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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/119,175	03/08/2023	Fletcher R. Rothkopf	P22914USC12	4975

62579 7590 05/24/2023

APPLE INC./BROWNSTEIN
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675 15th Street
Suite 2900
Denver, CO 80202

EXAMINER	
GEDEON, BRIAN T	

ART UNIT	PAPER NUMBER
3792	

NOTIFICATION DATE	DELIVERY MODE
05/24/2023	ELECTRONIC

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

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

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

patentdocket@bhfs.com

APPLE 2014
Masimo v. Apple
IPR2023-00634

Office Action Summary	Application No. 18/119,175	Applicant(s) Rothkopf et al.	
	Examiner BRIAN T GEDEON	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 9 March 2023.

☐ 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) 21-40 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) 21-40 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 8 March 2023 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: _____.

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.

Information Disclosure Statement

2. The information disclosure statements filed 10 April 2023, 29 March 2023 (2), and 9 March 2023 have been considered.

Response to Amendment

3. The preliminary amendment filed 9 March 2023 has been acknowledged. Claims 21-40 are pending.

Claim Objections

4. Claim 30 is objected to because of the following informalities: line two, immediately after "a rear surface and", please incorporate a space in the recited "aside" to properly recite "a side". Appropriate correction is required.

Claim Rejections - 35 USC § 103

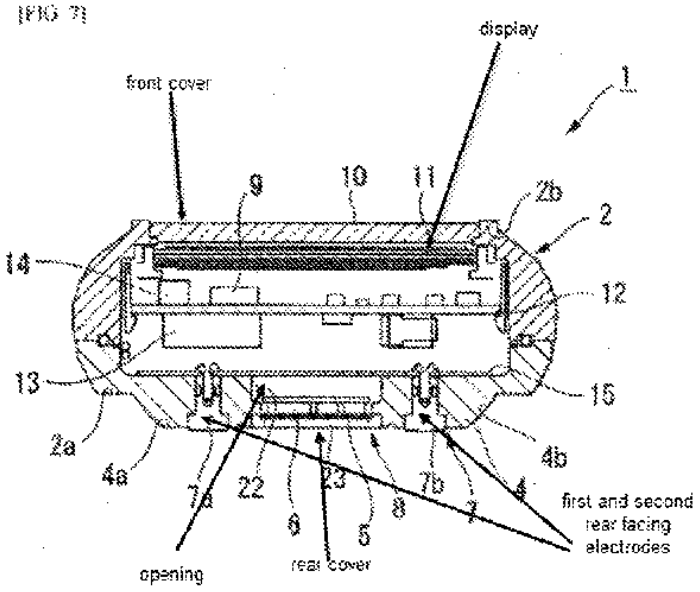
5. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> 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.

6. Claim(s) 21-23, 25, 27, 28, 30-33, and 35-37 is/are rejected under 35 U.S.C. 103 as being unpatentable over Kotangi et al. (Seiko Instruments Inc. WO 2005/092182 – disclosed by Applicant) in view of Park et al. (US Publication no. 2015/0026647), further in view of Lo et al. (US Patent no. 5,738,104 – disclosed by Applicant).

In regard to claims 21 and 35, Kotangi et al. describes a wearable electronic device in the form of a wrist watch. The device of Kotangi et al. is configured to be worn on a user and detect biological information from a biosensor disposed within an opening of the wearable housing and below a cover. Figure 1 of Kotangi et al. shows the wearable device comprising a sensor housing 2 and a band attached to the housing 2. Figure 7 of Kotangi et al. (reproduced below), shows the housing includes



a display 11, wherein the display is partially surrounded by the housing 2. A front cover 10 positioned over the display 11 and located on a side considered the top or front of

the housing 2. A cover 23 positioned on a side considered the bottom or rear side of the housing 2. A light emitter (LED) 5 positioned below the rear cover and configured to emit light through cover 23 and a light detector or photodetector 6 configure to produce a first signal in response to receiving a reflected portion of the light emitted by the light source (para 46, 54, and 55). A first electrode 7A and a second electrode 7B are located on the rear side of the housing 2 in order to detect contact with the user skin to ensure elements 5 and 6 are properly contacted (para 58 and 59). Kotangi et al. also includes a data processing part 9 for processing signals from elements 5 and 6 and electrodes 7A and 7B (para 46 and 50). The data processing part 9 calculates a health metric relating to heart rate/pulse rate from photodetector 6, and uses information from electrodes 7A and 7B to detect contact with the user skin (para 57 and 59).

Kotangi et al. is considered to substantially describe the invention as claimed, however does teach that the display of each respective device is a touch-sensitive display positioned below the front cover. Park et al. analogous to Kotangi et al., describes a wearable electronic device in the form of a wrist watch. The device of Park et al. is configured to be worn on a user and detect biological information from a biosensor disposed within an opening of the wearable housing and below a cover. Figures 4A and 4F show that the wearable electronic device comprises a touch sensor with the display and front cover so as to create a touch-sensitive display (para 85-95, 148-149, 162, and 170-171). The touch sensitive display allows for a user to provide input to the device via finger gesture. Modification to include a touch sensitive display is considered to have been obvious to one of ordinary skill in the art at the time of the invention since Park et al. demonstrates that touch displays are well known in the

analogous art. The modification is considered to comprise the application of known element to a known device to yield a predictable improvement to the functioning of the device (the touch display could eliminate the buttons of Kotangi et al. for entering input, thus allowing for enlargement of the display).

Kotangi et al. as modified by Park et al. is considered to describe the invention as claimed, however Kotangi et al. fails to teach that the electrodes 7A and 7B may be used to detect signals useful for calculating a health metric such as an electrocardiogram. Additionally, the electrodes of Kotangi et al. are located on the same side of the housing (i.e., the rear) such that Kotangi et al. does not describe a first electrode on the rear of the housing and the second electrode on a side of the housing. Park et al., in the wearable device, contemplate obtaining an ECG signal as a physiological signal (para 256), but falls short in enabling the measurement. Lo et al., describes a similar wearable wrist watch electronic device analogous to the cited references in structure, function, and solution to stated problem. The wristwatch obtains heart rate measurements and also includes at least three electrodes for measuring ECG signals (col 5 lines 17-28 and col 7 lines 25-27). The ECG signals are obtained by electrodes 14, 16, and 18, wherein the electrodes are located on the exterior surface of the watch, and at least one electrode (e.g., either 14 or 16) is mounted along the top portion of the watch (col 7 lines 25-42). Lo et al. also includes processing circuitry for determining the ECG signal from the first 14, second 16, and third 18 electrodes. In the least, Lo et al. demonstrates that ECG sensors may be part of a wearable electronic watch. In view of this, it is considered that modification of the devices described by Kotangi et al. and Park et al. to include ECG electrodes in combination with the optical

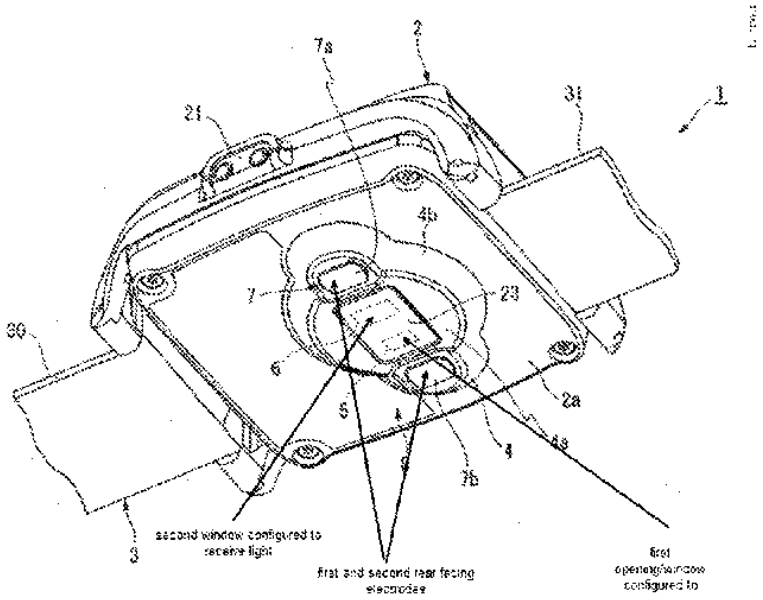
biosensors since the combination is demonstrated by Lo et al. (col 1 line 51 – col 2 line 12) and would comprise combining prior art elements according to known methods to yield a predictable result. Such ECG collection may be implemented via electrodes 7a and 7B of Kotangi et al. This combination is considered to comprise the acquisition of a first health metric and a second health metric (i.e., both ECG and optical heart rate). Further, the present specification fails to provide any criticality to the location of an ECG electrode located on the side of the housing beyond teaching that the location permits a user to touch the electrode with their finger. Lo et al. demonstrates that the location of the ECG electrodes is not critical to the acquisition of the ECG signal, and the Examiner submits that the electrode located on the top of Lo et al. would also provide the taught function. In view of this, the modification is considered obvious based on choice in design.

In regard to claim 22, in Kotangi et al., the light source 5 and photodetector 6 operate to provide an optical measurement of pulse rate (para 46 and 47). The pulse rate measurement is considered synonymous to the heart rate, and wherein this arrangement of elements in view of its functionality is synonymous to a photoplethysmography (para 65).

In regard to claim 23, the electrodes 7a and 7B of Kotangi et al. as modified by Lo et al. would operate to acquire ECG signals, therefore providing the second health metric related to the electrocardiogram.

In regard to claim 25, the rear side of Kotangi et al. comprising an external biosensor 8 located beneath rear cover 23 is described to have a protruding convex shape such that the surface extends outward from the rear housing surface (see figures

5 and 7 element 4b referred to as protruding part, para 54). Additionally, figure 5 of Kotangi et al. (below) shows that the light source 5 and photodetector 6 appear to have separate openings/windows within the cover 23 for emitting and receiving light.

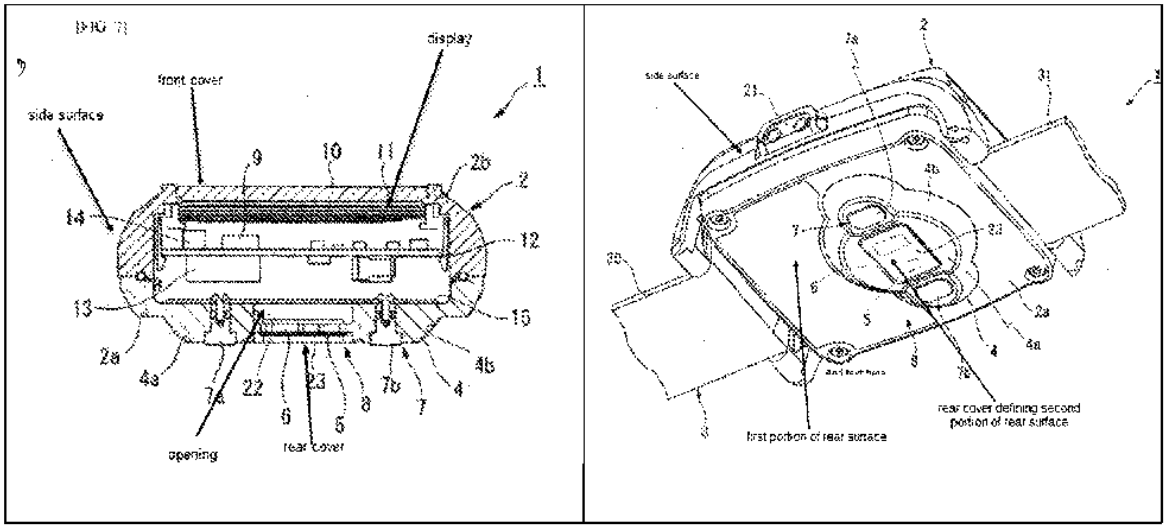


In regard to claim 27, Kotangi et al. is considered to substantially describe the invention as claimed, however does not include a speaker. Park et al. includes a speaker to provide audio output (para 101). The speaker is not described as being configured to provide an audio output in response to a touch detected by the touch sensitive display. This is considered to comprise an intended use of the speaker. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. Here it is considered that the speaker contained in Park et al. is capable of being used in this manner and may provide an alert for any required action. Modification to include a speaker in Kotangi et

al. is considered to have been obvious to one of ordinary skill in the art since the speaker is known to provide an audible alarm in watch to alert a user to particular time. Modification is considered to comprise to application of a known element to a known device to yield a predictable result.

In regard to claim 28, Kotangi et al. includes recharging means to recharge a rechargeable battery located within the housing (para 49 and 53). The recharging means includes an external connection terminal 21 for recharging the rechargeable battery 13 (para 53). The external connection terminal is considered to comprise the recited "power interface" which is configured to receive power from an external device. The external connection terminal located on a side of housing 2. The functionality of the terminal is considered to perform as intended regardless of the location. However, modification to relocate the terminal to the rear side is considered obvious to one of ordinary skill in the art at the time of the invention since it would merely constitute the rearrangement of working parts.

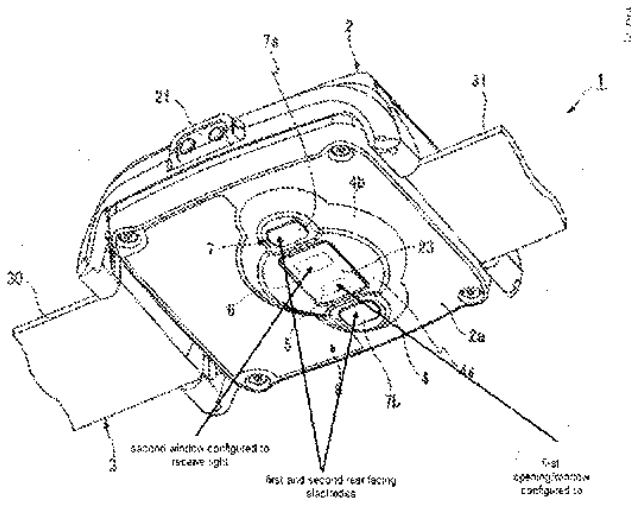
In regard to claim 30, Kotangi et al., in view of Park et al. and Lo et al. are considered to substantially suggest the invention as claimed (see rejection with respect to claim 21). Figure 5 of Kotangi et al. (below right) further shows that the housing includes a side surface and that the rear surface defined by a first portion of the rear surface and the cover 23 and protruding portion 4b comprising a second portion of a rear surface.



In regard to claim 31, in Kotangi et al., the light source 5 and photodetector 6 operate to provide an optical measurement of pulse rate (para 46 and 47). The pulse rate measurement is considered synonymous to the heart rate, and wherein this arrangement of elements in view of its functionality is synonymous to a photoplethysmography (para 65). Additionally, the electrodes 7a and 7B of Kotangi et al. as modified by Lo et al. would operate to acquire ECG signals, therefore providing the second health metric related to the electrocardiogram.

In regard to claim 32, the rear side of Kotangi et al. comprising an external biosensor 8 located beneath rear cover 23 is described to have a protruding convex shape such that the surface extends outward from the rear housing surface (see figures 5 and 7 element 4b referred to as protruding part, para 54).

In regard to claim 33, figure 5 of Kotangi et al. (below) shows that the light source 5 and photodetector 6 appear to have separate openings/windows within the cover 23 for emitting and receiving light.



In regard to claim 36, the optical biosensor of Kotangi et al. comprising photodetector 6 is configured to measure a change in light absorption by a region of skin of the user (para 65).

In regard to claim 37, in Kotangi et al., the light source 5 and photodetector 6 operate to provide an optical measurement of pulse rate based on a detected blood perfusion of the user (para 46, 47, and 65). The pulse rate measurement is considered synonymous to the heart rate, and wherein this arrangement of elements in view of its functionality is synonymous to a photoplethysmography (para 65). Additionally, the electrodes 7a and 7B of Kotangi et al. as modified by Lo et al. would operate to acquire ECG signals, therefore providing the second health metric related to the electrocardiogram or related to an electrical response of the user.

7. Claim(s) 24, 26, 34, and 38-40 is/are rejected under 35 U.S.C. 103 as being unpatentable over Kotangi et al. (Seiko Instruments Inc. WO 2005/092182 – disclosed by Applicant) in view of Park et al. (US Publication no. 2015/0026647) and Lo et al. (US

Patent no. 5,738,104 – disclosed by Applicant), further in view of Hong et al. (US Publication no. 2014/0275852).

In regard to claims 24 and 34, Kotangi et al. in view of Park et al. and Lo et al. is considered to substantially suggest the invention as claimed. However, none of the references teach that photodetector comprises a set of photodetectors, the set of photodetectors arranged around a central region of the rear cover. Hong et al. describes a similar wearable wrist watch electronic device analogous to the cited references in structure, function, and solution to stated problem. Figure 2b illustrates an exemplary embodiment. Figure 3C shows a cross section of a biosensor located therein. The biosensor is considered to comprise a current state of the art equivalent to Kotangi et al. The biosensor of Hong et al. includes a first light source and a second light source (light source LEDS), and a photodetector. This is similarly shown in figure 11D with light source 1 and light source 2. Figure 11D also shows two photodetectors (i.e., light detectors 1 and 2; This is considered to comprise a set). The use of two light source enable the device to emit two different wavelengths of light (e.g., red and infrared) which is useful for sensing blood oxygen saturation levels (para 142). The use of two light detectors of figure 11D permits detection of light from each light source. Additionally, figure 4C of Hong et al. shows that the optical elements of the optical biosensor are arranged in a central manner in a central region of the rear portion of the wrist watch device. Therefore it is considered to have been obvious to one of ordinary skill in the art at the time of the invention to modify the light source and light detector of Kotangi et al. to include an additional light source and an additional light detector since Hong et al.

shows that it is known in the art to incorporate additional light sources so that both red and infrared light for detecting blood oxygen saturation levels in optical sensors.

In regard to claims 26 and 40, Kotangi et al. in view of Park et al. and Lo et al. is considered to substantially suggest the invention as claimed. However, none of the references teach that electronic device includes a temperature sensor. Hong et al. describes a similar wearable wrist watch electronic device analogous to the cited references in structure, function, and solution to stated problem. Hong et al. includes a skin or body temperature sensor to assist with determining when a user is falling asleep or to adjust emitted light from the optical biosensor (para 110, 130-132, 143). Modification of the cited prior art to include a temperature sensor is considered to have been obvious to one of ordinary skill in the art at the time of the invention since temperature sensors were known in similar devices to aiding in user sleep detection. Such modification would comprise combining prior art elements according to known methods to yield a predictable result.

In regard to claim 38 and 39, Kotangi et al. in view of Park et al. and Lo et al. is considered to substantially suggest the invention as claimed. However, none of the references teach that the sensors incorporated therein determine a blood oxygenation level of a user or a respiration rate. The optical sensor described by Hong et al. acquires various forms of physiological data including respiration and SpO_2 oxygen saturation levels (para 110, 127, and 141, Table 1). Therefore it is considered obvious to modify the optical sensing components and data processing part of Kotangi et al. to derive information related to respiration or oxygen saturation since Hong et al. teaches deriving this information from optical signal was expressly known in the art. The

modification is considered to comprise the application of a known technique to a known device to yield a predictable improvement.

8. Claim(s) 29 are rejected under 35 U.S.C. 103 as being unpatentable over Kotangi et al. (Seiko Instruments Inc. WO 2005/092182 – disclosed by Applicant) in view of Park et al. (US Publication no. 2015/0026647) and Lo et al. (US Patent no. 5,738,104 – disclosed by Applicant), further in view of Lyon (US Patent no. 7,474,592).

In regard to claim 29, Kotangi et al. in view of both Park et al. and Lo et al. is considered to substantially suggest the invention as claimed. However, none of the references provide a feature enabling the wearable electronic devices described therein to have a near-field communication interface to communicate wirelessly through an external payment device, such that the electronic watch is configured to authorize a purchase with the external payment device using the near-field communication interface. Lyon is directed to an electronic device embodied as a wristwatch. Similar to Kotangi et al., Park et al., and Lo et al. figure 1 shows the wristwatch device a biosensor 70 (col 4 lines 14-19). The wristwatch of Lyon is configured to facilitate a wireless transaction for an authenticated user when worn by the authenticated user (col 1 lines 16-32, col 3 lines 24-42). The wristwatch requires a wireless link similar to that as claimed to facilitate and authorize a transaction between the wristwatch and external payment device (col 3 lines 43-62). The wireless link is described as being a short-range radio or transponder link (col 1 lines 21-24). Modification of the applied prior art to incorporate a form of wireless transaction communication interface bearing the features as claimed is considered to have been obvious to one of ordinary skill in the art

at the time of the invention since Lyon expressly teaches that wristwatch devices are suitable mechanisms for providing good authentication and identifying a user for wireless transactions. The modification is considered to comprise the application of a known technique to a known device to yield a predictable result.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRIAN T GEDEON whose telephone number is (571)272-3447. The examiner can normally be reached M-F 8:00 am to 5:30 PM ET.

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, David E. Hamaoui can be reached on 571-270-5625. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and

https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/BRIAN T GEDEON/
Primary Examiner, Art Unit 3792
18 May 2023

Notice of References Cited	Application/Control No. 18/119,175	Applicant(s)/Patent Under Reexamination Rothkopf et al.	
	Examiner BRIAN T GEDEON	Art Unit 3792	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20150026647-A1	01-2015	PARK; Yonghahk	G06F1/3231	715/863
*	B	US-20140275852-A1	09-2014	Hong; Jung Ook	A61B5/0002	600/479
*	C	US-7474592-B2	01-2009	Lyon; Geoffrey Martin	H04W12/068	368/10
	D					
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	L					
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FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
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	P					
	Q					
	R					
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NON-PATENT DOCUMENTS

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

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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/119,175	Rothkopf et al.
	Examiner	Art Unit
	BRIAN T GEDEON	3792

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Detailed SEARCH history attached.	05/18/2023	BTG
Inventor name search.	05/18/2023	BTG
IDS considered.	05/18/2023	BTG
IPR2023-00634 inter partes review for Application no. 15/261,917 considered.	05/18/2023	BTG
IPR2023-00734 inter partes review for Application no. 16/826,130 considered.	05/18/2023	BTG
IPR2023-00807 inter partes review of Application no. 17/672,653 considered.	05/18/2023	BTG

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/119,175	Rothkopf et al.
	Examiner	Art Unit
	BRIAN T GEDEON	3792

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

PTO/SB/08A (08-03) U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** *(Use as many sheets as necessary)*	**APPLICATION NO.:** 18/119,175	**FILING DATE:** March 8, 2023
	INVENTOR(S): Fletcher Rothkopf et al.	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P22914USC12

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PATENT NUMBER Number – Kind Code[2] (if known)	ISSUE DATE MM-DD-YYYY	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1.	8,810,514	08/2014	Zhao et al.	

U.S. PUBLICATION DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PUBLICATION NUMBER Number – Kind Code[2] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Inventor(s) of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	B1.	2021/0353226	11/2021	Hiemstra	
	B2.	2023/0077241	03/01/2023	Pandya et al.	

FOREIGN PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	DOCUMENT NUMBER Country Code[3] – Number[4] – Kind Code[5] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T[6]

EXAMINER	DATE CONSIDERED
/BRIAN T GEDEON/	05/18/2023

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

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[1] Applicant's unique citation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto gov or MPEP 901 04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.
1.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.T.G/

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	12	(US-4914831-$ | US-6587400-$ | US-6846998-$ | US-7034237-$ | US-7255473-$ | US-7506269-$ | US-8456430-$ | US-8816962-$ | US-9034666-$ | US-9176577-$ | US-9632318-$ | US-9800717-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:07 AM
L2	42	(US-0018026-$ | US-0024683-$ | US-0061863-$ | US-0062623-$ | US-0103985-$ | US-0104902-$ | US-0253487-$ | US-0269715-$ | US-0285404-$ | US-0306446-$ | US-0331869-$ | US-0335196-$ | US-0347289-$ | US-0357465-$ | US-20130335196-$ | US-20140347289-$ | US-20160062623-$ | US-20160103985-$ | US-20160253487-$ | US-20160306446-$ | US-20170061863-$ | US-20170104902-$ | US-20170269715-$ | US-20170285404-$ | US-20170331869-$ | US-20170357465-$ | US-20180018026-$ | US-20180024683-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:07 AM
L3	3	"9836025".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:07 AM
L4	9	(US-4395134-$ | US-4634861-$ | US-4987299-$ | US-5631881-$ | US-5825353-$ | US-6392640-$ | US-6896403-$ | US-7102626-$ | US-9430042-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:08 AM

L5	12	(US-0069713-$ | US-0109861-$ | US-0248986-$ | US-0307414-$ | US-20160069713-$ | US-20160109861-$ | US-20170248986-$ | US-20170307414-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:08 AM
L6	22	(US-2288215-$ | US-2788236-$ | US-2797592-$ | US-3410247-$ | US-4311026-$ | US-4766642-$ | US-5509174-$ | US-6502982-$ | US-6834430-$ | US-7111365-$ | US-7285738-$ | US-7371745-$ | US-7591582-$ | US-8607662-$ | US-8783944-$ | US-8905631-$ | US-9052696-$ | US-9244438-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:09 AM
L7	12	(US-0116306-$ | US-0122656-$ | US-0130971-$ | US-0272784-$ | US-20040130971-$ | US-20090122656-$ | US-20120272784-$ | US-20160116306-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:09 AM
L8	0	"201700192391".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:10 AM
L9	0	(201600327911|20170045958).PN.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:10 AM
L10	1	"20170192391".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:10 AM
L11	3	(20160327911|20170045958).PN.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:10 AM
L12	4	(8188989|9947741).PN.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:11 AM
L13	244	(US-0003655-$ | US-0010751-$ | US-0013775-$ | US-0033430-$ | US-0037396-$ | US-0050054-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:11 AM

		0051649-$ | US- 0053468-$ | US- 0054813-$ | US- 0058375-$ | US- 0061636-$ | US- 0067711-$ | US- 0068857-$ | US- 0069443-$ | US- 0069444-$ | US- 0069447-$ | US- 0071050-$ | US- 0071098-$ | US- 0073119-$ | US- 0075082-$ | US- 0075558-$ | US- 0081375-$ | US- 0082414-$ | US- 0087443-$ | US- 0090148-$ | US- 0098016-$ | US- 0112859-$ | US- 0113044-$ | US- 0130914-$ | US- 0132516-$ | US- 0146975-$ | US- 0149099-$ | US- 0152452-$ | US- 0168178-$ | US- 0174590-$ | US- 0197936-$ | US- 0206248-$ | US- 0211042-$ | US- 0217207-$ | US- 0221460-$ | US- 0222756-$ | US- 0227217-$ | US- 0229671-$ | US- 0247421-$ | US- 0250377-$ | US- 0258784-$ | US- 0259301-$ | US- 0285443-$ | US- 0306437-$ | US- 0312051-$ | US- 0313703-$ | US- 0327630-$ | US- 0340318-$ | US- 0341031-$ | US- 0378070-$ | US- 0378071-$ | US- 0378072-$ | US- 15483374-$ | US- 2237860-$ | US- 2497935-$ | US- 2771734-$ | US- 20030174590-$ | US- 20040082414-$ | US- 20050075558-$ | US-					

		20060250377-$ | US- 20070013775-$ | US- 20070050054-$ | US- 20070211042-$ | US- 20070222756-$ | US- 20070229671-$ | US- 20070247421-$ | US- 20080130914-$ | US- 20090051649-$ | US- 20090073119-$ | US- 20090146975-$ | US- 20090152452-$ | US- 20090217207-$ | US- 20090285443-$ | US- 20090312051-$ | US- 20100033430-$ | US- 20100053468-$ | US- 20100081375-$ | US- 20100149099-$ | US- 20110090148-$ | US- 20120067711-$ | US- 20120068857-$ | US- 20120075082-$ | US- 20120112859-$ | US- 20120113044-$ | US- 20120206248-$ | US- 20130037396-$ | US- 20130087443-$ | US- 20140071050-$ | US- 20140071098-$ | US- 20140132516-$ | US- 20140197936-$ | US- 20140327630-$ | US- 20140340318-$ | US- 20150221460-$ | US- 20150227217-$ | US- 20150341031-$ | US- 20160054813-$ | US- 20160058375-$ | US- 20160061636-$ | US- 20160098016-$ | US- 20160168178-$ | US- 20160258784-$ | US- 20160259301-$ | US- 20160306437-$ | US- 20160313703-$ | US- 20160378070-$ | US- 20160378071-$ | US- 20160378072-$ | US- 20170003655-$ | US- 20170010751-$ | US- 20170069443-$ | US- 20170069444-$ | US- 20170069447-$ | US- 3040514-$ | US- 3056030-$ | US- 3130539-$ | US- 3495398-$ | US-					

		3621649-$ | US- 4007347-$ | US- 4031341-$ | US- 4037068-$ | US- 4077200-$ | US- 4133404-$ | US- 4170104-$ | US- 4258096-$ | US- 4287400-$ | US- 4289400-$ | US- 4311990-$ | US- 4324956-$ | US- 4345119-$ | US- 4364674-$ | US- 4379642-$ | US- 4417824-$ | US- 4581509-$ | US- 4600316-$ | US- 4617461-$ | US- 4641026-$ | US- 4670737-$ | US- 4783772-$ | US- 4884073-$ | US- 4922070-$ | US- 4931794-$ | US- 4952799-$ | US- 4980685-$ | US- 5034602-$ | US- 5214278-$ | US- 5258592-$ | US- 5288993-$ | US- 5347123-$ | US- 5383166-$ | US- 5471054-$ | US- 5572314-$ | US- 5583560-$ | US- 5726645-$ | US- 5748111-$ | US- 5841050-$ | US- 5847335-$ | US- 5867082-$ | US- 5943233-$ | US- 5953001-$ | US- 5963332-$ | US- 5423873-$ | US- 6069567-$ | US- 6134189-$ | US- 6154201-$ | US- 6175679-$ | US- 6246050-$ | US- 6252825-$ | US- 6304247-$ | US- 6355891-$ | US- 6422740-$ | US- 6477117-$ | US- 6525278-$ | US- 6556222-$ | US- 6646635-$).DID.					

