 무선 통신부(110)는, 방송 수신 모듈(111), 이동통신 모듈(112), 무선 인터넷 모듈(113), 근거리 통신 모듈(114), 위치정보 모듈(115) 중 적어도 하나를 포함할 수 있다.

[54] 입력부(120)는, 영상 신호 입력을 위한 카메라(121) 또는 영상 입력부, 오디오 신호 입력을 위한 마이크로폰(microphone, 122), 또는 오디오 입력부, 사용자로부터 정보를 입력받기 위한 사용자 입력부(123, 예를 들어, 터치키(touch key), 푸시키(mechanical key) 등)를 포함할 수 있다. 입력부(120)에서 수집한 음성 데이터나 이미지 데이터는 분석되어 사용자의 제어명령으로 처리될 수 있다.

[55] 센싱부(140)는 웨어러블 디바이스 내 정보, 웨어러블 디바이스를 둘러싼 주변 환경 정보 및 사용자 정보 중 적어도 하나를 센싱하기 위한 하나 이상의 센서를 포함할 수 있다. 예를 들어, 센싱부(140)는 근접센서(141, proximity sensor), 조도 센서(142, illumination sensor), 터치 센서(touch sensor), 가속도 센서(acceleration sensor), 자기 센서(magnetic sensor), 중력 센서(G-sensor), 자이로스코프 센서(gyroscope sensor), 모션 센서(motion sensor), RGB 센서, 적외선 센서(IR 센서: infrared sensor), 지문인식 센서(finger scan sensor), 초음파 센서(ultrasonic sensor), 광 센서(optical sensor, 예를 들어, 카메라(121 참조)), 마이크로폰(microphone, 122 참조), 배터리 게이지(battery gauge), 환경 센서(예를 들어, 기압계, 습도계, 온도계, 방사능 감지 센서, 열 감지 센서, 가스 감지 센서 등), 화학 센서(예를 들어, 전자 코, 헬스케어 센서, 생체 인식 센서 등) 중 적어도 하나를 포함할 수 있다. 한편, 본 명세서에 개시된 웨어러블 디바이스는, 이러한 센서들 중 적어도 둘 이상의 센서에서 센싱되는 정보들을 조합하여 활용할 수 있다.

[56] 출력부(150)는 시각, 청각 또는 촉각 등과 관련된 출력을 발생시키기 위한 것으로, 디스플레이부(151), 음향 출력부(152), 햅팁 모듈(153), 광 출력부(154) 중 적어도 하나를 포함할 수 있다. 디스플레이부(151)는 터치 센서와 상호 레이어 구조를 이루거나 일체형으로 형성됨으로써, 터치 스크린을 구현할 수 있다. 이러한 터치 스크린은, 웨어러블 디바이스(100)와 사용자 사이의 입력 인터페이스를 제공하는 사용자 입력부(123)로써 기능함과 동시에, 웨어러블 디바이스(100)와 사용자 사이의 출력 인터페이스를 제공할 수 있다.

[57] 인터페이스부(160)는 웨어러블 디바이스(100)에 연결되는 다양한 종류의 외부 기기와의 통로 역할을 수행한다. 이러한 인터페이스부(160)는, 유/무선 헤드셋 포트(port), 외부 충전기 포트(port), 유/무선 데이터 포트(port), 메모리 카드(memory card) 포트, 식별 모듈이 구비된 장치를 연결하는 포트(port), 오디오 I/O(Input/Output) 포트(port), 비디오 I/O(Input/Output) 포트(port), 이어폰 포트(port) 중 적어도 하나를 포함할 수 있다. 웨어러블 디바이스(100)에서는, 상기 인터페이스부(160)에 외부 기기가 연결되는 것에 대응하여, 연결된 외부 기기와 관련된 적절할 제어를 수행할 수 있다.

[58] 또한, 메모리(170)는 웨어러블 디바이스(100)의 다양한 기능을 지원하는 데이터를 저장한다. 메모리(170)는 웨어러블 디바이스(100)에서 구동되는 다수의 응용 프로그램(application program 또는 애플리케이션(application)), 웨어러블 디바이스(100)의 동작을 위한 데이터들, 명령어들을 저장할 수 있다. 이러한 응용 프로그램 중 적어도 일부는, 무선 통신을 통해 외부 서버로부터 다운로드 될 수 있다. 또한 이러한 응용 프로그램 중 적어도 일부는, 웨어러블 디바이스(100)의 기본적인 기능(예를 들어, 전화 착신, 발신 기능, 메시지 수신, 발신 기능)을 위하여 출고 당시부터 웨어러블 디바이스(100)상에 존재할 수 있다. 한편, 응용 프로그램은, 메모리(170)에 저장되고, 웨어러블 디바이스(100)

상에 설치되어, 제어부(180)에 의하여 상기 웨어러블 디바이스의 동작(또는 기능)을 수행하도록 구동될 수 있다.

[59] 제어부(180)는 상기 응용 프로그램과 관련된 동작 외에도, 통상적으로 웨어러블 디바이스(100)의 전반적인 동작을 제어한다. 제어부(180)는 위에서 살펴본 구성요소들을 통해 입력 또는 출력되는 신호, 데이터, 정보 등을 처리하거나 메모리(170)에 저장된 응용 프로그램을 구동함으로써, 사용자에게 적절한 정보 또는 기능을 제공 또는 처리할 수 있다.

[60] 또한, 제어부(180)는 메모리(170)에 저장된 응용 프로그램을 구동하기 위하여, 도 1a와 함께 살펴본 구성요소들 중 적어도 일부를 제어할 수 있다. 나아가, 제어부(180)는 상기 응용 프로그램의 구동을 위하여, 웨어러블 디바이스(100)에 포함된 구성요소들 중 적어도 둘 이상을 서로 조합하여 동작시킬 수 있다.

[61] 전원공급부(190)는 제어부(180)의 제어 하에서, 외부의 전원, 내부의 전원을 인가 받아 웨어러블 디바이스(100)에 포함된 각 구성요소들에 전원을 공급한다. 이러한 전원공급부(190)는 배터리를 포함하며, 상기 배터리는 내장형 배터리 또는 교체가능한 형태의 배터리가 될 수 있다.

[62] 상기 각 구성요소들 중 적어도 일부는, 이하에서 설명되는 다양한 실시 예들에 따른 웨어러블 디바이스의 동작, 제어, 또는 제어방법을 구현하기 위하여 서로 협력하여 동작할 수 있다. 또한, 상기 웨어러블 디바이스의 동작, 제어, 또는 제어방법은 상기 메모리(170)에 저장된 적어도 하나의 응용 프로그램의 구동에 의하여 웨어러블 디바이스 상에서 구현될 수 있다.

[63] 이하에서는, 위에서 살펴본 웨어러블 디바이스(100)를 통하여 구현되는 다양한 실시 예들을 살펴보기에 앞서, 위에서 열거된 구성요소들에 대하여 도 1a를 참조하여 보다 구체적으로 살펴본다.

[64] 먼저, 무선 통신부(110)에 대하여 살펴보면, 무선 통신부(110)의 방송 수신 모듈(111)은 방송 채널을 통하여 외부의 방송 관리 서버로부터 방송 신호 및/또는 방송 관련된 정보를 수신한다. 상기 방송 채널은 위성 채널, 지상파 채널을 포함할 수 있다. 적어도 두 개의 방송 채널들에 대한 동시 방송 수신 또는 방송 채널 스위칭을 위해 둘 이상의 상기 방송 수신 모듈이 상기 이동단말기(100)에 제공될 수 있다.

[65] 이동통신 모듈(112)은, 이동통신을 위한 기술표준들 또는 통신방식(예를 들어, GSM(Global System for Mobile communication), CDMA(Code Division Multi Access), CDMA2000(Code Division Multi Access 2000), EV-DO(Enhanced Voice-Data Optimized or Enhanced Voice-Data Only), WCDMA(Wideband CDMA), HSDPA(High Speed Downlink Packet Access), HSUPA(High Speed Uplink Packet Access), LTE(Long Term Evolution), LTE-A(Long Term Evolution-Advanced) 등)에 따라 구축된 이동 통신망 상에서 기지국, 외부의 단말, 서버 중 적어도 하나와 무선 신호를 송수신한다.

[66] 상기 무선 신호는, 음성 호 신호, 화상 통화 호 신호 또는 문자/멀티미디어

메시지 송수신에 따른 다양한 형태의 데이터를 포함할 수 있다.

[67] 무선 인터넷 모듈(113)은 무선 인터넷 접속을 위한 모듈을 말하는 것으로, 웨어러블 디바이스(100)에 내장되거나 외장될 수 있다. 무선 인터넷 모듈(113)은 무선 인터넷 기술들에 따른 통신망에서 무선 신호를 송수신하도록 이루어진다.

[68] 무선 인터넷 기술로는, 예를 들어 WLAN(Wireless LAN), Wi-Fi(Wireless-Fidelity), Wi-Fi(Wireless Fidelity) Direct, DLNA(Digital Living Network Alliance), WiBro(Wireless Broadband), WiMAX(World Interoperability for Microwave Access), HSDPA(High Speed Downlink Packet Access), HSUPA(High Speed Uplink Packet Access), LTE(Long Term Evolution), LTE-A(Long Term Evolution-Advanced) 등이 있으며, 상기 무선 인터넷 모듈(113)은 상기에서 나열되지 않은 인터넷 기술까지 포함한 범위에서 적어도 하나의 무선 인터넷 기술에 따라 데이터를 송수신하게 된다.

[69] WiBro, HSDPA, HSUPA, GSM, CDMA, WCDMA, LTE, LTE-A 등에 의한 무선인터넷 접속은 이동통신망을 통해 이루어진다는 관점에서 본다면, 상기 이동통신망을 통해 무선인터넷 접속을 수행하는 상기 무선 인터넷 모듈(113)은 상기 이동통신 모듈(112)의 일종으로 이해될 수도 있다.

[70] 근거리 통신 모듈(114)은 근거리 통신(Short range communication)을 위한 것으로서, 블루투스(Bluetooth™), RFID(Radio Frequency Identification), 적외선 통신(Infrared Data Association; IrDA), UWB(Ultra Wideband), ZigBee, NFC(Near Field Communication), Wi-Fi(Wireless-Fidelity), Wi-Fi Direct, Wireless USB(Wireless Universal Serial Bus) 기술 중 적어도 하나를 이용하여, 근거리 통신을 지원할 수 있다. 이러한, 근거리 통신 모듈(114)은, 근거리 무선 통신망(Wireless Area Networks)을 통해 웨어러블 디바이스(100)와 무선 통신 시스템 사이, 웨어러블 디바이스(100)와 다른 이동 단말기 사이, 또는 웨어러블 디바이스(100)와 다른 웨어러블 디바이스(또는 외부서버)가 위치한 네트워크 사이의 무선 통신을 지원할 수 있다. 상기 근거리 무선 통신망은 근거리 무선 개인 통신망(Wireless Personal Area Networks)일 수 있다.

[71] 여기에서, 다른 웨어러블 디바이스(100)는 본 발명에 따른 웨어러블 디바이스(100)와 데이터를 상호 교환하는 것이 가능한(또는 연동 가능한) 이동 단말기 또는 다른 웨어러블 디바이스(wearable device, 예를 들어, 스마트워치(smartwatch), 스마트 글래스(smart glass), HMD(head mounted display))가 될 수 있다. 근거리 통신 모듈(114)은, 웨어러블 디바이스(100) 주변에, 상기 웨어러블 디바이스(100)와 통신 가능한 웨어러블 디바이스를 감지(또는 인식)할 수 있다. 나아가, 제어부(180)는 상기 감지된 웨어러블 디바이스가 본 발명에 따른 웨어러블 디바이스(100)와 통신하도록 인증된 디바이스인 경우, 웨어러블 디바이스(100)에서 처리되는 데이터의 적어도 일부를, 상기 근거리 통신 모듈(114)을 통해 웨어러블 디바이스로 전송할 수 있다. 따라서, 웨어러블 디바이스의 사용자는, 웨어러블 디바이스(100)에서 처리되는 데이터를,

웨어러블 디바이스를 통해 이용할 수 있다. 예를 들어, 이에 따르면 사용자는, 웨어러블 디바이스(100)에 전화가 수신된 경우, 웨어러블 디바이스를 통해 전화 통화를 수행하거나, 웨어러블 디바이스(100)에 메시지가 수신된 경우, 웨어러블 디바이스를 통해 상기 수신된 메시지를 확인하는 것이 가능하다.

[72] 위치정보 모듈(115)은 웨어러블 디바이스의 위치(또는 현재 위치)를 획득하기 위한 모듈로서, 그의 대표적인 예로는 GPS(Global Positioning System) 모듈 또는 WiFi(Wireless Fidelity) 모듈이 있다. 예를 들어, 웨어러블 디바이스는 GPS모듈을 활용하면, GPS 위성에서 보내는 신호를 이용하여 웨어러블 디바이스의 위치를 획득할 수 있다. 다른 예로서, 웨어러블 디바이스는 Wi-Fi모듈을 활용하면, Wi-Fi모듈과 무선신호를 송신 또는 수신하는 무선 AP(Wireless Access Point)의 정보에 기반하여, 웨어러블 디바이스의 위치를 획득할 수 있다. 필요에 따라서, 위치정보모듈(115)은 치환 또는 부가적으로 웨어러블 디바이스의 위치에 관한 데이터를 얻기 위해 무선 통신부(110)의 다른 모듈 중 어느 기능을 수행할 수 있다. 위치정보모듈(115)은 웨어러블 디바이스의 위치(또는 현재 위치)를 획득하기 위해 이용되는 모듈로, 웨어러블 디바이스의 위치를 직접적으로 계산하거나 획득하는 모듈로 한정되지는 않는다.

[73] 다음으로, 입력부(120)는 영상 정보(또는 신호), 오디오 정보(또는 신호), 데이터, 또는 사용자로부터 입력되는 정보의 입력을 위한 것으로서, 영상 정보의 입력을 위하여, 웨어러블 디바이스(100) 는 하나 또는 복수의 카메라(121)를 구비할 수 있다. 카메라(121)는 화상 통화모드 또는 촬영 모드에서 이미지 센서에 의해 얻어지는 정지영상 또는 동영상 등의 화상 프레임을 처리한다. 처리된 화상 프레임은 디스플레이부(151)에 표시되거나 메모리(170)에 저장될 수 있다. 한편, 웨어러블 디바이스(100)에 구비되는 복수의 카메라(121)는 매트릭스 구조를 이루도록 배치될 수 있으며, 이와 같이 매트릭스 구조를 이루는 카메라(121)를 통하여, 웨어러블 디바이스(100)에는 다양한 각도 또는 초점을 갖는 복수의 영상정보가 입력될 수 있다. 또한, 복수의 카메라(121)는 입체영상을 구현하기 위한 좌 영상 및 우 영상을 획득하도록, 스트레오 구조로 배치될 수 있다.

[74] 마이크로폰(122)은 외부의 음향 신호를 전기적인 음성 데이터로 처리한다. 처리된 음성 데이터는 웨어러블 디바이스(100)에서 수행 중인 기능(또는 실행 중인 응용 프로그램)에 따라 다양하게 활용될 수 있다. 한편, 마이크로폰(122)에는 외부의 음향 신호를 입력 받는 과정에서 발생되는 잡음(noise)을 제거하기 위한 다양한 잡음 제거 알고리즘이 구현될 수 있다.

[75] 사용자 입력부(123)는 사용자로부터 정보를 입력받기 위한 것으로서, 사용자 입력부(123)를 통해 정보가 입력되면, 제어부(180)는 입력된 정보에 대응되도록 웨어러블 디바이스(100)의 동작을 제어할 수 있다. 이러한, 사용자 입력부(123)는 기계식 (mechanical) 입력수단(또는, 메커니컬 키, 예를 들어, 웨어러블 디바이스(100)의 전/후면 또는 측면에 위치하는 버튼, 돔 스위치 (dome switch), 조그 휠, 조그 스위치 등) 및 터치식 입력수단을 포함할 수 있다. 일 예로서,

터치식 입력수단은, 소프트웨어적인 처리를 통해 터치스크린에 표시되는 가상 키(virtual key), 소프트 키(soft key) 또는 비주얼 키(visual key)로 이루어지거나, 상기 터치스크린 이외의 부분에 배치되는 터치 키(touch key)로 이루어질 수 있다. 한편, 상기 가상키 또는 비주얼 키는, 다양한 형태를 가지면서 터치스크린 상에 표시되는 것이 가능하며, 예를 들어, 그래픽(graphic), 텍스트(text), 아이콘(icon), 비디오(video) 또는 이들의 조합으로 이루어질 수 있다.

[76] 한편, 센싱부(140)는 웨어러블 디바이스 내 정보, 웨어러블 디바이스를 둘러싼 주변 환경 정보 및 사용자 정보 중 적어도 하나를 센싱하고, 이에 대응하는 센싱 신호를 발생시킨다. 제어부(180)는 이러한 센싱 신호에 기초하여, 웨어러블 디바이스(100)의 구동 또는 동작을 제어하거나, 웨어러블 디바이스(100)에 설치된 응용 프로그램과 관련된 데이터 처리, 기능 또는 동작을 수행 할 수 있다. 센싱부(140)에 포함될 수 있는 다양한 센서 중 대표적인 센서들의 대하여, 보다 구체적으로 살펴본다.

[77] 먼저, 근접 센서(141)는 소정의 검출면에 접근하는 물체, 혹은 근방에 존재하는 물체의 유무를 전자계의 힘 또는 적외선 등을 이용하여 기계적 접촉이 없이 검출하는 센서를 말한다. 이러한 근접 센서(141)는 위에서 살펴본 터치 스크린에 의해 감싸지는 웨어러블 디바이스의 내부 영역 또는 상기 터치 스크린의 근처에 근접 센서(141)가 배치될 수 있다.