L14	99	(US-6661438-$ | US-6672758-$ | US-6794992-$ | US-6809275-$ | US-6888076-$ | US-6909378-$ | US-6914551-$ | US-6961099-$ | US-6963039-$ | US-6985107-$ | US-6987568-$ | US-6998553-$ | US-7016263-$ | US-7081905-$ | US-7119289-$ | US-7135673-$ | US-7167083-$ | US-7244927-$ | US-7265336-$ | US-7274303-$ | US-7292741-$ | US-7358481-$ | US-7369308-$ | US-7404667-$ | US-7465917-$ | US-7520664-$ | US-7528824-$ | US-7545367-$ | US-7593755-$ | US-7605846-$ | US-7634263-$ | US-7646677-$ | US-7710456-$ | US-7761246-$ | US-7763819-$ | US-7772507-$ | US-7778115-$ | US-7781726-$ | US-7791597-$ | US-7856255-$ | US-7858583-$ | US-7865324-$ | US-8063892-$ | US-8138488-$ | US-8167126-$ | US-8169402-$ | US-8195313-$ | US-8248815-$ | US-8263886-$ | US-8263889-$ | US-8312495-$ | US-8368677-$ | US-8371745-$ | US-8373661-$ | US-8410971-$ | US-8432368-$ | US-8439559-$ | US-8441450-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:11 AM

		8446713-$ | US-8477118-$ | US-8493190-$ | US-8525777-$ | US-8568313-$ | US-8576044-$ | US-8593598-$ | US-8614881-$ | US-8666682-$ | US-8704787-$ | US-8711093-$ | US-8724087-$ | US-8730167-$ | US-8743088-$ | US-8824245-$ | US-8859971-$ | US-8860674-$ | US-8863219-$ | US-8878657-$ | US-8885856-$ | US-8895911-$ | US-8920022-$ | US-8922399-$ | US-8928452-$ | US-8994827-$ | US-9024733-$ | US-9041663-$ | US-9086738-$ | US-9105413-$ | US-9123483-$ | US-9176598-$ | US-9202372-$ | US-9213409-$ | US-9223296-$ | US-9277156-$ | US-9350850-$ | US-9449770-$ | US-9607505-$ | US-9620312-$ | US-9627163-$ | US-RE41637-$ | US-X6-$).DID.					
L15	7	(3355873|20110007468|20120177237).PN.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:12 AM
L16	0	rothkoph-fletcher-r.in.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:23 AM
L17	253	((("Rothkopf") near3 ("Fletcher") near3 ("R"))).INV.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 09:23 AM
L18	850	biosensor AND ((wrist NEAR watch) OR wristwatch)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:24 AM
L19	4	L17 AND L18	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2018/05/30 09:24 AM

			JPO)				
L20	1954995	curve	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:29 AM
L21	244	L18 AND L20	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:29 AM
L22	8927	smartwatch	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 10:23 AM
L23	89438	biosensor	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 10:23 AM
L24	218	L22 AND L23	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 10:23 AM
L25	21	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$).did.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 10:35 AM
L26	36	("20030176815" | "20050228297" | "20060252999" | "20070049461" | "20070167844" | "20080039731" | "20090216132" | "20100081951" | "20100106029" | "20100292589" | "20110003665" | "20110152637" | "20120244995" | "20130296723" | "20130338460" | "20140073969" | "20140107493" | "20140167973" | "20140249398" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 10:37 AM

		"20140257533" | "20140257534" | "20140257535" | "20140274159" | "20140278139" | "20140354527" | "20150374310" | "4830017" | "4893631" | "4987898" | "5243992" | "5617867" | "6371920" | "6443906" | "6475153" | "6723054" | "7539532").PN. OR ("9848825").URPN.					
L27	16	("20010008074" | "20040020856" | "20040152957" | "20070279852" | "20120293323" | "20130222271" | "20140207264" | "20140275852" | "20140378777" | "20150026647" | "20150371516" | "6619835" | "6736759" | "6832109" | "8988349" | "9288836").PN. OR ("9737212").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 10:39 AM
L28	49	("20020055117" | "20030165954" | "20030175993" | "20060057707" | "20080022089" | "20080038738" | "20080266546" | "20130146659" | "20130231711" | "20130234850" | "20130346168" | "20140139422" | "20140139486" | "20140139637" | "20140143737" | "20140180595" | "20140239065" | "20140275850" | "20140275852" | "20140275854" | "20140276244" | "20140316305" | "20140366123" | "20150073907" | "20150186609" | "20150196200" | "20150238150" | "20150366518" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 10:41 AM

		"20150371215" | "20160036811" | "20160037346" | "20160125600" | "20160162873" | "20160239624" | "20160286210" | "20160328282" | "20160374588" | "20160379205" | "20170011210" | "20170011223" | "20170018150" | "20170031449" | "20170039358" | "20170071483" | "8784271" | "9100493" | "9299238").PN. OR ("9704154").URPN.					
L29	13	("20020167488" | "20040030753" | "20050195805" | "20050272408" | "20060036642" | "20110080289" | "20110234414" | "20120052922" | "20120218101" | "20130002441" | "20130325922" | "20150279168" | "8744113").PN. OR ("9622214").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 10:55 AM
L30	17	("20030099459" | "4736196" | "5537102" | "5883576" | "5936530" | "6158884" | "6255951" | "6350055" | "6396403" | "6431455" | "7133843").PN. OR ("7474592").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 10:57 AM
L31	45	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:03 PM

		US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$).did.					
L32	1	"15261912"	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:09 PM
L33	33545	(smartwatch) OR (smart NEAR watch)	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:28 PM
L34	223931	apple	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:28 PM
L35	8043	L33 AND L34	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:28 PM
L36	2386928	curve$4	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:29 PM
L37	1219	L35 AND L36	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:29 PM
L38	1756218	rectangular	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:29 PM
L39	345	L37 AND L38	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:29 PM
L40	18177	((("Apple") near3 ("Inc"))).AS,AANM.	(USPAT)	OR	ON	ON	2018/05/30 02:59 PM
L41	33545	(smartwatch) OR (smart NEAR watch)	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 02:59 PM
L42	407	L40 AND L41	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 02:59 PM
L43	279935	crown	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2018/05/30 03:02 PM

			JPO)				
L44	18	L42 AND L43	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:02 PM
L45	120000	(heart NEAR rate)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:03 PM
L46	39	L42 AND L45	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:03 PM
L47	482	"iwatch"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:09 PM
L48	23	L40 AND L47	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:09 PM
L49	1	"15261912"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:12 PM
L50	248238	(photosensor OR photodetector)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:21 PM
L51	16	L42 AND L50	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:21 PM
L52	155606	sapphire	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:23 PM
L53	16	L42 AND L52	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:23 PM
L54	58538	(transparent NEAr cover)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:59 PM
L55	3	L42 AND L54	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:59 PM
L56	6820268	cover	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:00 PM
L57	81	L41 AND L54	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:00 PM
L58	42	("20030197648" | "20050156908" | "20060196849" | "20060273304" | "20080164578" | "20090104409" | "20090124062" | "20100231466" | "20110019123" | "20110072856" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 04:04 PM

		"20110223840" | "20120118228" | "20120135177" | "20120299841" | "20130002583" | "20130071601" | "20130140965" | "20130188366" | "20130236699" | "20140178647" | "20150085429" | "20150085432" | "20160058375" | "20160064800" | "20160378069" | "20160378070" | "20160378071" | "3740944" | "3911670" | "4561783" | "5369267" | "5545277" | "6206563" | "6406769" | "6677906" | "7712954" | "8596860" | "8721917" | "8824140" | "9271395" | "9288294" | "9369553").PN. OR ("9977464").URPN.					
L59	850	biosensor AND ((wrist NEAR watch) OR wristwatch)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:08 PM
L60	719	L AND L59	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 04:08 PM
L61	0	L40 AND L59	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 04:08 PM
L62	58057	((wrist NEAR watch) OR wristwatch)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:08 PM
L63	967	L40 AND L62	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:09 PM
L64	48	L45 AND L63	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:09 PM
L65	68	L52 AND L63	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:14 PM
L66	5183	L45 AND L62	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:17 PM
L67	221	L52 AND L66	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:18 PM
L68	72	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 09:38 AM

		US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-					

		D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$).did.					
L69	40	("20100193972" | "20110186324" | "20110210825" | "20110222248" | "20110241949" | "20120028679" | "20120133597" | "20120223865" | "20130044074" | "20130052947" | "20130078917" | "20130140965" | "20130229362" | "20130234910" | "20130300618" | "20130321216" | "20140080411" | "20140112511" | "20140132462" | "20140133074" | "20140170975" | "20140209691" | "20140213178" | "20140218250" | "20140226291" | "20140232609" | "20150035709" | "20150207913" | "20150311960" | "20150351292" | "5768217" | "6825751" | "7233291" | "7506436" | "7815820" | "8502739" | "8679393" | "8766858" | "8780581" | "8803745").PN. OR ("9680205").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 09:53 AM
L70	3	(9242085|20080033504|9011355).pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 09:54 AM
L71	37	("1313644" | "1692079" | "1817475" | "20040025984" | "20070125816" | "20080060224" | "20080086911" | "20120102691" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 11:05 AM

		"20140070042" | "20140094728" | "20150135410" | "20160255944" | "20160272458" | "20160345653" | "20160345661" | "3890801" | "4941236" | "5485848" | "6301754" | "6799887" | "7562640" | "7618384" | "7690220" | "7752774" | "8147417" | "8370998" | "8522456" | "8769844" | "9044372" | "9129503" | "9144273" | "9204690" | "9307804" | "9365387").PN. OR ("9781984").URPN.					
L72	4437806	(contour$4 OR round$4 OR curve$4)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:08 PM
L73	58102	((wrist NEAR watch) OR wristwatch)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 12:08 PM
L74	15419	L72 AND L73	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:08 PM
L75	66	watchface	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:08 PM
L76	26	("2225474" | "3469391" | "4034552" | "4167850" | "4194355" | "4417821" | "4506992").PN. OR ("4903253").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:12 PM
L77	69	("20100061191" | "3640065" | "4903253" | "5265009" | "5386933" | "6655831" | "6712501" | "6970157" | "7004469" | "7106197" | "7708457" | "8647268" | "8766805" | "9060683" | "9551608" | "D287471" | "D439172" | "D496589" | "D513195" | "D528018" | "D528439" | "D528928" | "D558227" | "D563434" | "D569389" | "D572266" | "D574735" | "D578922" | "D584170" | "D586823" | "D589375" | "D596610" | "D616417" | "D637094" | "D637918" | "D650706" | "D651216" | "D666503" | "D681483" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:12 PM

		"D699701" | "D712870" | "D728624" | "D737156" | "D737157" | "D737158" | "D737159" | "D741726" | "D744356" | "D745421" | "D746707" | "D746868" | "D747288" | "D751070" | "D752044" | "D756357" | "D756824" | "D757819" | "D758363" | "D759011" | "D759725" | "D765655" | "D766752" | "D771035" | "D771504" | "D777163" | "D782537" | "D784326" | "D790517").PN. OR ("D798905").URPN.					
L78	0	akana-joan.in.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:19 PM
L79	717	akana-jody.in.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:19 PM
L80	406132	((wrist NEAR watch) OR wristwatch OR watch)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 12:26 PM
L81	18177	((("Apple") near3 ("Inc"))).AS,AANM.	(USPAT)	OR	ON	ON	2018/05/31 12:26 PM
L82	2430	L81 AND L80	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 12:26 PM
L83	124655	rectangular AND orthogonal AND (contour$4 OR round$4 OR curve$4 OR curvature)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 12:27 PM
L84	71	L82 AND L83	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 12:27 PM
L85	76	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 12:42 PM

		US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-					

		7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$).did.					
L86	78	ely-colin-m.in.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 12:43 PM
L87	52	de-jong-erik-g.in.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 12:46 PM
L88	75	memering-dale-n.in..in.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 12:48 PM
L89	75	memering-dale-n.in.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 12:48 PM
L90	4	mylvaganam-jeffrey-c.in.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 12:51 PM
L91	3	("20120169465"|"20120245439"|"20130231574").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 01:00 PM
L92	1	"20150186609".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 01:54 PM
L93	908170	convex	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 02:15 PM
L94	9	L85 AND L93	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 02:15 PM
L95	1304822	mask	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 02:18 PM
L96	14	L85 AND L95	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 02:19 PM
L97	8	(20150186609|20140275852|20140107493|20130236693|4903253).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 08:01 AM
L98	3	"14145856"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 09:52 AM
L99	1	"14073550"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 09:55 AM
L100	17	("20110121449"|"20130072765"|"20140121471"|"20140334083"|"20150065840"|"3515798"|"6500367"|"8591411").PN.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 09:58 AM
L101	77	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/01 02:39 PM

		US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-					

		9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$).did.					
L102	280007	crown	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:39 PM
L103	6	L101 AND L102	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:39 PM
L104	740594	acoustic	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:40 PM
L105	21	L101 AND L104	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:40 PM
L106	2738169	gasket OR seal	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:42 PM
L107	0	L101 AND LL6	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:42 PM
L108	16	L101 AND L106	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:42 PM
L109	1304822	mask	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 03:06 PM
L110	14	L101 AND L109	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 03:06 PM
L111	33714	(smartwatch) OR (smart NEAR watch)	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/01 04:33 PM
L112	2738169	gasket OR seal	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 04:33 PM
L113	2278	L111 AND L112	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 04:33 PM
L114	180804	ledge	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 04:33 PM

L115	73	L113 AND L114	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 04:34 PM
L116	77	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/01 04:36 PM

		D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$).did.					
L117	461759	gasket	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 04:36 PM
L118	5	L116 AND L117	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 04:36 PM
L119	6	(15261914|15261917|15627321|15870718|15879223|14842617)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/04 04:46 PM
L120	77	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/04 06:22 PM

		US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$).did.					
L121	132091	sapphire	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/04 07:38 PM
L122	9	L120 AND L121	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/04 07:39 PM

L123	77	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/07 03:23 PM

		D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$).did.					
L124	77772	crown AND (rotary OR rotation)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:23 PM
L125	5	L123 AND L124	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:24 PM
L126	33999	(smartwatch) OR (smart NEAR watch)	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/07 03:24 PM
L127	162	L126 AND L124	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:24 PM
L128	406910	(watch OR wristwatch OR (wrist NEAR watch))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:32 PM
L129	3396	L124 AND L128	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:32 PM
L130	2	"20150124415".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:36 PM
L131	1	"15261912"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:52 PM
L132	14	(speaker SAME (recess OR aperture) SAME fluid SAME (intrusion OR ingress))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 04:03 PM
L133	299	(waterproof NEAR port)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 04:04 PM
L134	0	L126 AND L133	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 04:04 PM
L135	25	L128 AND L133	(US-PGPUB; USPAT;	OR	ON	ON	2018/06/07

			USOCR; FPRS; EPO; JPO)				04:04 PM
L136	319	(waterproof SAME (audio OR acoustic) SAME port)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 04:09 PM
L137	8	L126 AND L136	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 04:09 PM
L138	56	L128 AND L136	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 04:09 PM
L139	81	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/07 04:49 PM

		9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$).did.					
L140	1	"8229535".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/07 04:50 PM
L141	39	("0012016"|"0012017"|"0022016"|"0032012"|"0032017"|"0042018"|"0052010"|"0052011"|"0052015"|"0052018"|"0062008"|"0062010"|"0062017"|"0072015"|"0072016"|"0082013"|"0082015"|"0082016"|"0092016"|"0102017"|"0112014"|"0112016"|"0122005"|"20040264301"|"20110242064"|"20130261405"|"20150098309"|"20160018846"|"20160320583"|"20170011210"|"20170031449"|"20170139489"|"20170216668"|"20170238138"|"20170251561	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/11 05:21 PM

		"|"20170301314"|"2018 0136613"|"2018013668 6"|"4396298").PN.					
L142	1267679	(translation$4)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/11 05:22 PM
L143	4	L141 AND L142	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/11 05:24 PM
L144	10	("0062016"|"10001817"| "20130191220"|"20160 147432"|"20160170598 "|"20160170608"|"6396 006"|"8294670"|"95520 23"|"9659482").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/11 05:28 PM
L145	2	("20110158057"|"91410 87").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/11 05:28 PM
L146	4	("20180239306"|"20180 246469"|"20180299834 "|"9971405").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/11 05:28 PM
L147	5	("20040047244"|"20150 366098"|"20180307363 "|"5960366"|"9520100"). PN.	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/11 05:29 PM
L148	22	(US-2288215-$ | US-2788236-$ | US-2797592-$ | US-3410247-$ | US-4311026-$ | US-4766642-$ | US-5509174-$ | US-6502982-$ | US-6834430-$ | US-7111365-$ | US-7285738-$ | US-7371745-$ | US-7591582-$ | US-8607662-$ | US-8783944-$ | US-8905631-$ | US-9052696-$ | US-9244438-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/11 06:07 PM
L149	2	L142 AND L148	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/11 06:07 PM
L150	4	"15178089"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/11 06:18 PM
L151	22	(US-2288215-$ | US-2788236-$ | US-2797592-$ | US-3410247-$ | US-4311026-$ | US-4766642-$ | US-5509174-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 07:10 AM

		6502982-$ | US-6834430-$ | US-7111365-$ | US-7285738-$ | US-7371745-$ | US-7591582-$ | US-8607662-$ | US-8783944-$ | US-8905631-$ | US-9052696-$ | US-9244438-$).DID.					
L152	25	(US-4396298-$ | US-6977868-$ | US-7385874-$ | US-7708457-$ | US-7732724-$ | US-7946758-$ | US-8143981-$ | US-8508511-$ | US-9028134-$ | US-9086717-$ | US-9101184-$ | US-9241635-$ | US-9256209-$ | US-9386932-$ | US-9426275-$ | US-9437357-$ | US-9501044-$ | US-9532723-$ | US-9545541-$ | US-9599964-$ | US-9680831-$ | US-9946297-$ | US-9971305-$ | US-D717679-$ | US-D800172-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 07:19 AM
L155	13	(9836025|9709956|9620312).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 09:13 AM
L156	4	"14842617"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 09:14 AM
L157	49919	crown SAME ((rotary OR rotation OR rotat$4) OR (translat$4 OR translatable))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 09:20 AM
L158	3	L155 AND L157	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 09:20 AM
L159	15	"14455375"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 09:22 AM
L160	1	"15261914"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 09:30 AM

L161	1	"8954135".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/01/08 09:51 AM
L162	12	(US-10092203-$ | US-5999168-$ | US-6241684-$ | US-6361502-$ | US-6982930-$ | US-7113450-$ | US-7468036-$ | US-7791588-$ | US-9039614-$ | US-9042971-$ | US-9898032-$ | US-9979426-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:35 AM
L163	2846978	wireless	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:38 AM
L164	9	L162 AND L163	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:38 AM
L165	25	(US-0049059-$ | US-0196517-$ | US-0235491-$ | US-0270358-$ | US-0320346-$ | US-0338642-$ | US-0368442-$ | US-0375579-$ | US-20110270358-$ | US-20140368442-$ | US-20140375579-$ | US-20150049059-$ | US-20150320346-$ | US-20150338642-$ | US-20160338642-$ | US-20180196517-$ | US-20180235491-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:44 AM
L166	3	(US-3362154-$ | US-9001625-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:45 AM
L167	21	(US-0017846-$ | US-0027461-$ | US-0073486-$ | US-0329368-$ | US-0335891-$ | US-0341342-$ | US-0364815-$ | US-20140073486-$ | US-20170027461-$ | US-20180329368-$ | US-20180335891-$ | US-20180341342-$ | US-20180364815-$ | US-20190017846-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:46 AM
L168	88408	haptic	(US-PGPUB; USPAT;	OR	ON	ON	2019/02/15

			USOCR; FPRS; EPO; JPO)				09:55 AM
L169	5	L165 AND L168	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:55 AM
L170	0	L166 AND L168	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:56 AM
L171	6	L162 AND L168	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:56 AM
L172	9	(7822469|8908477|20170216519).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/05/06 10:15 AM
L173	9	(10209148|10114342|8677285|20130235704|20160241688).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/05/23 10:39 AM
L174	993	haptic AND crown	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/05/23 10:40 AM
L175	0	L173 AND L174	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/05/23 10:40 AM
L176	81	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2019/05/23 10:49 AM

		9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$).did.					
L177	18	L176 AND Haptic	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/05/23 10:50 AM
L178	2	("7021442"|"7894957").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2019/07/29 08:05 AM
L179	2	("7021442"|"7894957").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2019/07/29 08:11 AM

L180	2	("7021442"|"7894957").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2019/07/29 08:11 AM
L181	25	(3733803|4520306|6377239|6882596|6967903|7286063|7655874|8975543|9836025|10331082|20080088417|20170090599|20190163324).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/07/29 08:13 AM
L182	3	"9627163".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/07/29 08:20 AM
L183	3	"9627163".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/08/13 07:07 PM
L184	15	("10331082"|"20050088417"|"20170090599"|"20190163324"|"3733803"|"4520306"|"6377239"|"6882596"|"6967903"|"7021442"|"7286063"|"7655874"|"7894957"|"8975543"|"9836025").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2019/08/13 08:09 PM
L185	5	(7021442|7894957).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/08/13 08:11 PM
L186	4	("20190250754"|"20190294117"|"20190302902"|"5177355").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2019/11/24 05:25 PM
L187	3	(5477508|8275327).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/02/28 01:14 PM
L188	4	(10613485|10620591|10627783|10599101).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/01 01:23 PM
L189	83	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/01 01:38 PM

		US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-					

		3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$).did.					
L190	278	("10001817"|"10018966"|"10019097"|"10037006"|"10048802"|"10061399"|"10092203"|"10114342"|"10145711"|"10175652"|"10209148"|"10216147"|"10222756"|"10222909"|"10234828"|"10296125"|"10331081"|"10331082"|"10379629"|"10509486"|"2237860"|"2288215"|"2497935"|"2771734"|"2788236"|"2797592"|"3040514"|"3056030"|"3130539"|"3355873"|"3362154"|"3410247"|"3495398"|"3577876"|"3621649"|"3662618"|"3733803"|"4007347"|"4031341"|"4037068"|"4077200"|"4133404"|"4170104"|"4258096"|"4287400"|"4289400"|"4311026"|"4311990"|"4324956"|"4345119"|"4364674"|"4379642"|"4395134"|"4396298"|"4417824"|"4520306"|"4581509"|"4600316"|"4617461"|"4634861"|"4641026"|"4670737"|"4766642"|"4783772"|"4884073"|"4914831"|"4922070"|"4931794"|"4952799"|"4980685"|"4987299"|"5034602"|"5177355"|"5214278"|"5258592"|"5288993"|"5347123"|"5383166"|"5471054"|"5477508"|"5509174"|"5572314"|"5583560"|"5631881"|"5726645"|"5748111"|"5825353"|"5841050"|"5847335"|"5867082"|"5943233"|"5953001"|"5960366"|"5963332"|"5999168"|"6069567"|"6134189"|"6154201"|"6175679"|"6241684"|"6246050"|"6252825"|"6304247"|"6355891"|"6361502"|"6377239"|"6392640"|"6396006"|"6	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/01 02:00 PM

		422740"|"6477117"|"65 02982"|"6525278"|"655 6222"|"6575618"|"6587 400"|"6646635"|"66614 38"|"6672758"|"679499 2"|"6809275"|"6834430" |"6846998"|"6882596"|" 6888076"|"6896403"|"6 909378"|"6914551"|"69 61099"|"6963039"|"696 7903"|"6977868"|"6982 930"|"6985107"|"69875 68"|"6998553"|"701626 3"|"7021442"|"7034237" |"7081905"|"7102626"|" 7111365"|"7113450"|"7 119289"|"7135673"|"71 67083"|"7244927"|"725 5473"|"7265336"|"7274 303"|"7285738"|"72860 63"|"7292741"|"735848 1"|"7369308"|"7371745" |"7385874"|"7404667"|" 7465917"|"7468036"|"7 506269"|"7520664"|"75 28824"|"7545367"|"759 1582"|"7593755"|"7605 846"|"7634263"|"76466 77"|"7655874"|"768207 0"|"7708457"|"7710456" |"7732724"|"7761246"|" 7763819"|"7772507"|"7 778115"|"7781726"|"77 91588"|"7791597"|"782 2469"|"7856255"|"7858 583"|"7865324"|"78949 57"|"7946758"|"806389 2"|"8138488"|"8143981" |"8167126"|"8169402"|" 8188989"|"8195313"|"8 229535"|"8248815"|"82 63886"|"8263889"|"827 5327"|"8294670"|"8312 495"|"8368677"|"83717 45"|"8373661"|"841097 1"|"8432368"|"8439559" |"8441450"|"8446713"|" 8456430"|"8477118"|"8 493190"|"8508511"|"85 25777"|"8562489"|"856 8313"|"8576044"|"8593 598"|"8607662"|"86148 81"|"8666682"|"867728 5"|"8704787"|"8711093" |"8724087"|"8730167"|" 8743088"|"8783944"|"8 804993"|"8816962"|"88 24245"|"8847741"|"885					

		9971"|"8860674"|"8863219"|"8878657"|"8885856"|"8895911"|"8905631"|"8908477"|"8920022"|"8922399"|"8928452"|"8954135"|"8975543"|"8994827"|"9001625"|"9024733"|"9028134"|"9030446"|"9034666"|"9039614"|"9041663"|"9042971"|"9052696"|"9086717"|"9086738"|"9101184"|"9105413"|"9123483"|"9141087"|"9176577"|"9176598"|"9202372"|"9213409"|"9223296"|"9241635"|"9244438"|"9256209"|"9277156"|"9350850"|"9386932"|"9426275"|"9430042"|"9437357"|"9449770"|"9501044"|"9520100"|"9532723").PN.					
L191	33	("9542016"|"9545541"|"9552023"|"9599964"|"9607505"|"9620312"|"9627163"|"9632318"|"9638587"|"9651922"|"9659482"|"9680831"|"9709956"|"9753436"|"9800717"|"9836025"|"9873711"|"9874945"|"9886006"|"9891590"|"9891651"|"9898032"|"9927902"|"9939923"|"9946297"|"9952558"|"9952682"|"9971305"|"9971405"|"9979426"|"D717679"|"D800172"|"RE41637").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/01 02:00 PM
L192	4	(20150186609|20140107493|D647107|7474592).pn.	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/01 02:11 PM
L193	18	("20030099459" | "4736196" | "5537102" | "5883576" | "5936530" | "6158884" | "6255951" | "6350055" | "6396403" | "6431455" | "7133843").PN. OR ("7474592").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/05/01 02:37 PM
L194	83	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 04:20 PM

		US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-					

		9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$).did.					
L195	112037	("ECG" OR "EKG" OR electrocardiogra$4)	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 04:43 PM
L196	23	L194 AND L195	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 04:43 PM
L197	278	("10001817"|"10018966"|"10019097"|"10037006"|"10048802"|"10061399"|"10092203"|"10114342"|"10145711"|"10175652"|"10209148"|"10216147"|"10222756"|"10222909"|"10234828"|"10296125"|"10331081"|"10331082"|"10379629"|"10509486"|"2237860"|"2288215"|"2497935"|"2771734"|"2788236"|"2797592"|"3040514"|"3056030"|"3130539"|"3355873"|"3362154"|"3410247"|"3495398"|"3577876"|"3621649"|"3662618"|"3733803"|"4007347"|"4031341"|"4037068"|"4077200"|"4133404"|"4170104"|"4258096"|"4287400"|"4289400"|"4311026"|"4311990"|"4324956"|"4345119"|"4364674"|"4379642"|"4395134"|"4396298"|"4417824"|"4520306"|"4581509"|"4600316"|"4617461"|"4634861"|"4641026"|"4670737"|"4766642"|"4783772"|"4884073"|"4914831"|"4922070"|"4931794"|"4952799"|"4980685"	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 04:57 PM

		|"4987299"|"5034602"|"5177355"|"5214278"|"5258592"|"5288993"|"5347123"|"5383166"|"5471054"|"5477508"|"5509174"|"5572314"|"5583560"|"5631881"|"5726645"|"5748111"|"5825353"|"5841050"|"5847335"|"5867082"|"5943233"|"5953001"|"5960366"|"5963332"|"5999168"|"6069567"|"6134189"|"6154201"|"6175679"|"6241684"|"6246050"|"6252825"|"6304247"|"6355891"|"6361502"|"6377239"|"6392640"|"6396006"|"6422740"|"6477117"|"6502982"|"6525278"|"6556222"|"6575618"|"6587400"|"6646635"|"6661438"|"6672758"|"6794992"|"6809275"|"6834430"|"6846998"|"6882596"|"6888076"|"6896403"|"6909378"|"6914551"|"6961099"|"6963039"|"6967903"|"6977868"|"6982930"|"6985107"|"6987568"|"6998553"|"7016263"|"7021442"|"7034237"|"7081905"|"7102626"|"7111365"|"7113450"|"7119289"|"7135673"|"7167083"|"7244927"|"7255473"|"7265336"|"7274303"|"7285738"|"7286063"|"7292741"|"7358481"|"7369308"|"7371745"|"7385874"|"7404667"|"7465917"|"7468036"|"7506269"|"7520664"|"7528824"|"7545367"|"7591582"|"7593755"|"7605846"|"7634263"|"7646677"|"7655874"|"7682070"|"7708457"|"7710456"|"7732724"|"7761246"|"7763819"|"7772507"|"7778115"|"7781726"|"7791588"|"7791597"|"7822469"|"7856255"|"7858583"|"7865324"|"7894957"|"7946758"|"8063892"|"8138488"|"8143981"|"8167126"|"8169402"|"8188989"|"8195313"|"8					

		229535"|"8248815"|"82 63886"|"8263889"|"827 5327"|"8294670"|"8312 495"|"8368677"|"83717 45"|"8373661"|"841097 1"|"8432368"|"8439559" |"8441450"|"8446713"|" 8456430"|"8477118"|"8 493190"|"8508511"|"85 25777"|"8562489"|"856 8313"|"8576044"|"8593 598"|"8607662"|"86148 81"|"8666682"|"867728 5"|"8704787"|"8711093" |"8724087"|"8730167"|" 8743088"|"8783944"|"8 804993"|"8816962"|"88 24245"|"8847741"|"885 9971"|"8860674"|"8863 219"|"8878657"|"88858 56"|"8895911"|"890563 1"|"8908477"|"8920022" |"8922399"|"8928452"|" 8954135"|"8975543"|"8 994827"|"9001625"|"90 24733"|"9028134"|"903 0446"|"9034666"|"9039 614"|"9041663"|"90429 71"|"9052696"|"908671 7"|"9086738"|"9101184" |"9105413"|"9123483"|" 9141087"|"9176577"|"9 176598"|"9202372"|"92 13409"|"9223296"|"924 1635"|"9244438"|"9256 209"|"9277156"|"93508 50"|"9386932"|"942627 5"|"9430042"|"9437357" |"9449770"|"9501044"|" 9520100"|"9532723").PN.				
L198	13	L195 AND L197	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 04:57 PM
L199	33	("9542016"|"9545541"|" 9552023"|"9599964"|"9 607505"|"9620312"|"96 27163"|"9632318"|"963 8587"|"9651922"|"9659 482"|"9680831"|"97099 56"|"9753436"|"980071 7"|"9836025"|"9873711" |"9874945"|"9886006"|" 9891590"|"9891651"|"9 898032"|"9927902"|"99 39923"|"9946297"|"995 2558"|"9952682"|"9971 305"|"9971405"|"99794	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 05:04 PM

		26"|"D717679"|"D800172"|"RE41637").PN.					
L200	7	L199 AND L195	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 05:04 PM
L201	83	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 10:45 AM

		9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$).did.					
L202	4081	(((wrist NEAR watch) OR (wristwatch)) AND ("ECG" OR "EKG" OR electrocardiogra$4))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 10:46 AM
L203	4144877	electrode	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 10:47 AM
L204	2474	L202 AND L203	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 10:47 AM
L205	939	(((wrist NEAR watch) OR (wristwatch)) SAME ("ECG" OR "EKG" OR electrocardiogra$4))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 10:48 AM
L206	760	L204 AND L205	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 10:48 AM
L207	84	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 10:56 AM

		US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-					

		D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$ or US-4448199-$).did.					
L208	919589	dielectric OR ceraminc	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:06 AM
L209	1700627	dielectric OR ceramic	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:06 AM
L210	20	L207 AND L209	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:06 AM
L211	0	"16826130"	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:11 AM
L212	1	"10613485".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:11 AM
L213	1178366	coil	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:25 AM
L214	15	L207 AND L213	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:27 AM
L215	126	(wireless SAME recharg$4 SAME (coil OR antenna) SAME magnet)	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 12:42 PM
L216	70511	(((wrist NEAR watch) OR (wristwatch)))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 12:42 PM
L217	24	L216 AND L215	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 12:42 PM
L218	28998	wireless NEAR charg$4	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:18 PM
L219	83	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:19 PM

		US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-					

		9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$).did.					
L220	5	L218 AND L219	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:19 PM
L221	278	("10001817"|"10018966"|"10019097"|"10037006"|"10048802"|"10061399"|"10092203"|"10114342"|"10145711"|"10175652"|"10209148"|"10216147"|"10222756"|"10222909"|"10234828"|"10296125"|"10331081"|"10331082"|"10379629"|"10509486"|"2237860"|"2288215"|"2497935"|"2771734"|"2788236"|"2797592"|"3040514"|"3056030"|"3130539"|"3355873"|"3362154"|"3410247"|"3495398"|"3577876"|"3621649"|"3662618"|"3733803"|"4007347"|"4031341"|"4037068"|"4077200"|"4133404"|"4170104"|"4258096"|"4287400"|"4289400"|"4311026"|"4311990"|"4324956"|"4345119"|"4364674"|"4379642"|"4395134"|"4396298"|"4417824"|"4520306"|"4581509"|"4600316"|"4617461"|"4634861"|"4641026"|"4670737"|"4766642"|"4783772"|"4884073"|"4914831"|"4922070"|"4931794"|"4952799"|"4980685"|"4987299"|"5034602"|"5177355"|"5214278"|"5258592"|"5288993"|"5347123"|"5383166"|"547	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:22 PM

		1054"|"5477508"|"5509 174"|"5572314"|"55835 60"|"5631881"|"572664 5"|"5748111"|"5825353" |"5841050"|"5847335"|" 5867082"|"5943233"|"5 953001"|"5960366"|"59 63332"|"5999168"|"606 9567"|"6134189"|"6154 201"|"6175679"|"62416 84"|"6246050"|"625282 5"|"6304247"|"6355891" |"6361502"|"6377239"|" 6392640"|"6396006"|"6 422740"|"6477117"|"65 02982"|"6525278"|"655 6222"|"6575618"|"6587 400"|"6646635"|"66614 38"|"6672758"|"679499 2"|"6809275"|"6834430" |"6846998"|"6882596"|" 6888076"|"6896403"|"6 909378"|"6914551"|"69 61099"|"6963039"|"696 7903"|"6977868"|"6982 930"|"6985107"|"69875 68"|"6998553"|"701626 3"|"7021442"|"7034237" |"7081905"|"7102626"|" 7111365"|"7113450"|"7 119289"|"7135673"|"71 67083"|"7244927"|"725 5473"|"7265336"|"7274 303"|"7285738"|"72860 63"|"7292741"|"735848 1"|"7369308"|"7371745" |"7385874"|"7404667"|" 7465917"|"7468036"|"7 506269"|"7520664"|"75 28824"|"7545367"|"759 1582"|"7593755"|"7605 846"|"7634263"|"76466 77"|"7655874"|"768207 0"|"7708457"|"7710456" |"7732724"|"7761246"|" 7763819"|"7772507"|"7 778115"|"7781726"|"77 91588"|"7791597"|"782 2469"|"7856255"|"7858 583"|"7865324"|"78949 57"|"7946758"|"806389 2"|"8138488"|"8143981" |"8167126"|"8169402"|" 8188989"|"8195313"|"8 229535"|"8248815"|"82 63886"|"8263889"|"827 5327"|"8294670"|"8312 495"|"8368677"|"83717					

		45"|"8373661"|"8410971"|"8432368"|"8439559"|"8441450"|"8446713"|"8456430"|"8477118"|"8493190"|"8508511"|"8525777"|"8562489"|"8568313"|"8576044"|"8593598"|"8607662"|"8614881"|"8666682"|"8677285"|"8704787"|"8711093"|"8724087"|"8730167"|"8743088"|"8783944"|"8804993"|"8816962"|"8824245"|"8847741"|"8859971"|"8860674"|"8863219"|"8878657"|"8885856"|"8895911"|"8905631"|"8908477"|"8920022"|"8922399"|"8928452"|"8954135"|"8975543"|"8994827"|"9001625"|"9024733"|"9028134"|"9030446"|"9034666"|"9039614"|"9041663"|"9042971"|"9052696"|"9086717"|"9086738"|"9101184"|"9105413"|"9123483"|"9141087"|"9176577"|"9176598"|"9202372"|"9213409"|"9223296"|"9241635"|"9244438"|"9256209"|"9277156"|"9350850"|"9386932"|"9426275"|"9430042"|"9437357"|"9449770"|"9501044"|"9520100"|"9532723").PN.					
L222	6	L218 AND L221	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:22 PM
L223	33	("9542016"|"9545541"|"9552023"|"9599964"|"9607505"|"9620312"|"9627163"|"9632318"|"9638587"|"9651922"|"9659482"|"9680831"|"9709956"|"9753436"|"9800717"|"9836025"|"9873711"|"9874945"|"9886006"|"9891590"|"9891651"|"9898032"|"9927902"|"9939923"|"9946297"|"9952558"|"9952682"|"9971305"|"9971405"|"9979426"|"D717679"|"D800172"|"RE41637").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:23 PM
L224	4	L218 AND L223	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:23 PM

L225	33	("9542016"|"9545541"|"9552023"|"9599964"|"9607505"|"9620312"|"9627163"|"9632318"|"9638587"|"9651922"|"9659482"|"9680831"|"9709956"|"9753436"|"9800717"|"9836025"|"9873711"|"9874945"|"9886006"|"9891590"|"9891651"|"9898032"|"9927902"|"9939923"|"9946297"|"9952558"|"9952682"|"9971305"|"9971405"|"9979426"|"D717679"|"D800172"|"RE41637").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:24 PM
L226	4	L218 AND L225	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:24 PM
L227	5	L218 AND L201	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:24 PM
L228	16	("0052020"|"10012550"|"10241593"|"10353487"|"10551798"|"20070182708"|"20140009397"|"20140045547"|"20200041962"|"20200073339"|"20200110473"|"6128006"|"6203190"|"6636197"|"8318340"|"8797153").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2020/10/22 02:58 PM
L229	216	(coil SAME (recharg$4 OR charg$4) SAME cover SAME dielectric)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/22 03:03 PM
L230	0	L228 AND L229	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/22 03:03 PM
L231	27643	(coil AND (recharg$4 OR charg$4) AND cover AND dielectric)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/22 03:06 PM
L232	1	L228 AND L231	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/22 03:06 PM
L233	58	(watch AND housing AND cover AND (touch NEAr display) AND dielectric AND optical AND coil AND wireless AND (heart NEAR rate) AND (electrocardiog$4 OR "ECG" OR "EKG"))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/22 03:16 PM
L235	358	((("Rothkopf") near3 ("Fletcher") near3 ("R"))).INV.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/10/29 09:55 AM
L236	527578	watch	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2020/10/29 09:56 AM

			JPO)				
L237	127	L235 AND L236	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/29 09:56 AM
L238	1031	Watch AND band AND (wireless SAME coil SAME inductive)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/29 10:35 AM
L239	1459613	dielectric	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/29 10:35 AM
L240	308	L238 AND L239	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/29 10:36 AM
L241	293	(housing AND watch AND (band OR strap) AND cover AND dielectric AND coil AND charg$4 AND surface AND electrode AND (heart NEAr rate))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/29 01:39 PM
L243	2	(9134807|10474194).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/01/13 01:19 PM
L244	275	("0000005"|"0000055"|"0000072"|"0000073"|"0000078"|"0000555"|"0000726"|"0000728"|"0000786"|"0022019"|"0022020"|"0032019"|"0032020"|"0042020"|"0052019"|"0052020"|"0052585"|"0062019"|"0072019"|"0078949"|"0079467"|"0082019"|"0082020"|"0112019"|"0122019"|"10001817"|"10012550"|"10018966"|"10019097"|"10037006"|"10048802"|"10061399"|"10092203"|"10114342"|"10145711"|"10175652"|"20030174590"|"20040047244"|"20040082414"|"20040130971"|"20040264301"|"20050075558"|"20050088417"|"20060250377"|"2237860"|"2288215"|"2497935"|"2771734"|"2788236"|"2797592"|"3040514"|"3056030"|"3130539"|"3355873"|"3362154"|"3410247"|"3495398"|"3577876"|"3621649"|"3662618"|"3733803"|"4007347"|"4031341"|"4037068"|"4077200"|"41	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 11:05 AM

		33404"|"4170104"|"425 8096"|"4287400"|"4289 400"|"4311026"|"43119 90"|"4324956"|"434511 9"|"4364674"|"4379642" |"4395134"|"4396298"|" 4417824"|"4448199"|"4 520306"|"4581509"|"46 00316"|"4617461"|"463 4861"|"4641026"|"4670 737"|"4766642"|"47837 72"|"4884073"|"491483 1"|"4922070"|"4931794" |"4952799"|"4980685"|" 4987299"|"5034602"|"5 177355"|"5214278"|"52 88993"|"5631881"|"584 1050"|"5847335"|"5867 082"|"5943233"|"59530 01"|"5960366"|"596333 2"|"5999168"|"6069567" |"6128006"|"6134189"|" 6154201"|"6175679"|"6 203190"|"6241684"|"62 46050"|"6252825"|"630 4247"|"6355891"|"6361 502"|"6377239"|"63926 40"|"6396006"|"642274 0"|"6477117"|"6502982" |"6525278"|"6556222"|" 6575618"|"6587400"|"6 636197"|"6646635"|"66 61438"|"6672758"|"679 4992"|"6809275"|"6834 430"|"6846998"|"68825 96"|"6888076"|"689640 3"|"6909378"|"6914551" |"6961099"|"6963039"|" 6967903"|"6977868"|"6 982930"|"6985107"|"69 87568"|"6998553"|"701 6263"|"7021442"|"7031 228"|"7034237"|"70819 05"|"7102626"|"711136 5"|"7113450"|"7119289" |"7135673"|"7167083"|" 7244927"|"7274303"|"7 286063"|"7292741"|"73 69308"|"7371745"|"738 5874"|"7404667"|"7465 917"|"7468036"|"75062 69"|"7520664"|"752882 4"|"7545367"|"7591582" |"7593755"|"7605846"|" 7634263"|"7646677"|"7 655874"|"7682070"|"77 08457"|"7710456"|"773 2724"|"7761246"|"7763					

		819"|"7772507"|"77781 15"|"7781726"|"779158 8"|"7791597"|"7822469" |"8063892"|"8138488"|" 8143981"|"8167126"|"8 169402"|"8188989"|"81 95313"|"8229535"|"824 8815"|"8263886"|"8263 889"|"8275327"|"82946 70"|"8312495"|"831834 0"|"8368677"|"8371745" |"8373661"|"8410971"|" 8432368"|"8439559"|"8 441450"|"8446713"|"84 56430"|"8477118"|"849 3190"|"8508511"|"8525 777"|"8562489"|"85683 13"|"8576044"|"859359 8"|"8607662"|"8614881" |"8666682"|"8677285"|" 8704787"|"8711093"|"8 724087"|"8730167"|"87 43088"|"8783944"|"879 7153"|"8804993"|"8816 962"|"8824245"|"88477 41"|"8859971"|"886067 4"|"8863219"|"8878657" |"8885856"|"8895911"|" 8905631"|"8908477"|"8 920022"|"8922399"|"89 28452"|"8948832"|"895 4135"|"8975543"|"8994 827"|"9001625"|"90247 33"|"9028134"|"903044 6"|"9034666"|"9039614" |"9041663"|"9042971"|" 9049998"|"9052696"|"9 086717"|"9086738"|"91 00493"|"9101184"|"910 5413"|"9123483"|"9134 807"|"9141087").PN.					
L245	52	("9176577"|"9176598"|" 9202372"|"9213409"|"9 223296"|"9241635"|"92 44438"|"9256209"|"927 7156"|"9350850"|"9386 932"|"9426275"|"94300 42"|"9437357"|"944977 0"|"9501044"|"9520100" |"9532723"|"9542016"|" 9545541"|"9552023"|"9 599964"|"9607505"|"96 20312"|"9627163"|"963 2318"|"9638587"|"9651 922"|"9659482"|"96808 31"|"9709956"|"975343 6"|"9800717"|"9836025" |"9873711"|"9874945"|	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 11:05 AM

		9886006"|"9891590"|"9891651"|"9898032"|"9927902"|"9939923"|"9946297"|"9952558"|"9952682"|"9971305"|"9971405"|"9971407"|"9979426"|"D717679"|"D800172"|"RE41637").PN.					
L246	341583	crown	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 11:06 AM
L247	16	L245 AND L246	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 11:06 AM
L248	86	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$ or US-20150351690-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 11:09 AM

		7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$ or US-4448199-$ or US-5738104-$).did.					
L249	9	L246 AND L248	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 11:09 AM
L250	4	(10942491|10613485|10620591|10599101).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 11:14 AM
L251	49	L244 AND L246	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 11:20 AM
L252	6361313	sensor	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 12:06 PM

L253	23	L251 AND L252	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 12:06 PM
L254	403796	(tactile OR haptic)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 12:44 PM
L255	30	L245 AND L254	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 12:44 PM
L256	63	L244 AND L254	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 12:51 PM
L259	6581094	optical	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 02:50 PM
L260	92	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$ or US-20150351690-$ or US-20030174590-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 02:50 PM

		8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$ or US-4448199-$ or US-5738104-$ or US-8908477-$ or US-7034237-$ or US-6882596-$ or US-9971405-$ or US-9651922-$).did.					
L261	59	L259 AND L260	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 02:50 PM
L262	4	(20140275852|4448199).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2021/05/04 03:01 PM

			JPO)				
L263	92	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$ or US-20150351690-$ or US-20030174590-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:02 PM

		D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$ or US-4448199-$ or US-5738104-$ or US-8908477-$ or US-7034237-$ or US-6882596-$ or US-9971405-$ or US-9651922-$).did.					
L264	176	ely-colin-m.in.	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:13 PM
L265	2438	((touch OR force) NEAr sensor) AND crown AND sensor	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:23 PM
L266	275	("0000005"|"0000055"|"0000072"|"0000073"|"0000078"|"0000555"|"0000726"|"0000728"|"0000786"|"0022019"|"0022020"|"0032019"|"0032020"|"0042020"|"0052019"|"0052020"|"0052585"|"0062019"|"0072019"|"0078949"|"0079467"|"0082019"|"0082020"|"0112019"|"0122019"|"10001817"|"10012550"|"10018966"|"10019097"|"10037006"|"10048802"|"10061399"|"10092203"|	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:23 PM

		"10114342"|"10145711" |"10175652"|"20030174 590"|"20040047244"|"2 0040082414"|"2004013 0971"|"20040264301"|" 20050075558"|"200500 88417"|"20060250377"| "2237860"|"2288215"|"2 497935"|"2771734"|"27 88236"|"2797592"|"304 0514"|"3056030"|"3130 539"|"3355873"|"33621 54"|"3410247"|"349539 8"|"3577876"|"3621649" |"3662618"|"3733803"|" 4007347"|"4031341"|"4 037068"|"4077200"|"41 33404"|"4170104"|"425 8096"|"4287400"|"4289 400"|"4311026"|"43119 90"|"4324956"|"434511 9"|"4364674"|"4379642" |"4395134"|"4396298"|" 4417824"|"4448199"|"4 520306"|"4581509"|"46 00316"|"4617461"|"463 4861"|"4641026"|"4670 737"|"4766642"|"47837 72"|"4884073"|"491483 1"|"4922070"|"4931794" |"4952799"|"4980685"|" 4987299"|"5034602"|"5 177355"|"5214278"|"52 88993"|"5631881"|"584 1050"|"5847335"|"5867 082"|"5943233"|"59530 01"|"5960366"|"596333 2"|"5999168"|"6069567" |"6128006"|"6134189"|" 6154201"|"6175679"|"6 203190"|"6241684"|"62 46050"|"6252825"|"630 4247"|"6355891"|"6361 502"|"6377239"|"63926 40"|"6396006"|"642274 0"|"6477117"|"6502982" |"6525278"|"6556222"|" 6575618"|"6587400"|"6 636197"|"6646635"|"66 61438"|"6672758"|"679 4992"|"6809275"|"6834 430"|"6846998"|"68825 96"|"6888076"|"689640 3"|"6909378"|"6914551" |"6961099"|"6963039"|" 6967903"|"6977868"|"6 982930"|"6985107"|"69 87568"|"6998553"|"701					

		6263"|"7021442"|"7031 228"|"7034237"|"70819 05"|"7102626"|"711136 5"|"7113450"|"7119289" |"7135673"|"7167083"|" 7244927"|"7274303"|"7 286063"|"7292741"|"73 69308"|"7371745"|"738 5874"|"7404667"|"7465 917"|"7468036"|"75062 69"|"7520664"|"752882 4"|"7545367"|"7591582" |"7593755"|"7605846"|" 7634263"|"7646677"|"7 655874"|"7682070"|"77 08457"|"7710456"|"773 2724"|"7761246"|"7763 819"|"7772507"|"77781 15"|"7781726"|"779158 8"|"7791597"|"7822469" |"8063892"|"8138488"|" 8143981"|"8167126"|"8 169402"|"8188989"|"81 95313"|"8229535"|"824 8815"|"8263886"|"8263 889"|"8275327"|"82946 70"|"8312495"|"831834 0"|"8368677"|"8371745" |"8373661"|"8410971"|" 8432368"|"8439559"|"8 441450"|"8446713"|"84 56430"|"8477118"|"849 3190"|"8508511"|"8525 777"|"8562489"|"85683 13"|"8576044"|"859359 8"|"8607662"|"8614881" |"8666682"|"8677285"|" 8704787"|"8711093"|"8 724087"|"8730167"|"87 43088"|"8783944"|"879 7153"|"8804993"|"8816 962"|"8824245"|"88477 41"|"8859971"|"886067 4"|"8863219"|"8878657" |"8885856"|"8895911"|" 8905631"|"8908477"|"8 920022"|"8922399"|"89 28452"|"8948832"|"895 4135"|"8975543"|"8994 827"|"9001625"|"90247 33"|"9028134"|"903044 6"|"9034666"|"9039614" |"9041663"|"9042971"|" 9049998"|"9052696"|"9 086717"|"9086738"|"91 00493"|"9101184"|"910 5413"|"9123483"|"9134 807"|"9141087").PN.					