[78] 근접 센서(141)의 예로는 투과형 광전 센서, 직접 반사형 광전 센서, 미러 반사형 광전 센서, 고주파 발진형 근접 센서, 정전 용량형 근접 센서, 자기형 근접 센서, 적외선 근접 센서 등이 있다. 터치 스크린이 정전식인 경우에, 근접 센서(141)는 전도성을 갖는 물체의 근접에 따른 전계의 변화로 상기 물체의 근접을 검출하도록 구성될 수 있다. 이 경우 터치 스크린(또는 터치 센서) 자체가 근접 센서로 분류될 수 있다.

[79] 한편, 설명의 편의를 위해, 터치 스크린 상에 물체가 접촉되지 않으면서 근접되어 상기 물체가 상기 터치 스크린 상에 위치함이 인식되도록 하는 행위를 "근접 터치(proximity touch)"라고 명명하고, 상기 터치 스크린 상에 물체가 실제로 접촉되는 행위를 "접촉 터치(contact touch)"라고 명명한다. 상기 터치 스크린 상에서 물체가 근접 터치 되는 위치라 함은, 상기 물체가 근접 터치될 때 상기 물체가 상기 터치 스크린에 대해 수직으로 대응되는 위치를 의미한다. 상기 근접 센서(141)는, 근접 터치와, 근접 터치 패턴(예를 들어, 근접 터치 거리, 근접 터치 방향, 근접 터치 속도, 근접 터치 시간, 근접 터치 위치, 근접 터치 이동 상태 등)을 감지할 수 있다. 한편, 제어부(180)는 위와 같이, 근접 센서(141)를 통해 감지된 근접 터치 동작 및 근접 터치 패턴에 상응하는 데이터(또는 정보)를 처리하며, 나아가, 처리된 데이터에 대응하는 시각적인 정보를 터치 스크린상에 출력시킬 수 있다. 나아가, 제어부(180)는, 터치 스크린 상의 동일한 지점에 대한 터치가, 근접 터치인지 또는 접촉 터치인지에 따라, 서로 다른 동작 또는 데이터(또는 정보)가 처리되도록 웨어러블 디바이스(100)를 제어할 수 있다.

[80] 터치 센서는 저항막 방식, 정전용량 방식, 적외선 방식, 초음파 방식, 자기장 방식 등 여러 가지 터치방식 중 적어도 하나를 이용하여 터치 스크린(또는 디스플레이부(151))에 가해지는 터치(또는 터치입력)을 감지한다.

[81] 일 예로서, 터치 센서는, 터치 스크린의 특정 부위에 가해진 압력 또는 특정 부위에 발생하는 정전 용량 등의 변화를 전기적인 입력신호로 변환하도록 구성될 수 있다. 터치 센서는, 터치 스크린 상에 터치를 가하는 터치 대상체가 터치 센서 상에 터치 되는 위치, 면적, 터치 시의 압력, 터치 시의 정전 용량 등을 검출할 수 있도록 구성될 수 있다. 여기에서, 터치 대상체는 상기 터치 센서에 터치를 인가하는 물체로서, 예를 들어, 손가락, 터치펜 또는 스타일러스 펜(Stylus pen), 포인터 등이 될 수 있다.

[82] 이와 같이, 터치 센서에 대한 터치 입력이 있는 경우, 그에 대응하는 신호(들)는 터치 제어기로 보내진다. 터치 제어기는 그 신호(들)를 처리한 다음 대응하는 데이터를 제어부(180)로 전송한다. 이로써, 제어부(180)는 디스플레이부(151)의 어느 영역이 터치 되었는지 여부 등을 알 수 있게 된다. 여기에서, 터치 제어기는, 제어부(180)와 별도의 구성요소일 수 있고, 제어부(180) 자체일 수 있다.

[83] 한편, 제어부(180)는, 터치 스크린(또는 터치 스크린 이외에 구비된 터치키)을 터치하는, 터치 대상체의 종류에 따라 서로 다른 제어를 수행하거나, 동일한 제어를 수행할 수 있다. 터치 대상체의 종류에 따라 서로 다른 제어를 수행할지 또는 동일한 제어를 수행할 지는, 현재 웨어러블 디바이스(100)의 동작상태 또는 실행 중인 응용 프로그램에 따라 결정될 수 있다.

[84] 한편, 위에서 살펴본 터치 센서 및 근접 센서는 독립적으로 또는 조합되어, 터치 스크린에 대한 숏(또는 탭) 터치(short touch), 롱 터치(long touch), 멀티 터치(multi touch), 드래그 터치(drag touch), 플리크 터치(flick touch), 핀치-인 터치(pinch-in touch), 핀치-아웃 터치(pinch-out 터치), 스와이프(swype) 터치, 호버링(hovering) 터치 등과 같은, 다양한 방식의 터치를 센싱할 수 있다.

[85] 초음파 센서는 초음파를 이용하여, 감지대상의 위치정보를 인식할 수 있다. 한편 제어부(180)는 광 센서와 복수의 초음파 센서로부터 감지되는 정보를 통해, 파동 발생원의 위치를 산출하는 것이 가능하다. 파동 발생원의 위치는, 광이 초음파보다 매우 빠른 성질, 즉, 광이 광 센서에 도달하는 시간이 초음파가 초음파 센서에 도달하는 시간보다 매우 빠름을 이용하여, 산출될 수 있다. 보다 구체적으로 광을 기준 신호로 초음파가 도달하는 시간과의 시간차를 이용하여 파동 발생원의 위치가 산출될 수 있다.

[86] 한편, 입력부(120)의 구성으로 살펴본, 카메라(121)는 카메라 센서(예를 들어, CCD, CMOS 등), 포토 센서(또는 이미지 센서) 및 레이저 센서 중 적어도 하나를 포함한다.

[87] 카메라(121)와 레이저 센서는 서로 조합되어, 3차원 입체영상에 대한 감지대상의 터치를 감지할 수 있다. 포토 센서는 디스플레이 소자에 적층될 수 있는데, 이러한 포토 센서는 터치 스크린에 근접한 감지대상의 움직임을

스캐닝하도록 이루어진다. 보다 구체적으로, 포토 센서는 행/열에 Photo Diode와 TR(Transistor)를 실장하여 Photo Diode에 인가되는 빛의 양에 따라 변화되는 전기적 신호를 이용하여 포토 센서 위에 올려지는 내용물을 스캔한다. 즉, 포토 센서는 빛의 변화량에 따른 감지대상의 좌표 계산을 수행하며, 이를 통하여 감지대상의 위치정보가 획득될 수 있다.

[88] 디스플레이부(151)는 웨어러블 디바이스(100)에서 처리되는 정보를 표시(출력)한다. 예를 들어, 디스플레이부(151)는 웨어러블 디바이스(100)에서 구동되는 응용 프로그램의 실행화면 정보, 또는 이러한 실행화면 정보에 따른 UI(User Interface), GUI(Graphic User Interface) 정보를 표시할 수 있다.

[89] 또한, 상기 디스플레이부(151)는 입체영상을 표시하는 입체 디스플레이부로서 구성될 수 있다.

[90] 상기 입체 디스플레이부에는 스테레오스코픽 방식(안경 방식), 오토 스테레오스코픽 방식(무안경 방식), 프로젝션 방식(홀로그래픽 방식) 등의 3차원 디스플레이 방식이 적용될 수 있다.

[91] 음향 출력부(152)는 호신호 수신, 통화모드 또는 녹음 모드, 음성인식 모드, 방송수신 모드 등에서 무선 통신부(110)로부터 수신되거나 메모리(170)에 저장된 오디오 데이터를 출력할 수 있다. 음향 출력부(152)는 웨어러블 디바이스(100)에서 수행되는 기능(예를 들어, 호신호 수신음, 메시지 수신음 등)과 관련된 음향 신호를 출력하기도 한다. 이러한 음향 출력부(152)에는 리시버(receiver), 스피커(speaker), 버저(buzzer) 등이 포함될 수 있다.

[92] 햅틱 모듈(haptic module)(153)은 사용자가 느낄 수 있는 다양한 촉각 효과를 발생시킨다. 햅틱 모듈(153)이 발생시키는 촉각 효과의 대표적인 예로는 진동이 될 수 있다. 햅틱 모듈(153)에서 발생하는 진동의 세기와 패턴 등은 사용자의 선택 또는 제어부의 설정에 의해 제어될 수 있다. 예를 들어, 상기 햅틱 모듈(153)은 서로 다른 진동을 합성하여 출력하거나 순차적으로 출력할 수도 있다.

[93] 햅틱 모듈(153)은, 진동 외에도, 접촉 피부면에 대해 수직 운동하는 핀 배열, 분사구나 흡입구를 통한 공기의 분사력이나 흡입력, 피부 표면에 대한 스침, 전극(electrode)의 접촉, 정전기력 등의 자극에 의한 효과와, 흡열이나 발열 가능한 소자를 이용한 냉온감 재현에 의한 효과 등 다양한 촉각 효과를 발생시킬 수 있다.

[94] 햅틱 모듈(153)은 직접적인 접촉을 통해 촉각 효과를 전달할 수 있을 뿐만 아니라, 사용자가 손가락이나 팔 등의 근 감각을 통해 촉각 효과를 느낄 수 있도록 구현할 수도 있다. 햅틱 모듈(153)은 웨어러블 디바이스(100)의 구성 태양에 따라 2개 이상이 구비될 수 있다.

[95] 광출력부(154)는 웨어러블 디바이스(100)의 광원의 빛을 이용하여 이벤트 발생을 알리기 위한 신호를 출력한다. 웨어러블 디바이스(100)에서 발생 되는 이벤트의 예로는 메시지 수신, 호 신호 수신, 부재중 전화, 알람, 일정 알림,

이메일 수신, 애플리케이션을 통한 정보 수신 등이 될 수 있다.

[96] 광출력부(154)가 출력하는 신호는 웨어러블 디바이스가 전면이나 후면으로 단색이나 복수색의 빛을 발광함에 따라 구현된다. 상기 신호 출력은 웨어러블 디바이스가 사용자의 이벤트 확인을 감지함에 의하여 종료될 수 있다.

[97] 인터페이스부(160)는 웨어러블 디바이스(100)에 연결되는 모든 외부 기기와의 통로 역할을 한다. 인터페이스부(160)는 외부 기기로부터 데이터를 전송받거나, 전원을 공급받아 웨어러블 디바이스(100) 내부의 각 구성요소에 전달하거나, 웨어러블 디바이스(100) 내부의 데이터가 외부 기기로 전송되도록 한다. 예를 들어, 유/무선 헤드셋 포트(port), 외부 충전기 포트(port), 유/무선 데이터 포트(port), 메모리 카드(memory card) 포트(port), 식별 모듈이 구비된 장치를 연결하는 포트(port), 오디오 I/O(Input/Output) 포트(port), 비디오 I/O(Input/Output) 포트(port), 이어폰 포트(port) 등이 인터페이스부(160)에 포함될 수 있다.

[98] 한편, 식별 모듈은 웨어러블 디바이스(100)의 사용 권한을 인증하기 위한 각종 정보를 저장한 칩으로서, 사용자 인증 모듈(user identify module; UIM), 가입자 인증 모듈(subscriber identity module; SIM), 범용 사용자 인증 모듈(universal subscriber identity module; USIM) 등을 포함할 수 있다. 식별 모듈이 구비된 장치(이하 '식별 장치')는, 스마트 카드(smart card) 형식으로 제작될 수 있다. 따라서 식별 장치는 상기 인터페이스부(160)를 통하여 단말기(100)와 연결될 수 있다.

[99] 또한, 상기 인터페이스부(160)는 웨어러블 디바이스(100)가 외부 크래들(cradle)과 연결될 때 상기 크래들로부터의 전원이 상기 웨어러블 디바이스(100)에 공급되는 통로가 되거나, 사용자에 의해 상기 크래들에서 입력되는 각종 명령 신호가 상기 웨어러블 디바이스(100)로 전달되는 통로가 될 수 있다. 상기 크래들로부터 입력되는 각종 명령 신호 또는 상기 전원은 상기 웨어러블 디바이스(100)가 상기 크래들에 정확히 장착되었음을 인지하기 위한 신호로 동작될 수 있다.

[100] 메모리(170)는 제어부(180)의 동작을 위한 프로그램을 저장할 수 있고, 입/출력되는 데이터들(예를 들어, 폰북, 메시지, 정지영상, 동영상 등)을 임시 저장할 수도 있다. 상기 메모리(170)는 상기 터치 스크린 상의 터치 입력시 출력되는 다양한 패턴의 진동 및 음향에 관한 데이터를 저장할 수 있다.

[101] 메모리(170)는 플래시 메모리 타입(flash memory type), 하드디스크 타입(hard disk type), SSD 타입(Solid State Disk type), SDD 타입(Silicon Disk Drive type), 멀티미디어 카드 마이크로 타입(multimedia card micro type), 카드 타입의 메모리(예를 들어 SD 또는 XD 메모리 등), 램(random access memory; RAM), SRAM(static random access memory), 롬(read-only memory; ROM), EEPROM(electrically erasable programmable read-only memory), PROM(programmable read-only memory), 자기 메모리, 자기 디스크 및 광디스크 중 적어도 하나의 타입의 저장매체를 포함할 수 있다. 웨어러블 디바이스(100)는

인터넷(internet)상에서 상기 메모리(170)의 저장 기능을 수행하는 웹 스토리지(web storage)와 관련되어 동작될 수도 있다.

[102] 한편, 앞서 살펴본 것과 같이, 제어부(180)는 응용 프로그램과 관련된 동작과, 통상적으로 웨어러블 디바이스(100)의 전반적인 동작을 제어한다. 예를 들어, 제어부(180)는 상기 웨어러블 디바이스의 상태가 설정된 조건을 만족하면, 애플리케이션들에 대한 사용자의 제어 명령의 입력을 제한하는 잠금 상태를 실행하거나, 해제할 수 있다.

[103] 또한, 제어부(180)는 음성 통화, 데이터 통신, 화상 통화 등과 관련된 제어 및 처리를 수행하거나, 터치 스크린 상에서 행해지는 필기 입력 또는 그림 그리기 입력을 각각 문자 및 이미지로 인식할 수 있는 패턴 인식 처리를 행할 수 있다. 나아가 제어부(180)는 이하에서 설명되는 다양한 실시 예들을 본 발명에 따른 웨어러블 디바이스(100) 상에서 구현하기 위하여, 위에서 살펴본 구성요소들을 중 어느 하나 또는 복수를 조합하여 제어할 수 있다.

[104] 전원 공급부(190)는 제어부(180)의 제어에 의해 외부의 전원, 내부의 전원을 인가 받아 각 구성요소들의 동작에 필요한 전원을 공급한다. 전원공급부(190)는 배터리를 포함하며, 배터리는 충전 가능하도록 이루어지는 내장형 배터리가 될 수 있으며, 충전 등을 위하여 단말기 바디에 착탈 가능하게 결합될 수 있다.

[105] 또한, 전원공급부(190)는 연결포트를 구비할 수 있으며, 연결포트는 배터리의 충전을 위하여 전원을 공급하는 외부 충전기가 전기적으로 연결되는 인터페이스(160)의 일 예로서 구성될 수 있다.

[106] 다른 예로서, 전원공급부(190)는 상기 연결포트를 이용하지 않고 무선방식으로 배터리를 충전하도록 이루어질 수 있다. 이 경우에, 전원공급부(190)는 외부의 무선 전력 전송장치로부터 자기 유도 현상에 기초한 유도 결합(Inductive Coupling) 방식이나 전자기적 공진 현상에 기초한 공진 결합(Magnetic Resonance Coupling) 방식 중 하나 이상을 이용하여 전력을 전달받을 수 있다.

[107] 한편, 이하에서 다양한 실시 예는 예를 들어, 소프트웨어, 하드웨어 또는 이들의 조합된 것을 이용하여 컴퓨터 또는 이와 유사한 장치로 읽을 수 있는 기록매체 내에서 구현될 수 있다.

[108] 이하, 도 1b는 본 발명과 관련된 웨어러블 디바이스가 동작가능한 통신 시스템을 설명하기 위한 도면이다.

[109] 먼저, 통신 시스템은, 서로 다른 무선 인터페이스 및/또는 물리 계층을 이용할 수도 있다. 예를 들어, 통신 시스템에 의해 이용 가능한 무선 인터페이스에는, 주파수 분할 다중 접속(Frequency Division Multiple Access, FDMA), 시분할 다중 접속(Time Division Multiple Access, TDMA), 코드 분할 다중 접속(Code Division Multiple Access, CDMA), 범용 이동통신 시스템(Universal Mobile Telecommunications Systems, UMTS)(특히, LTE(Long Term Evolution), LTE-A(Long Term Evolution-Advanced)), 이동통신 글로벌 시스템(Global System for Mobile Communications, GSM) 등이 포함될 수 있다.

[110] 이하에서는, 설명의 편의를 위하여, CDMA에 한정하여 설명하도록 한다. 그러나, 본 발명은, CDMA 무선 통신 시스템뿐만 아니라 OFDM(Orthogonal Frequency Division Multiplexing) 무선 통신 시스템을 포함한 모든 통신 시스템 적용될 수 있음은 자명하다.