L267	5	L265 AND L266	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:23 PM
L268	52	("9176577"|"9176598"|"9202372"|"9213409"|"9223296"|"9241635"|"9244438"|"9256209"|"9277156"|"9350850"|"9386932"|"9426275"|"9430042"|"9437357"|"9449770"|"9501044"|"9520100"|"9532723"|"9542016"|"9545541"|"9552023"|"9599964"|"9607505"|"9620312"|"9627163"|"9632318"|"9638587"|"9651922"|"9659482"|"9680831"|"9709956"|"9753436"|"9800717"|"9836025"|"9873711"|"9874945"|"9886006"|"9891590"|"9891651"|"9898032"|"9927902"|"9939923"|"9946297"|"9952558"|"9952682"|"9971305"|"9971405"|"9979426"|"D717679"|"D800172"|"RE41637").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:24 PM
L269	11	L265 AND L268	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:24 PM
L270	1038	(((touch OR force) NEAr sensor) WITH (screen OR display)) AND crown AND sensor	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:41 PM
L271	412793	watch	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:41 PM
L272	744	L270 AND L271	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:42 PM
L273	82705	(biosensor)	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:42 PM
L274	33	L272 AND L273	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:42 PM
L275	25	(10942491|10613485|10620591|10627783|10599101).pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/09 10:10 AM
L276	5	(10942491|10613485|10620591|10627783|10599101).pn.	(USPAT)	OR	ON	ON	2022/11/09 10:12 AM
L277	5	(10942491|10613485|10620591|10627783|10599101).pn.	(USPAT)	OR	ON	ON	2022/11/09 10:31 AM

L278	1	"11474483".pn.	(USPAT)	OR	ON	ON	2022/11/09 11:03 AM
L279	250	("0000002" OR "0012021" OR "0012022" OR "0032020" OR "0032021" OR "0042020" OR "0042021" OR "0052020" OR "0052021" OR "0062021" OR "0062022" OR "0072022" OR "0082020" OR "0102022" OR "0112020" OR "0112021" OR "0122020" OR "0122021" OR "10001817" OR "10012550" OR "10018966" OR "10019097" OR "10037006" OR "10037081" OR "10048802" OR "10061399" OR "10066970" OR "10092203" OR "10108016" OR "10114342" OR "10145711" OR "10175652" OR "10190891" OR "10203662" OR "10209148" OR "10216147" OR "10222755" OR "10222756" OR "10222909" OR "10234828" OR "10241593" OR "10296125" OR "10331081" OR "10331082" OR "10332111" OR "10353487" OR "10379629" OR "10386940" OR "10401961" OR "10429959" OR "10474194" OR "10503258" OR "10509486" OR "10524671" OR "10534320" OR "10534900" OR	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 01:49 PM

		"10551798" OR "10572053" OR "10579090" OR "10593617" OR "20020101457" OR "20030174590" OR "20040047244" OR "20040082414" OR "20040130971" OR "20040264301" OR "20050075558" OR "20050088417" OR "20060250377" OR "20070013775" OR "20070050054" OR "20070182708" OR "20070211042" OR "20070222756" OR "20070229671" OR "20070247421" OR "20080130914" OR "20090051649" OR "20090073119" OR "20090122656" OR "20090146975" OR "20090152452" OR "20090217207" OR "20090285443" OR "20090312051" OR "20090312655" OR "20100033430" OR "20100053468" OR "20100081375" OR "20100149099" OR "20110007468" OR "20110090148" OR "20110158057" OR "20110242064" OR "20110270358" OR "20120067711" OR "20120068857" OR "20120075082" OR "20120112859" OR "20120113044" OR "20120206248" OR "20120272784" OR "20130037396" OR "20130087443" OR "20130191220" OR "20130235704" OR "20130261405" OR "20130335196" OR "20140009397" OR "20140045547" OR "20140071098" OR "20140073486" OR "20140132516" OR "20140197936" OR					

		"20140340318" OR "20140347289" OR "20140368442" OR "20140375579" OR "20150049059" OR "20150098309" OR "20150124415" OR "20150186609" OR "20150221460" OR "20150293592" OR "20150320346" OR "20150338642" OR "20150341031" OR "20150366098" OR "20160018846" OR "20160054813" OR "20160058375" OR "20160061636" OR "20160062623" OR "20160069713" OR "20160109861" OR "20160116306" OR "20160147432" OR "20160170598" OR "20160170608" OR "20160170624" OR "20160241688" OR "20160253487" OR "20160306446" OR "20160320583" OR "20160327911" OR "20160338642" OR "20160378069" OR "20160378070" OR "20160378071" OR "20170011210" OR "20170027461" OR "20170031449" OR "20170045958" OR "20170061863" OR "20170069443" OR "20170069444" OR "20170069447" OR "20170090572" OR "20170090599" OR "20170104902" OR "20170139489" OR "20170216519" OR "20170216668" OR "20170238138" OR "20170251561" OR "20170269715" OR "20170285404" OR "20170301314" OR "20170307414" OR "20170331869" OR "20170357465" OR "20180018026" OR					

		"20180059624" OR "20180136686" OR "20180196517" OR "20180225701" OR "20180235491" OR "20180337551" OR "20180364815" OR "20190017846" OR "20190072911" OR "20190072912" OR "20190088583" OR "20190278232" OR "20190317454" OR "20190391539" OR "20200041962" OR "20200064774" OR "20200064779" OR "20200073339" OR "20200110473" OR "20200159172" OR "20200233380" OR "20200233529" OR "20200271483" OR "20200326659" OR "20210055696" OR "20210096688" OR "20210181682" OR "20210181688" OR "20210181690" OR "20210181691" OR "20210181692" OR "20210181865" OR "20210255590" OR "20210373501" OR "20210405594" OR "2237860" OR "2288215" OR "2497935" OR "2771734" OR "2788236" OR "2797592" OR "3040514" OR "3056030" OR "3130539" OR "3355873" OR "3362154" OR "3410247" OR "3495398" OR "3577876" OR "3621649" OR "3662618" OR "3733803" OR "4007347" OR "4031341" OR "4037068" OR "4077200" OR "4133404" OR "4170104" OR					

		"4258096" OR "4274152" OR "4287400" OR "4289400" OR "4311026" OR "4311990" OR "4324956" OR "4345119" OR "4364674" OR "4379642" OR "4395134" OR "4396298" OR "4417824" OR "4448199" OR "4520306" OR "4581509" OR "4600316" OR "4617461" OR "4634861" OR "4641026").pn.					
L280	250	("4670737" OR "4766642" OR "4783772" OR "4884073" OR "4914831" OR "4922070" OR "4931794" OR "4952799" OR "4980685" OR "4987299" OR "5034602" OR "5177355" OR "5214278" OR "5258592" OR "5288993" OR "5347123" OR "5383166" OR "5471054" OR "5477508" OR "5509174" OR "5559761" OR "5572314" OR "5583560" OR "5631881" OR "5726645" OR "5738104" OR "5748111" OR "5825353" OR "5841050" OR "5847335" OR "5867082" OR "5943233" OR "5953001" OR "5960366" OR "5963332" OR "5999168" OR "6069567" OR "6128006" OR	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 01:49 PM

		"6134189" OR "6154201" OR "6175679" OR "6203190" OR "6241684" OR "6246050" OR "6252825" OR "6304247" OR "6355891" OR "6361502" OR "6377239" OR "6392640" OR "6396006" OR "6422740" OR "6477117" OR "6502982" OR "6525278" OR "6556222" OR "6575618" OR "6587400" OR "6636197" OR "6646635" OR "6661438" OR "6672758" OR "6794992" OR "6809275" OR "6834430" OR "6846998" OR "6882596" OR "6888076" OR "6896403" OR "6909378" OR "6914551" OR "6950695" OR "6961099" OR "6963039" OR "6967903" OR "6977868" OR "6982930" OR "6985107" OR "6987568" OR "6998553" OR "7016263" OR "7021442" OR "7031228" OR "7034237" OR "7081905" OR "7102626" OR "7111365" OR "7113450" OR "7119289" OR "7135673" OR "7167083" OR "7187359" OR "7244927" OR "7255473" OR "7265336" OR "7274303" OR				

		"7285738" OR "7286063" OR "7292741" OR "7358481" OR "7369308" OR "7371745" OR "7385874" OR "7404667" OR "7465917" OR "7468036" OR "7506269" OR "7520664" OR "7528824" OR "7545367" OR "7591582" OR "7593755" OR "7605846" OR "7634263" OR "7646677" OR "7655874" OR "7682070" OR "7708457" OR "7710456" OR "7732724" OR "7761246" OR "7763819" OR "7772507" OR "7778115" OR "7781726" OR "7791587" OR "7791588" OR "7791597" OR "7822469" OR "7856255" OR "7858583" OR "7865324" OR "7894957" OR "7946758" OR "8063892" OR "8138488" OR "8143981" OR "8167126" OR "8169402" OR "8188989" OR "8195313" OR "8229535" OR "8248815" OR "8263886" OR "8263889" OR "8275327" OR "8294670" OR "8312495" OR "8318340" OR "8368677" OR "8371745" OR "8373661" OR "8405618" OR "8410971" OR					

		"8432368" OR "8439559" OR "8441450" OR "8446713" OR "8456430" OR "8477118" OR "8493190" OR "8508511" OR "8525777" OR "8562489" OR "8568313" OR "8576044" OR "8593598" OR "8607662" OR "8614881" OR "8666682" OR "8677285" OR "8704787" OR "8711093" OR "8717151" OR "8724087" OR "8730167" OR "8743088" OR "8783944" OR "8797153" OR "8804993" OR "8816962" OR "8824245" OR "8847741" OR "8851372" OR "8859971" OR "8860674" OR "8863219" OR "8878657" OR "8885856" OR "8895911" OR "8905631" OR "8908477" OR "8920022" OR "8922399" OR "8928452" OR "8948832" OR "8954135" OR "8975543" OR "8994827" OR "9001625" OR "9024733" OR "9028134" OR "9030446" OR "9034666" OR "9039614" OR "9041663" OR "9042971" OR "9049998" OR "9052696" OR "9086717" OR "9086738" OR "9091309" OR					

		"9100493" OR "9101184" OR "9105413" OR "9123483" OR "9134807" OR "9141087" OR "9176577" OR "9176598" OR "9202372" OR "9213409" OR "9223296" OR "9241635" OR "9244438" OR "9256209" OR "9277156" OR "9350850" OR "9367146" OR "9386932" OR "9426275" OR "9430042" OR "9437357" OR "9449770" OR "9501044" OR "9520100" OR "9532723" OR "9542016" OR "9545541" OR "9552023" OR "9599964" OR "9600071" OR "9607505" OR "9620312" OR "9627163" OR "9632318" OR "9632537" OR "9638587" OR "9651922" OR "9659482").pn.					
L281	24	("9680831" OR "9709956" OR "9753436" OR "9800717" OR "9836025" OR "9873711" OR "9874945" OR "9886006" OR "9891590" OR "9891651" OR "9898032" OR "9913591" OR "9927902" OR "9939923" OR "9946297" OR "9952558" OR "9952682" OR "9971305" OR "9971405" OR "9971407" OR	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 01:49 PM

		"9979426" OR "D717679" OR "D800172" OR "RE41637").pn.					
L282	1339759	coil	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 02:20 PM
L283	57	L280 AND L282	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 02:20 PM
L284	47	L279 AND L282	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:06 PM
L285	1098	wristwatch AND (coil SAME wireless)	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:16 PM
L286	1209770	antenna	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:16 PM
L287	884	L285 AND L286	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:16 PM
L288	969891	charging	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:19 PM
L289	649	L287 AND L288	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:20 PM
L290	10893332	@ad<="20140902"	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:22 PM
L291	137	L289 AND L290	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:22 PM
L292	6	(coil SAME (optical NEAR (window OR cover)) SAME wireless SAME charg$4)	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:42 PM
L293	1369	(coil SAME ((window OR cover)) SAME wireless SAME charg$4)	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:43 PM
L294	36905	wristwatch	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:44 PM
L295	51	L293 AND L294	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:44 PM
L296	424	((("Rothkopf") near3 ("Fletcher") near3 ("R"))).INV.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/12/14 03:55 PM
L297	424	((("Rothkopf") near3 ("Fletcher") near3 ("R"))).INV.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:55 PM
L298	6	(11474483|10942491|10613485|10620591|10627783|10599101).pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:05 PM
L299	1209770	antenna	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:25 PM
L300	282172	antenna.clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:25 PM
L301	1	L298 AND L300	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:25 PM

L302	35	L297 AND L300	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:33 PM
L303	207	ely-colin-m.in.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:37 PM
L304	14	L300 AND L303	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:38 PM
L305	6	L298 AND coil	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/17 11:00 AM
L306	4	L298 AND coil.clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/17 11:00 AM
L307	102	((US-9507459-B2 OR US-9680205-B2 OR US-9591913-B2 OR US-9791833-B1 OR US-8596860-B2 OR US-9288294-B2 OR US-D790517-S OR US-9547425-B2 OR US-7654732-B2 OR US-D768634-S OR US-9459781-B2 OR US-D758363-S OR US-D758219-S OR US-D752044-S OR US-D741726-S OR US-D737159-S OR US-D728624-S OR US-D727198-S OR US-9575591-B2 OR US-9781984-B2 OR US-9627163-B2 OR US-7932893-B1 OR US-9651922-B2 OR US-9971405-B2 OR US-6882596-B2 OR US-7034237-B2 OR US-8908477-B2 OR US-5738104-A OR US-4448199-A OR US-7286063-B2 OR US-9625944-B2 OR US-9615476-B2 OR US-9300344-B2 OR US-3577876-A OR US-D647107-S OR US-D578922-S OR US-8766805-B2 OR US-4903253-A OR US-7682070-B2 OR US-8630633-B1 OR US-5722397-A OR US-6694158-B2 OR US-7474592-B2 OR US-7674231-B2 OR US-8527038-B2 OR US-8617069-B2 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/02/06 11:20 AM

		8727977-B2 OR US-8738118-B2 OR US-9622214-B2 OR US-9629120-B2 OR US-9704154-B2 OR US-9737212-B2 OR US-9737221-B2 OR US-9848825-B2 OR US-6158884-A OR US-6255951-B1 OR US-6350055-B1 OR US-6431455-B1 OR US-9091715-B2 OR US-9423418-B2 OR US-9288836-B1 OR US-6443906-B1 OR US-9386932-B2 OR US-9141087-B2 OR US-9049998-B2 OR US-8948832-B2 OR US-7385874-B2 OR US-11527824-B2 OR US-6825751-B1 OR US-11526034-B1).did. AND USPT.dbnm.) OR ((US-20090124062-A1 OR US-20130236699-A1 OR US-20150085429-A1 OR US-20160064800-A1 OR US-20030174590-A1 OR US-20150351690-A1 OR US-20160064804-A1 OR US-20150124415-A1 OR US-20140107493-A1 OR US-20140278139-A1 OR US-20160091965-A1 OR US-20160198996-A1 OR US-20160367987-A1 OR US-20110003665-A1 OR US-20150313542-A1 OR US-20160274726-A1 OR US-20140366123-A1 OR US-20160313703-A1 OR US-20030175993-A1 OR US-20130234850-A1 OR US-20140139486-A1 OR US-20140276244-A1 OR US-20160350514-A1 OR US-20150186609-A1 OR US-20160379205-A1 OR					

		US-20170011210-A1 OR US-20170039358-A1 OR US-20170071483-A1 OR US-20140275852-A1 OR US-20140378777-A1 OR US-20150026647-A1 OR US-20100292599-A1).did. AND PGPB.dbnm.)					
L308	139	("20070255122"|"20070219419"|"20090018418"|"20080046286"|"8709488"|"20100076321"|"20110028803"|"8137698"|"8795251"|"8808268"|"20030232370"|"20110028803"|"20070219419"|"20100049010"|"8481082"|"8323188"|"20060258920"|"20100222657"|"20130330116"|"20140200423"|"7214190"|"20060205564"|"20070027367"|"20140379273"|"20100010571"|"7844314"|"20100222657"|"20070231393"|"8668935"|"8932636"|"20040122297"|"20130267791"|"20050054907"|"20040122297"|"20060165805"|"20120232918"|"6454707"|"8801690"|"20100049010"|"7214190"|"20100072994"|"6707360"|"20070073558"|"9017729"|"20090118605").PN.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/02/06 11:29 AM
L309	250	("0000002" OR "10001817" OR "10002731" OR "10012550" OR "10018966" OR "10019097" OR "10025399" OR "10037006" OR "10037081" OR "10041813" OR "10048802" OR "10055030" OR "10057470" OR "10061399" OR "10061404" OR "10066970" OR "10092203" OR "10095394" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:32 AM

		"10108016" OR "10114342" OR "10114450" OR "10145711" OR "10145712" OR "10175652" OR "10187364" OR "10190891" OR "10194271" OR "10203662" OR "10209148" OR "10216147" OR "10222755" OR "10222756" OR "10222909" OR "10234828" OR "10241593" OR "10290440" OR "10296125" OR "10331081" OR "10331082" OR "10332111" OR "10353487" OR "10379629" OR "10386940" OR "10401961" OR "10429959" OR "10444862" OR "10444941" OR "10447748" OR "10474194" OR "10503258" OR "10503388" OR "10509486" OR "10520768" OR "10524671" OR "10534320" OR "10534900" OR "10545657" OR "10551798" OR "10561035" OR "10572053" OR "10579090" OR "10593617" OR "10599101" OR "10610157" OR "10613485" OR "10613685" OR "10620591" OR "10627783" OR "10655988" OR "10664074" OR "10685626" OR "10732571" OR "10747467" OR "10765019" OR "10782925" OR "10845764" OR					

		"10852700" OR "10852855" OR "10871385" OR "10884549" OR "10936071" OR "10942491" OR "10948880" OR "10955937" OR "10962930" OR "10962935" OR "10987054" OR "11000193" OR "11002572" OR "11029831" OR "11036318" OR "11148292" OR "11163362" OR "11181863" OR "11194298" OR "11194299" OR "11221590" OR "11347189" OR "11347351" OR "11360440" OR "11385599" OR "11429256" OR "11432766" OR "11451084" OR "11474483" OR "11513613" OR "20020101457" OR "20030174590" OR "20040047244" OR "20040082414" OR "20040130971" OR "20040264301" OR "20050075558" OR "20050088417" OR "20060250377" OR "20070013775" OR "20070050054" OR "20070182708" OR "20070211042" OR "20070222756" OR "20070229671" OR "20070247421" OR "20080130914" OR "20090051649" OR "20090073119" OR "20090122656" OR "20090146975" OR "20090152452" OR "20090217207" OR "20090285443" OR "20090312051" OR "20090312655" OR "20100033430" OR "20100053468" OR					

		"20100081375" OR "20100149099" OR "20110007468" OR "20110090148" OR "20110158057" OR "20110242064" OR "20110270358" OR "20120067711" OR "20120068857" OR "20120075082" OR "20120112859" OR "20120113044" OR "20120206248" OR "20120272784" OR "20130037396" OR "20130087443" OR "20130191220" OR "20130235704" OR "20130261405" OR "20130335196" OR "20140009397" OR "20140045547" OR "20140071098" OR "20140073486" OR "20140132516" OR "20140197936" OR "20140368442" OR "20140375579" OR "20150049059" OR "20150098309" OR "20150124415" OR "20150186609" OR "20150293592" OR "20150320346" OR "20150366098" OR "20160018846" OR "20160147432" OR "20160170624" OR "20160241688" OR "20160320583" OR "20160327911" OR "20160338642" OR "20170027461" OR "20170031449" OR "20170069443" OR "20170069444" OR "20170216519" OR "20170216668" OR "20180059624" OR "20180225701" OR "20190056700" OR "20190072911" OR "20190278232" OR "20200041962" OR "20200064779" OR "20200159172" OR "20210181682" OR "20210181691" OR					

		"20210181692" OR "20210255590" OR "20210303081" OR "20210373501" OR "20210405594" OR "20220043397" OR "20220043402" OR "20220075328" OR "20220261111" OR "20220299944" OR "20220326660" OR "2237860" OR "2288215" OR "2497935" OR "2771734" OR "2788236" OR "2797592" OR "3040514" OR "3056030" OR "3130539" OR "3355873" OR "3362154" OR "3410247" OR "3495398" OR "3577876" OR "3621649" OR "3662618" OR "3733803" OR "3937002" OR "4007347" OR "4031341" OR "4037068" OR "4051665" OR "4077200" OR "4133404" OR "4170104" OR "4258096" OR "4274152" OR "4287400" OR "4289400" OR "4311026" OR "4311990" OR "4324956" OR "4345119" OR "4364674" OR "4379642" OR "4395134" OR "4396298" OR "4417824" OR "4448199" OR "4520306" OR "4581509" OR "4600316" OR "4617461" OR "4634861" OR "4641026" OR "4670737" OR "4766642").pn.					

L310	250	("4783772" OR "4884073" OR "4914831" OR "4922070" OR "4931794" OR "4952799" OR "4980685" OR "4987299" OR "5034602" OR "5177355" OR "5214278" OR "5258592" OR "5288993" OR "5347123" OR "5383166" OR "5471054" OR "5477508" OR "5509174" OR "5559761" OR "5572314" OR "5583560" OR "5631881" OR "5726645" OR "5738104" OR "5748111" OR "5825353" OR "5841050" OR "5847335" OR "5867082" OR "5943233" OR "5953001" OR "5960366" OR "5963332" OR "5999168" OR "6069567" OR "6128006" OR "6134189" OR "6154201" OR "6175679" OR "6203190" OR "6241684" OR "6246050" OR "6252825" OR "6304247" OR "6355891" OR "6361502" OR "6377239" OR "6392640" OR "6396006" OR "6422740" OR "6477117" OR "6502982" OR "6525278" OR "6556222" OR "6575618" OR "6587400" OR "6636197" OR "6646635" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:32 AM

		"6661438" OR "6672758" OR "6794992" OR "6809275" OR "6834430" OR "6846998" OR "6882596" OR "6888076" OR "6896403" OR "6909378" OR "6914551" OR "6950695" OR "6961099" OR "6963039" OR "6967903" OR "6977868" OR "6982930" OR "6985107" OR "6987568" OR "6998553" OR "7009915" OR "7016263" OR "7021442" OR "7031228" OR "7034237" OR "7081905" OR "7102626" OR "7111365" OR "7113450" OR "7119289" OR "7135673" OR "7167083" OR "7187359" OR "7244927" OR "7255473" OR "7265336" OR "7274303" OR "7285738" OR "7286063" OR "7292741" OR "7358481" OR "7369308" OR "7371745" OR "7385874" OR "7404667" OR "7465917" OR "7468036" OR "7506269" OR "7520664" OR "7528824" OR "7545367" OR "7591582" OR "7593755" OR "7605846" OR "7634263" OR "7646677" OR "7655874" OR "7682070" OR					

		"7708457" OR "7710456" OR "7732724" OR "7761246" OR "7763819" OR "7772507" OR "7778115" OR "7781726" OR "7791587" OR "7791588" OR "7791597" OR "7822469" OR "7856255" OR "7858583" OR "7865324" OR "7894957" OR "7946758" OR "8063892" OR "8138488" OR "8143981" OR "8167126" OR "8169402" OR "8188989" OR "8195313" OR "8229535" OR "8248815" OR "8263886" OR "8263889" OR "8275327" OR "8294670" OR "8312495" OR "8318340" OR "8368677" OR "8371745" OR "8373661" OR "8405618" OR "8410971" OR "8432368" OR "8439559" OR "8441450" OR "8446713" OR "8456430" OR "8477118" OR "8493190" OR "8508511" OR "8525777" OR "8562489" OR "8568313" OR "8576044" OR "8593598" OR "8607662" OR "8614881" OR "8666682" OR "8677285" OR "8704787" OR "8711093" OR "8717151" OR "8724087" OR					

		"8730167" OR "8743088" OR "8783944" OR "8797153" OR "8804993" OR "8816962" OR "8824245" OR "8847741" OR "8851372" OR "8859971" OR "8860674" OR "8863219" OR "8878657" OR "8885856" OR "8895911" OR "8905631" OR "8908477" OR "8920022" OR "8922399" OR "8928452" OR "8948832" OR "8954135" OR "8975543" OR "8994827" OR "9001625" OR "9024733" OR "9028134" OR "9030446" OR "9034666" OR "9039614" OR "9041663" OR "9042971" OR "9049998" OR "9052696" OR "9086717" OR "9086738" OR "9091309" OR "9100493" OR "9101184" OR "9105413" OR "9123483" OR "9134807" OR "9141087" OR "9176577" OR "9176598" OR "9202372" OR "9213409" OR "9223296" OR "9241635" OR "9244438" OR "9256209" OR "9277156" OR "9350850" OR "9367146" OR "9386932" OR "9426275" OR "9430042" OR "9437357" OR					

		"9449770" OR "9501044" OR "9520100" OR "9532723" OR "9542016" OR "9545541" OR "9552023" OR "9599964" OR "9600071" OR "9607505" OR "9620312" OR "9627163" OR "9632318" OR "9632537" OR "9638587" OR "9651922" OR "9659482" OR "9680831").pn.					
L311	25	("9709956" OR "9753436" OR "9800717" OR "9836025" OR "9873711" OR "9874945" OR "9886006" OR "9891590" OR "9891651" OR "9891667" OR "9898032" OR "9913591" OR "9921548" OR "9927902" OR "9939923" OR "9946297" OR "9952558" OR "9952682" OR "9971305" OR "9971405" OR "9971407" OR "9979426" OR "D717679" OR "D800172" OR "RE41637").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:32 AM
L312	10893500	@ad<="20140902"	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:33 AM
L313	0	L309 AND L310	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:33 AM
L314	103	L309 AND L312	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:34 AM
L315	240	L310 AND L312	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:41 AM
L316	0	"18075253"	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:59 AM
L317	1	"17951973"	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 12:02 PM

L318	6	"20150366098"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/02/09 10:24 AM
L319	2	"20150366098".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/02/09 10:31 AM
L320	250	("0000002" OR "10001817" OR "10002731" OR "10012550" OR "10018966" OR "10019097" OR "10025399" OR "10037006" OR "10037081" OR "10041813" OR "10048802" OR "10055030" OR "10057470" OR "10061399" OR "10061404" OR "10066970" OR "10092203" OR "10095394" OR "10108016" OR "10114342" OR "10114450" OR "10145711" OR "10145712" OR "10175652" OR "10187364" OR "10190891" OR "10194271" OR "10203662" OR "10209148" OR "10216147" OR "10222755" OR "10222756" OR "10222909" OR "10234828" OR "10241593" OR "10290440" OR "10296125" OR "10331081" OR "10331082" OR "10332111" OR "10353487" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/09 10:44 AM

		"10379629" OR "10386940" OR "10401961" OR "10429959" OR "10444862" OR "10444941" OR "10447748" OR "10474194" OR "10503258" OR "10503388" OR "10509486" OR "10520768" OR "10524671" OR "10534320" OR "10534900" OR "10545657" OR "10551798" OR "10561035" OR "10572053" OR "10579090" OR "10593617" OR "10599101" OR "10610157" OR "10613485" OR "10613685" OR "10620591" OR "10627783" OR "10655988" OR "10664074" OR "10685626" OR "10732571" OR "10747467" OR "10765019" OR "10782925" OR "10845764" OR "10852700" OR "10852855" OR "10871385" OR "10884549" OR "10936071" OR "10942491" OR "10948880" OR "10955937" OR "10962930" OR "10962935" OR "10987054" OR "11000193" OR "11002572" OR "11029831" OR "11036318" OR "11148292" OR "11163362" OR "11181863" OR "11194298" OR "11194299" OR "11221590" OR "11347189" OR "11347351" OR					

		"11360440" OR "11385599" OR "11429256" OR "11432766" OR "11451084" OR "11474483" OR "11513613" OR "20020101457" OR "20030174590" OR "20040047244" OR "20040082414" OR "20040130971" OR "20040264301" OR "20050075558" OR "20050088417" OR "20060250377" OR "20070013775" OR "20070050054" OR "20070182708" OR "20070211042" OR "20070222756" OR "20070229671" OR "20070247421" OR "20080130914" OR "20090051649" OR "20090073119" OR "20090122656" OR "20090146975" OR "20090152452" OR "20090217207" OR "20090285443" OR "20090312051" OR "20090312655" OR "20100033430" OR "20100053468" OR "20100081375" OR "20100149099" OR "20110007468" OR "20110090148" OR "20110158057" OR "20110242064" OR "20110270358" OR "20120067711" OR "20120068857" OR "20120075082" OR "20120112859" OR "20120113044" OR "20120206248" OR "20120272784" OR "20130037396" OR "20130087443" OR "20130191220" OR "20130235704" OR "20130261405" OR "20130335196" OR "20140009397" OR "20140045547" OR "20140071098" OR					

		"20140073486" OR "20140132516" OR "20140197936" OR "20140368442" OR "20140375579" OR "20150049059" OR "20150098309" OR "20150124415" OR "20150186609" OR "20150293592" OR "20150320346" OR "20150366098" OR "20160018846" OR "20160147432" OR "20160170624" OR "20160241688" OR "20160320583" OR "20160327911" OR "20160338642" OR "20170027461" OR "20170031449" OR "20170069443" OR "20170069444" OR "20170216519" OR "20170216668" OR "20180059624" OR "20180225701" OR "20190056700" OR "20190072911" OR "20190278232" OR "20200041962" OR "20200064779" OR "20200159172" OR "20210181682" OR "20210181691" OR "20210181692" OR "20210255590" OR "20210303081" OR "20210373501" OR "20210405594" OR "20220043397" OR "20220043402" OR "20220075328" OR "20220261111" OR "20220299944" OR "20220326660" OR "2237860" OR "2288215" OR "2497935" OR "2771734" OR "2788236" OR "2797592" OR "3040514" OR "3056030" OR "3130539" OR "3355873" OR "3362154" OR "3410247" OR					

		"3495398" OR "3577876" OR "3621649" OR "3662618" OR "3733803" OR "3937002" OR "4007347" OR "4031341" OR "4037068" OR "4051665" OR "4077200" OR "4133404" OR "4170104" OR "4258096" OR "4274152" OR "4287400" OR "4289400" OR "4311026" OR "4311990" OR "4324956" OR "4345119" OR "4364674" OR "4379642" OR "4395134" OR "4396298" OR "4417824" OR "4448199" OR "4520306" OR "4581509" OR "4600316" OR "4617461" OR "4634861" OR "4641026" OR "4670737" OR "4766642").pn.					
L321	250	("4783772" OR "4884073" OR "4914831" OR "4922070" OR "4931794" OR "4952799" OR "4980685" OR "4987299" OR "5034602" OR "5177355" OR "5214278" OR "5258592" OR "5288993" OR "5347123" OR "5383166" OR "5471054" OR "5477508" OR "5509174" OR "5559761" OR "5572314" OR "5583560" OR "5631881" OR "5726645" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/09 10:44 AM

		"5738104" OR "5748111" OR "5825353" OR "5841050" OR "5847335" OR "5867082" OR "5943233" OR "5953001" OR "5960366" OR "5963332" OR "5999168" OR "6069567" OR "6128006" OR "6134189" OR "6154201" OR "6175679" OR "6203190" OR "6241684" OR "6246050" OR "6252825" OR "6304247" OR "6355891" OR "6361502" OR "6377239" OR "6392640" OR "6396006" OR "6422740" OR "6477117" OR "6502982" OR "6525278" OR "6556222" OR "6575618" OR "6587400" OR "6636197" OR "6646635" OR "6661438" OR "6672758" OR "6794992" OR "6809275" OR "6834430" OR "6846998" OR "6882596" OR "6888076" OR "6896403" OR "6909378" OR "6914551" OR "6950695" OR "6961099" OR "6963039" OR "6967903" OR "6977868" OR "6982930" OR "6985107" OR "6987568" OR "6998553" OR "7009915" OR "7016263" OR "7021442" OR					

		"7031228" OR "7034237" OR "7081905" OR "7102626" OR "7111365" OR "7113450" OR "7119289" OR "7135673" OR "7167083" OR "7187359" OR "7244927" OR "7255473" OR "7265336" OR "7274303" OR "7285738" OR "7286063" OR "7292741" OR "7358481" OR "7369308" OR "7371745" OR "7385874" OR "7404667" OR "7465917" OR "7468036" OR "7506269" OR "7520664" OR "7528824" OR "7545367" OR "7591582" OR "7593755" OR "7605846" OR "7634263" OR "7646677" OR "7655874" OR "7682070" OR "7708457" OR "7710456" OR "7732724" OR "7761246" OR "7763819" OR "7772507" OR "7778115" OR "7781726" OR "7791587" OR "7791588" OR "7791597" OR "7822469" OR "7856255" OR "7858583" OR "7865324" OR "7894957" OR "7946758" OR "8063892" OR "8138488" OR "8143981" OR "8167126" OR "8169402" OR "8188989" OR					

		"8195313" OR "8229535" OR "8248815" OR "8263886" OR "8263889" OR "8275327" OR "8294670" OR "8312495" OR "8318340" OR "8368677" OR "8371745" OR "8373661" OR "8405618" OR "8410971" OR "8432368" OR "8439559" OR "8441450" OR "8446713" OR "8456430" OR "8477118" OR "8493190" OR "8508511" OR "8525777" OR "8562489" OR "8568313" OR "8576044" OR "8593598" OR "8607662" OR "8614881" OR "8666682" OR "8677285" OR "8704787" OR "8711093" OR "8717151" OR "8724087" OR "8730167" OR "8743088" OR "8783944" OR "8797153" OR "8804993" OR "8816962" OR "8824245" OR "8847741" OR "8851372" OR "8859971" OR "8860674" OR "8863219" OR "8878657" OR "8885856" OR "8895911" OR "8905631" OR "8908477" OR "8920022" OR "8922399" OR "8928452" OR "8948832" OR "8954135" OR "8975543" OR					

		"8994827" OR "9001625" OR "9024733" OR "9028134" OR "9030446" OR "9034666" OR "9039614" OR "9041663" OR "9042971" OR "9049998" OR "9052696" OR "9086717" OR "9086738" OR "9091309" OR "9100493" OR "9101184" OR "9105413" OR "9123483" OR "9134807" OR "9141087" OR "9176577" OR "9176598" OR "9202372" OR "9213409" OR "9223296" OR "9241635" OR "9244438" OR "9256209" OR "9277156" OR "9350850" OR "9367146" OR "9386932" OR "9426275" OR "9430042" OR "9437357" OR "9449770" OR "9501044" OR "9520100" OR "9532723" OR "9542016" OR "9545541" OR "9552023" OR "9599964" OR "9600071" OR "9607505" OR "9620312" OR "9627163" OR "9632318" OR "9632537" OR "9638587" OR "9651922" OR "9659482" OR "9680831").pn.					
L322	25	("9709956" OR "9753436" OR "9800717" OR "9836025" OR "9873711" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/09 10:44 AM

		"9874945" OR "9886006" OR "9891590" OR "9891651" OR "9891667" OR "9898032" OR "9913591" OR "9921548" OR "9927902" OR "9939923" OR "9946297" OR "9952558" OR "9952682" OR "9971305" OR "9971405" OR "9971407" OR "9979426" OR "D717679" OR "D800172" OR "RE41637").pn.					
L323	7	(11567457|11474483|10942491|10613485|10620591|10627783|10599101).pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/09 10:47 AM
L324	1	"17951973"	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/09 11:00 AM
L325	5	(11567457|11474483|10942491).pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/02/10 02:19 PM
L326	3	(11567457|11474483|10942491).pn.	(USPAT)	OR	ON	ON	2023/02/10 02:20 PM
L327	1	("6721540").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/04/19 11:55 AM
L328	31	("0000002" OR "10060788" OR "10231629" OR "11531306" OR "20010056243" OR "20050116820" OR "20070276270" OR "20080208009" OR "20120221254" OR "20140135594" OR "20150214749" OR "20150355604" OR "20160073914" OR "20160228064" OR "20190025940" OR "20210353226" OR "20230012897" OR "20230013283" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/04/19 11:57 AM

		"20230028554" OR "20230077241" OR "4129124" OR "4163447" OR "4224948" OR "4248244" OR "4375219" OR "5613008" OR "6075755" OR "6091530" OR "6265789" OR "8810514" OR "9277880").pn.					
L329	104	((US-9507459-B2 OR US-9680205-B2 OR US-9591913-B2 OR US-9791833-B1 OR US-8596860-B2 OR US-9288294-B2 OR US-D790517-S OR US-9547425-B2 OR US-7654732-B2 OR US-D768634-S OR US-9459781-B2 OR US-D758363-S OR US-D758219-S OR US-D752044-S OR US-D741726-S OR US-D737159-S OR US-D728624-S OR US-D727198-S OR US-9575591-B2 OR US-9781984-B2 OR US-9627163-B2 OR US-7932893-B1 OR US-9651922-B2 OR US-9971405-B2 OR US-6882596-B2 OR US-7034237-B2 OR US-8908477-B2 OR US-5738104-A OR US-4448199-A OR US-7286063-B2 OR US-9625944-B2 OR US-9615476-B2 OR US-9300344-B2 OR US-3577876-A OR US-D647107-S OR US-D578922-S OR US-8766805-B2 OR US-4903253-A OR US-7682070-B2 OR US-8630633-B1 OR US-5722397-A OR US-6694158-B2 OR US-7474592-B2 OR US-7674231-B2 OR US-8527038-B2 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 12:56 PM

		8617069-B2 OR US-8727977-B2 OR US-8738118-B2 OR US-9622214-B2 OR US-9629120-B2 OR US-9704154-B2 OR US-9737212-B2 OR US-9737221-B2 OR US-9848825-B2 OR US-6158884-A OR US-6255951-B1 OR US-6350055-B1 OR US-6431455-B1 OR US-9091715-B2 OR US-9423418-B2 OR US-9288836-B1 OR US-6443906-B1 OR US-9386932-B2 OR US-9141087-B2 OR US-9049998-B2 OR US-8948832-B2 OR US-7385874-B2 OR US-11527824-B2 OR US-6825751-B1 OR US-11567457-B2 OR US-11526034-B1).did. AND USPT.dbnm.) OR ((US-20090124062-A1 OR US-20130236699-A1 OR US-20150085429-A1 OR US-20160064800-A1 OR US-20030174590-A1 OR US-20150351690-A1 OR US-20160064804-A1 OR US-20150124415-A1 OR US-20140107493-A1 OR US-20140278139-A1 OR US-20160091965-A1 OR US-20160198996-A1 OR US-20160367987-A1 OR US-20110003665-A1 OR US-20150313542-A1 OR US-20160274726-A1 OR US-20140366123-A1 OR US-20160313703-A1 OR US-20030175993-A1 OR US-20130234850-A1 OR US-20140139486-A1 OR US-20140276244-A1 OR US-20160350514-A1 OR US-20150186609-					

		A1 OR US-20160379205-A1 OR US-20170011210-A1 OR US-20170039358-A1 OR US-20170071483-A1 OR US-20140275852-A1 OR US-20140378777-A1 OR US-20150026647-A1 OR US-20100292599-A1 OR US-20150366098-A1).did. AND PGPB.dbnm.)					
L330	540716	(touch NEAR sensitive)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 12:56 PM
L331	34	L329 AND L330	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 12:56 PM
L332	4	"20140135594".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 01:02 PM
L333	2	"20140214749".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 01:41 PM
L334	2	"20150214749".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 01:42 PM
L335	5	"6265789".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP,	OR	ON	ON	2023/04/19 02:03 PM

			AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L336	5	"5316008".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 02:26 PM
L337	8014731	green	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 02:30 PM
L338	22	L337 AND L329	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 02:30 PM
L339	104	((US-9507459-B2 OR US-9680205-B2 OR US-9591913-B2 OR US-9791833-B1 OR US-8596860-B2 OR US-9288294-B2 OR US-D790517-S OR US-9547425-B2 OR US-7654732-B2 OR US-D768634-S OR US-9459781-B2 OR US-D758363-S OR US-D758219-S OR US-D752044-S OR US-D741726-S OR US-D737159-S OR US-D728624-S OR US-D727198-S OR US-9575591-B2 OR US-9781984-B2 OR US-9627163-B2 OR US-7932893-B1 OR US-9651922-B2 OR US-9971405-B2 OR US-6882596-B2 OR US-7034237-B2 OR US-8908477-B2 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 09:32 AM

		5738104-A OR US-4448199-A OR US-7286063-B2 OR US-9625944-B2 OR US-9615476-B2 OR US-9300344-B2 OR US-3577876-A OR US-D647107-S OR US-D578922-S OR US-8766805-B2 OR US-4903253-A OR US-7682070-B2 OR US-8630633-B1 OR US-5722397-A OR US-6694158-B2 OR US-7474592-B2 OR US-7674231-B2 OR US-8527038-B2 OR US-8617069-B2 OR US-8727977-B2 OR US-8738118-B2 OR US-9622214-B2 OR US-9629120-B2 OR US-9704154-B2 OR US-9737212-B2 OR US-9737221-B2 OR US-9848825-B2 OR US-6158884-A OR US-6255951-B1 OR US-6350055-B1 OR US-6431455-B1 OR US-9091715-B2 OR US-9423418-B2 OR US-9288836-B1 OR US-6443906-B1 OR US-9386932-B2 OR US-9141087-B2 OR US-9049998-B2 OR US-8948832-B2 OR US-7385874-B2 OR US-11527824-B2 OR US-6825751-B1 OR US-11567457-B2 OR US-11526034-B1).did. AND USPT.dbnm.) OR ((US-20090124062-A1 OR US-20130236699-A1 OR US-20150085429-A1 OR US-20160064800-A1 OR US-20030174590-A1 OR US-20150351690-A1 OR US-20160064804-A1 OR US-20150124415-A1 OR US-20140107493-A1 OR US-20140278139-A1 OR						

		US-20160091965-A1 OR US-20160198996-A1 OR US-20160367987-A1 OR US-20110003665-A1 OR US-20150313542-A1 OR US-20160274726-A1 OR US-20140366123-A1 OR US-20160313703-A1 OR US-20030175993-A1 OR US-20130234850-A1 OR US-20140139486-A1 OR US-20140276244-A1 OR US-20160350514-A1 OR US-20150186609-A1 OR US-20160379205-A1 OR US-20170011210-A1 OR US-20170039358-A1 OR US-20170071483-A1 OR US-20140275852-A1 OR US-20140378777-A1 OR US-20150026647-A1 OR US-20100292599-A1 OR US-20150366098-A1).did. AND PGPB.dbnm.)					
L340	503912	("ECG" OR "EKG" OR electrocardiogra$5)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 09:32 AM
L341	31	L339 AND L340	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 09:35 AM
L342	5	"5738104".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 09:47 AM
L343	5	"5316008".pn.	(US-PGPUB; USPAT;	OR	ON	ON	2023/04/20

			USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				09:48 AM
L344	4	"20150026647".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 09:54 AM
L345	2	"20140275852".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 10:59 AM
L346	2	"18075253"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 11:03 AM
L347	3	"18119175"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/18 01:37 PM
L348	0	"18075253".pn.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/18 01:38 PM
L349	2	"18075253"	(US-PGPUB; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO))	OR	ON	ON	2023/05/18 01:39 PM
L350	104	((US-9507459-B2 OR US-9680205-B2 OR US-9591913-B2 OR US-9791833-B1 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR,	OR	ON	ON	2023/05/18 02:01 PM

		US-8596860-B2 OR US-9288294-B2 OR US-D790517-S OR US-9547425-B2 OR US-7654732-B2 OR US-D768634-S OR US-9459781-B2 OR US-D758363-S OR US-D758219-S OR US-D752044-S OR US-D741726-S OR US-D737159-S OR US-D728624-S OR US-D727198-S OR US-9575591-B2 OR US-9781984-B2 OR US-9627163-B2 OR US-7932893-B1 OR US-9651922-B2 OR US-9971405-B2 OR US-6882596-B2 OR US-7034237-B2 OR US-8908477-B2 OR US-5738104-A OR US-4448199-A OR US-7286063-B2 OR US-9625944-B2 OR US-9615476-B2 OR US-9300344-B2 OR US-3577876-A OR US-D647107-S OR US-D578922-S OR US-8766805-B2 OR US-4903253-A OR US-7682070-B2 OR US-8630633-B1 OR US-5722397-A OR US-6694158-B2 OR US-7474592-B2 OR US-7674231-B2 OR US-8527038-B2 OR US-8617069-B2 OR US-8727977-B2 OR US-8738118-B2 OR US-9622214-B2 OR US-9629120-B2 OR US-9704154-B2 OR US-9737212-B2 OR US-9737221-B2 OR US-9848825-B2 OR US-6158884-A OR US-6255951-B1 OR US-6350055-B1 OR US-6431455-B1 OR US-9091715-B2 OR US-9423418-B2 OR US-9288836-B1 OR US-6443906-B1 OR US-	GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				

		9386932-B2 OR US-9141087-B2 OR US-9049998-B2 OR US-8948832-B2 OR US-7385874-B2 OR US-11527824-B2 OR US-6825751-B1 OR US-11567457-B2 OR US-11526034-B1).did. AND USPT.dbnm.) OR ((US-20090124062-A1 OR US-20130236699-A1 OR US-20150085429-A1 OR US-20160064800-A1 OR US-20030174590-A1 OR US-20150351690-A1 OR US-20160064804-A1 OR US-20150124415-A1 OR US-20140107493-A1 OR US-20140278139-A1 OR US-20160091965-A1 OR US-20160198996-A1 OR US-20160367987-A1 OR US-20110003665-A1 OR US-20150313542-A1 OR US-20160274726-A1 OR US-20140366123-A1 OR US-20160313703-A1 OR US-20030175993-A1 OR US-20130234850-A1 OR US-20140139486-A1 OR US-20140276244-A1 OR US-20160350514-A1 OR US-20150186609-A1 OR US-20160379205-A1 OR US-20170011210-A1 OR US-20170039358-A1 OR US-20170071483-A1 OR US-20140275852-A1 OR US-20140378777-A1 OR US-20150026647-A1 OR US-20100292599-A1 OR US-20150366098-A1).did. AND PGPB.dbnm.)				
L351	47175008	(temperature)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD,	OR	ON	ON	2023/05/18 02:01 PM

			DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L352	60	L350 AND L351	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/18 02:01 PM
L353	1779782	payment	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/18 02:20 PM
L354	10	L350 AND L353	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/18 02:20 PM
L355	4	"20150026647".pn.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/18 03:07 PM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N153	0	(wearable AND housing AND band AND display AND (touch NEAR sensor) AND crown AND (rotatable OR rotational OR rotat$4) AND switch AND haptic).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/12 07:07 AM
N154	0	(wearable AND housing AND band AND display AND (touch NEAR sensor) AND crown AND (rotatable OR rotational OR rotat$4)	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/12 07:08 AM

		AND switch AND vibrat$4).clm.					
N234	0	(watch AND housing AND cover AND (touch NEAr display) AND dielectric AND optical AND coil AND wireless AND (heart NEAR rate) AND (electrocardiog$4 OR "ECG" OR "EKG")).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2020/10/22 03:24 PM
N242	1	(housing AND watch AND (band OR strap) AND cover AND dielectric AND coil AND charg$4 AND surface AND electrode AND (heart NEAr rate)).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2020/10/29 01:39 PM

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	12	(US-4914831-$ | US-6587400-$ | US-6846998-$ | US-7034237-$ | US-7255473-$ | US-7506269-$ | US-8456430-$ | US-8816962-$ | US-9034666-$ | US-9176577-$ | US-9632318-$ | US-9800717-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:07 AM
L2	42	(US-0018026-$ | US-0024683-$ | US-0061863-$ | US-0062623-$ | US-0103985-$ | US-0104902-$ | US-0253487-$ | US-0269715-$ | US-0285404-$ | US-0306446-$ | US-0331869-$ | US-0335196-$ | US-0347289-$ | US-0357465-$ | US-20130335196-$ | US-20140347289-$ | US-20160062623-$ | US-20160103985-$ | US-20160253487-$ | US-20160306446-$ | US-20170061863-$ | US-20170104902-$ | US-20170269715-$ | US-20170285404-$ | US-20170331869-$ | US-20170357465-$ | US-20180018026-$ | US-20180024683-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:07 AM
L3	3	"9836025".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:07 AM
L4	9	(US-4395134-$ | US-4634861-$ | US-4987299-$ | US-5631881-$ | US-5825353-$ | US-6392640-$ | US-6896403-$ | US-7102626-$ | US-9430042-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:08 AM

L5	12	(US-0069713-$ | US-0109861-$ | US-0248986-$ | US-0307414-$ | US-20160069713-$ | US-20160109861-$ | US-20170248986-$ | US-20170307414-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:08 AM
L6	22	(US-2288215-$ | US-2788236-$ | US-2797592-$ | US-3410247-$ | US-4311026-$ | US-4766642-$ | US-5509174-$ | US-6502982-$ | US-6834430-$ | US-7111365-$ | US-7285738-$ | US-7371745-$ | US-7591582-$ | US-8607662-$ | US-8783944-$ | US-8905631-$ | US-9052696-$ | US-9244438-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:09 AM
L7	12	(US-0116306-$ | US-0122656-$ | US-0130971-$ | US-0272784-$ | US-20040130971-$ | US-20090122656-$ | US-20120272784-$ | US-20160116306-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:09 AM
L8	0	"201700192391".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:10 AM
L9	0	(201600327911|20170045958).PN.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:10 AM
L10	1	"20170192391".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:10 AM
L11	3	(20160327911|20170045958).PN.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:10 AM
L12	4	(8188989|9947741).PN.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:11 AM
L13	244	(US-0003655-$ | US-0010751-$ | US-0013775-$ | US-0033430-$ | US-0037396-$ | US-0050054-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:11 AM

		0051649-$ | US- 0053468-$ | US- 0054813-$ | US- 0058375-$ | US- 0061636-$ | US- 0067711-$ | US- 0068857-$ | US- 0069443-$ | US- 0069444-$ | US- 0069447-$ | US- 0071050-$ | US- 0071098-$ | US- 0073119-$ | US- 0075082-$ | US- 0075558-$ | US- 0081375-$ | US- 0082414-$ | US- 0087443-$ | US- 0090148-$ | US- 0098016-$ | US- 0112859-$ | US- 0113044-$ | US- 0130914-$ | US- 0132516-$ | US- 0146975-$ | US- 0149099-$ | US- 0152452-$ | US- 0168178-$ | US- 0174590-$ | US- 0197936-$ | US- 0206248-$ | US- 0211042-$ | US- 0217207-$ | US- 0221460-$ | US- 0222756-$ | US- 0227217-$ | US- 0229671-$ | US- 0247421-$ | US- 0250377-$ | US- 0258784-$ | US- 0259301-$ | US- 0285443-$ | US- 0306437-$ | US- 0312051-$ | US- 0313703-$ | US- 0327630-$ | US- 0340318-$ | US- 0341031-$ | US- 0378070-$ | US- 0378071-$ | US- 0378072-$ | US- 15483374-$ | US- 2237860-$ | US- 2497935-$ | US- 2771734-$ | US- 20030174590-$ | US- 20040082414-$ | US- 20050075558-$ | US-					

		20060250377-$ | US- 20070013775-$ | US- 20070050054-$ | US- 20070211042-$ | US- 20070222756-$ | US- 20070229671-$ | US- 20070247421-$ | US- 20080130914-$ | US- 20090051649-$ | US- 20090073119-$ | US- 20090146975-$ | US- 20090152452-$ | US- 20090217207-$ | US- 20090285443-$ | US- 20090312051-$ | US- 20100033430-$ | US- 20100053468-$ | US- 20100081375-$ | US- 20100149099-$ | US- 20110090148-$ | US- 20120067711-$ | US- 20120068857-$ | US- 20120075082-$ | US- 20120112859-$ | US- 20120113044-$ | US- 20120206248-$ | US- 20130037396-$ | US- 20130087443-$ | US- 20140071050-$ | US- 20140071098-$ | US- 20140132516-$ | US- 20140197936-$ | US- 20140327630-$ | US- 20140340318-$ | US- 20150221460-$ | US- 20150227217-$ | US- 20150341031-$ | US- 20160054813-$ | US- 20160058375-$ | US- 20160061636-$ | US- 20160098016-$ | US- 20160168178-$ | US- 20160258784-$ | US- 20160259301-$ | US- 20160306437-$ | US- 20160313703-$ | US- 20160378070-$ | US- 20160378071-$ | US- 20160378072-$ | US- 20170003655-$ | US- 20170010751-$ | US- 20170069443-$ | US- 20170069444-$ | US- 20170069447-$ | US- 3040514-$ | US- 3056030-$ | US- 3130539-$ | US- 3495398-$ | US-					

		3621649-$ | US- 4007347-$ | US- 4031341-$ | US- 4037068-$ | US- 4077200-$ | US- 4133404-$ | US- 4170104-$ | US- 4258096-$ | US- 4287400-$ | US- 4289400-$ | US- 4311990-$ | US- 4324956-$ | US- 4345119-$ | US- 4364674-$ | US- 4379642-$ | US- 4417824-$ | US- 4581509-$ | US- 4600316-$ | US- 4617461-$ | US- 4641026-$ | US- 4670737-$ | US- 4783772-$ | US- 4884073-$ | US- 4922070-$ | US- 4931794-$ | US- 4952799-$ | US- 4980685-$ | US- 5034602-$ | US- 5214278-$ | US- 5258592-$ | US- 5288993-$ | US- 5347123-$ | US- 5383166-$ | US- 5471054-$ | US- 5572314-$ | US- 5583560-$ | US- 5726645-$ | US- 5748111-$ | US- 5841050-$ | US- 5847335-$ | US- 5867082-$ | US- 5943233-$ | US- 5953001-$ | US- 5963332-$ | US- 5423873-$ | US- 6069567-$ | US- 6134189-$ | US- 6154201-$ | US- 6175679-$ | US- 6246050-$ | US- 6252825-$ | US- 6304247-$ | US- 6355891-$ | US- 6422740-$ | US- 6477117-$ | US- 6525278-$ | US- 6556222-$ | US- 6646635-$).DID.					