[111] CDMA 무선 통신 시스템은, 적어도 하나의 단말기(100), 적어도 하나의 기지국(Base Station, BS (Node B 혹은 Evolved Node B로 명칭될 수도 있다.)), 적어도 하나의 기지국 제어부(Base Station Controllers, BSCs), 이동 스위칭 센터(Mobile Switching Center, MSC)를 포함할 수 있다. MSC는, 일반 전화 교환망(Public Switched Telephone Network, PSTN) 및 BSCs와 연결되도록 구성된다. BSCs는, 백홀 라인(backhaul line)을 통하여, BS와 짝을 이루어 연결될 수 있다. 백홀 라인은, E1/T1, ATM, IP, PPP, Frame Relay, HDSL, ADSL 또는 xDSL 중 적어도 하나에 따라서 구비될 수 있다. 따라서, 복수의 BSCs가 CDMA 무선 통신 시스템에 포함될 수 있다.

[112] 복수의 BS 각각은 적어도 하나의 섹터를 포함할 수 있고, 각각의 섹터는, 전방향성 안테나 또는 BS로부`터 방사상의 특정 방향을 가리키는 안테나를 포함할 수 있다. 또한, 각각의 섹터는, 다양한 형태의 안테나를 두 개 이상 포함할 수도 있다. 각각의 BS는, 복수의 주파수 할당을 지원하도록 구성될 수 있고, 복수의 주파수 할당은 각각 특정 스펙트럼(예를 들어, 1.25MHz, 5MHz 등)을 가질 수 있다.

[113] 섹터와 주파수 할당의 교차는, CDMA 채널이라고 불릴 수 있다. BS는, 기지국 송수신 하부 시스템(Base Station Transceiver Subsystem, BTSs)이라고 불릴 수 있다. 이러한 경우, 하나의 BSC 및 적어도 하나의 BS를 합하여 “기지국”이라고 칭할 수 있다. 기지국은, 또한 "셀 사이트"를 나타낼 수도 있다. 또는, 특정 BS에 대한 복수의 섹터들 각각은, 복수의 셀 사이트로 불릴 수도 있다.

[114] 방송 송신부(Broadcasting Transmitter, BT) 는, 시스템 내에서 동작하는 단말기들(100)에게 방송 신호를 송신한다. 도 1a에 도시된 방송 수신 모듈(111)은, BT에 의해 전송되는 방송 신호를 수신하기 위해 단말기(100) 내에 구비된다.

[115] 뿐만 아니라, CDMA 무선 통신 시스템에는 이동 단말기(100)의 위치를 확인하기 위한, 위성 위치 확인 시스템(Global Positioning System, GPS)이 연계될 수 있다. 상기 위성(300)은, 이동 단말기(100)의 위치를 파악하는 것을 돕는다. 유용한 위치 정보는, 두 개 이하 또는 이상의 위성들에 의해 획득될 수도 있다. 여기에서는, GPS 추적 기술뿐만 아니라 위치를 추적할 수 있는 모든 기술들을 이용하여 이동 단말기(100)의 위치가 추적될 수 있다. 또한, GPS 위성 중 적어도 하나는, 선택적으로 또는 추가로 위성 DMB 전송을 담당할 수도 있다.

[116] 다음으로, 도 2는 본 발명과 관련된 웨어러블 디바이스의 일 예로, 와치형 웨어러블 디바이스의 일 예를 보인 사시도이다.

[117] 도 2를 참조하면, 와치형 웨어러블 디바이스(100)는 디스플레이부(151)를

구비하는 본체(101) 및 본체(101)에 연결되어 손목에 착용 가능하도록 구성되는 밴드(102)를 포함한다. 일반적으로 와치형 웨어러블 디바이스(100)는 도 1a의 웨어러블 디바이스(100)의 특징 또는 그와 유사한 특징을 포함할 수 있다.

[118] 본체(101)는 외관을 형성하는 케이스를 포함한다. 도시된 바와 같이, 케이스는 각종 전자부품들을 수용하는 내부 공간을 마련하는 제1케이스(101a) 및 제2케이스(101b)를 포함할 수 있다. 다만, 본 발명은 이에 한정되는 것은 아니고, 하나의 케이스가 상기 내부 공간을 마련하도록 구성되어 유니 바디의 와치형 웨어러블 디바이스(100)가 구현될 수도 있다.

[119] 와치형 웨어러블 디바이스(100)는 무선 통신이 가능하도록 구성되며, 본체(101)에는 상기 무선 통신을 위한 안테나가 설치될 수 있다. 한편, 안테나는 케이스를 이용하여 그 성능을 확장시킬 수 있다. 예를 들어, 도전성 재질을 포함하는 케이스가 안테나와 전기적으로 연결되어 그라운드 영역 또는 방사 영역을 확장시키도록 구성될 수 있다.

[120] 또한, 본체(101)의 전면에는 디스플레이부(151)가 배치되어 정보를 출력할 수 있으며, 디스플레이부(151)에는 터치센서가 구비되어 터치 스크린으로 구현될 수 있다. 도시된 바와 같이, 디스플레이부(151)의 윈도우(351a)는 제1케이스(101a)에 장착되어 제1케이스(101a)와 함께 단말기 바디의 전면을 형성할 수 있다.

[121] 디스플레이부(151)는 별도의 터치 없이도 시간 정보가 표시되는 올웨이즈 온 디스플레이(Alway on Display) 형태로 구현될 수 있다. 이러한 경우, 저전력 소모를 위해, 상기 디스플레이부(151)는 백라이트가 없는 반사 LCD 패널 등의 저전력 디스플레이 모듈을 사용하여 구현될 수 있다.

[122] 또한, 본체(101)에는 음향 출력부(152), 카메라(121), 마이크로폰(122), 사용자 입력부(123) 등이 구비될 수 있다. 디스플레이부(151)가 터치 스크린으로 구현되는 경우, 사용자 입력부(123)로 기능할 수 있으며, 이에 따라 본체(101)에 별도의 키가 구비되지 않을 수 있다. 또한, 본체(101)에는 본체의 착용 여부 및 본체의 착용에 따른 사용자의 움직임정보와 생체정보를 획득하기 위한 다양한 센서들, 자이로센서, PPG, ECG, 등이 구비될 수 있다.

[123] 밴드(102)는 손목에 착용되어 손목을 감싸도록 이루어지며, 착용이 용이하도록 플렉서블 재질로 형성될 수 있다. 그러한 예로서, 밴드(102)는 가죽, 고무, 실리콘, 합성수지 재질 등으로 형성될 수 있다. 또한, 밴드(102)는 본체(101)에 착탈 가능하게 구성되어, 사용자가 취향에 따라 다양한 형태의 밴드로 교체 가능하게 구성될 수 있다.

[124] 한편, 밴드(102)는 안테나의 성능을 확장시키는 데에 이용될 수 있다. 예를 들어, 밴드에는 안테나와 전기적으로 연결되어 그라운드 영역을 확장시키는 그라운드 확장부(미도시)가 내장될 수 있다.

[125] 밴드(102)에는 파스너(fastener; 102a)가 구비될 수 있다. 파스너(102a)는 버클(buckle), 스냅핏(snap-fit)이 가능한 후크(hook) 구조, 또는 벨크로(velcro;

상표명) 등에 의하여 구현될 수 있으며, 신축성이 있는 구간 또는 재질을 포함할 수 있다. 본 도면에서는, 파스너(102a)가 버클 형태로 구현된 예를 제시하고 있다.

[126] 이상에서 설명한 구성 중 하나 이상을 구비한 본 발명의 실시 예에 따른 웨어러블 디바이스(100)는, 본체가 착용됨에 따라 사용자의 스트레스지수를 상시 측정할 수 있다. 구체적으로, 상기 웨어러블 디바이스(100)는 본체의 착용에 따라 감지되는 사용자의 생체정보, 즉 센서를 통해 감지되는 사용자의 신체에서 발생하는 전기적 신호를 기초로 사용자의 스트레스지수를 상시 측정한다.

[127] 또, 상기 웨어러블 디바이스(100)는 측정된 스트레스지수는 누적하고, 증가된 스트레스지수가 기준범위 이상 완화되는 구간, 즉 스트레스가 효율적으로 감소되는 구간에서의 상황 정보를 수집하여 저장해둔다. 한편, 웨어러블 디바이스(100)는 스트레스지수의 모니터링 결과, 측정된 스트레스지수가 기준범위의 임계값을 벗어나면, 본체의 위치 정보를 기준으로 하여 저장된 상황 정보 중 적어도 하나를 추출하고, 추출된 상황 정보와 관련된 컨텐츠의 출력을 유도하는 아이콘을 화면에 출력시킬 수 있다. 그에 따라, 개인화된 스트레스 해소 정보들을 저장할 수 있고, 스트레스 발견시 현재 위치에 적합한 스트레스 해소 정보를 제공하는 것이 가능하다.

[128] 또한, 상기 웨어러블 디바이스(100)는 저전력 모드로 스트레스지수를 상시 측정하되, 상황에 따라 스트레스지수의 측정 주기를 가변할 수 있다. 구체적으로, 상기 웨어러블 디바이스(100)는 위치 정보, 시간 정보, 및 사용자의 스트레스 상태 정보 중 적어도 하나를 관련시켜 스트레스지수의 측정 주기를 이전보다 길게 또는 짧게 가변할 수 있다. 이와 같이, 측정 주기를 유연하게 변경함으로써, 스트레스지수를 보다 정확하게 모니터링할 수 있고 전력 소모의 낭비를 줄일 수 있다.

[129] 이하, 도 3은 본 발명의 실시 예에 따른 웨어러블 디바이스에서 구현되는 동작을 설명하기 위한 대표 흐름도이다.

[130] 도 3에 도시된 바와 같이, 먼저 본 발명의 실시 예에 따른 웨어러블 디바이스는, 본체의 착용을 감지한다(S10). 다음, 본체를 착용한 사용자의 생체정보, 예를 들어 심박정보, 호흡 정보 등을 기초로 사용자의 스트레스지수를 측정한다(S20). 또, 본체의 착용이 유지되는 동안, 측정되는 스트레스지수를 누적한다(S30). 그리고, 누적된 스트레스지수를 기초로 스트레스지수의 측정 주기를 가변한다(S40).

[131] 또한, 스트레스지수가 증가한 경우, 증가된 스트레스지수가 기준범위내로 완화되는 구간에서의 상황 정보를 수집하여 저장할 수 있다.

[132] 즉, 스트레스지수가 효율적으로 감소된 구간이 발견되면, 스트레스지수가 증가된 시점부터 감소된 시점까지의 동안 발생했던 모든 상황 정보(예, 시간, 위치, 단말의 동작 상태, 사용자의 행동 정보, 주변 소음 등)를 수집하여 기록한다.

[133] 여기에서, 기준범위란 스트레스 상태가 해소된 것으로 판단되는

스트레스지수범위를 의미한다. 한편, 사용자마다 평균 스트레스 지수가 다르고 사용자가 처한 상황에 따라 스트레스 해소 상태로 판단되는 스트레스 지수도 각각 다르므로, 전술한 기준범위는 사용자 개인에 따라 그리고 사용자가 처한 상황, 예를 들어 장소별, 시간대별, 활동량 등에 따라 달라질 수 있다.

[134] 또한, 측정된 스트레스지수가 기준범위의 임계값을 벗어난 것이 감지되면, 저장된 상황 정보들 중에서 본체의 현재 위치에 대응되는 상황 정보를 선택적으로 추출할 수 있다. 여기서, 기준범위의 임계값이란, 스트레스 상태로 판단되지 않는 스트레스지수의 임계값 또는 임계범위를 의미한다. 따라서, 스트레스지수가 기준범위의 임계값을 벗어난 경우란, 스트레스 상태로 정의될 수 있다.

[135] 이 또한, 사용자마다 평균 스트레스 지수가 다르고 사용자가 처한 상황에 따라 스트레스 상태로 판단되는 스트레스 지수도 각각 다르므로, 전술한 기준범위의 임계값은 사용자 개인에 따라 그리고 사용자가 처한 상황, 예를 들어 장소별, 시간대별, 활동량 등에 따라 달라질 수 있다.

[136] 또한, 이와 같이 측정된 스트레스지수가 기준범위의 임계값을 벗어나면, 추출된 상황 정보와 관련된 스트레스 해소 정보의 출력을 유도할 수 있다. 예를 들어, 스트레스 상태를 알려주는 알림 정보를 화면에 출력하고, 알림 정보에 입력이 가해지면 추출된 상황 정보와 관련된 스트레스 해소 정보로, 특정 컨텐츠를 출력시킬 수 있다.

[137] 이하, 상술한 흐름도의 각 과정을 보다 구체적으로 기술하겠다.

[138] 먼저, 웨어러블 디바이스 본체가 착용되면(S10), 본체의 측정부(182, 도 1a)는 구비된 센서들을 통해 감지되는 사용자의 생체정보를 기초로 스트레스지수를 저전력 소모(low-energy)로 상시 측정할 수 있다(S20).

[139] 여기에서, 사용자의 생체 정보란, 웨어러블 디바이스(100)를 착용한 사용자의 신체에서 발생하는 다양한 전기적 신호를 의미할 수 있다. 이러한 전기적 신호는, 예를 들어 예를 들어, ECG(ElectroCardioGram) 신호, PPG(Photoplethymogram) 신호, 또는 GSR(Galvanic Skin Response) 신호 중 어느 하나일 수 있겠으나, 이에 한정되지 않고 스트레스 지수를 측정하기 위해 당업계에서 널리 사용되는 다양한 종류의 신호가 모두 포함될 수 있다. 예를 들어, 웨어러블 디바이스에 체온 센서, 심장 박동 센서, 압력 센서 등이 더 구비된 경우, 그로부터 감지되는 생체정보를 더 획득할 수 있다.

[140] 구체적으로, 심전도(electrocardiogram, ECG) 신호는 심장의 전기적 활동이 피부 표면에서 발생하는 전기적 신호이다. 심전도 신호는 심장의 박동에 따라 심근에서 발생하는 활동 전류를 체표면의 적당한 2개소로 유도하여 측정될 수 있다. ECG의 주기 및 파형의 변화 특성을 주기적으로 관찰하면, 웨어러블 디바이스(100) 등을 착용한 사용자의 심리적 상태를 구분할 수 있다.

[141] 근전도(electromyogram, EMG) 신호는 근육의 수축력, 근활성도 및 피로도가 피부 표면에서 발생하는 전기적 신호이다. 근전도는 예를 들어 웨어러블

디바이스(100) 등의 착용을 통해 감지되는 사용자의 손가락의 움직임에 따른 힘줄들의 움직임을 감지할 수 있다. 이러한 경우 제어부(180)는 감지된 정보를 기초로 손가락들이 어떤 제스처를 취하고 있는지 판단할 수 있다.

[142] 뇌전도(electroencephalogram, EEG) 신호는 집중력 또는 외부 자극에 대한 뇌활성도가 피부 표면에서 발생하는 전기적 신호이다. 뇌전도 신호는 사람의 대뇌에 일어나는 전위변동, 또는 그것에 의하여 일어나는 뇌전류를 두피 상에서 유도하여 측정될 수 있다. 이러한, EEG는 주파수의 특성에 따라, 여섯 가지 유형으로 구분할 수 있다. 일반적으로 델타 유형은 '수면 상태', 세타 유형은 '졸음 상태', 알파 유형은 '편안한 상태', 낮은 베타 유형은 '집중 상태', 중간 베타 유형은 '주의 상태', 높은 베타 유형은 '흥분 상태'를 나타낸다. 즉, EEG를 통해 사용자 개인의 심리 상태를 추정할 수 있다.

[143] 또한, 피부전도도(galvanic skin reflex, GSR) 신호는 교감신경 활성에 대한 피부 저항의 변화가 피부 표면에서 발생하는 전기적 신호이다. 피부전도도 신호는 생체의 피부에서 외적인 자극이나 정서적인 흥분에 의해 발생된 전기적 저항이 일시적으로 감소하거나 활동전위가 발생하거나 하는 현상을 측정하여 획득될 수 있다. 사용자가 긴장/각성하게 되어 교감신경계가 활성화되면 피부표면의 땀샘이 활성화되어 전도성이 증가되어, GSR이 증가한다.

[144] 또한, 심박동변이도(Heart Rate Variability, HRV)는 심전도의 R-피크와 R-피크 간의 간격(RRI: R-R Interval)의 변화가 피부 표면에서 발생하는 전기적 신호이다. RRI의 시계열 신호를 푸리에 변환하여 심박동변이도의 주파수 영역 파워스펙트럼을 구할 수 있다. 이 파워스펙트럼의 LF(Low Frequency: 0~0.15Hz) 영역은 주로 교감신경계의 활성도를 반영하고, HF(High Frequency: 0.15~0.4Hz) 영역은 부교감신경계의 활성도를 나타낸다.

[145] 또한, 맥파(Photoplethysmogram, PPG) 신호는 심장박동에 동기되어 손가락 끝 혈관에서의 동맥혈량(arterial blood volume)이 증가하고 감소하는 상태가 반복되는 것을 측정하여 획득되는 전기적 신호이다. 손가락 끝의 광수신부에서 검출된 투과광은 손가락에서 흡수된 광량만큼 차감되어 수신되어 심장박동에 동기된 혈류변화 파형으로 나타나는데, 이러한 파형이 PPG이다.

[146] 이와 같이 감지된 다양한 생체정보들을 통해, 웨어러블 디바이스(100)는 사용자의 신체 상태와 심리 상태에 대응되는 스트레스지수를 측정할 수 있다. 예를 들어, 웨어러블 디바이스(100)는 HRV의 주파수 영역 및/또는 시간 영역을 분석하여 현재 스트레스 지수가 평소보다 낮은지 높은지, 또는 어느 정도로 높거나 낮은지를 판단할 수 있다.