L14	99	(US-6661438-$ | US-6672758-$ | US-6794992-$ | US-6809275-$ | US-6888076-$ | US-6909378-$ | US-6914551-$ | US-6961099-$ | US-6963039-$ | US-6985107-$ | US-6987568-$ | US-6998553-$ | US-7016263-$ | US-7081905-$ | US-7119289-$ | US-7135673-$ | US-7167083-$ | US-7244927-$ | US-7265336-$ | US-7274303-$ | US-7292741-$ | US-7358481-$ | US-7369308-$ | US-7404667-$ | US-7465917-$ | US-7520664-$ | US-7528824-$ | US-7545367-$ | US-7593755-$ | US-7605846-$ | US-7634263-$ | US-7646677-$ | US-7710456-$ | US-7761246-$ | US-7763819-$ | US-7772507-$ | US-7778115-$ | US-7781726-$ | US-7791597-$ | US-7856255-$ | US-7858583-$ | US-7865324-$ | US-8063892-$ | US-8138488-$ | US-8167126-$ | US-8169402-$ | US-8195313-$ | US-8248815-$ | US-8263886-$ | US-8263889-$ | US-8312495-$ | US-8368677-$ | US-8371745-$ | US-8373661-$ | US-8410971-$ | US-8432368-$ | US-8439559-$ | US-8441450-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:11 AM

		8446713-$ | US-8477118-$ | US-8493190-$ | US-8525777-$ | US-8568313-$ | US-8576044-$ | US-8593598-$ | US-8614881-$ | US-8666682-$ | US-8704787-$ | US-8711093-$ | US-8724087-$ | US-8730167-$ | US-8743088-$ | US-8824245-$ | US-8859971-$ | US-8860674-$ | US-8863219-$ | US-8878657-$ | US-8885856-$ | US-8895911-$ | US-8920022-$ | US-8922399-$ | US-8928452-$ | US-8994827-$ | US-9024733-$ | US-9041663-$ | US-9086738-$ | US-9105413-$ | US-9123483-$ | US-9176598-$ | US-9202372-$ | US-9213409-$ | US-9223296-$ | US-9277156-$ | US-9350850-$ | US-9449770-$ | US-9607505-$ | US-9620312-$ | US-9627163-$ | US-RE41637-$ | US-X6-$).DID.					
L15	7	(3355873|20110007468|20120177237).PN.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:12 AM
L16	0	rothkoph-fletcher-r.in.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:23 AM
L17	253	((("Rothkopf") near3 ("Fletcher") near3 ("R"))).INV.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 09:23 AM
L18	850	biosensor AND ((wrist NEAR watch) OR wristwatch)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:24 AM
L19	4	L17 AND L18	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2018/05/30 09:24 AM

			JPO)				
L20	1954995	curve	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:29 AM
L21	244	L18 AND L20	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 09:29 AM
L22	8927	smartwatch	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 10:23 AM
L23	89438	biosensor	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 10:23 AM
L24	218	L22 AND L23	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 10:23 AM
L25	21	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$).did.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 10:35 AM
L26	36	("20030176815" | "20050228297" | "20060252999" | "20070049461" | "20070167844" | "20080039731" | "20090216132" | "20100081951" | "20100106029" | "20100292589" | "20110003665" | "20110152637" | "20120244995" | "20130296723" | "20130338460" | "20140073969" | "20140107493" | "20140167973" | "20140249398" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 10:37 AM

		"20140257533" | "20140257534" | "20140257535" | "20140274159" | "20140278139" | "20140354527" | "20150374310" | "4830017" | "4893631" | "4987898" | "5243992" | "5617867" | "6371920" | "6443906" | "6475153" | "6723054" | "7539532").PN. OR ("9848825").URPN.					
L27	16	("20010008074" | "20040020856" | "20040152957" | "20070279852" | "20120293323" | "20130222271" | "20140207264" | "20140275852" | "20140378777" | "20150026647" | "20150371516" | "6619835" | "6736759" | "6832109" | "8988349" | "9288836").PN. OR ("9737212").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 10:39 AM
L28	49	("20020055117" | "20030165954" | "20030175993" | "20060057707" | "20080022089" | "20080038738" | "20080266546" | "20130146659" | "20130231711" | "20130234850" | "20130346168" | "20140139422" | "20140139486" | "20140139637" | "20140143737" | "20140180595" | "20140239065" | "20140275850" | "20140275852" | "20140275854" | "20140276244" | "20140316305" | "20140366123" | "20150073907" | "20150186609" | "20150196200" | "20150238150" | "20150366518" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 10:41 AM

		"20150371215" | "20160036811" | "20160037346" | "20160125600" | "20160162873" | "20160239624" | "20160286210" | "20160328282" | "20160374588" | "20160379205" | "20170011210" | "20170011223" | "20170018150" | "20170031449" | "20170039358" | "20170071483" | "8784271" | "9100493" | "9299238").PN. OR ("9704154").URPN.					
L29	13	("20020167488" | "20040030753" | "20050195805" | "20050272408" | "20060036642" | "20110080289" | "20110234414" | "20120052922" | "20120218101" | "20130002441" | "20130325922" | "20150279168" | "8744113").PN. OR ("9622214").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 10:55 AM
L30	17	("20030099459" | "4736196" | "5537102" | "5883576" | "5936530" | "6158884" | "6255951" | "6350055" | "6396403" | "6431455" | "7133843").PN. OR ("7474592").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 10:57 AM
L31	45	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:03 PM

		US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$).did.					
L32	1	"15261912"	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:09 PM
L33	33545	(smartwatch) OR (smart NEAR watch)	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:28 PM
L34	223931	apple	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:28 PM
L35	8043	L33 AND L34	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:28 PM
L36	2386928	curve$4	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:29 PM
L37	1219	L35 AND L36	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:29 PM
L38	1756218	rectangular	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:29 PM
L39	345	L37 AND L38	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 12:29 PM
L40	18177	((("Apple") near3 ("Inc"))).AS,AANM.	(USPAT)	OR	ON	ON	2018/05/30 02:59 PM
L41	33545	(smartwatch) OR (smart NEAR watch)	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/30 02:59 PM
L42	407	L40 AND L41	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 02:59 PM
L43	279935	crown	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2018/05/30 03:02 PM

			JPO)				
L44	18	L42 AND L43	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:02 PM
L45	120000	(heart NEAR rate)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:03 PM
L46	39	L42 AND L45	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:03 PM
L47	482	"iwatch"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:09 PM
L48	23	L40 AND L47	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:09 PM
L49	1	"15261912"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:12 PM
L50	248238	(photosensor OR photodetector)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:21 PM
L51	16	L42 AND L50	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:21 PM
L52	155606	sapphire	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:23 PM
L53	16	L42 AND L52	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:23 PM
L54	58538	(transparent NEAr cover)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:59 PM
L55	3	L42 AND L54	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 03:59 PM
L56	6820268	cover	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:00 PM
L57	81	L41 AND L54	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:00 PM
L58	42	("20030197648" | "20050156908" | "20060196849" | "20060273304" | "20080164578" | "20090104409" | "20090124062" | "20100231466" | "20110019123" | "20110072856" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 04:04 PM

		"20110223840" | "20120118228" | "20120135177" | "20120299841" | "20130002583" | "20130071601" | "20130140965" | "20130188366" | "20130236699" | "20140178647" | "20150085429" | "20150085432" | "20160058375" | "20160064800" | "20160378069" | "20160378070" | "20160378071" | "3740944" | "3911670" | "4561783" | "5369267" | "5545277" | "6206563" | "6406769" | "6677906" | "7712954" | "8596860" | "8721917" | "8824140" | "9271395" | "9288294" | "9369553").PN. OR ("9977464").URPN.					
L59	850	biosensor AND ((wrist NEAR watch) OR wristwatch)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:08 PM
L60	719	L AND L59	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 04:08 PM
L61	0	L40 AND L59	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/30 04:08 PM
L62	58057	((wrist NEAR watch) OR wristwatch)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:08 PM
L63	967	L40 AND L62	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:09 PM
L64	48	L45 AND L63	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:09 PM
L65	68	L52 AND L63	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:14 PM
L66	5183	L45 AND L62	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:17 PM
L67	221	L52 AND L66	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/30 04:18 PM
L68	72	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 09:38 AM

		US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-					

		D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$).did.					
L69	40	("20100193972" | "20110186324" | "20110210825" | "20110222248" | "20110241949" | "20120028679" | "20120133597" | "20120223865" | "20130044074" | "20130052947" | "20130078917" | "20130140965" | "20130229362" | "20130234910" | "20130300618" | "20130321216" | "20140080411" | "20140112511" | "20140132462" | "20140133074" | "20140170975" | "20140209691" | "20140213178" | "20140218250" | "20140226291" | "20140232609" | "20150035709" | "20150207913" | "20150311960" | "20150351292" | "5768217" | "6825751" | "7233291" | "7506436" | "7815820" | "8502739" | "8679393" | "8766858" | "8780581" | "8803745").PN. OR ("9680205").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 09:53 AM
L70	3	(9242085|20080033504|9011355).pn.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 09:54 AM
L71	37	("1313644" | "1692079" | "1817475" | "20040025984" | "20070125816" | "20080060224" | "20080086911" | "20120102691" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 11:05 AM

		"20140070042" | "20140094728" | "20150135410" | "20160255944" | "20160272458" | "20160345653" | "20160345661" | "3890801" | "4941236" | "5485848" | "6301754" | "6799887" | "7562640" | "7618384" | "7690220" | "7752774" | "8147417" | "8370998" | "8522456" | "8769844" | "9044372" | "9129503" | "9144273" | "9204690" | "9307804" | "9365387").PN. OR ("9781984").URPN.					
L72	4437806	(contour$4 OR round$4 OR curve$4)	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:08 PM
L73	58102	((wrist NEAR watch) OR wristwatch)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 12:08 PM
L74	15419	L72 AND L73	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:08 PM
L75	66	watchface	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:08 PM
L76	26	("2225474" | "3469391" | "4034552" | "4167850" | "4194355" | "4417821" | "4506992").PN. OR ("4903253").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:12 PM
L77	69	("20100061191" | "3640065" | "4903253" | "5265009" | "5386933" | "6655831" | "6712501" | "6970157" | "7004469" | "7106197" | "7708457" | "8647268" | "8766805" | "9060683" | "9551608" | "D287471" | "D439172" | "D496589" | "D513195" | "D528018" | "D528439" | "D528928" | "D558227" | "D563434" | "D569389" | "D572266" | "D574735" | "D578922" | "D584170" | "D586823" | "D589375" | "D596610" | "D616417" | "D637094" | "D637918" | "D650706" | "D651216" | "D666503" | "D681483" |	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:12 PM

		"D699701" | "D712870" | "D728624" | "D737156" | "D737157" | "D737158" | "D737159" | "D741726" | "D744356" | "D745421" | "D746707" | "D746868" | "D747288" | "D751070" | "D752044" | "D756357" | "D756824" | "D757819" | "D758363" | "D759011" | "D759725" | "D765655" | "D766752" | "D771035" | "D771504" | "D777163" | "D782537" | "D784326" | "D790517").PN. OR ("D798905").URPN.					
L78	0	akana-joan.in.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:19 PM
L79	717	akana-jody.in.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2018/05/31 12:19 PM
L80	406132	((wrist NEAR watch) OR wristwatch OR watch)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 12:26 PM
L81	18177	((("Apple") near3 ("Inc"))).AS,AANM.	(USPAT)	OR	ON	ON	2018/05/31 12:26 PM
L82	2430	L81 AND L80	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 12:26 PM
L83	124655	rectangular AND orthogonal AND (contour$4 OR round$4 OR curve$4 OR curvature)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 12:27 PM
L84	71	L82 AND L83	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 12:27 PM
L85	76	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 12:42 PM

		US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-					

		7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$).did.					
L86	78	ely-colin-m.in.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 12:43 PM
L87	52	de-jong-erik-g.in.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 12:46 PM
L88	75	memering-dale-n.in..in.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 12:48 PM
L89	75	memering-dale-n.in.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 12:48 PM
L90	4	mylvaganam-jeffrey-c.in.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 12:51 PM
L91	3	("20120169465"|"20120245439"|"20130231574").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2018/05/31 01:00 PM
L92	1	"20150186609".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 01:54 PM
L93	908170	convex	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 02:15 PM
L94	9	L85 AND L93	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 02:15 PM
L95	1304822	mask	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 02:18 PM
L96	14	L85 AND L95	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/05/31 02:19 PM
L97	8	(20150186609|20140275852|20140107493|20130236693|4903253).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 08:01 AM
L98	3	"14145856"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 09:52 AM
L99	1	"14073550"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 09:55 AM
L100	17	("20110121449"|"20130072765"|"20140121471"|"20140334083"|"20150065840"|"3515798"|"6500367"|"8591411").PN.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 09:58 AM
L101	77	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/01 02:39 PM

		US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-					

		9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$).did.					
L102	280007	crown	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:39 PM
L103	6	L101 AND L102	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:39 PM
L104	740594	acoustic	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:40 PM
L105	21	L101 AND L104	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:40 PM
L106	2738169	gasket OR seal	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:42 PM
L107	0	L101 AND LL6	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:42 PM
L108	16	L101 AND L106	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 02:42 PM
L109	1304822	mask	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 03:06 PM
L110	14	L101 AND L109	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 03:06 PM
L111	33714	(smartwatch) OR (smart NEAR watch)	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/01 04:33 PM
L112	2738169	gasket OR seal	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 04:33 PM
L113	2278	L111 AND L112	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 04:33 PM
L114	180804	ledge	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 04:33 PM

L115	73	L113 AND L114	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 04:34 PM
L116	77	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/01 04:36 PM

		D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$).did.					
L117	461759	gasket	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 04:36 PM
L118	5	L116 AND L117	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/01 04:36 PM
L119	6	(15261914|15261917|15627321|15870718|15879223|14842617)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/04 04:46 PM
L120	77	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/04 06:22 PM

		US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$).did.					
L121	132091	sapphire	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/04 07:38 PM
L122	9	L120 AND L121	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/04 07:39 PM

L123	77	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/07 03:23 PM

		D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$).did.					
L124	77772	crown AND (rotary OR rotation)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:23 PM
L125	5	L123 AND L124	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:24 PM
L126	33999	(smartwatch) OR (smart NEAR watch)	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/07 03:24 PM
L127	162	L126 AND L124	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:24 PM
L128	406910	(watch OR wristwatch OR (wrist NEAR watch))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:32 PM
L129	3396	L124 AND L128	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:32 PM
L130	2	"20150124415".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:36 PM
L131	1	"15261912"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 03:52 PM
L132	14	(speaker SAME (recess OR aperture) SAME fluid SAME (intrusion OR ingress))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 04:03 PM
L133	299	(waterproof NEAR port)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 04:04 PM
L134	0	L126 AND L133	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 04:04 PM
L135	25	L128 AND L133	(US-PGPUB; USPAT;	OR	ON	ON	2018/06/07

			USOCR; FPRS; EPO; JPO)				04:04 PM
L136	319	(waterproof SAME (audio OR acoustic) SAME port)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 04:09 PM
L137	8	L126 AND L136	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 04:09 PM
L138	56	L128 AND L136	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/06/07 04:09 PM
L139	81	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/07 04:49 PM

		9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$).did.					
L140	1	"8229535".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2018/06/07 04:50 PM
L141	39	("0012016"|"0012017"|"0022016"|"0032012"|"0032017"|"0042018"|"0052010"|"0052011"|"0052015"|"0052018"|"0062008"|"0062010"|"0062017"|"0072015"|"0072016"|"0082013"|"0082015"|"0082016"|"0092016"|"0102017"|"0112014"|"0112016"|"0122005"|"20040264301"|"20110242064"|"20130261405"|"20150098309"|"20160018846"|"20160320583"|"20170011210"|"20170031449"|"20170139489"|"20170216668"|"20170238138"|"20170251561	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/11 05:21 PM

		"|"20170301314"|"2018 0136613"|"2018013668 6"|"4396298").PN.					
L142	1267679	(translation$4)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/11 05:22 PM
L143	4	L141 AND L142	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/11 05:24 PM
L144	10	("0062016"|"10001817"| "20130191220"|"20160 147432"|"20160170598 "|"20160170608"|"6396 006"|"8294670"|"95520 23"|"9659482").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/11 05:28 PM
L145	2	("20110158057"|"91410 87").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/11 05:28 PM
L146	4	("20180239306"|"20180 246469"|"20180299834 "|"9971405").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/11 05:28 PM
L147	5	("20040047244"|"20150 366098"|"20180307363 "|"5960366"|"9520100"). PN.	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/11 05:29 PM
L148	22	(US-2288215-$ | US-2788236-$ | US-2797592-$ | US-3410247-$ | US-4311026-$ | US-4766642-$ | US-5509174-$ | US-6502982-$ | US-6834430-$ | US-7111365-$ | US-7285738-$ | US-7371745-$ | US-7591582-$ | US-8607662-$ | US-8783944-$ | US-8905631-$ | US-9052696-$ | US-9244438-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/11 06:07 PM
L149	2	L142 AND L148	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/11 06:07 PM
L150	4	"15178089"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/11 06:18 PM
L151	22	(US-2288215-$ | US-2788236-$ | US-2797592-$ | US-3410247-$ | US-4311026-$ | US-4766642-$ | US-5509174-$ | US-	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 07:10 AM

		6502982-$ | US-6834430-$ | US-7111365-$ | US-7285738-$ | US-7371745-$ | US-7591582-$ | US-8607662-$ | US-8783944-$ | US-8905631-$ | US-9052696-$ | US-9244438-$).DID.					
L152	25	(US-4396298-$ | US-6977868-$ | US-7385874-$ | US-7708457-$ | US-7732724-$ | US-7946758-$ | US-8143981-$ | US-8508511-$ | US-9028134-$ | US-9086717-$ | US-9101184-$ | US-9241635-$ | US-9256209-$ | US-9386932-$ | US-9426275-$ | US-9437357-$ | US-9501044-$ | US-9532723-$ | US-9545541-$ | US-9599964-$ | US-9680831-$ | US-9946297-$ | US-9971305-$ | US-D717679-$ | US-D800172-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 07:19 AM
L155	13	(9836025|9709956|9620312).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 09:13 AM
L156	4	"14842617"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 09:14 AM
L157	49919	crown SAME ((rotary OR rotation OR rotat$4) OR (translat$4 OR translatable))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 09:20 AM
L158	3	L155 AND L157	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 09:20 AM
L159	15	"14455375"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 09:22 AM
L160	1	"15261914"	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2018/12/12 09:30 AM

L161	1	"8954135".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/01/08 09:51 AM
L162	12	(US-10092203-$ | US-5999168-$ | US-6241684-$ | US-6361502-$ | US-6982930-$ | US-7113450-$ | US-7468036-$ | US-7791588-$ | US-9039614-$ | US-9042971-$ | US-9898032-$ | US-9979426-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:35 AM
L163	2846978	wireless	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:38 AM
L164	9	L162 AND L163	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:38 AM
L165	25	(US-0049059-$ | US-0196517-$ | US-0235491-$ | US-0270358-$ | US-0320346-$ | US-0338642-$ | US-0368442-$ | US-0375579-$ | US-20110270358-$ | US-20140368442-$ | US-20140375579-$ | US-20150049059-$ | US-20150320346-$ | US-20150338642-$ | US-20160338642-$ | US-20180196517-$ | US-20180235491-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:44 AM
L166	3	(US-3362154-$ | US-9001625-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:45 AM
L167	21	(US-0017846-$ | US-0027461-$ | US-0073486-$ | US-0329368-$ | US-0335891-$ | US-0341342-$ | US-0364815-$ | US-20140073486-$ | US-20170027461-$ | US-20180329368-$ | US-20180335891-$ | US-20180341342-$ | US-20180364815-$ | US-20190017846-$).DID.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:46 AM
L168	88408	haptic	(US-PGPUB; USPAT;	OR	ON	ON	2019/02/15

			USOCR; FPRS; EPO; JPO)				09:55 AM
L169	5	L165 AND L168	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:55 AM
L170	0	L166 AND L168	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:56 AM
L171	6	L162 AND L168	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/02/15 09:56 AM
L172	9	(7822469|8908477|20170216519).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/05/06 10:15 AM
L173	9	(10209148|10114342|8677285|20130235704|20160241688).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/05/23 10:39 AM
L174	993	haptic AND crown	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/05/23 10:40 AM
L175	0	L173 AND L174	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/05/23 10:40 AM
L176	81	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2019/05/23 10:49 AM

		9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$).did.					
L177	18	L176 AND Haptic	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/05/23 10:50 AM
L178	2	("7021442"|"7894957").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2019/07/29 08:05 AM
L179	2	("7021442"|"7894957").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2019/07/29 08:11 AM

L180	2	("7021442"|"7894957").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2019/07/29 08:11 AM
L181	25	(3733803|4520306|6377239|6882596|6967903|7286063|7655874|8975543|9836025|10331082|20080088417|20170090599|20190163324).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/07/29 08:13 AM
L182	3	"9627163".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/07/29 08:20 AM
L183	3	"9627163".pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/08/13 07:07 PM
L184	15	("10331082"|"20050088417"|"20170090599"|"20190163324"|"3733803"|"4520306"|"6377239"|"6882596"|"6967903"|"7021442"|"7286063"|"7655874"|"7894957"|"8975543"|"9836025").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2019/08/13 08:09 PM
L185	5	(7021442|7894957).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2019/08/13 08:11 PM
L186	4	("20190250754"|"20190294117"|"20190302902"|"5177355").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2019/11/24 05:25 PM
L187	3	(5477508|8275327).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/02/28 01:14 PM
L188	4	(10613485|10620591|10627783|10599101).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/01 01:23 PM
L189	83	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/01 01:38 PM

		US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-					

		3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$).did.					
L190	278	("10001817"|"10018966"|"10019097"|"10037006"|"10048802"|"10061399"|"10092203"|"10114342"|"10145711"|"10175652"|"10209148"|"10216147"|"10222756"|"10222909"|"10234828"|"10296125"|"10331081"|"10331082"|"10379629"|"10509486"|"2237860"|"2288215"|"2497935"|"2771734"|"2788236"|"2797592"|"3040514"|"3056030"|"3130539"|"3355873"|"3362154"|"3410247"|"3495398"|"3577876"|"3621649"|"3662618"|"3733803"|"4007347"|"4031341"|"4037068"|"4077200"|"4133404"|"4170104"|"4258096"|"4287400"|"4289400"|"4311026"|"4311990"|"4324956"|"4345119"|"4364674"|"4379642"|"4395134"|"4396298"|"4417824"|"4520306"|"4581509"|"4600316"|"4617461"|"4634861"|"4641026"|"4670737"|"4766642"|"4783772"|"4884073"|"4914831"|"4922070"|"4931794"|"4952799"|"4980685"|"4987299"|"5034602"|"5177355"|"5214278"|"5258592"|"5288993"|"5347123"|"5383166"|"5471054"|"5477508"|"5509174"|"5572314"|"5583560"|"5631881"|"5726645"|"5748111"|"5825353"|"5841050"|"5847335"|"5867082"|"5943233"|"5953001"|"5960366"|"5963332"|"5999168"|"6069567"|"6134189"|"6154201"|"6175679"|"6241684"|"6246050"|"6252825"|"6304247"|"6355891"|"6361502"|"6377239"|"6392640"|"6396006"|"6	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/01 02:00 PM

		422740"|"6477117"|"65 02982"|"6525278"|"655 6222"|"6575618"|"6587 400"|"6646635"|"66614 38"|"6672758"|"679499 2"|"6809275"|"6834430" |"6846998"|"6882596"|" 6888076"|"6896403"|"6 909378"|"6914551"|"69 61099"|"6963039"|"696 7903"|"6977868"|"6982 930"|"6985107"|"69875 68"|"6998553"|"701626 3"|"7021442"|"7034237" |"7081905"|"7102626"|" 7111365"|"7113450"|"7 119289"|"7135673"|"71 67083"|"7244927"|"725 5473"|"7265336"|"7274 303"|"7285738"|"72860 63"|"7292741"|"735848 1"|"7369308"|"7371745" |"7385874"|"7404667"|" 7465917"|"7468036"|"7 506269"|"7520664"|"75 28824"|"7545367"|"759 1582"|"7593755"|"7605 846"|"7634263"|"76466 77"|"7655874"|"768207 0"|"7708457"|"7710456" |"7732724"|"7761246"|" 7763819"|"7772507"|"7 778115"|"7781726"|"77 91588"|"7791597"|"782 2469"|"7856255"|"7858 583"|"7865324"|"78949 57"|"7946758"|"806389 2"|"8138488"|"8143981" |"8167126"|"8169402"|" 8188989"|"8195313"|"8 229535"|"8248815"|"82 63886"|"8263889"|"827 5327"|"8294670"|"8312 495"|"8368677"|"83717 45"|"8373661"|"841097 1"|"8432368"|"8439559" |"8441450"|"8446713"|" 8456430"|"8477118"|"8 493190"|"8508511"|"85 25777"|"8562489"|"856 8313"|"8576044"|"8593 598"|"8607662"|"86148 81"|"8666682"|"867728 5"|"8704787"|"8711093" |"8724087"|"8730167"|" 8743088"|"8783944"|"8 804993"|"8816962"|"88 24245"|"8847741"|"885					