[147] 다음, 웨어러블 디바이스(100)는 측정된 스트레스지수를 소정 시간 누적하여 저장할 수 있고(S30), 누적된 스트레스지수를 기초로 스트레스지수의 측정 주기를 가변할 수 있다(S40).

[148] 구체적으로, 누적된 스트레스지수가 기준범위내에서 모니터링되면 스트레스지수의 측정 주기를 기준값보다 길게 변경할 수 있다. 반면, 누적된

스트레스지수가 기준범위를 벗어난 것이 모니터링되면 스트레스지수의 측정 주기를 기준값보다 짧게 변경할 수 있다.

[149] 여기서, 기준값은 스트레스지수의 초기 측정 주기 또는 평균 측정 주기를 의미하며, 예를 들어, 6분 간격으로 1분 동안 스트레스지수를 측정하는 경우에 대응될 수 있다. 또한, 여기서, 기준범위란 스트레스 상태가 해소된 것으로 판단되거나 또는 스트레스 상태가 아닌 것으로 판단되는 스트레스지수범위를 의미한다.

[150] 한편, 나아가 본 발명에서는 증가된 스트레스지수가 기준범위내로 완화되는 구간에서의 상황 정보를 수집하여 저장부(170, 도 1a)에 저장할 수 있다.

[151] 측정된 스트레스지수의 일정 기간 누적되면, 웨어러블 디바이스(100)는 사용자의 평균 스트레스 지수를 파악할 수 있다. 또한, 사용자가 어느 시간 영역에서 스트레스가 높은지, 평균적으로 스트레스가 해소되는데 얼마나 걸리는지 등의 개인화된 스트레스 패턴을 파악할 수 있다. 이를 기초로, 최근 스트레스 패턴에 이상신호가 있는지 여부를 파악할 수 있다.

[152] 또한, 여기에서, '증가된 스트레스지수가 기준범위내로 완화되는 구간'이란, 증가된 스트레스지수가 효율적으로 감소되는 구간으로서, 증가된 스트레스지수의 감소율이 기준치보다 큰 경우의 시간 영역에 대응된다.

[153] 일반적으로, 증가된 스트레스는 사람의 교감신경과 부교감신경의 상호작용에 따라, 일정 시간이 경과하면 자연적으로 해소된다. 그러나, 어떤 경우에는 증가된 스트레스의 감소율이 큰 경우가 있는데, 이때의 상황 정보를 선별적으로 수집함으로써 다음에 스트레스 지수가 상승한 경우에 효율적으로 활용할 수 있다.

[154] 다시 말해, 본 발명에서는 증가된 스트레스지수가 기준범위의 임계값(전술한 '스트레스 상태가 아닌 스트레스지수의 임계범위') 이하로 감소되는 모든 구간에서의 상황정보를 수집할 수도 있으나, 일 실시 예에서는 증가된 스트레스지수가 효율적으로 감소한 구간, 즉 증가된 스트레스지수의 감소율이 기준치보다 큰 구간에 한하여 선택적으로 상황정보를 수집할 수도 있다. 그에 따라, 보다 사용자 맞춤형 스트레스 해소 서비스를 제공할 수 있도록 동작한다.

[155] 이를 위해, 웨어러블 디비이스(100)는 본체의 착용이 유지되는 동안, 항시 스트레스지수를 모니터링하고, 모니터링 결과 스트레스지수가 스트레스 상태로 판단되는 소정값 이상을 만족하는 경우, 타이머 기능을 트리거 하여 스트레스지수의 감소율을 산출할 수 있다. 또한, 스트레스지수의 감소율은 사용자의 성별, 나이, 직업군 등에 따라 개인마다 차이가 있을 수 있겠으나, 본 발명에서는 일정 기간 동안 누적된 생체 정보들을 기초로 생성된 개인 맞춤형 스트레스 패턴을 이용하여 스트레스지수의 감소율을 산출할 수 있다.

[156] 산출된 감소율이 기준치보다 큰 지점이 감지되면, 이지점으로부터 역산하여 스트레스 상태가 발견된 지점까지를, 전술한 '증가된 스트레스지수가 기준범위내로 완화되는 구간(이하, '스트레스 해소 구간'으로도 명명될 수

있음)'으로 정의한다.

[157] 즉, 본 발명에서 '스트레스 해소 구간'은 증가된 스트레스가 자연적으로 해소되기까지 소요되는 시간에 대응되는 스트레스지수 감소율이 관찰되는 시간 영역은 제외된다. 따라서 이러한 시간 영역에서 수집된 상황정보들은 무시할 수 있다.

[158] 또한, 여기에서, 상황 정보란, 상황정보 수집구간에 대응되는 시간(예, '낮 또는 밤'), 위치(예, '집, 회사'), 사용자가 처한 상황(예, '수면, 활동량, 심리상태 등'), 사용자의 행동(예, '사용자의 제스처, 사용자의 음성 등'), 단말의 동작 상태(예, '음악 재생, 동영상 플레이, 통화 중'), 주변환경정보(예, '날씨, 외부 소음, 소음정도' 등), 등을 모두 포함할 수 있다. 또, 이러한 상황 정보는 기설정된 기준, 예를 들어 장소별, 시간별, 날짜별로 구분하여 수집될 수 있다.

[159] 또한, 웨어러블 디바이스(100)는 이와 같이 수집된 상황정보들을 기초로, 스트레스의 해소 시나리오를 생성할 수 있다. 이를 위해, 복수의 상황 정보들을 기설정된 기준, 예를 들어 상황정보의 수집 순서, 빈도 수, 스트레스지수의 감소율 변화 등을 기준으로, 사용자에게 제공할 스트레스 해소 시나리오를 생성할 수 있다. 그리고, 생성된 스트레스 해소 시나리오는 사용자의 반응(스트레스지수의 감소율, 단말의 조작 여부)을 기초로 업데이트 될 수 있다.

[160] 웨어러블 디바이스(100)는 이러한 상황 정보를 보다 정확하게 수집하기 위하여, 구비된 다양한 센서, 예를 들어 카메라 모듈, 음성 인식 모듈 등을 활성화시킬 수 있다. 또한, 웨어러블 디바이스(100)는 파악된 상황 정보에 대하여 사용자에게 확인을 요청하고, 사용자의 응답을 기초로 상황 정보를 수정 및 확정하여 저장할 수 있다.

[161] 이와 같이 스트레스지수를 모니터링하는 중에, 측정된 스트레스지수가 기준범위의 임계값을 벗어나면, 저장된 상황 정보 중 본체의 현재 위치에 대응되는 상황 정보를 추출할 수 있다.

[162] 이를 위해, 웨어러블 디바이스는 스트레스지수가 기준범위의 임계값을 벗어나면, 위치 정보 모듈(115) 등을 활성화하여 위치 정보를 획득할 수 있다.

[163] 한편, 여기에서 측정된 스트레스지수가 기준범위의 임계값을 벗어나는 경우란, 개인 맞춤형 스트레스 패턴을 벗어나는 스트레스 지수가 발견된 경우로서, 측정된 스트레스지수가 평균 스트레스지수보다 기준치 이상 높거나 또는 매우 낮은 경우를 모두 포함한다. 즉, 측정된 스트레스지수가 기준범위의 임계값을 벗어나는 경우란, 앞서 말한 바와 같이 '스트레스 상태'로 정의할 수 있다.

[164] 또한, '스트레스 상태'는 사람마다 모두 다르므로, 웨어러블 디바이스(100)는 측정된 스트레스지수가 기준범위의 임계값을 벗어나지는 여부를 판단하는 데 있어서, 개인 맞춤형 스트레스 패턴을 기준으로 하여 스트레스지수가 측정된 시간과 장소를 참작할 수 있다.

[165] 저장된 상황 정보 중 본체의 현재 위치에 대응되는 상황 정보란, 스트레스를 해소하기 위하여 본체의 현재 위치에 적합한 상황정보 또는 적합하지 않은

상황정보를 제외한 나머지 상황정보를 의미한다.

[166] 예를 들어, 스트레스지수가 기준범위의 임계값을 벗어난 시점에서 웨어러블 디바이스(100)의 현재 위치가 '회사'인 경우, 사용자의 활동에 제약이 있는 것으로 판단하고, 스트레스 해소 구간에 대응되는 상황 정보로 '운동하기', '수면', '영화보기' 등은 추출에서 제외될 수 있다. 또, 예를 들어, 웨어러블 디바이스(100)의 현재 위치가 '공원'인 경우, 해당 장소에서 바로 실행할 수 있는 상황 정보로 '걷기', '음악듣기' 등이 우선하여 추출될 수 있다.

[167] 또한, 웨어러블 디바이스(100)는 본체의 현재 위치뿐만 아니라, 시간 정보를 고려하여 상황 정보를 추출할 수 있다. 예를 들어, 스트레스지수가 기준범위의 임계값을 벗어난 시점에서 현재 위치가 '집'이여서 사용자의 활동에 제약은 없으나, '밤 시간대'인 경우, 사용자의 수면을 방해하지 않거나 사용자의 수면을 유도하는 상황 정보를 우선적으로 추출할 수 있다.

[168] 이와 같이, 현재 위치(및 시간)에 적절한 상황 정보가 추출되면, 웨어러블 디바이스(100)는 추출된 상황정보와 관련된 스트레스 해소 정보를 제공하거나 이를 유도하는 알림 정보를 출력할 수 있다.

[169] 구체적으로, 추출된 상황정보와 관련된 컨텐츠의 출력을 유도하는 과정으로, 웨어러블 디바이스(100)의 제어부(180)는, 스트레스지수가 기준범위의 임계값을 벗어나면, 스트레스 상태임을 알려주는 정보(예, 알림 신호, 알림 아이콘 출력 등)를 선행적으로 출력시킬 수 있다.

[170] 그런 다음, 소정 시간이 경과하거나 또는 알림 아이콘에 사용자의 입력이 수신되면, 추출된 상황 정보와 관련된 컨텐츠로 진입할 수 있다. 여기서, 추출된 상황 정보와 관련된 컨텐츠는, 스트레스 해소를 위하여 추출된 상황 정보와 동일 또는 유사한 상황을 제공하기 위해 활성화되는 디바이스의 특정 기능(예, 음악 재생, 보이스기능 활성화 등), 특정 애플리케이션, 특정 음성, 메시지, 이미지, 텍스트, 또는 그래픽변화 등의 정보를 모두 포함한다.

[171] 한편, 다른 예에서는, 디스플레이부(151)가 활성화되거나 사용자 입력이 수신되면, 제어부(180)는 사용자의 스트레스 상태를 알려주지 않고, 추출된 상황정보와 관련된 컨텐츠를 화면에 출력하거나 또는 디폴트된 컨텐츠, 예를 들어 '맞춤형 심호흡 따라하기' 컨텐츠를 실행하여 음성으로 안내할 수 있다.

[172] 또한, 상기 제어부(180)는 컨텐츠가 출력된 후, 스트레스지수가 해소되는 정도를 모니터링하여, 다른 컨텐츠의 출력을 연쇄적으로 유도할 수 있다. 예를 들어, 제어부(180)는, 디스플레이부(151)에 제1컨텐츠가 출력된 후 소정 시간내에 스트레스지수가 기준치 이하로 감소되지 않으면, 다른 상황 정보와 관련된 제2컨텐츠를 이어서 출력시킬 수 있다.

[173] 또, 상기 제어부(180)는 컨텐츠의 출력과 스트레스지수가 해소되는 정도의 모니터링 결과를 연관시켜, 대응되는 상황 정보의 이력을 업데이트할 수 있다. 그에 따라, 이후 동일 또는 유사한 스트레스 상태에서 추출된 상황정보에 대응되는 컨텐츠의 종류, 출력되는 순서 등을 다르게 제어할 수 있다.

[174] 이상에서 살펴본 바와 같이, 본 발명의 실시 예에 의하면, 스트레스지수를 저전력으로 항시 측정하여 누적된 스트레스지수를 기초로 맞춤형 스트레스 패턴을 파악할 수 있고, 이를 기초로 스트레스 상태에서 현재 상황을 고려하여 보다 적합한 스트레스 해소 방안을 제공한다.

[175] 한편, 본 발명에서는 웨어러블 디바이스의 전력 소모 측면을 고려하여, 본체가 착용되면 스트레스지수를 항시 측정하되, 저전력 소모(low-energy)로 측정한다. 나아가, 현재 상황을 기초로 스트레스지수의 측정 주기를 가변할 수 있다.

[176] 이와 관련하여, 도 4a 내지 도 4d는 본 발명의 실시 예에 따라, 사용자의 생체정보를 이용한 스트레스지수의 측정과 관련된 도면들이다.

[177] 도 4a는 스트레스지수의 측정에 활용되는 일 예로, 심박동변이도(Heart Rate Variability, HRV)를 산출하는 방법을 보여주고 있다.

[178] 심박동변이도(Heart Rate Variability, HRV)는 심전도의 R-피크와 R-피크 간의 간격(RRI: R-R Interval)(T1, T2)의 변화가 피부 표면에서 발생하는 전기적 신호이다. 사람의 몸은 교감 신경과 부교감 신경의 끊임없는 길항작용을 수행하므로, 정상 상태에서는 RRI가 불규칙하고 그렇지 않은 경우 RRI가 규칙적으로 모니터링된다. 즉, 건강한 사람은 RRI의 불규칙도, 즉 심박동변이도(HRV)의 변화가 다양하고 뚜렷하게 나타난다. 다시 말해, RRI 패턴이 규칙적이면 스트레스지수가 높다고 말할 수 있고, 이러한 상태가 소정 시간 지속되면 스트레스 상태인 것으로 판단할 수 있다.

[179] 본 발명에서, 심박동변이도(HRV)는 이하에 후술되는 PPG 신호를 이용하여 측정될 수도 있다.

[180] RRI는 사용자마다 다르게 분석될 수 있다. 이러한 RRI의 시계열 신호는 푸리에 변환하여 심박동변이도(HRV)의 시간 영역 분석(RRI의 표준편차 산출) 또는 주파수 영역 파워스펙트럼을 통해 구할 수 있다. 도 4c는 이러한 주파수 영역 분석 방법을 보여주고 있다.

[181] 도 4c에서, LF(Low Frequency: 0.04~0.15Hz) 영역은 주로 교감신경계의 활성도를 반영하고, HF(High Frequency: 0.15~0.4Hz) 영역은 주로 부교감신경계의 활성도를 나타낸다. LF와 HF간의 비율, 또는 HF의 비율이 높을수록 건강 상태가 좋다고 말할 수 있다. 도 4c의 좌측 그림은 LF와 HF간의 비율이 동일한 경우로 보통 상태이고, 우측 그림은 LF 비율이 높은 경우로 스트레스 상태임을 추정할 수 있다.

[182] 한편, 도 4b는 스트레스지수의 측정 및 스트레스 해소를 위한 심호흡에 활용되는 일 예로, 호흡신호를 산출하는 방법을 보여주고 있다.

[183] 먼저, 웨어러블 디바이스(100)에 구비된 PPG 센서를 이용하여, 맥파(Photoplethysmogram, PPG) 신호를 검출한다. 맥파 신호는, 앞서 살펴본 바와 같이, 심장박동에 동기되어 손가락 끝 혈관에서의 동맥혈량(arterial blood volume)이 증가하고 감소하는 상태가 반복되는 것을 측정하여 획득되는 전기적 신호이다. 손가락 끝의 광수신부에서 검출된 투과광은 손가락에서 흡수된

광량만큼 차감되어 수신되어 심장박동에 동기된 혈류변화 파형으로 나타나는데, 이러한 파형이 PPG이다.

[184] 도 4b의 위쪽 그림은 PPG 광혈류 신호이다. 들숨에서는 PPG 신호의 주기가 감소하고, 날숨에서는 PPG 신호의 주기가 증가한다. 그리고, 아래쪽 그림은, PPG 광혈류 신호로부터 추정된 호흡신호를 나타낸 것이다. 이러한 호흡신호는, PPG 광혈류 신호를 Bandpass필터(예, 필터 계수를 0.01~0.4로 설정) 등을 이용하여 잡음(artifact)을 제거하거나 또는 특정 잡음만 추출하고(예, Internal Artifact), ODE 미분법을 적용하여 쉽게 추정될 수 있다.

[185] 이와 같이 추정된 호흡신호는, 전술한 심박동변이도를 산출하는데 이용될 뿐만 아니라, 스트레스 상태를 해소하기 위한 사용자 맞춤형 심호흡에도 활용될 수 있다.

[186] 다음으로, 도 4d는 하루 동안 측정한 심박동변이도(Heart Rate Variability, HRV)를 이용하여 스트레스지수를 측정하는 방법을 보여주고 있다.

[187] 도 4d에서, 예를 들어 제1파형(A)이 평균 심박동변이도이고, 일정 시간 동안(예, 일주일 이상) 관찰된 심박동변이도가 제2파형(B)으로 변화했다면, 평균 심박동변이도의 베이스라인(baseline)이 변화된 만성 스트레스 상태임을 나타낸다. 한편, 제2파형(B)이 평균 심박동변이도라고 가정한 경우, 하루 동안 관찰된 심박동변이도가 제3파형(C)으로 변화했다면, 일시적으로 베이스라인(baseline)이 낮아진 경우로서 급성 스트레스가 발생한 경우를 나타낸 것이다.

[188] 여기에서, 심박동변이도(HRV)의 베이스라인(baseline)이란, 심박동변이도(HRV)의 시간범위 분석에서, 심박의 주기적인 변화를 모니터링하기 위한 기준이 되는 바닥값 또는 바닥 구간을 의미한다. 베이스라인(baseline)은, 호흡, 자율신경계 활동의 변이, 흡연, 음주, 불면, 스트레스 상태 등에 의하여 일시적으로 낮아질 수 있으나 오랜 시간 지속되면 신진대사 비율의 이상, 수면 사이클의 이상, 체온 이상 등이 발생할 수 있고, 그에 따라 심박동변이도(HRV)의 베이스라인(baseline)이 만성적으로 낮아질 수 있다.