		9971"|"8860674"|"8863219"|"8878657"|"8885856"|"8895911"|"8905631"|"8908477"|"8920022"|"8922399"|"8928452"|"8954135"|"8975543"|"8994827"|"9001625"|"9024733"|"9028134"|"9030446"|"9034666"|"9039614"|"9041663"|"9042971"|"9052696"|"9086717"|"9086738"|"9101184"|"9105413"|"9123483"|"9141087"|"9176577"|"9176598"|"9202372"|"9213409"|"9223296"|"9241635"|"9244438"|"9256209"|"9277156"|"9350850"|"9386932"|"9426275"|"9430042"|"9437357"|"9449770"|"9501044"|"9520100"|"9532723").PN.					
L191	33	("9542016"|"9545541"|"9552023"|"9599964"|"9607505"|"9620312"|"9627163"|"9632318"|"9638587"|"9651922"|"9659482"|"9680831"|"9709956"|"9753436"|"9800717"|"9836025"|"9873711"|"9874945"|"9886006"|"9891590"|"9891651"|"9898032"|"9927902"|"9939923"|"9946297"|"9952558"|"9952682"|"9971305"|"9971405"|"9979426"|"D717679"|"D800172"|"RE41637").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/01 02:00 PM
L192	4	(20150186609|20140107493|D647107|7474592).pn.	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/01 02:11 PM
L193	18	("20030099459" | "4736196" | "5537102" | "5883576" | "5936530" | "6158884" | "6255951" | "6350055" | "6396403" | "6431455" | "7133843").PN. OR ("7474592").URPN.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/05/01 02:37 PM
L194	83	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 04:20 PM

		US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-					

		9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$).did.					
L195	112037	("ECG" OR "EKG" OR electrocardiogra$4)	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 04:43 PM
L196	23	L194 AND L195	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 04:43 PM
L197	278	("10001817"|"10018966"|"10019097"|"10037006"|"10048802"|"10061399"|"10092203"|"10114342"|"10145711"|"10175652"|"10209148"|"10216147"|"10222756"|"10222909"|"10234828"|"10296125"|"10331081"|"10331082"|"10379629"|"10509486"|"2237860"|"2288215"|"2497935"|"2771734"|"2788236"|"2797592"|"3040514"|"3056030"|"3130539"|"3355873"|"3362154"|"3410247"|"3495398"|"3577876"|"3621649"|"3662618"|"3733803"|"4007347"|"4031341"|"4037068"|"4077200"|"4133404"|"4170104"|"4258096"|"4287400"|"4289400"|"4311026"|"4311990"|"4324956"|"4345119"|"4364674"|"4379642"|"4395134"|"4396298"|"4417824"|"4520306"|"4581509"|"4600316"|"4617461"|"4634861"|"4641026"|"4670737"|"4766642"|"4783772"|"4884073"|"4914831"|"4922070"|"4931794"|"4952799"|"4980685"	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 04:57 PM

		|"4987299"|"5034602"|"5177355"|"5214278"|"5258592"|"5288993"|"5347123"|"5383166"|"5471054"|"5477508"|"5509174"|"5572314"|"5583560"|"5631881"|"5726645"|"5748111"|"5825353"|"5841050"|"5847335"|"5867082"|"5943233"|"5953001"|"5960366"|"5963332"|"5999168"|"6069567"|"6134189"|"6154201"|"6175679"|"6241684"|"6246050"|"6252825"|"6304247"|"6355891"|"6361502"|"6377239"|"6392640"|"6396006"|"6422740"|"6477117"|"6502982"|"6525278"|"6556222"|"6575618"|"6587400"|"6646635"|"6661438"|"6672758"|"6794992"|"6809275"|"6834430"|"6846998"|"6882596"|"6888076"|"6896403"|"6909378"|"6914551"|"6961099"|"6963039"|"6967903"|"6977868"|"6982930"|"6985107"|"6987568"|"6998553"|"7016263"|"7021442"|"7034237"|"7081905"|"7102626"|"7111365"|"7113450"|"7119289"|"7135673"|"7167083"|"7244927"|"7255473"|"7265336"|"7274303"|"7285738"|"7286063"|"7292741"|"7358481"|"7369308"|"7371745"|"7385874"|"7404667"|"7465917"|"7468036"|"7506269"|"7520664"|"7528824"|"7545367"|"7591582"|"7593755"|"7605846"|"7634263"|"7646677"|"7655874"|"7682070"|"7708457"|"7710456"|"7732724"|"7761246"|"7763819"|"7772507"|"7778115"|"7781726"|"7791588"|"7791597"|"7822469"|"7856255"|"7858583"|"7865324"|"7894957"|"7946758"|"8063892"|"8138488"|"8143981"|"8167126"|"8169402"|"8188989"|"8195313"|"8					

		229535"|"8248815"|"82 63886"|"8263889"|"827 5327"|"8294670"|"8312 495"|"8368677"|"83717 45"|"8373661"|"841097 1"|"8432368"|"8439559" |"8441450"|"8446713"|" 8456430"|"8477118"|"8 493190"|"8508511"|"85 25777"|"8562489"|"856 8313"|"8576044"|"8593 598"|"8607662"|"86148 81"|"8666682"|"867728 5"|"8704787"|"8711093" |"8724087"|"8730167"|" 8743088"|"8783944"|"8 804993"|"8816962"|"88 24245"|"8847741"|"885 9971"|"8860674"|"8863 219"|"8878657"|"88858 56"|"8895911"|"890563 1"|"8908477"|"8920022" |"8922399"|"8928452"|" 8954135"|"8975543"|"8 994827"|"9001625"|"90 24733"|"9028134"|"903 0446"|"9034666"|"9039 614"|"9041663"|"90429 71"|"9052696"|"908671 7"|"9086738"|"9101184" |"9105413"|"9123483"|" 9141087"|"9176577"|"9 176598"|"9202372"|"92 13409"|"9223296"|"924 1635"|"9244438"|"9256 209"|"9277156"|"93508 50"|"9386932"|"942627 5"|"9430042"|"9437357" |"9449770"|"9501044"|" 9520100"|"9532723").PN.				
L198	13	L195 AND L197	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 04:57 PM
L199	33	("9542016"|"9545541"|" 9552023"|"9599964"|"9 607505"|"9620312"|"96 27163"|"9632318"|"963 8587"|"9651922"|"9659 482"|"9680831"|"97099 56"|"9753436"|"980071 7"|"9836025"|"9873711" |"9874945"|"9886006"|" 9891590"|"9891651"|"9 898032"|"9927902"|"99 39923"|"9946297"|"995 2558"|"9952682"|"9971 305"|"9971405"|"99794	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 05:04 PM

		26"|"D717679"|"D800172"|"RE41637").PN.					
L200	7	L199 AND L195	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/06 05:04 PM
L201	83	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 10:45 AM

		9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$).did.					
L202	4081	(((wrist NEAR watch) OR (wristwatch)) AND ("ECG" OR "EKG" OR electrocardiogra$4))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 10:46 AM
L203	4144877	electrode	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 10:47 AM
L204	2474	L202 AND L203	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 10:47 AM
L205	939	(((wrist NEAR watch) OR (wristwatch)) SAME ("ECG" OR "EKG" OR electrocardiogra$4))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 10:48 AM
L206	760	L204 AND L205	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 10:48 AM
L207	84	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 10:56 AM

		US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-					

		D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$ or US-4448199-$).did.					
L208	919589	dielectric OR ceraminc	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:06 AM
L209	1700627	dielectric OR ceramic	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:06 AM
L210	20	L207 AND L209	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:06 AM
L211	0	"16826130"	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:11 AM
L212	1	"10613485".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:11 AM
L213	1178366	coil	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:25 AM
L214	15	L207 AND L213	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 11:27 AM
L215	126	(wireless SAME recharg$4 SAME (coil OR antenna) SAME magnet)	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 12:42 PM
L216	70511	(((wrist NEAR watch) OR (wristwatch)))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 12:42 PM
L217	24	L216 AND L215	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/05/08 12:42 PM
L218	28998	wireless NEAR charg$4	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:18 PM
L219	83	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:19 PM

		US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-					

		9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$).did.					
L220	5	L218 AND L219	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:19 PM
L221	278	("10001817"|"10018966"|"10019097"|"10037006"|"10048802"|"10061399"|"10092203"|"10114342"|"10145711"|"10175652"|"10209148"|"10216147"|"10222756"|"10222909"|"10234828"|"10296125"|"10331081"|"10331082"|"10379629"|"10509486"|"2237860"|"2288215"|"2497935"|"2771734"|"2788236"|"2797592"|"3040514"|"3056030"|"3130539"|"3355873"|"3362154"|"3410247"|"3495398"|"3577876"|"3621649"|"3662618"|"3733803"|"4007347"|"4031341"|"4037068"|"4077200"|"4133404"|"4170104"|"4258096"|"4287400"|"4289400"|"4311026"|"4311990"|"4324956"|"4345119"|"4364674"|"4379642"|"4395134"|"4396298"|"4417824"|"4520306"|"4581509"|"4600316"|"4617461"|"4634861"|"4641026"|"4670737"|"4766642"|"4783772"|"4884073"|"4914831"|"4922070"|"4931794"|"4952799"|"4980685"|"4987299"|"5034602"|"5177355"|"5214278"|"5258592"|"5288993"|"5347123"|"5383166"|"547	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:22 PM

		1054"|"5477508"|"5509 174"|"5572314"|"55835 60"|"5631881"|"572664 5"|"5748111"|"5825353" |"5841050"|"5847335"|" 5867082"|"5943233"|"5 953001"|"5960366"|"59 63332"|"5999168"|"606 9567"|"6134189"|"6154 201"|"6175679"|"62416 84"|"6246050"|"625282 5"|"6304247"|"6355891" |"6361502"|"6377239"|" 6392640"|"6396006"|"6 422740"|"6477117"|"65 02982"|"6525278"|"655 6222"|"6575618"|"6587 400"|"6646635"|"66614 38"|"6672758"|"679499 2"|"6809275"|"6834430" |"6846998"|"6882596"|" 6888076"|"6896403"|"6 909378"|"6914551"|"69 61099"|"6963039"|"696 7903"|"6977868"|"6982 930"|"6985107"|"69875 68"|"6998553"|"701626 3"|"7021442"|"7034237" |"7081905"|"7102626"|" 7111365"|"7113450"|"7 119289"|"7135673"|"71 67083"|"7244927"|"725 5473"|"7265336"|"7274 303"|"7285738"|"72860 63"|"7292741"|"735848 1"|"7369308"|"7371745" |"7385874"|"7404667"|" 7465917"|"7468036"|"7 506269"|"7520664"|"75 28824"|"7545367"|"759 1582"|"7593755"|"7605 846"|"7634263"|"76466 77"|"7655874"|"768207 0"|"7708457"|"7710456" |"7732724"|"7761246"|" 7763819"|"7772507"|"7 778115"|"7781726"|"77 91588"|"7791597"|"782 2469"|"7856255"|"7858 583"|"7865324"|"78949 57"|"7946758"|"806389 2"|"8138488"|"8143981" |"8167126"|"8169402"|" 8188989"|"8195313"|"8 229535"|"8248815"|"82 63886"|"8263889"|"827 5327"|"8294670"|"8312 495"|"8368677"|"83717					

		45"|"8373661"|"8410971"|"8432368"|"8439559"|"8441450"|"8446713"|"8456430"|"8477118"|"8493190"|"8508511"|"8525777"|"8562489"|"8568313"|"8576044"|"8593598"|"8607662"|"8614881"|"8666682"|"8677285"|"8704787"|"8711093"|"8724087"|"8730167"|"8743088"|"8783944"|"8804993"|"8816962"|"8824245"|"8847741"|"8859971"|"8860674"|"8863219"|"8878657"|"8885856"|"8895911"|"8905631"|"8908477"|"8920022"|"8922399"|"8928452"|"8954135"|"8975543"|"8994827"|"9001625"|"9024733"|"9028134"|"9030446"|"9034666"|"9039614"|"9041663"|"9042971"|"9052696"|"9086717"|"9086738"|"9101184"|"9105413"|"9123483"|"9141087"|"9176577"|"9176598"|"9202372"|"9213409"|"9223296"|"9241635"|"9244438"|"9256209"|"9277156"|"9350850"|"9386932"|"9426275"|"9430042"|"9437357"|"9449770"|"9501044"|"9520100"|"9532723").PN.					
L222	6	L218 AND L221	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:22 PM
L223	33	("9542016"|"9545541"|"9552023"|"9599964"|"9607505"|"9620312"|"9627163"|"9632318"|"9638587"|"9651922"|"9659482"|"9680831"|"9709956"|"9753436"|"9800717"|"9836025"|"9873711"|"9874945"|"9886006"|"9891590"|"9891651"|"9898032"|"9927902"|"9939923"|"9946297"|"9952558"|"9952682"|"9971305"|"9971405"|"9979426"|"D717679"|"D800172"|"RE41637").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:23 PM
L224	4	L218 AND L223	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:23 PM

L225	33	("9542016"|"9545541"|"9552023"|"9599964"|"9607505"|"9620312"|"9627163"|"9632318"|"9638587"|"9651922"|"9659482"|"9680831"|"9709956"|"9753436"|"9800717"|"9836025"|"9873711"|"9874945"|"9886006"|"9891590"|"9891651"|"9898032"|"9927902"|"9939923"|"9946297"|"9952558"|"9952682"|"9971305"|"9971405"|"9979426"|"D717679"|"D800172"|"RE41637").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:24 PM
L226	4	L218 AND L225	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:24 PM
L227	5	L218 AND L201	(US-PGPUB; USPAT)	OR	ON	ON	2020/05/08 01:24 PM
L228	16	("0052020"|"10012550"|"10241593"|"10353487"|"10551798"|"20070182708"|"20140009397"|"20140045547"|"20200041962"|"20200073339"|"20200110473"|"6128006"|"6203190"|"6636197"|"8318340"|"8797153").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2020/10/22 02:58 PM
L229	216	(coil SAME (recharg$4 OR charg$4) SAME cover SAME dielectric)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/22 03:03 PM
L230	0	L228 AND L229	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/22 03:03 PM
L231	27643	(coil AND (recharg$4 OR charg$4) AND cover AND dielectric)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/22 03:06 PM
L232	1	L228 AND L231	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/22 03:06 PM
L233	58	(watch AND housing AND cover AND (touch NEAr display) AND dielectric AND optical AND coil AND wireless AND (heart NEAR rate) AND (electrocardiog$4 OR "ECG" OR "EKG"))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/22 03:16 PM
L235	358	((("Rothkopf") near3 ("Fletcher") near3 ("R"))).INV.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2020/10/29 09:55 AM
L236	527578	watch	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2020/10/29 09:56 AM

			JPO)				
L237	127	L235 AND L236	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/29 09:56 AM
L238	1031	Watch AND band AND (wireless SAME coil SAME inductive)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/29 10:35 AM
L239	1459613	dielectric	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/29 10:35 AM
L240	308	L238 AND L239	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/29 10:36 AM
L241	293	(housing AND watch AND (band OR strap) AND cover AND dielectric AND coil AND charg$4 AND surface AND electrode AND (heart NEAr rate))	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2020/10/29 01:39 PM
L243	2	(9134807|10474194).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/01/13 01:19 PM
L244	275	("0000005"|"0000055"|"0000072"|"0000073"|"0000078"|"0000555"|"0000726"|"0000728"|"0000786"|"0022019"|"0022020"|"0032019"|"0032020"|"0042020"|"0052019"|"0052020"|"0052585"|"0062019"|"0072019"|"0078949"|"0079467"|"0082019"|"0082020"|"0112019"|"0122019"|"10001817"|"10012550"|"10018966"|"10019097"|"10037006"|"10048802"|"10061399"|"10092203"|"10114342"|"10145711"|"10175652"|"20030174590"|"20040047244"|"20040082414"|"20040130971"|"20040264301"|"20050075558"|"20050088417"|"20060250377"|"2237860"|"2288215"|"2497935"|"2771734"|"2788236"|"2797592"|"3040514"|"3056030"|"3130539"|"3355873"|"3362154"|"3410247"|"3495398"|"3577876"|"3621649"|"3662618"|"3733803"|"4007347"|"4031341"|"4037068"|"4077200"|"41	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 11:05 AM

		33404"|"4170104"|"425 8096"|"4287400"|"4289 400"|"4311026"|"43119 90"|"4324956"|"434511 9"|"4364674"|"4379642" |"4395134"|"4396298"|" 4417824"|"4448199"|"4 520306"|"4581509"|"46 00316"|"4617461"|"463 4861"|"4641026"|"4670 737"|"4766642"|"47837 72"|"4884073"|"491483 1"|"4922070"|"4931794" |"4952799"|"4980685"|" 4987299"|"5034602"|"5 177355"|"5214278"|"52 88993"|"5631881"|"584 1050"|"5847335"|"5867 082"|"5943233"|"59530 01"|"5960366"|"596333 2"|"5999168"|"6069567" |"6128006"|"6134189"|" 6154201"|"6175679"|"6 203190"|"6241684"|"62 46050"|"6252825"|"630 4247"|"6355891"|"6361 502"|"6377239"|"63926 40"|"6396006"|"642274 0"|"6477117"|"6502982" |"6525278"|"6556222"|" 6575618"|"6587400"|"6 636197"|"6646635"|"66 61438"|"6672758"|"679 4992"|"6809275"|"6834 430"|"6846998"|"68825 96"|"6888076"|"689640 3"|"6909378"|"6914551" |"6961099"|"6963039"|" 6967903"|"6977868"|"6 982930"|"6985107"|"69 87568"|"6998553"|"701 6263"|"7021442"|"7031 228"|"7034237"|"70819 05"|"7102626"|"711136 5"|"7113450"|"7119289" |"7135673"|"7167083"|" 7244927"|"7274303"|"7 286063"|"7292741"|"73 69308"|"7371745"|"738 5874"|"7404667"|"7465 917"|"7468036"|"75062 69"|"7520664"|"752882 4"|"7545367"|"7591582" |"7593755"|"7605846"|" 7634263"|"7646677"|"7 655874"|"7682070"|"77 08457"|"7710456"|"773 2724"|"7761246"|"7763					

		819"|"7772507"|"77781 15"|"7781726"|"779158 8"|"7791597"|"7822469" |"8063892"|"8138488"|" 8143981"|"8167126"|"8 169402"|"8188989"|"81 95313"|"8229535"|"824 8815"|"8263886"|"8263 889"|"8275327"|"82946 70"|"8312495"|"831834 0"|"8368677"|"8371745" |"8373661"|"8410971"|" 8432368"|"8439559"|"8 441450"|"8446713"|"84 56430"|"8477118"|"849 3190"|"8508511"|"8525 777"|"8562489"|"85683 13"|"8576044"|"859359 8"|"8607662"|"8614881" |"8666682"|"8677285"|" 8704787"|"8711093"|"8 724087"|"8730167"|"87 43088"|"8783944"|"879 7153"|"8804993"|"8816 962"|"8824245"|"88477 41"|"8859971"|"886067 4"|"8863219"|"8878657" |"8885856"|"8895911"|" 8905631"|"8908477"|"8 920022"|"8922399"|"89 28452"|"8948832"|"895 4135"|"8975543"|"8994 827"|"9001625"|"90247 33"|"9028134"|"903044 6"|"9034666"|"9039614" |"9041663"|"9042971"|" 9049998"|"9052696"|"9 086717"|"9086738"|"91 00493"|"9101184"|"910 5413"|"9123483"|"9134 807"|"9141087").PN.					
L245	52	("9176577"|"9176598"|" 9202372"|"9213409"|"9 223296"|"9241635"|"92 44438"|"9256209"|"927 7156"|"9350850"|"9386 932"|"9426275"|"94300 42"|"9437357"|"944977 0"|"9501044"|"9520100" |"9532723"|"9542016"|" 9545541"|"9552023"|"9 599964"|"9607505"|"96 20312"|"9627163"|"963 2318"|"9638587"|"9651 922"|"9659482"|"96808 31"|"9709956"|"975343 6"|"9800717"|"9836025" |"9873711"|"9874945"|	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 11:05 AM

		9886006"|"9891590"|"9891651"|"9898032"|"9927902"|"9939923"|"9946297"|"9952558"|"9952682"|"9971305"|"9971405"|"9971407"|"9979426"|"D717679"|"D800172"|"RE41637").PN.					
L246	341583	crown	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 11:06 AM
L247	16	L245 AND L246	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 11:06 AM
L248	86	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$ or US-20150351690-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 11:09 AM

		7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$ or US-4448199-$ or US-5738104-$).did.					
L249	9	L246 AND L248	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 11:09 AM
L250	4	(10942491|10613485|10620591|10599101).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 11:14 AM
L251	49	L244 AND L246	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 11:20 AM
L252	6361313	sensor	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 12:06 PM

L253	23	L251 AND L252	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 12:06 PM
L254	403796	(tactile OR haptic)	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 12:44 PM
L255	30	L245 AND L254	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 12:44 PM
L256	63	L244 AND L254	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 12:51 PM
L259	6581094	optical	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 02:50 PM
L260	92	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$ or US-20150351690-$ or US-20030174590-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 02:50 PM

		8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$ or US-4448199-$ or US-5738104-$ or US-8908477-$ or US-7034237-$ or US-6882596-$ or US-9971405-$ or US-9651922-$).did.					
L261	59	L259 AND L260	(US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO)	OR	ON	ON	2021/05/04 02:50 PM
L262	4	(20140275852|4448199).pn.	(US-PGPUB; USPAT; USOCR; FPRS; EPO;	OR	ON	ON	2021/05/04 03:01 PM

			JPO)				
L263	92	(US-20160350514-$ or US-20160274726-$ or US-20150313542-$ or US-20160367987-$ or US-20160198996-$ or US-20160091965-$ or US-20140278139-$ or US-20140107493-$ or US-20110003665-$ or US-20150026647-$ or US-20140378777-$ or US-20140275852-$ or US-20170071483-$ or US-20170039358-$ or US-20170011210-$ or US-20160379205-$ or US-20150186609-$ or US-20140366123-$ or US-20140276244-$ or US-20140139486-$ or US-20130234850-$ or US-20030175993-$ or US-20160313703-$ or US-20160064804-$ or US-20160064800-$ or US-20150085429-$).did. or (US-20130236699-$ or US-20090124062-$ or US-20150124415-$ or US-20150351690-$ or US-20030174590-$).did. or (US-9848825-$ or US-9737221-$ or US-9737212-$ or US-9704154-$ or US-9629120-$ or US-9622214-$ or US-8738118-$ or US-8727977-$ or US-8630633-$ or US-8617069-$ or US-8527038-$ or US-7674231-$ or US-7474592-$ or US-6694158-$ or US-5722397-$ or US-6443906-$ or US-9288836-$ or US-9423418-$ or US-9091715-$ or US-6431455-$ or US-6350055-$ or US-6255951-$ or US-6158884-$ or US-9781984-$ or US-9575591-$ or US-	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:02 PM

		D727198-$).did. or (US-D728624-$ or US-D737159-$ or US-D741726-$ or US-D752044-$ or US-D758219-$ or US-D758363-$ or US-9459781-$ or US-D768634-$ or US-9507459-$ or US-9547425-$ or US-D790517-$ or US-9288294-$ or US-8596860-$ or US-9791833-$ or US-9591913-$ or US-9680205-$ or US-7654732-$ or US-7682070-$ or US-4903253-$ or US-8766805-$ or US-D578922-$ or US-D647107-$ or US-3577876-$ or US-9300344-$ or US-9615476-$ or US-9625944-$ or US-9627163-$).did. or (US-7286063-$ or US-4448199-$ or US-5738104-$ or US-8908477-$ or US-7034237-$ or US-6882596-$ or US-9971405-$ or US-9651922-$).did.					
L264	176	ely-colin-m.in.	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:13 PM
L265	2438	((touch OR force) NEAr sensor) AND crown AND sensor	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:23 PM
L266	275	("0000005"|"0000055"|"0000072"|"0000073"|"0000078"|"0000555"|"0000726"|"0000728"|"0000786"|"0022019"|"0022020"|"0032019"|"0032020"|"0042020"|"0052019"|"0052020"|"0052585"|"0062019"|"0072019"|"0078949"|"0079467"|"0082019"|"0082020"|"0112019"|"0122019"|"10001817"|"10012550"|"10018966"|"10019097"|"10037006"|"10048802"|"10061399"|"10092203"|	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:23 PM

		"10114342"|"10145711" |"10175652"|"20030174 590"|"20040047244"|"2 0040082414"|"2004013 0971"|"20040264301"|" 20050075558"|"200500 88417"|"20060250377"| "2237860"|"2288215"|"2 497935"|"2771734"|"27 88236"|"2797592"|"304 0514"|"3056030"|"3130 539"|"3355873"|"33621 54"|"3410247"|"349539 8"|"3577876"|"3621649" |"3662618"|"3733803"|" 4007347"|"4031341"|"4 037068"|"4077200"|"41 33404"|"4170104"|"425 8096"|"4287400"|"4289 400"|"4311026"|"43119 90"|"4324956"|"434511 9"|"4364674"|"4379642" |"4395134"|"4396298"|" 4417824"|"4448199"|"4 520306"|"4581509"|"46 00316"|"4617461"|"463 4861"|"4641026"|"4670 737"|"4766642"|"47837 72"|"4884073"|"491483 1"|"4922070"|"4931794" |"4952799"|"4980685"|" 4987299"|"5034602"|"5 177355"|"5214278"|"52 88993"|"5631881"|"584 1050"|"5847335"|"5867 082"|"5943233"|"59530 01"|"5960366"|"596333 2"|"5999168"|"6069567" |"6128006"|"6134189"|" 6154201"|"6175679"|"6 203190"|"6241684"|"62 46050"|"6252825"|"630 4247"|"6355891"|"6361 502"|"6377239"|"63926 40"|"6396006"|"642274 0"|"6477117"|"6502982" |"6525278"|"6556222"|" 6575618"|"6587400"|"6 636197"|"6646635"|"66 61438"|"6672758"|"679 4992"|"6809275"|"6834 430"|"6846998"|"68825 96"|"6888076"|"689640 3"|"6909378"|"6914551" |"6961099"|"6963039"|" 6967903"|"6977868"|"6 982930"|"6985107"|"69 87568"|"6998553"|"701					

		6263"|"7021442"|"7031 228"|"7034237"|"70819 05"|"7102626"|"711136 5"|"7113450"|"7119289" |"7135673"|"7167083"|" 7244927"|"7274303"|"7 286063"|"7292741"|"73 69308"|"7371745"|"738 5874"|"7404667"|"7465 917"|"7468036"|"75062 69"|"7520664"|"752882 4"|"7545367"|"7591582" |"7593755"|"7605846"|" 7634263"|"7646677"|"7 655874"|"7682070"|"77 08457"|"7710456"|"773 2724"|"7761246"|"7763 819"|"7772507"|"77781 15"|"7781726"|"779158 8"|"7791597"|"7822469" |"8063892"|"8138488"|" 8143981"|"8167126"|"8 169402"|"8188989"|"81 95313"|"8229535"|"824 8815"|"8263886"|"8263 889"|"8275327"|"82946 70"|"8312495"|"831834 0"|"8368677"|"8371745" |"8373661"|"8410971"|" 8432368"|"8439559"|"8 441450"|"8446713"|"84 56430"|"8477118"|"849 3190"|"8508511"|"8525 777"|"8562489"|"85683 13"|"8576044"|"859359 8"|"8607662"|"8614881" |"8666682"|"8677285"|" 8704787"|"8711093"|"8 724087"|"8730167"|"87 43088"|"8783944"|"879 7153"|"8804993"|"8816 962"|"8824245"|"88477 41"|"8859971"|"886067 4"|"8863219"|"8878657" |"8885856"|"8895911"|" 8905631"|"8908477"|"8 920022"|"8922399"|"89 28452"|"8948832"|"895 4135"|"8975543"|"8994 827"|"9001625"|"90247 33"|"9028134"|"903044 6"|"9034666"|"9039614" |"9041663"|"9042971"|" 9049998"|"9052696"|"9 086717"|"9086738"|"91 00493"|"9101184"|"910 5413"|"9123483"|"9134 807"|"9141087").PN.					