[189] 또는, 심박동변이도(HRV)의 베이스라인(baseline)이란, 본 발명에서 말하는 스트레스 상태가 아닌 것으로 판단되는 임계범위에 대응될 수 있다. 이러한 경우, 심박동변이도(HRV)의 베이스라인(baseline)을 벗어나는 경우란, 스트레스 상태로 정의될 수 있다. 스트레스지수의 측정 결과, 일시적으로 심박동변이도(HRV)의 베이스라인(baseline)을 벗어난 경우 급성 스트레스 상태로 정의될 수 있고, 오랜 시간 만성적으로 심박동변이도(HRV)의 베이스라인(baseline)을 벗어난 것이 관찰되면 만성 스트레스 상태로 정의될 수 있다.

[190] 일시적인 변화인 급성 스트레스보다 만성 스트레스 상태가 의학적으로 위험하므로, 본 발명에서는 스트레스지수를 상시 측정하여 기존의 평균 심박동변이도, 즉 맞춤형 스트레스 패턴의 베이스라인이 낮아지지 않도록

피드백을 수행하도록 구현되었다.

[191] 이와 같이 본 발명에 따른 웨어러블 디바이스(100)는 PPG 센서 등을 이용하여 감지되는 다양한 생체정보를 기초로 사용자의 스트레스지수를 상시 측정할 수 있다. 또, 생체정보의 변화도, 예를 들어 심박동변이도의 불규칙도를 기준으로 스트레스지수를 복수의 레벨 또는 단계로 구분하여 알려줄 수 있다.

[192] 도 5는 본 발명의 실시 예에 따라, 사용자의 활동 패턴을 기초로 스트레스지수의 측정 주기를 가변하는 방법을 설명하기 위한 그래프이다.

[193] 본 발명에서는 스트레스지수를 보다 정확하게 측정하고 스트레스지수 상시 측정에 따른 전력 소모를 최소화하기 위해 스트레스지수의 측정 주기를 가변할 수 있다. 이와 관련하여, 도 5는 하루 동안 웨어러블 디바이스(100)를 착용한 사용자의 활동 패턴을 기초로 스트레스지수의 측정 주기를 가변할 수 있다.

[194] 도 5에서, 웨어러블 디바이스(100)가 착용된 초기에는 기본 측정 주기(예, 1회/6분, 평균 소모전류 약 1mA)에 따라 스트레스지수를 측정한다. 또한, 스트레스지수의 측정 신뢰도를 높이기 위해, 장소 이동과 같이 사용자의 움직임이 많이 감지되는 지점 또는 구간(예, '걷기, 이동')에서는 사용자의 움직임이 감소될 때까지 스트레스지수의 측정을 일시적으로 중단하거나, 스트레스지수의 측정 주기를 길게 하거나, 또는 측정된 수치를 무시할 수 있다.

[195] 또, 제어부(180)는, 소정 시간 누적된 스트레스지수에 기초하여서, 스트레스지수의 측정 주기를 가변할 수 있다. 도 5에서, 작업을 수행하는 낮시간대(A, B)에는 누적된 스트레스지수의 평균치가 높음을 고려하여, 스트레스지수의 측정 주기를 짧게 조절할 수 있다(예, 1분/5분). 반면, 휴식 또는 수면을 수행하는 밤시간대(C)에는 누적된 스트레스지수의 평균치가 낮음을 고려하여, 스트레스지수의 측정 주기를 길게 조절하거나(예, 1분/20분) 또는 슬립 모드(예, 1분/1시간)에 진입하도록 조절할 수 있다.

[196] 또한, 상기 제어부(180)는 누적된 스트레스지수가 기준범위내에서 모니터링되는 동안에는 스트레스지수의 측정 주기를 기준값보다 길게 하고, 스트레스지수가 기준범위를 벗어난 것이 모니터링된 시점에 스트레스지수의 측정 주기를 기준값보다 짧게 제어할 수 있다.

[197] 여기에서, 상기 제어부(180)는 스트레스지수가 기준범위를 벗어난 정도에 따라 스트레스지수 측정 간격의 변화도를 다르게 조절할 수 있다. 예를 들어, 측정된 스트레스지수가 기준범위를 조금 벗어난 경우에는 스트레스지수 측정 주기를 3~5분마다 1분씩 측정하고, 측정된 스트레스지수가 기준범위를 훨씬 벗어난 경우에는 스트레스지수 측정 주기를 보다 짧게, 예를 들어 2분마다 1분씩 측정하거나 스트레스지수가 소정치로 완화될 때까지 휴지 구간 없이 지속적으로 측정하도록 조절할 수 있다.

[198] 또한, 상기 제어부(180)는 스트레스지수의 측정 주기가 가변되었음을 알려주는 알림 정보를, 예를 들어, 소리, 화면 변화, 진동, LED 광 등의 형태로 출력함으로써, 사용자에게 스트레스지수의 측정 주기가 가변되었음을 알려줄

수 있다. 이때, 상기 알림 정보에는 스트레스지수의 측정 주기의 증감 여부뿐만 아니라, 구체적인 측정 주기의 수치(예, 3분 간격에서 5분 간격으로 변경합니다)가 포함될 수 있다.

[199] 또한, 이와 같은 알림 정보가 출력되는 동안, 디스플레이부(151)에 터치입력이 가해지면, 상기 제어부(180)는 가변된 측정 주기를 초기화하거나 기설정된 시간 간격으로 증감시킬 수도 있다.

[200] 도 6은 본 발명의 실시 예에 따라, 측정 위치별로 스트레스지수의 측정 주기를 가변하는 방법을 설명하기 위한 도면이다. 이를 위해, 웨어러블 디바이스(100)는 본체의 착용이 감지되면, 위치 정보 모듈을 활성화하여, 본체의 위치 정보를 수신할 수 있다.

[201] 본 발명의 일 실시 예에서, 웨어러블 디바이스(100)의 제어부(180)는 소정 시간 누적된 스트레스지수를 본체의 위치 정보와 연관시켜 위치별 스트레스지표를 생성할 수 있다.

[202] 여기서, 스트레스지표는 맞춤형 스트레스 패턴에 위치 정보를 연관시킨 것으로 정의될 수 있다. 즉, 사람마다 다른 스트레스 패턴을 생성함은 물론, 사용자마다 기정의된 복수의 위치에 대응되는 복수의 스트레스지표가 생성된다. 스트레스지표는 스트레스지수의 누적 정보가 포함되며, 스트레스지표의 베이스(base)는 해당 스트레스지표에서 스트레스 상태가 아닌 경우로 인식되는 범위의 스트레스지수 임계치를 의미한다.

[203] 예를 들어, 도 6에서, 'Company'에 대한 스트레스지표와 'Home'에 대한 스트레스지표가 각각 생성될 수 있다. 여기서, 'Company'에 대한 스트레스지표의 베이스(base)와 'Home'에 대한 스트레스지표의 베이스(base)는 상이한 값을 가질 수 있다. 여기서, 스트레스지표의 베이스(base)는 해당 스트레스지표에서 스트레스 상태가 아닌 경우로 인식되는 범위의 스트레스지수 임계치 또는 임계범위에 대응된다.

[204] 이러한 경우, 제어부(180)는 스트레스지수의 측정시, 본체의 위치 정보에 대응되는 스트레스지표를 기준으로 하여, 스트레스 상태를 판단하기 위한 기준범위의 임계값을 다르게 설정할 수 있다.

[205] 예를 들어, 현재 스트레스지수가 '70'이고, 'Company'에 대한 스트레스지표의 베이스(base), 즉 스트레스 상태가 아닌 경우로 인식되는 임계 스트레스지수가 '80', 'Home'에 대한 스트레스지표의 베이스(base)는 '60'이라고 가정하자. 스트레스지수의 측정시, 현재 위치가 'Company'인 경우라면 기준범위의 임계값을 벗어나지 않는 정도의 스트레스지수로 판단되지만, 현재 위치가 'Home'인 경우라면 기준범위의 임계값을 벗어난 '스트레스 상태'로 판단되어, 전술한 스트레스 해소를 위한 일련의 과정이 수행된다.

[206] 또한, 상기 제어부(180)는, 본체의 위치 정보에 대응되는 스트레스지표의 베이스(base)에 기초하여, 스트레스지수의 측정 주기를 변경할 수 있다.

[207] 구체적으로, 제어부(180)는 현재 위치 정보를 기초로 선택된 스트레스지표의

베이스(base)가 이전보다 낮아진 경우, 스트레스지수의 측정 주기를 기준값보다 길게 변경할 수 있다. 반면, 상기 제어부(180)는 현재 위치 정보를 기초로 선택된 스트레스지표의 베이스(base)가 이전보다 높아진 경우, 스트레스지수의 측정 주기를 기준값으로 또는 기준값보다 짧게 변경할 수 있다.

[208] 예를 들어, 도 6에서 'Company'에서의 스트레스지표의 베이스(예, '80')가 'Home'에서의 스트레스지표의 베이스(예, '60')보다 높으므로, 'Company'에서의 스트레스지수의 측정 주기를 기준치로 하거나(예, '6분마다 1분씩') 또는 그보다 짧은 간격으로 하고, 'Home'에서의 트레스지수의 측정 주기를 기준치보다 긴 간격(예, '18분마다 1분씩')으로 조절하여 스트레스지수를 측정할 수 있다.

[209] 한편, 동일 장소에 대하여 사람마다 스트레스지표가 다르게 분석될 수 있는데, 예를 들어 'Company'에서보다 'Home'에서의 스트레스지표의 베이스가 높은 사용자의 경우, 'Home'에서의 스트레스지수의 측정 간격을 더 짧게 조절할 수 있을 것이다.

[210] 이상에서와 같이, 스트레스지수가 평균적으로 높은 장소에서는 스트레스지수를 보다 자주 측정하고 그렇지 않은 장소에서는 측정 간격을 늘림으로써, 스트레스지수의 측정 신뢰도를 향상시키면서 동시에 전력소모(예, 스트레스지수 측정의 휴지기에는 PPG 센서를 비활성화시킬 수 있음)를 감소시킬 수 있다.

[211] 다음, 본 발명의 일 실시 예로, 도 7a 및 도 7b를 참조하여, 사용자의 움직임 정보와 스트레스지수를 기초로 스트레스지수의 측정 모드를 변경하는 방법을 설명하기로 한다.

[212] 웨어러블 디바이스(100)의 착용이 감지되면, 제어부(180)는 가속도 센서, 자이로 센서 등을 이용하여 본체를 착용한 사용자의 움직임 정보를 획득할 수 있다.

[213] 또, 상기 제어부(180)는 획득된 움직임 정보를 기초로 스트레스지수의 측정 모드에 진입할 수 있다. 구체적으로, 획득된 움직임 정보의 분석 결과, 활동량이 기준치 이상인 경우, 상기 제어부(180)는 스트레스 측정 모드에 진입하지 않고 대기 모드를 유지할 수 있다. 이는, 사용자의 움직임이 많은 경우에 감지된 생체정보를 기초로 스트레스지수를 측정하는 경우, 스트레스지수의 신뢰도가 떨어지기 때문이다.

[214] 이에, 제어부(180)는 획득된 움직임 정보의 분석 결과, 활동량이 기준치 이하인 경우에 스트레스 측정 모드에 진입하고, 스트레스 측정 모드에 진입하면 스트레스지수의 측정과 관련된 센서들, 예를 들어 PPG, ECG, 위치 정보 모듈 등을 활성화시킬 수 있다.

[215] 한편, 스트레스 측정 모드는, 사용자의 생체정보를 감지하기 위해 활성화되는 센서의 종류, 개수, 생체정보의 분석방식 중 적어도 하나를 달리하는 복수의 동작 모드를 포함할 수 있다. 구체적으로, 스트레스 측정 모드는, 스트레스지수를 측정하는 정밀도에 따라, 저전력 모드와 정밀 모드를 포함할 수

있다.

[216] 일 실시 예에서, 제어부(180)는 본체의 착용에 따라 획득된 움직임 정보에 대응되는 활동량을 산출하고, 산출된 활동량을 기초로 상기 저전력 모드와 정밀 모드 중 어느 하나를 실행하여 스트레스 지수를 측정할 수 있다.

[217] 저전력 모드에서는 전력 소모가 크지 않은 센서들을 이용하거나 스트레스지수의 측정 간격을 길게 하여(휴지구간 동안에는 센서를 비활성화 상태로 전환) 스트레스지수를 측정할 수 있다. 반면, 정밀 모드에서는 사용자의 스트레스지수를 정확하게 측정하는 것에 집중하여 가능한 많은 개수의 센서들을 이용하거나 스트레스지수의 측정 간격 또는 측정 시간(예, 6분마다 2분씩)을 짧게 한다.

[218] 구체적으로, 상기 제어부(180)는 기준 시간 동안 획득된 움직임 정보를 기초로 산출된 활동량이 소정값 이하이면 저전력 모드로 스트레스지수를 측정할 수 있다. 또, 상기 제어부(180)는 저전력 모드에서 기준범위의 임계값을 초과하는 스트레스지수가 감지되거나 또는 산출된 활동량이 임계치를 초과하는 상태가 소정 시간 지속되면, 정밀 모드로 스트레스지수를 측정할 수 있다.

[219] 일 예로, 도 7a에서, 와치형 웨어러블 디바이스(100)를 착용한 사용자의 움직임 정보가 분석 결과, 활동량이 기준치 이하이면 저전력 모드로 스트레스지수의 측정을 개시하고, 저전력 모드의 실행에 대응되는 화면 정보, 예를 들어 저전력 모드에서 측정되는 스트레스지수의 그래프(701)가 디스플레이부(151)에 출력될 수 있다. 저전력 모드에서는, 획득된 생체정보를 약 20Hz로 로우 샘플링하여 스트레스지수를 측정한다.

[220] 여기서, 스트레스지수의 그래프(701)는 디스플레이부(151)에 출력되고 있는 정보(예, 시간 정보)를 가리지 않도록 소정의 투명도를 갖거나 특정 영역에 한정하여 표시될 수 있다. 또한, 상기 화면 정보(701)에는 스트레스지수의 측정 진행률을 알려주는 인디케이터 바(711)가 더 표시될 수 있다.

[221] 저전력 모드에서 스트레스지수의 측정 중에, 기준치를 초과하는 활동량이 감지되면, 예를 들어 도 7a에 도시된 바와 같이 경고 이미지(702)를 화면에 출력하여 움직임을 줄이도록 유도할 수 있다. 그리고, 스트레스지수의 측정이 완료되면, 스트레스 정보를 알려주는 알림 정보(703)가 화면에 출력된다.

[222] 알림 정보(703)에는 스트레스 정도를 나타내는 그래프객체(712)와 텍스트정보(713)(예, 'High Stress')가 표시되며, 이와 구분되는 영역에 심박수 정보(714) 및 스트레스지수와 관련된 정보를 제공하는 프롬프트(715)가 출력될 수 있다. 프롬프트(715)는 음성 형태를 병행할 수 있고, 스트레스 상태를 해소하기 위한 가이드 정보가 이어서 제공된다. 예를 들어, '오늘 하루 힘드셨나요?' 이후 '운동을 해볼까요?'와 같은 정보가 토크백(talk back) 형태로 제공될 수 있다.

[223] 또한, 비록 도시되지는 않았지만, 알림 정보(703)에는 스트레스 정도는 표시되지 않고, 스트레스 해소 정보의 출력을 유도하는 정보만 출력될 수도

있다. 예를 들어, 사용자가 이차적인 스트레스를 받지 않도록, 상기 알림 정보(703)에는 스트레스를 해소할 수 있는 이미지나, 동영상 등만 포함될 수 있다.

[224] 한편, 비록 도시되지는 않았지만, 스트레스지수의 측정 중, 현재 위치에 대응되는 스트레스지표를 기준으로 스트레스 상태가 소정 시간 지속되면, 저전력 모드에서 정밀 모드로 전환하여 스트레스지수를 측정할 수 있다.

[225] 다른 예로, 도 7b는 와치형 웨어러블 디바이스(100)를 착용한 사용자의 움직임 정보가 분석 결과, 활동량이 기준치를 초과하는 경우 스트레스지수 측정의 신뢰도를 고려하여 측정 모드에 진입하지 않고 대기할 수 있다. 이후, 활동량이 기준치를 초과하는 상태가 소정 시간 지속되면, 도 7b와 같이 움직임을 줄이도록 유도하는 알림 정보(721)를 디스플레이부(151)에 출력한다. 이때, 알림 정보(721)의 내용은 기준치를 초과하는 활동량의 크기 및 존속 시간에 따라 달라질 수 있다.

[226] 예를 들어, 활동량의 크기 및 존속 시간이 최대레벨인 경우, 경고음을 함께 출력할 수 있다. 알림 정보(721)가 출력되고, 이후 사용자의 움직임 정보가 기준치 이하로 감소되면, 정밀 모드로 스트레스지수의 측정을 개시하고, 정밀 모드의 실행에 대응되는 화면 정보, 예를 들어 정밀 모드에서 측정되는 스트레스지수의 그래프(704)가 디스플레이부(151)에 출력될 수 있다. 정밀 모드에서는, 획득된 생체정보를 약 200Hz로 하이 샘플링하여 스트레스지수를 측정한다. 한편, 비록 도시되지는 않았지만, 스트레스지수의 측정 중, 현재 위치에 대응되는 스트레스지표를 기준으로 베이스 또는 그 이하의 구간에 속하는 상태가 소정 시간 지속되면, 정밀 모드에서 저전력 모드로 전환하여 스트레스지수를 측정할 수 있다.

[227] 이상에서 설명한 실시 예에 따르면, 사용자의 활동량 및 현재 스트레스지수를 기초로 보다 적합한 동작 모드로 스트레스를 측정할 수 있어서, 스트레스지수의 측정 신뢰도가 향상될 수 있다.

[228] 한편, 웨어러블 디바이스(100)는 스트레스지수의 측정 결과, 증가된 스트레스지수가 대응되는 스트레스지표의 베이스(base)에 도달하게 되면, 스트레스 상태가 해소된 것으로 인식할 수 있다. 이하에서는, 도 8은 내지 도 13을 참조하여, 증가된 스트레스지수가 대응되는 스트레스지표의 베이스(base)에 도달할 수 있도록 스트레스 해소 서비스를 제공하는 다양한 방법들을 설명하기로 한다.

[229] 먼저, 도 8은 스트레스지수의 모니터링 결과 스트레스 상태임이 판단된 경우, 스트레스를 해소하기 위해 기정의된 컨텐츠를 화면에 출력시키는 예시이다.

[230] 스트레스지수의 측정이 완료되거나, 스트레스 상태로 판단되거나, 또는 사용자의 단말 조작이 감지되면, 도 8에 도시된 바와 같이, 소정 시간 동안 누적된 스트레스지수를 기초로 생성된 스트레스 정보(801)가 디스플레이부(151)에 출력될 수있다. 일 예로, 스트레스 정보(801)에는, 스트레스

상태를 알려주는 정보가 제1영역(801a)에 표시되고, 스트레스 상태의 해소를 유도하는 정보가 제2영역(801b)에 표시된다. 또는, 다른 예로, 스트레스 정보(801)에는 스트레스 상태를 알려주는 정보는 생략되고, 스트레스 상태의 해소를 유도하는 정보만 출력될 수도 있다.

[231] 제1영역(801a)에는 평균 스트레스지수(예, '70')를 알려주는 객체(811)가 더 표시될 수 있고, 비록 도시되지는 않았지만 현재 위치 정보에 대응되는 이미지가 더 표시될 수 있다. 또, 제2영역(801b)에 표시된 정보는 소정 시간이 경과하거나 터치입력이 가해지면, 스트레스를 해소하기 위한 기정된 컨텐츠의 출력을 유도하는 가이드정보(802)로 변경된다.

[232] 일 예로, 사용자 맞춤형 호흡요법을 유도하는 가이드정보가 출력되고, 이에 대한 선택이 입력되면, 사용자 맞춤형 호흡요법이 실행되어 '들숨' 을 유도하는 이미지(804)와 '날숨'을 유도하는 이미지(805)이 정해진 호흡 주기에 따라 번갈아가면서 출력된다. 또, 비록 도시되지는 않았지만, '들숨' 및 '날숨'에 대응되는 음성 프롬프트(예, '숨을 깊게 내쉬세요, 잘하고 있네요 등')나, 음향 효과(예, 파도소리가 점진적으로 작아지거나 점진적으로 커짐)가 함께 출력될 수 있다.

[233] 사용자 맞춤형 호흡요법은 사용자의 심박변이도를 기초로 정해지므로, 사용자마다 '들숨' 및 '날숨'의 호흡주기가 다르게 실행된다. 사용자 맞춤형 호흡요법은, 평소에 호흡주기를 가변하면서 HRV를 측정함에 따라, 심박동수 변동폭이 최대가 되는 주기를 검출함으로써 획득될 수 있다. '들숨'에서는 PPG 신호의 주기가 감소하고, '날숨'에서는 PPG 신호의 주기가 증가하여 스트레스지수를 낮춰줄 수 있다.

[234] 또, 사용자 맞춤형 호흡요법이 실행되는 동안 웨어러블 디바이스(100)는 사용자의 심박변이도를 측정하여 정해진 호흡 주기를 잘 따라하는지를 판단할 수 있다. 그리고, 이 동안의 측정 기록을 기초로 사용자 맞춤형 호흡요법의 '들숨' 및 '날숨'의 호흡주기를 업데이트할 수 있다.

[235] 사용자 맞춤형 호흡요법이 수행되는 동안, 사용자 입력이 감지되거나 스트레스지수가 현재 위치에 대응되는 스트레스지표의 베이스 또는 그 이하로 감소된 경우, 제어부(180)는 사용자 맞춤형 호흡요법을 종료하고 이전에 출력되었던 화면정보를 이어서 출력한다.

[236] 또한, 일 실시 예에서, 도 9 및 도 10은 터치입력을 이용하여, 스트레스지수를 낮추기 위한 컨텐츠를 출력시키는 방법을 보여주고 있다.

[237] 본 발명의 실시 예에 따른 웨어러블 디바이스(100)의 제어부(180)는 스트레스지수를 상시 모니터링한 결과, 현재 위치에 대응되는 스트레스지표를 기준으로 기준범위의 임계값을 초과하는 스트레스 상태임이 발견되면, 현재 위치를 기준으로 스트레스 해소에 적합한 상황 정보를 추출할 수 있다. 이때, 현재 위치에 대응되는 스트레스지표가 없는 경우, 제어부(180)는 평균 스트레스 패턴을 활용하거나 현대 시간대에 자주참조하는 스트레스지표를 활용하여

스트레스 상태를 판단할 수 있다.

[238] 이를 위해, 제어부(180)는 증가된 스트레스지수가 기준범위 이상 완화되는 구간, 즉 스트레스 해소 구간에서의 상황 정보를 수집할 때, 본체의 위치 정보 및/또는 시간 정보를 함께 저장할 수 있다. 이후, 스트레스 상태가 발견되면, 현재 위치와 동일 또는 유사분류된 위치 정보에 대응되는 상황정보를 우선적으로 추출하거나 현재 시간대를 고려하여 상황정보를 추출할 수 있다.

[239] 예를 들어, 스트레스 해소 구간에서의 제1상황 정보로 '드라마 시청'이 수집된 시점에서의 단말 위치가 '집'이고 제2상황 정보로 '스트레칭'이 수집된 시점에서의 단말 위치가 '그 외의 장소'인 경우, 이후 '집'에서 스트레스 상태가 발견되면 위치가 동일한 지점에서 수집된 제1상황 정보, 즉 '드라마 시청'이 우선적으로 추출될 수 있다. 이때, 현재 시간대가 '밤'이라면, 사용자의 수면에 방해가 되는 '드라마 시청'은 제외되거나 추출되더라도 후순위로 추천될 수 있다.

[240] 이와 같이 스트레스 해소 구간에서의 상황정보가 체계적으로 저장된 상태에서, 스트레스 상태가 감지되면, 도 9에 도시된 바와 같이, 현재 화면(901)의 일 영역에는 스트레스 상태임을 알려주는 알림 아이콘(910)이 출력될 수 있다.

[241] 여기서, 현재 화면(901)의 종류에는 아무런 제한이 없으며, 디스플레이부(151) 전체가 비활성화 상태이거나 특정 애플리케이션이 실행중이거나, 또는 홈 스크린 화면 중 어느 하나일 수 있다.

[242] 알림 아이콘(910)은 측정된 스트레스지수에 대응되는 스트레스 레벨에 따라, 다른 이미지로 출력될 수 있다. 여기서, 다른 이미지는 이미지의 형상, 크기, 투명도, 컬러, 하이라이팅 중 적어도 하나가 다른 것을 의미한다. 예를 들어, 스트레스 레벨이 클수록 알림 아이콘(910)이 크게 표시되거나 시각적으로 더욱 구별되는 컬러로 표시될 수 있다.

[243] 또, 알림 아이콘(910)의 출력시, 대응되는 알람, 예를 들어 진동, 소리, LED광 등이 함께 출력될 수 있다. 이러한 경우, 제어부(180)는 측정된 스트레스지수가 기준범위의 임계값을 벗어난 정도에 따라 알람의 강도를 조절하여 출력할 수 있다.

[244] 또한, 제어부(180)는 디스플레이부(151)에 근접터치 또는 터치입력과 같은 사용자의 의도적인 조작이 감지된 경우에 한하여, 알림 아이콘(910)이 출력되도록 제한할 수 있다. 또는, 기설정된 시간대(예, '오후 9시')나, 특정 장소(예, 'Home')에서만 알림 아이콘(910)이 팝업되도록 제한할 수도 있다.

[245] 이러한 경우, 스트레스 상태가 감지된 횟수를 기초로 복수의 알림 아이콘이 출력될 수 있다. 또, 알림 아이콘(910)에 기정의된 이미지나 색상을 표시하여, 사용자의 스트레스 상태가 감지된 시점(시간대) 및/또는 그 시점에서의 단말의 위치를 한번에 알 수 있도록 정보를 제공할 수 있다.

[246] 한편, 알림 아이콘(910)에 터치입력이 가해지면, 현재 위치에 대응하여 추출된 상황 정보와 관련된 애플리케이션의 아이콘들(911, 912, 913)이 디스플레이될 수 있다. 이때, 애플리케이션의 아이콘들(911, 912, 913)은 기설정된 기준, 예를 들어

사용자의 선호도에 기초하여, 개수, 크기, 배열, 디스플레이 순서가 달라질 수 있다.

[247] 또, 애플리케이션의 아이콘들(911, 912, 913)에는 대응되는 애플리케이션에 대한 정보와 함께 추출된 상황 정보와 관련된 컨텐츠의 세부 정보가 표시될 수 있다. 예를 들어, 도 9에서 콜 애플리케이션의 아이콘(912)에는 통화 호를 수행하고자 하는 상대방 정보(예, 'MOM')가 표시될 수 있다.

[248] 디스플레이된 아이콘들(911, 912, 913) 중 하나가 선택되면, 선택된 아이콘(912)에 링크된 컨텐츠가 실행된다. 예를 들어, MOM에게 통화 연결을 시도하고, 통화 연결 화면(921)이 디스플레이부(151)에 출력된다.

[249] 한편, 비록 도시되지는 않았지만, 웨어러블 디바이스(100)는 MOM에게 통화 연결된 이후에도 지속적으로 스트레스지수를 모니터링할 수 있고, 모니터링 결과를 기초로 상황 정보를 업데이트할 수 있다. 또, 웨어러블 디바이스(100)는 선택된 컨텐츠를 통해 스트레스지수가 의미 있게 감소하지 않는 경우, 추출된 상황 정보에 대응되는 다른 컨텐츠를 추천할 수도 있다.

[250] 도 10은, 디바이스의 현재 위치에 따라, 스트레스를 해소하기 위한 컨텐츠가 다르게 제공되는 것을 보여주고 있다.

[251] 제어부(180)는 스트레스 상태가 감지되면, 현재 위치를 기준으로 하여 스트레스 해소 구간에서 저장된 상황 정보들을 검출한다.

[252] 도 10에서, 현재 위치가 'Company'인 경우에는 사용자의 활동이 제한됨을 고려하여 '호흡 따라하기'와 같은 컨텐츠(1011)가 스트레스 해소 정보로 추천된다. 반면, 현재 위치가 비교적 활동이 자유로운 'Home'인 경우에는 더 다양한 컨텐츠들(1011, 1012, 1013, 1014, 1015)이 스트레스 해소 정보로 추천될 수 있다. 이때, 추천되는 컨텐츠들(1011, 1012, 1013, 1014, 1015)은 사용자의 선호도에 따라 크기, 배열 등이 다르게 디스플레이될 수 있다. 특정 컨텐츠가 선택되면, 선택된 컨텐츠를 실행하여 사용자의 빠른 스트레스 완화를 도와준다.

[253] 다른 예로, 도 11을 참조하면, 스트레스 상태임을 알려주는 알림 아이콘(1110)에 터치입력이 가해지면, 건강 관리와 관련된 다양한 대분류 항목들(1111, 1112, 1113)이 리스트 형태로 디스플레이될 수 있다.

[254] 리스트은, 예를 들어 스트레스 상태와 관련된 세부정보 보기(1111), 스트레스 해소와 관련된 정보 보기(1112), 스트레스 요인 저장(1113) 등과 같은 섹터를 포함할 수 있다. 스트레스 해소와 관련된 정보 보기(1112)가 선택된 경우, 디바이스의 현재 위치를 파악하고, 그에 대응되는 상황 정보들을 추출하여 스트레스 해소 시나리오를 생성한다. 여기서, 스트레스 해소 시나리오는, 추출된 상황 정보에 대응되는 컨텐츠를 이용하여 생성되며, 스트레스 완화를 위한 사용자 조작을 유도하는 프롬프트 정보를 포함할 수 있다.

[255] 일 예로, 도 11에서 스트레스를 해소하기 위해, 특정 사진 이미지(1120)가 먼저 출력될 수 있다. 이때, 다음 컨텐츠를 실행하기 위한 조작으로 좌우방향의 플리킹 터치입력이 디스플레이부(151)에 가해지면, 프롬프트 정보(1131)와 함께,

스트레스를 해소하기 위한 다음 컨텐츠, 예를 들어 '책 구매하기'를 수행할 수 있는 다양한 애플리케이션의 아이콘들(1132, 1133, 1134)이 추천된다. 스트레스가 해소되면, 사용자의 조작 이력이나 실행된 컨텐츠의 이력 등을 기초로 상황 정보가 업데이트될 수 있다.

[256] 또 다른 예로, 도 12를 참조하면, 웨어러블 디바이스(100)를 통해 사용자가 스트레스 상태임이 발견되면, 음성 인식 기능과 STT(Speach To Text) 기능을 활성화하여, 사용자에게 친숙한 토크백(talkback) 방식으로 스트레스 해소 서비스를 제공할 수 있다. 즉, 웨어러블 디바이스(100)에서 텍스트 또는 텍스트및음성으로 스트레스 해소를 위한 가이드 정보를 제공하면, 사용자가 음성입력으로 응답을 수행할 수 있고, 입력된 음성이 텍스트로 변환되어 대화화면에 디스플레이될 수 있다.

[257] 이때, 웨어러블 디바이스(100)는 사용자와 나눈 대화 내용을 기억하여 다음 대화에 적용시킬 수 있다. 또, 웨어러블 디바이스(100)는 사용자와 나눈 대화 내용을 기초로 기저장된 상황 정보를 업데이트할 수 있다.

[258] 또 다른 예로, 도 13을 참조하면, 웨어러블 디바이스(100)와 연동된 이동 단말기(200) 예를 들어 스마트 폰를 통해 스트레스 해소 정보를 제공할 수도 있다. 여기서, 웨어러블 디바이스(100)와 연동된 이동 단말기(200)는 도 1a의 웨어러블 디바이스(100)의 특징 또는 그와 유사한 특징을 포함할 수 있다.

[259] 웨어러블 디바이스(100)를 통해 사용자의 스트레스지수를 모니터링한 결과 스트레스 상태임이 발견되면, 이에 대응되는 정보를 이동 단말기(200)로 전송할 수 있다. 이후, 이동 단말기(200)의 디스플레이부(151)에 근접 터치 또는 터치입력이 가해지면, 디스플레이부(151)의 일 영역, 예를 들어 가장자리영역에 스트레스 상태임을 알려주는 알림 아이콘(1310)이 출력될 수 있다.

[260] 이 상태에서, 알림 아이콘(1310)에 터치입력이 가해지면, 스트레스 해소 서비스를 제공하기 위해, 현재 위치를 기준으로 추출된 상황 정보에 대응되는 애플리케이션의 아이콘들(1311, 1312, 1313, 1314)이 추천된다.

[261] 이때, 특정 애플리케이션의 아이콘(1311)에 근접터치 또는 터치입력(예, '싱글터치')이 감지되면, 해당 애플리케이션의 실행시 제공될 스트레스 해소 정보의 적어도 일부 또는 요약(abstract)정보가 말풍선 또는 팝업창 형태로 표시되어(1321), 사용자에게 선택에 도움을 줄 수 있다. 이후, 애플리케이션의 아이콘(1311)을 선택하는 터치입력(예, '더블터치 또는 롱터치')이 인가되면, 해당 애플리케이션을 실행하여 링크된 특정 컨텐츠, 예를 들어 특정 사진 이미지(1330)를 디스플레이부(151)에 출력시킬 수 있다.

[262] 이상에서 설명한 본 발명의 실시 예에 따른 웨어러블 디바이스 및 그것의 제어방법에 의하면, 저전력으로 상시 스트레스를 측정할 수 있고, 스트레스 발생시 현재 상황에서 활용하기에 보다 적합한 스트레스 해소 정보를 선별적으로 제공할 수 있다. 그에 따라, 증가된 스트레스를 빠르고 효율적으로 감소시키는데 도움을 주며, 사용자 개인에 특화된 서비스를 제공할 수 있다.

또한, 사용자의 활동량, 스트레스지수를 고려하여 스트레스지수의 측정 주기나 측정 모드를 유연하게 가변할 수 있으므로, 스트레스지수의 측정 신뢰도 향상과 전력 소모 감소를 동시에 만족시킬 수 있다.

[263] 전술한 본 발명은, 프로그램이 기록된 매체에 컴퓨터가 읽을 수 있는 코드로서 구현하는 것이 가능하다. 컴퓨터가 읽을 수 있는 매체는, 컴퓨터 시스템에 의하여 읽혀질 수 있는 데이터가 저장되는 모든 종류의 기록장치를 포함한다. 컴퓨터가 읽을 수 있는 매체의 예로는, HDD(Hard Disk Drive), SSD(Solid State Disk), SDD(Silicon Disk Drive), ROM, RAM, CD-ROM, 자기 테이프, 플로피 디스크, 광 데이터 저장 장치 등이 있으며, 또한 캐리어 웨이브(예를 들어, 인터넷을 통한 전송)의 형태로 구현되는 것도 포함한다. 또한, 상기 컴퓨터는 단말기의 제어부(180)를 포함할 수도 있다. 따라서, 상기의 상세한 설명은 모든 면에서 제한적으로 해석되어서는 아니되고 예시적인 것으로 고려되어야 한다. 본 발명의 범위는 첨부된 청구항의 합리적 해석에 의해 결정되어야 하고, 본 발명의 등가적 범위 내에서의 모든 변경은 본 발명의 범위에 포함된다.

# 청구범위

[청구항 1] 웨어러블 디바이스 본체;
본체의 착용에 따라 감지되는 사용자의 생체정보를 기초로 사용자의 스트레스지수를 측정하는 측정부; 및
측정된 스트레스 지수를 소정 시간 누적하고, 누적된 스트레스 지수에 기초하여 스트레스지수의 측정 주기를 가변하는 제어부를 포함하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 2] 제1항에 있어서,
상기 제어부는,
누적된 스트레스지수가 기준범위내에서 모니터링되면 스트레스지수의 측정 주기를 기준값보다 길게 하고,
누적된 스트레스지수가 기준범위를 벗어난 것이 모니터링되면 스트레스지수의 측정 주기를 기준값보다 짧게 제어하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 3] 제1항에 있어서,
상기 제어부는,
누적된 스트레스지수를 본체의 위치 정보와 연관시켜 위치별 스트레스지표를 생성하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 4] 제3항에 있어서,
상기 제어부는,
스트레스지수의 측정시, 본체의 위치 정보에 대응되는 스트레스지표를 기준으로 스트레스 상태를 판단하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 5] 제3항에 있어서,
상기 제어부는,
본체의 현재 위치 정보에 대응되는 스트레스지표에 근거하여,
스트레스지수의 측정 주기를 변경하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 6] 제5항에 있어서,
상기 제어부는,
본체의 현재 위치 정보에 대응되는 스트레스지표를 선택하고,
선택된 스트레스지표의 베이스가 기준값 이하이면 스트레스지수의 측정 주기를 기준치보다 길게 하고,
선택된 스트레스지표의 베이스가 기준값을 초과하면 스크레스지수의 측정 주기를 기준치보다 짧게 제어하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 7] 제1항에 있어서,

상기 제어부는,
본체의 착용에 따라 감지되는 사용자의 움직임 정보를 획득하고, 획득된 움직임 정보에 기초하여 스트레스지수의 측정 모드에 진입하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 8] 제7항에 있어서,
상기 측정 모드는, 사용자의 생체정보를 감지하기 위해 활성화되는 센서의 종류 및 개수, 생체정보의 분석방식 중 적어도 하나를 달리하는 복수의 동작 모드를 포함하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 9] 제8항에 있어서,
상기 제어부는,
상기 획득된 움직임 정보에 대응되는 사용자의 활동량을 산출하고,
산출된 활동량을 기초로 상기 복수의 동작 모드 중 어느 하나를 실행하여 스트레스 지수를 측정하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 10] 제9항에 있어서,
상기 복수의 동작 모드는 저전력 모드 및 정밀 모드를 포함하고,
상기 제어부는,
기준 시간 동안 산출된 활동량이 소정값 이하이면 상기 저전력 모드로 스트레스지수를 측정하고,
상기 저전력 모드에서 기준범위의 임계값을 벗어나는 스트레스지수가 감지되거나 또는 산출된 활동량이 임계치를 초과하는 상태가 소정 시간 지속되면, 상기 정밀 모드로 변경하여 스트레스지수를 측정하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 11] 제1항에 있어서,
터치스크린; 및
증가된 스트레스지수가 기준범위내로 완화되는 구간에서의 상황 정보를 수집하여 저장하는 저장부;를 더 포함하고,
상기 제어부는,
측정된 스트레스지수가 기준범위의 임계값을 벗어나면, 본체의 위치 정보를 기준으로 상기 저장부에 저장된 상황 정보 중 적어도 하나를 추출하고, 추출된 상황 정보와 관련된 스트레스 해소 정보를 상기 터치스크린에 출력하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 12] 제11항에 있어서,
상기 상황 정보는 본체의 위치 정보 및 시간 정보 중 적어도 하나와 연관되어 저장되는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 13] 제11항에 있어서,
측정된 스트레스지수가 기준범위의 임계값을 벗어나면, 스트레스 상태를 알려주는 알림 아이콘이 터치 스크린에 출력되고,
상기 알림 아이콘에 터치입력이 가해지면, 상기 추출된 상황 정보와

관련된 스트레스 해소 정보를 제공하기 위한 애플리케이션의 아이콘이 상기 터치 스크린에 출력되는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 14] 제13항에 있어서,
상기 알림 아이콘은,
상기 터치 스크린에 터치입력이 가해지거나 또는 상기 본체가 기설정된 시간 또는 기설정된 위치에 진입한 것이 감지된 경우에 출력되는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 15] 제13항에 있어서,
상기 애플리케이션의 아이콘은,
측정된 스트레스지수, 본체의 현재 위치 정보, 및 사용자의 선호도 중 적어도 하나에 기초하여 디스플레이되는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 16] 제13항에 있어서,
상기 제어부는,
상기 알림 아이콘의 출력시 대응되는 알람을 출력하고, 상기 알람은 측정된 스트레스지수가 기준범위의 임계값을 벗어난 정도에 따라 강도가 달라지는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 17] 제11항에 있어서,
상기 스트레스 해소 정보는, 상기 측정된 스트레스지수를 기초로 생성된 심호흡 주기를 따라하도록 유도하는 프롬프트를 포함하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 18] 제11항에 있어서,
상기 제어부는,
상기 스트레스 해소 정보가 출력되는 동안 스트레스지수를 측정하고, 증가된 스트레스지수가 기준범위내로 감소되는 것을 모니터링하여, 대응되는 상황 정보를 업데이트하는 것을 특징으로 하는 웨어러블 디바이스.

[청구항 19] 본체의 착용을 감지하는 단계;
사용자의 생체정보를 기초로 사용자의 스트레스지수를 측정하는 단계;
측정된 스트레스지수를 소정 시간 누적하는 단계; 및
누적된 스트레스지수에 기초하여 스트레스지수의 측정 주기를 가변하는 단계;를 포함하여 이루어지는 것을 특징으로 하는 웨어러블 디바이스의 동작방법.

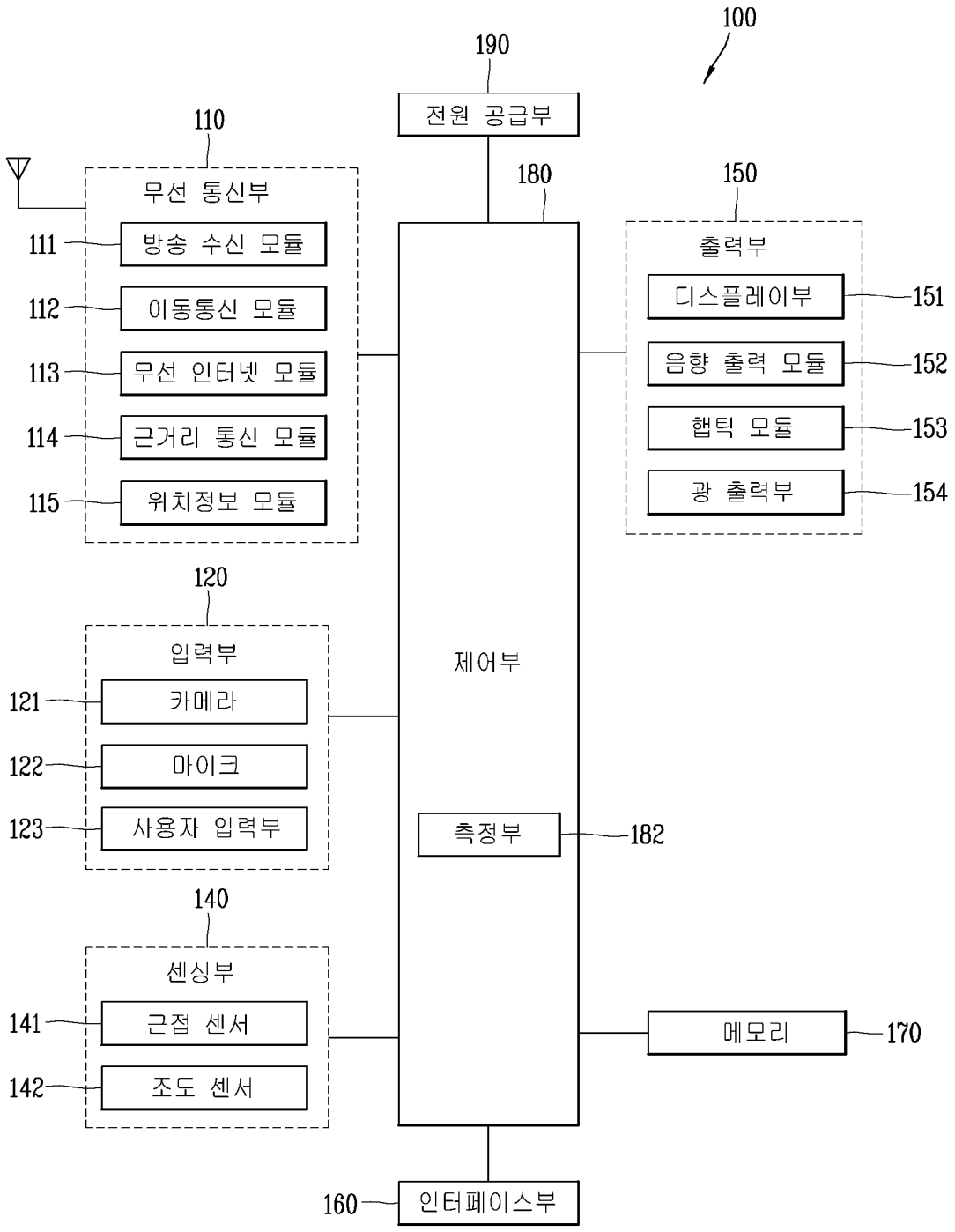
[청구항 20] 제19항에 있어서,
상기 스트레스지수의 측정 주기를 가변하는 단계는,
누적된 스트레스지수가 기준범위내에서 모니터링되면 스트레스지수의 측정 주기를 기준값보다 길게 하고,
누적된 스트레스지수가 기준범위를 벗어난 것이 모니터링되면

스트레스지수의 측정 주기를 기준값보다 짧게 측정 주기를 변경하는 단계를 포함하는 것을 특징으로 하는 웨어러블 디바이스의 동작방법.

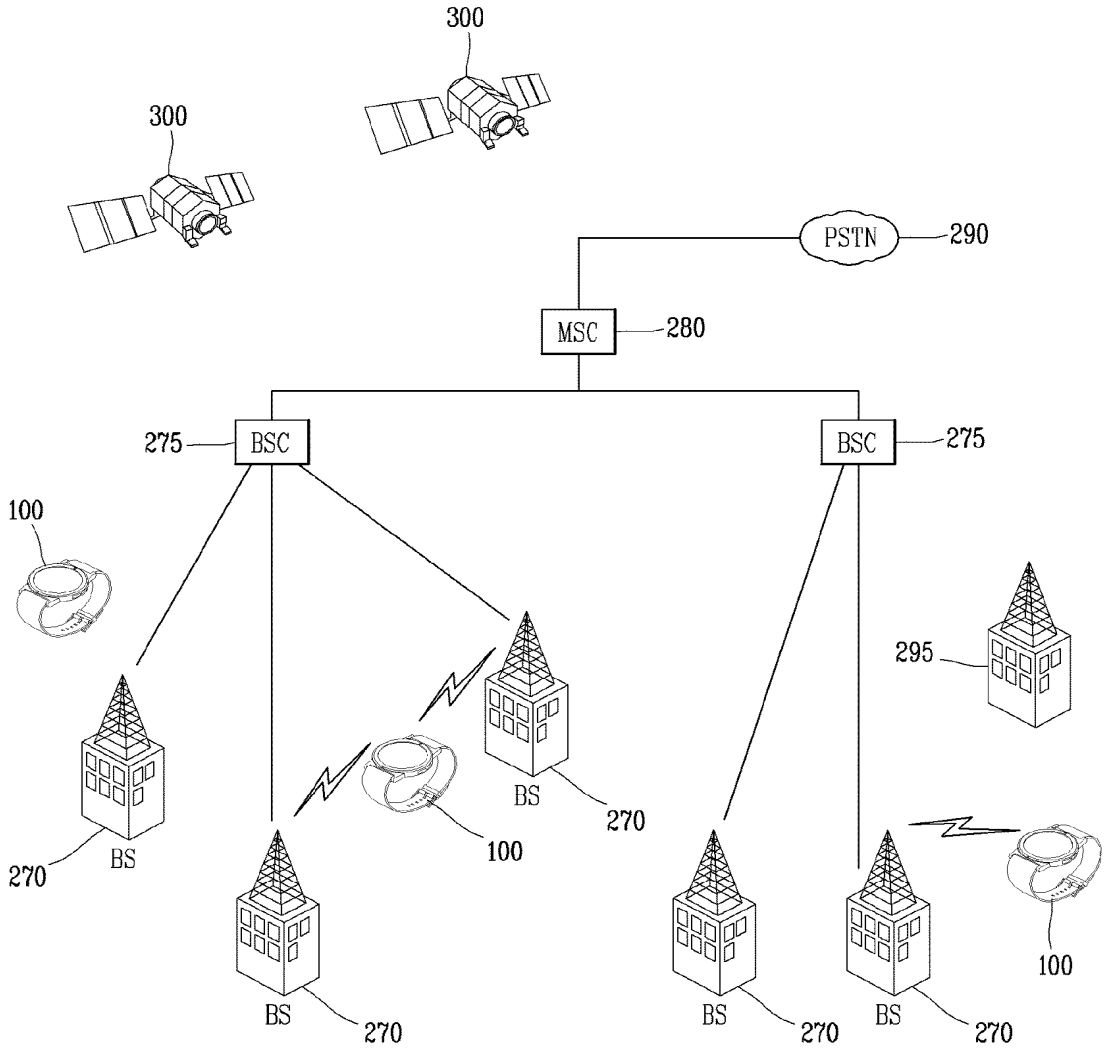
[청구항 21] 제19항에 있어서,
상기 스트레스지수의 측정 주기를 가변하는 단계는,
누적된 스트레스지수를 본체의 위치 정보와 연관시켜 위치별 스트레스지표를 생성하는 단계; 및
본체의 현재 위치 정보에 대응되는 스트레스지표에 기초하여, 스트레스지수의 측정 주기를 변경하는 단계를 더 포함하는 것을 특징으로 하는 웨어러블 디바이스의 동작방법.

[청구항 22] 제19항에 있어서,
증가된 스트레스지수가 기준범위내로 완화되는 구간에서의 상황 정보를 수집하여 저장하는 단계;
측정된 스트레스지수가 기준범위의 임계값을 벗어나면, 본체의 위치 정보를 기준으로 저장된 상황 정보 중 적어도 하나를 추출하는 단계; 및
추출된 상황 정보와 관련된 스트레스 해소 정보를 출력하는 단계를 더 포함하는 것을 특징으로 하는 웨어러블 디바이스의 동작방법.

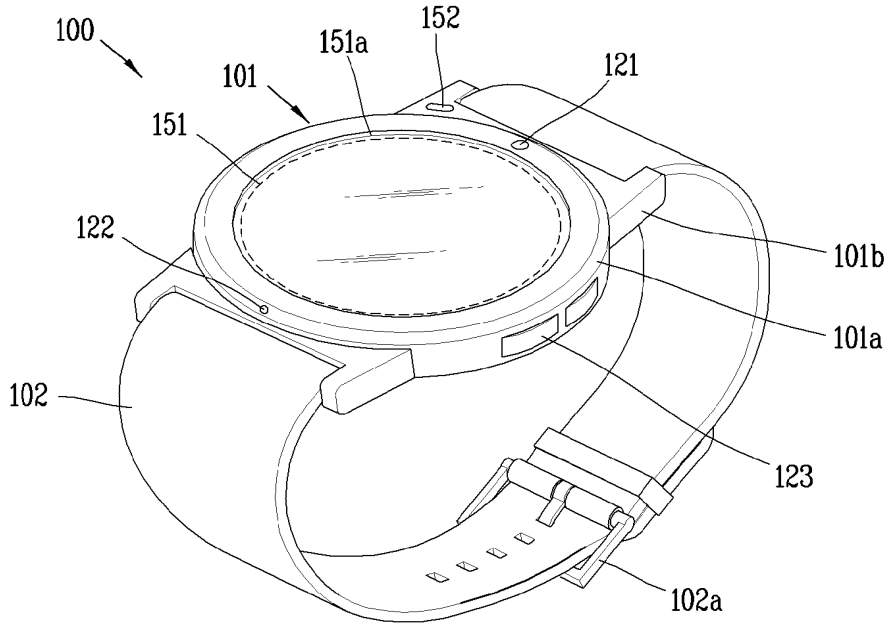
[도1a]


100
190
전원 공급부
110
무선 통신부
111
방송 수신 모듈
112
이동통신 모듈
113
무선 인터넷 모듈
114
근거리 통신 모듈
115
위치정보 모듈
180
150
출력부
디스플레이부
151
음향 출력 모듈
152
햅틱 모듈
153
광 출력부
154
120
입력부
121
카메라
122
마이크
123
사용자 입력부
제어부
측정부
182
140
센싱부
141
근접 센서
142
조도 센서
메모리
170
160
인터페이스부

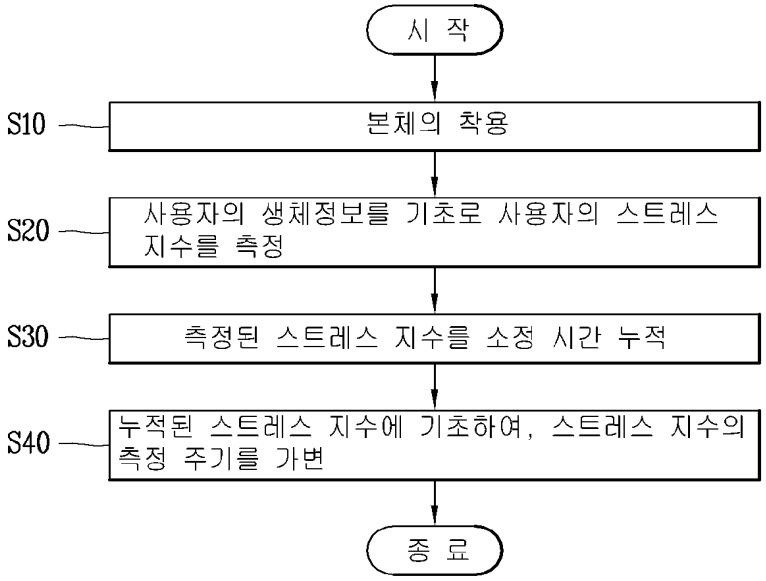
[도1b]


300
300
PSTN
290
MSC
280
275
BSC
BSC
275
100
295
BS
270
BS
270
100
BS
270
BS
270
BS
270
100

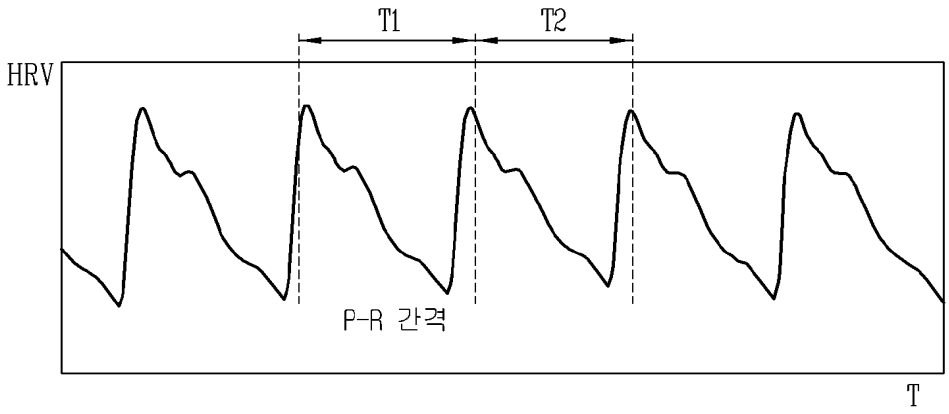
[도2]


100
151a
152
101
121
151
122
101b
101a
102
123
102a

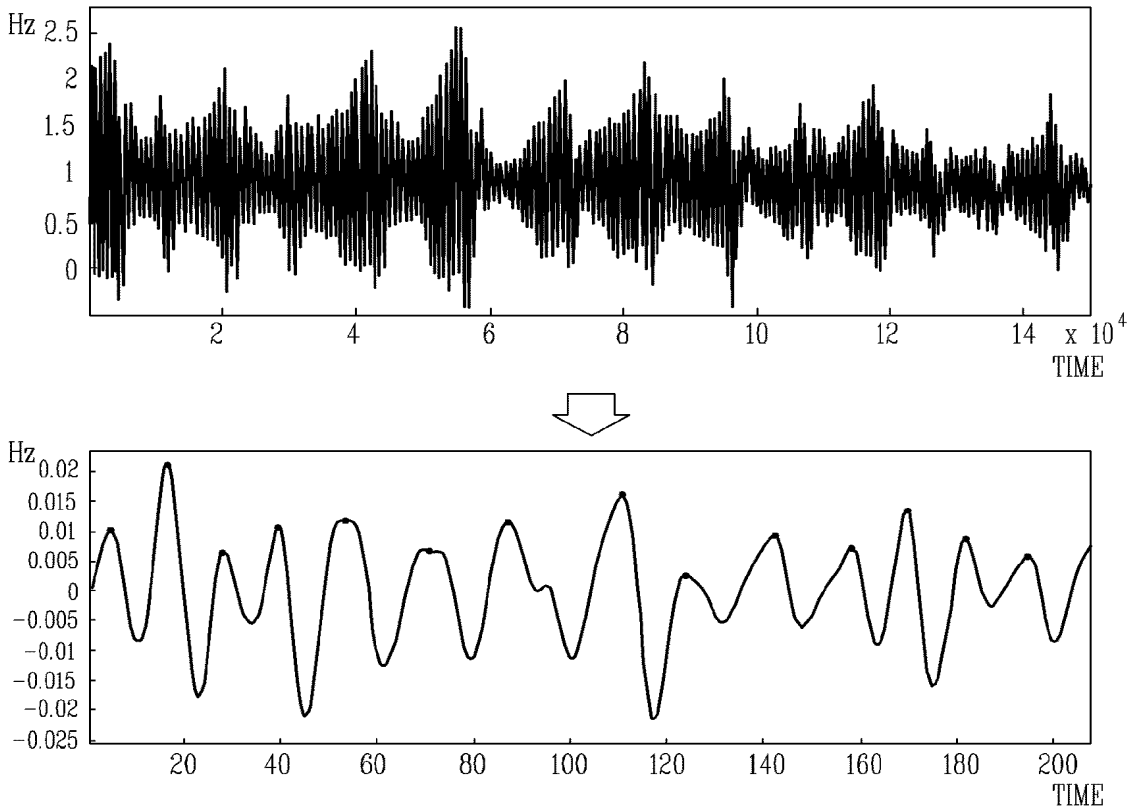
[도3]


시 작
S10
본체의 착용
S20
사용자의 생체정보를 기초로 사용자의 스트레스 지수를 측정
S30
측정된 스트레스 지수를 소정 시간 누적
S40
누적된 스트레스 지수에 기초하여, 스트레스 지수의 측정 주기를 가변
종 료

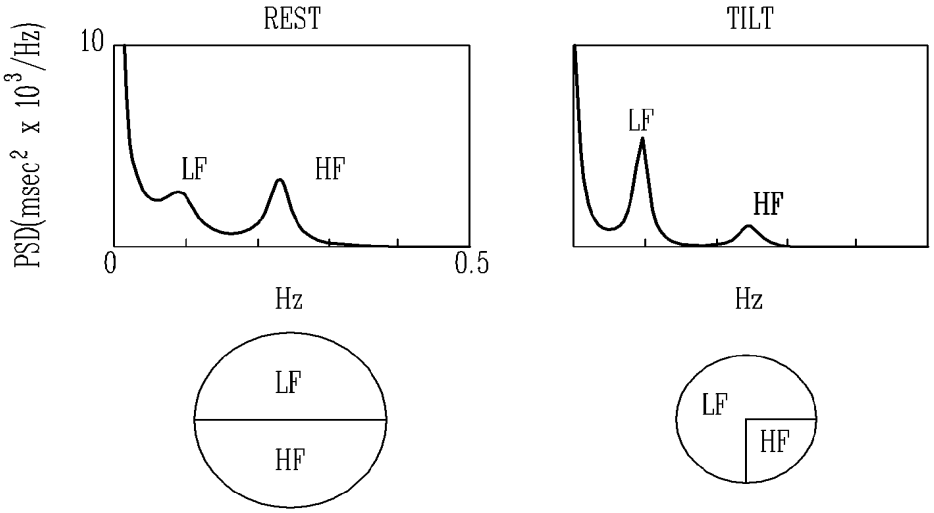
[도4a]


T1
T2
HRV
P-R 간격
T

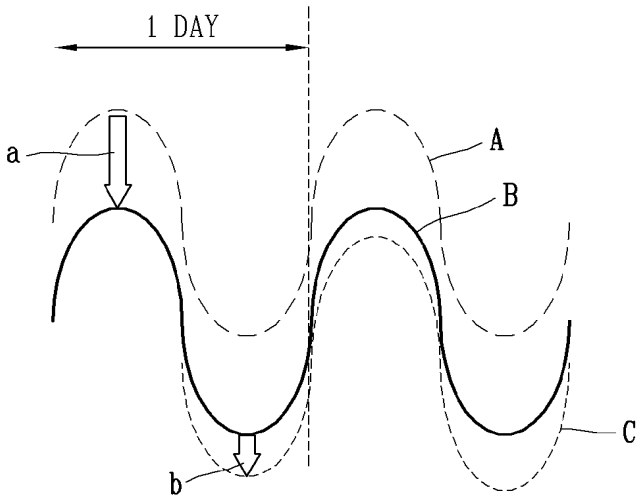
[도4b]


Hz
2.5
2
1.5
1
0.5
0
2
4
6
8
10
12
14
x 10^4
TIME
Hz
0.02
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.02
-0.025
20
40
60
80
100
120
140
160
180
200
TIME

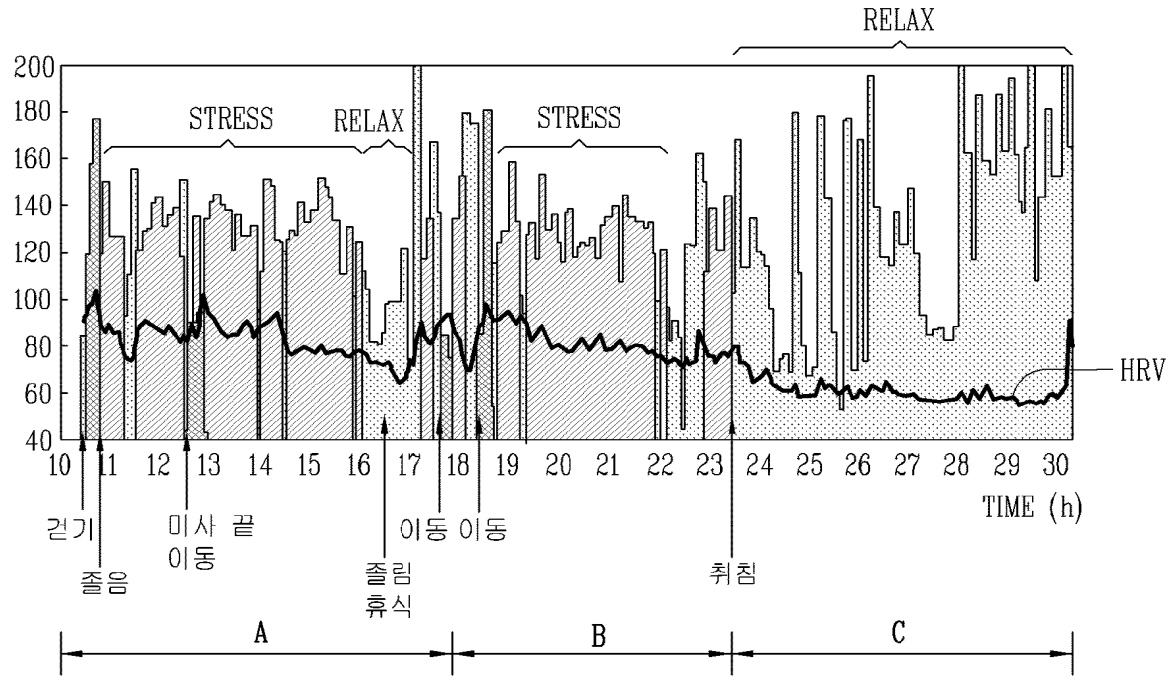
[도4c]


REST
TILT
10
PSD(msec² x 10³/Hz)
LF
HF
0
0.5
Hz
LF
HF
Hz
LF
HF
LF
HF

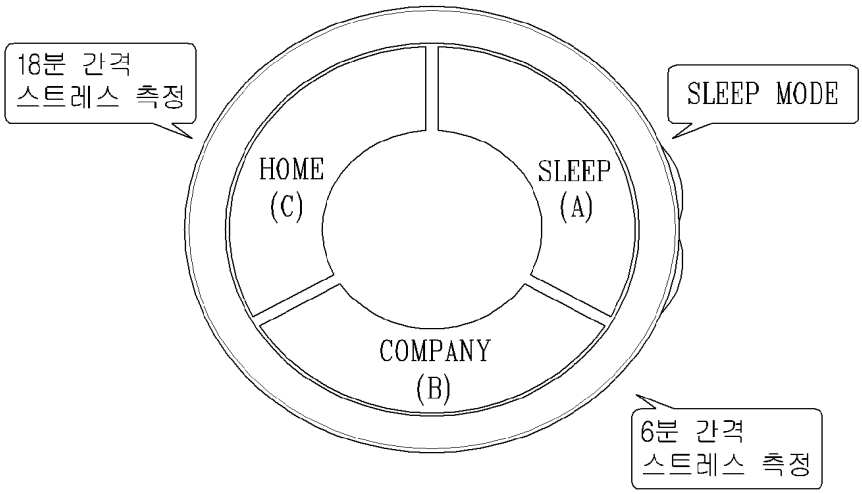
[도4d]


1 DAY
a
A
B
C
b

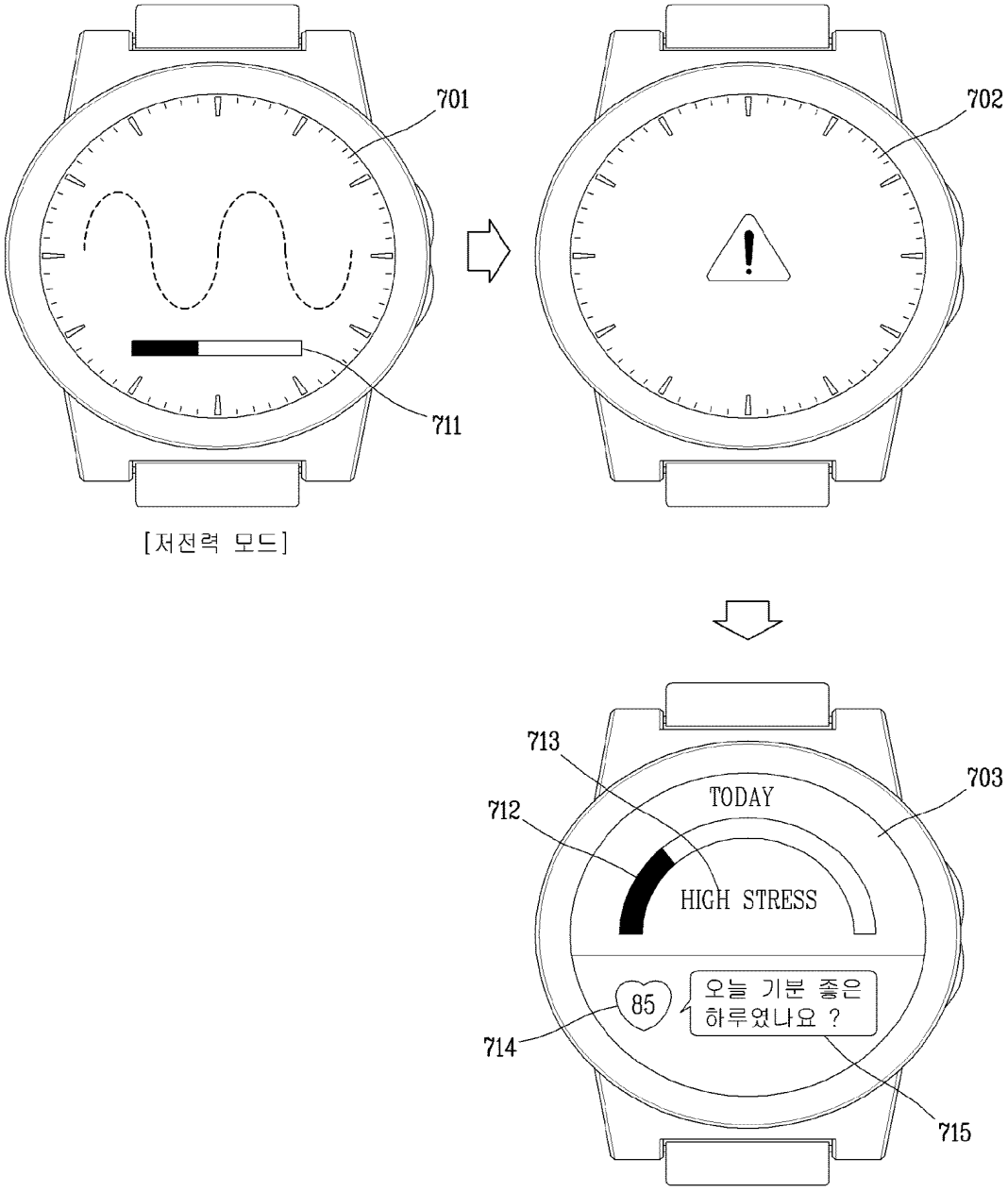
[도5]


RELAX
STRESS
RELAX
STRESS
200
180
160
140
120
100
80
60
40
HRV
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
TIME (h)
걷기
졸음
미사 끝
이동
졸림
휴식
이동 이동
취침
A
B
C

[도6]


18분 간격
스트레스 측정
SLEEP MODE
HOME
(C)
SLEEP
(A)
COMPANY
(B)
6분 간격
스트레스 측정

[도7a]


701
711
702
[저전력 모드]
713
712
TODAY
HIGH STRESS
703
85
오늘 기분 좋은
하루였나요 ?
714
715