L267	5	L265 AND L266	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:23 PM
L268	52	("9176577"|"9176598"|"9202372"|"9213409"|"9223296"|"9241635"|"9244438"|"9256209"|"9277156"|"9350850"|"9386932"|"9426275"|"9430042"|"9437357"|"9449770"|"9501044"|"9520100"|"9532723"|"9542016"|"9545541"|"9552023"|"9599964"|"9607505"|"9620312"|"9627163"|"9632318"|"9638587"|"9651922"|"9659482"|"9680831"|"9709956"|"9753436"|"9800717"|"9836025"|"9873711"|"9874945"|"9886006"|"9891590"|"9891651"|"9898032"|"9927902"|"9939923"|"9946297"|"9952558"|"9952682"|"9971305"|"9971405"|"9979426"|"D717679"|"D800172"|"RE41637").PN.	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:24 PM
L269	11	L265 AND L268	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:24 PM
L270	1038	(((touch OR force) NEAr sensor) WITH (screen OR display)) AND crown AND sensor	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:41 PM
L271	412793	watch	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:41 PM
L272	744	L270 AND L271	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:42 PM
L273	82705	(biosensor)	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:42 PM
L274	33	L272 AND L273	(US-PGPUB; USPAT)	OR	ON	ON	2021/05/04 03:42 PM
L275	25	(10942491|10613485|10620591|10627783|10599101).pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/09 10:10 AM
L276	5	(10942491|10613485|10620591|10627783|10599101).pn.	(USPAT)	OR	ON	ON	2022/11/09 10:12 AM
L277	5	(10942491|10613485|10620591|10627783|10599101).pn.	(USPAT)	OR	ON	ON	2022/11/09 10:31 AM

L278	1	"11474483".pn.	(USPAT)	OR	ON	ON	2022/11/09 11:03 AM
L279	250	("0000002" OR "0012021" OR "0012022" OR "0032020" OR "0032021" OR "0042020" OR "0042021" OR "0052020" OR "0052021" OR "0062021" OR "0062022" OR "0072022" OR "0082020" OR "0102022" OR "0112020" OR "0112021" OR "0122020" OR "0122021" OR "10001817" OR "10012550" OR "10018966" OR "10019097" OR "10037006" OR "10037081" OR "10048802" OR "10061399" OR "10066970" OR "10092203" OR "10108016" OR "10114342" OR "10145711" OR "10175652" OR "10190891" OR "10203662" OR "10209148" OR "10216147" OR "10222755" OR "10222756" OR "10222909" OR "10234828" OR "10241593" OR "10296125" OR "10331081" OR "10331082" OR "10332111" OR "10353487" OR "10379629" OR "10386940" OR "10401961" OR "10429959" OR "10474194" OR "10503258" OR "10509486" OR "10524671" OR "10534320" OR "10534900" OR	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 01:49 PM

		"10551798" OR "10572053" OR "10579090" OR "10593617" OR "20020101457" OR "20030174590" OR "20040047244" OR "20040082414" OR "20040130971" OR "20040264301" OR "20050075558" OR "20050088417" OR "20060250377" OR "20070013775" OR "20070050054" OR "20070182708" OR "20070211042" OR "20070222756" OR "20070229671" OR "20070247421" OR "20080130914" OR "20090051649" OR "20090073119" OR "20090122656" OR "20090146975" OR "20090152452" OR "20090217207" OR "20090285443" OR "20090312051" OR "20090312655" OR "20100033430" OR "20100053468" OR "20100081375" OR "20100149099" OR "20110007468" OR "20110090148" OR "20110158057" OR "20110242064" OR "20110270358" OR "20120067711" OR "20120068857" OR "20120075082" OR "20120112859" OR "20120113044" OR "20120206248" OR "20120272784" OR "20130037396" OR "20130087443" OR "20130191220" OR "20130235704" OR "20130261405" OR "20130335196" OR "20140009397" OR "20140045547" OR "20140071098" OR "20140073486" OR "20140132516" OR "20140197936" OR					

		"20140340318" OR "20140347289" OR "20140368442" OR "20140375579" OR "20150049059" OR "20150098309" OR "20150124415" OR "20150186609" OR "20150221460" OR "20150293592" OR "20150320346" OR "20150338642" OR "20150341031" OR "20150366098" OR "20160018846" OR "20160054813" OR "20160058375" OR "20160061636" OR "20160062623" OR "20160069713" OR "20160109861" OR "20160116306" OR "20160147432" OR "20160170598" OR "20160170608" OR "20160170624" OR "20160241688" OR "20160253487" OR "20160306446" OR "20160320583" OR "20160327911" OR "20160338642" OR "20160378069" OR "20160378070" OR "20160378071" OR "20170011210" OR "20170027461" OR "20170031449" OR "20170045958" OR "20170061863" OR "20170069443" OR "20170069444" OR "20170069447" OR "20170090572" OR "20170090599" OR "20170104902" OR "20170139489" OR "20170216519" OR "20170216668" OR "20170238138" OR "20170251561" OR "20170269715" OR "20170285404" OR "20170301314" OR "20170307414" OR "20170331869" OR "20170357465" OR "20180018026" OR					

		"20180059624" OR "20180136686" OR "20180196517" OR "20180225701" OR "20180235491" OR "20180337551" OR "20180364815" OR "20190017846" OR "20190072911" OR "20190072912" OR "20190088583" OR "20190278232" OR "20190317454" OR "20190391539" OR "20200041962" OR "20200064774" OR "20200064779" OR "20200073339" OR "20200110473" OR "20200159172" OR "20200233380" OR "20200233529" OR "20200271483" OR "20200326659" OR "20210055696" OR "20210096688" OR "20210181682" OR "20210181688" OR "20210181690" OR "20210181691" OR "20210181692" OR "20210181865" OR "20210255590" OR "20210373501" OR "20210405594" OR "2237860" OR "2288215" OR "2497935" OR "2771734" OR "2788236" OR "2797592" OR "3040514" OR "3056030" OR "3130539" OR "3355873" OR "3362154" OR "3410247" OR "3495398" OR "3577876" OR "3621649" OR "3662618" OR "3733803" OR "4007347" OR "4031341" OR "4037068" OR "4077200" OR "4133404" OR "4170104" OR					

		"4258096" OR "4274152" OR "4287400" OR "4289400" OR "4311026" OR "4311990" OR "4324956" OR "4345119" OR "4364674" OR "4379642" OR "4395134" OR "4396298" OR "4417824" OR "4448199" OR "4520306" OR "4581509" OR "4600316" OR "4617461" OR "4634861" OR "4641026").pn.					
L280	250	("4670737" OR "4766642" OR "4783772" OR "4884073" OR "4914831" OR "4922070" OR "4931794" OR "4952799" OR "4980685" OR "4987299" OR "5034602" OR "5177355" OR "5214278" OR "5258592" OR "5288993" OR "5347123" OR "5383166" OR "5471054" OR "5477508" OR "5509174" OR "5559761" OR "5572314" OR "5583560" OR "5631881" OR "5726645" OR "5738104" OR "5748111" OR "5825353" OR "5841050" OR "5847335" OR "5867082" OR "5943233" OR "5953001" OR "5960366" OR "5963332" OR "5999168" OR "6069567" OR "6128006" OR	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 01:49 PM

		"6134189" OR "6154201" OR "6175679" OR "6203190" OR "6241684" OR "6246050" OR "6252825" OR "6304247" OR "6355891" OR "6361502" OR "6377239" OR "6392640" OR "6396006" OR "6422740" OR "6477117" OR "6502982" OR "6525278" OR "6556222" OR "6575618" OR "6587400" OR "6636197" OR "6646635" OR "6661438" OR "6672758" OR "6794992" OR "6809275" OR "6834430" OR "6846998" OR "6882596" OR "6888076" OR "6896403" OR "6909378" OR "6914551" OR "6950695" OR "6961099" OR "6963039" OR "6967903" OR "6977868" OR "6982930" OR "6985107" OR "6987568" OR "6998553" OR "7016263" OR "7021442" OR "7031228" OR "7034237" OR "7081905" OR "7102626" OR "7111365" OR "7113450" OR "7119289" OR "7135673" OR "7167083" OR "7187359" OR "7244927" OR "7255473" OR "7265336" OR "7274303" OR					

		"7285738" OR "7286063" OR "7292741" OR "7358481" OR "7369308" OR "7371745" OR "7385874" OR "7404667" OR "7465917" OR "7468036" OR "7506269" OR "7520664" OR "7528824" OR "7545367" OR "7591582" OR "7593755" OR "7605846" OR "7634263" OR "7646677" OR "7655874" OR "7682070" OR "7708457" OR "7710456" OR "7732724" OR "7761246" OR "7763819" OR "7772507" OR "7778115" OR "7781726" OR "7791587" OR "7791588" OR "7791597" OR "7822469" OR "7856255" OR "7858583" OR "7865324" OR "7894957" OR "7946758" OR "8063892" OR "8138488" OR "8143981" OR "8167126" OR "8169402" OR "8188989" OR "8195313" OR "8229535" OR "8248815" OR "8263886" OR "8263889" OR "8275327" OR "8294670" OR "8312495" OR "8318340" OR "8368677" OR "8371745" OR "8373661" OR "8405618" OR "8410971" OR					

		"8432368" OR "8439559" OR "8441450" OR "8446713" OR "8456430" OR "8477118" OR "8493190" OR "8508511" OR "8525777" OR "8562489" OR "8568313" OR "8576044" OR "8593598" OR "8607662" OR "8614881" OR "8666682" OR "8677285" OR "8704787" OR "8711093" OR "8717151" OR "8724087" OR "8730167" OR "8743088" OR "8783944" OR "8797153" OR "8804993" OR "8816962" OR "8824245" OR "8847741" OR "8851372" OR "8859971" OR "8860674" OR "8863219" OR "8878657" OR "8885856" OR "8895911" OR "8905631" OR "8908477" OR "8920022" OR "8922399" OR "8928452" OR "8948832" OR "8954135" OR "8975543" OR "8994827" OR "9001625" OR "9024733" OR "9028134" OR "9030446" OR "9034666" OR "9039614" OR "9041663" OR "9042971" OR "9049998" OR "9052696" OR "9086717" OR "9086738" OR "9091309" OR					

		"9100493" OR "9101184" OR "9105413" OR "9123483" OR "9134807" OR "9141087" OR "9176577" OR "9176598" OR "9202372" OR "9213409" OR "9223296" OR "9241635" OR "9244438" OR "9256209" OR "9277156" OR "9350850" OR "9367146" OR "9386932" OR "9426275" OR "9430042" OR "9437357" OR "9449770" OR "9501044" OR "9520100" OR "9532723" OR "9542016" OR "9545541" OR "9552023" OR "9599964" OR "9600071" OR "9607505" OR "9620312" OR "9627163" OR "9632318" OR "9632537" OR "9638587" OR "9651922" OR "9659482").pn.					
L281	24	("9680831" OR "9709956" OR "9753436" OR "9800717" OR "9836025" OR "9873711" OR "9874945" OR "9886006" OR "9891590" OR "9891651" OR "9898032" OR "9913591" OR "9927902" OR "9939923" OR "9946297" OR "9952558" OR "9952682" OR "9971305" OR "9971405" OR "9971407" OR	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 01:49 PM

		"9979426" OR "D717679" OR "D800172" OR "RE41637").pn.					
L282	1339759	coil	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 02:20 PM
L283	57	L280 AND L282	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 02:20 PM
L284	47	L279 AND L282	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:06 PM
L285	1098	wristwatch AND (coil SAME wireless)	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:16 PM
L286	1209770	antenna	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:16 PM
L287	884	L285 AND L286	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:16 PM
L288	969891	charging	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:19 PM
L289	649	L287 AND L288	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:20 PM
L290	10893332	@ad<="20140902"	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:22 PM
L291	137	L289 AND L290	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:22 PM
L292	6	(coil SAME (optical NEAR (window OR cover)) SAME wireless SAME charg$4)	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:42 PM
L293	1369	(coil SAME ((window OR cover)) SAME wireless SAME charg$4)	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:43 PM
L294	36905	wristwatch	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:44 PM
L295	51	L293 AND L294	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:44 PM
L296	424	((("Rothkopf") near3 ("Fletcher") near3 ("R"))).INV.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/12/14 03:55 PM
L297	424	((("Rothkopf") near3 ("Fletcher") near3 ("R"))).INV.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 03:55 PM
L298	6	(11474483|10942491|10613485|10620591|10627783|10599101).pn.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:05 PM
L299	1209770	antenna	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:25 PM
L300	282172	antenna.clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:25 PM
L301	1	L298 AND L300	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:25 PM

L302	35	L297 AND L300	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:33 PM
L303	207	ely-colin-m.in.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:37 PM
L304	14	L300 AND L303	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/14 04:38 PM
L305	6	L298 AND coil	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/17 11:00 AM
L306	4	L298 AND coil.clm.	(US-PGPUB; USPAT)	OR	ON	ON	2022/12/17 11:00 AM
L307	102	((US-9507459-B2 OR US-9680205-B2 OR US-9591913-B2 OR US-9791833-B1 OR US-8596860-B2 OR US-9288294-B2 OR US-D790517-S OR US-9547425-B2 OR US-7654732-B2 OR US-D768634-S OR US-9459781-B2 OR US-D758363-S OR US-D758219-S OR US-D752044-S OR US-D741726-S OR US-D737159-S OR US-D728624-S OR US-D727198-S OR US-9575591-B2 OR US-9781984-B2 OR US-9627163-B2 OR US-7932893-B1 OR US-9651922-B2 OR US-9971405-B2 OR US-6882596-B2 OR US-7034237-B2 OR US-8908477-B2 OR US-5738104-A OR US-4448199-A OR US-7286063-B2 OR US-9625944-B2 OR US-9615476-B2 OR US-9300344-B2 OR US-3577876-A OR US-D647107-S OR US-D578922-S OR US-8766805-B2 OR US-4903253-A OR US-7682070-B2 OR US-8630633-B1 OR US-5722397-A OR US-6694158-B2 OR US-7474592-B2 OR US-7674231-B2 OR US-8527038-B2 OR US-8617069-B2 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/02/06 11:20 AM

		8727977-B2 OR US-8738118-B2 OR US-9622214-B2 OR US-9629120-B2 OR US-9704154-B2 OR US-9737212-B2 OR US-9737221-B2 OR US-9848825-B2 OR US-6158884-A OR US-6255951-B1 OR US-6350055-B1 OR US-6431455-B1 OR US-9091715-B2 OR US-9423418-B2 OR US-9288836-B1 OR US-6443906-B1 OR US-9386932-B2 OR US-9141087-B2 OR US-9049998-B2 OR US-8948832-B2 OR US-7385874-B2 OR US-11527824-B2 OR US-6825751-B1 OR US-11526034-B1).did. AND USPT.dbnm.) OR ((US-20090124062-A1 OR US-20130236699-A1 OR US-20150085429-A1 OR US-20160064800-A1 OR US-20030174590-A1 OR US-20150351690-A1 OR US-20160064804-A1 OR US-20150124415-A1 OR US-20140107493-A1 OR US-20140278139-A1 OR US-20160091965-A1 OR US-20160198996-A1 OR US-20160367987-A1 OR US-20110003665-A1 OR US-20150313542-A1 OR US-20160274726-A1 OR US-20140366123-A1 OR US-20160313703-A1 OR US-20030175993-A1 OR US-20130234850-A1 OR US-20140139486-A1 OR US-20140276244-A1 OR US-20160350514-A1 OR US-20150186609-A1 OR US-20160379205-A1 OR					

		US-20170011210-A1 OR US-20170039358-A1 OR US-20170071483-A1 OR US-20140275852-A1 OR US-20140378777-A1 OR US-20150026647-A1 OR US-20100292599-A1).did. AND PGPB.dbnm.)					
L308	139	("20070255122"|"20070219419"|"20090018418"|"20080046286"|"8709488"|"20100076321"|"20110028803"|"8137698"|"8795251"|"8808268"|"20030232370"|"20110028803"|"20070219419"|"20100049010"|"8481082"|"8323188"|"20060258920"|"20100222657"|"20130330116"|"20140200423"|"7214190"|"20060205564"|"20070027367"|"20140379273"|"20100010571"|"7844314"|"20100222657"|"20070231393"|"8668935"|"8932636"|"20040122297"|"20130267791"|"20050054907"|"20040122297"|"20060165805"|"20120232918"|"6454707"|"8801690"|"20100049010"|"7214190"|"20100072994"|"6707360"|"20070073558"|"9017729"|"20090118605").PN.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/02/06 11:29 AM
L309	250	("0000002" OR "10001817" OR "10002731" OR "10012550" OR "10018966" OR "10019097" OR "10025399" OR "10037006" OR "10037081" OR "10041813" OR "10048802" OR "10055030" OR "10057470" OR "10061399" OR "10061404" OR "10066970" OR "10092203" OR "10095394" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:32 AM

		"10108016" OR "10114342" OR "10114450" OR "10145711" OR "10145712" OR "10175652" OR "10187364" OR "10190891" OR "10194271" OR "10203662" OR "10209148" OR "10216147" OR "10222755" OR "10222756" OR "10222909" OR "10234828" OR "10241593" OR "10290440" OR "10296125" OR "10331081" OR "10331082" OR "10332111" OR "10353487" OR "10379629" OR "10386940" OR "10401961" OR "10429959" OR "10444862" OR "10444941" OR "10447748" OR "10474194" OR "10503258" OR "10503388" OR "10509486" OR "10520768" OR "10524671" OR "10534320" OR "10534900" OR "10545657" OR "10551798" OR "10561035" OR "10572053" OR "10579090" OR "10593617" OR "10599101" OR "10610157" OR "10613485" OR "10613685" OR "10620591" OR "10627783" OR "10655988" OR "10664074" OR "10685626" OR "10732571" OR "10747467" OR "10765019" OR "10782925" OR "10845764" OR					

		"10852700" OR "10852855" OR "10871385" OR "10884549" OR "10936071" OR "10942491" OR "10948880" OR "10955937" OR "10962930" OR "10962935" OR "10987054" OR "11000193" OR "11002572" OR "11029831" OR "11036318" OR "11148292" OR "11163362" OR "11181863" OR "11194298" OR "11194299" OR "11221590" OR "11347189" OR "11347351" OR "11360440" OR "11385599" OR "11429256" OR "11432766" OR "11451084" OR "11474483" OR "11513613" OR "20020101457" OR "20030174590" OR "20040047244" OR "20040082414" OR "20040130971" OR "20040264301" OR "20050075558" OR "20050088417" OR "20060250377" OR "20070013775" OR "20070050054" OR "20070182708" OR "20070211042" OR "20070222756" OR "20070229671" OR "20070247421" OR "20080130914" OR "20090051649" OR "20090073119" OR "20090122656" OR "20090146975" OR "20090152452" OR "20090217207" OR "20090285443" OR "20090312051" OR "20090312655" OR "20100033430" OR "20100053468" OR					

		"20100081375" OR "20100149099" OR "20110007468" OR "20110090148" OR "20110158057" OR "20110242064" OR "20110270358" OR "20120067711" OR "20120068857" OR "20120075082" OR "20120112859" OR "20120113044" OR "20120206248" OR "20120272784" OR "20130037396" OR "20130087443" OR "20130191220" OR "20130235704" OR "20130261405" OR "20130335196" OR "20140009397" OR "20140045547" OR "20140071098" OR "20140073486" OR "20140132516" OR "20140197936" OR "20140368442" OR "20140375579" OR "20150049059" OR "20150098309" OR "20150124415" OR "20150186609" OR "20150293592" OR "20150320346" OR "20150366098" OR "20160018846" OR "20160147432" OR "20160170624" OR "20160241688" OR "20160320583" OR "20160327911" OR "20160338642" OR "20170027461" OR "20170031449" OR "20170069443" OR "20170069444" OR "20170216519" OR "20170216668" OR "20180059624" OR "20180225701" OR "20190056700" OR "20190072911" OR "20190278232" OR "20200041962" OR "20200064779" OR "20200159172" OR "20210181682" OR "20210181691" OR					

		"20210181692" OR "20210255590" OR "20210303081" OR "20210373501" OR "20210405594" OR "20220043397" OR "20220043402" OR "20220075328" OR "20220261111" OR "20220299944" OR "20220326660" OR "2237860" OR "2288215" OR "2497935" OR "2771734" OR "2788236" OR "2797592" OR "3040514" OR "3056030" OR "3130539" OR "3355873" OR "3362154" OR "3410247" OR "3495398" OR "3577876" OR "3621649" OR "3662618" OR "3733803" OR "3937002" OR "4007347" OR "4031341" OR "4037068" OR "4051665" OR "4077200" OR "4133404" OR "4170104" OR "4258096" OR "4274152" OR "4287400" OR "4289400" OR "4311026" OR "4311990" OR "4324956" OR "4345119" OR "4364674" OR "4379642" OR "4395134" OR "4396298" OR "4417824" OR "4448199" OR "4520306" OR "4581509" OR "4600316" OR "4617461" OR "4634861" OR "4641026" OR "4670737" OR "4766642").pn.					

L310	250	("4783772" OR "4884073" OR "4914831" OR "4922070" OR "4931794" OR "4952799" OR "4980685" OR "4987299" OR "5034602" OR "5177355" OR "5214278" OR "5258592" OR "5288993" OR "5347123" OR "5383166" OR "5471054" OR "5477508" OR "5509174" OR "5559761" OR "5572314" OR "5583560" OR "5631881" OR "5726645" OR "5738104" OR "5748111" OR "5825353" OR "5841050" OR "5847335" OR "5867082" OR "5943233" OR "5953001" OR "5960366" OR "5963332" OR "5999168" OR "6069567" OR "6128006" OR "6134189" OR "6154201" OR "6175679" OR "6203190" OR "6241684" OR "6246050" OR "6252825" OR "6304247" OR "6355891" OR "6361502" OR "6377239" OR "6392640" OR "6396006" OR "6422740" OR "6477117" OR "6502982" OR "6525278" OR "6556222" OR "6575618" OR "6587400" OR "6636197" OR "6646635" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:32 AM

		"6661438" OR "6672758" OR "6794992" OR "6809275" OR "6834430" OR "6846998" OR "6882596" OR "6888076" OR "6896403" OR "6909378" OR "6914551" OR "6950695" OR "6961099" OR "6963039" OR "6967903" OR "6977868" OR "6982930" OR "6985107" OR "6987568" OR "6998553" OR "7009915" OR "7016263" OR "7021442" OR "7031228" OR "7034237" OR "7081905" OR "7102626" OR "7111365" OR "7113450" OR "7119289" OR "7135673" OR "7167083" OR "7187359" OR "7244927" OR "7255473" OR "7265336" OR "7274303" OR "7285738" OR "7286063" OR "7292741" OR "7358481" OR "7369308" OR "7371745" OR "7385874" OR "7404667" OR "7465917" OR "7468036" OR "7506269" OR "7520664" OR "7528824" OR "7545367" OR "7591582" OR "7593755" OR "7605846" OR "7634263" OR "7646677" OR "7655874" OR "7682070" OR					

		"7708457" OR "7710456" OR "7732724" OR "7761246" OR "7763819" OR "7772507" OR "7778115" OR "7781726" OR "7791587" OR "7791588" OR "7791597" OR "7822469" OR "7856255" OR "7858583" OR "7865324" OR "7894957" OR "7946758" OR "8063892" OR "8138488" OR "8143981" OR "8167126" OR "8169402" OR "8188989" OR "8195313" OR "8229535" OR "8248815" OR "8263886" OR "8263889" OR "8275327" OR "8294670" OR "8312495" OR "8318340" OR "8368677" OR "8371745" OR "8373661" OR "8405618" OR "8410971" OR "8432368" OR "8439559" OR "8441450" OR "8446713" OR "8456430" OR "8477118" OR "8493190" OR "8508511" OR "8525777" OR "8562489" OR "8568313" OR "8576044" OR "8593598" OR "8607662" OR "8614881" OR "8666682" OR "8677285" OR "8704787" OR "8711093" OR "8717151" OR "8724087" OR					

		"8730167" OR "8743088" OR "8783944" OR "8797153" OR "8804993" OR "8816962" OR "8824245" OR "8847741" OR "8851372" OR "8859971" OR "8860674" OR "8863219" OR "8878657" OR "8885856" OR "8895911" OR "8905631" OR "8908477" OR "8920022" OR "8922399" OR "8928452" OR "8948832" OR "8954135" OR "8975543" OR "8994827" OR "9001625" OR "9024733" OR "9028134" OR "9030446" OR "9034666" OR "9039614" OR "9041663" OR "9042971" OR "9049998" OR "9052696" OR "9086717" OR "9086738" OR "9091309" OR "9100493" OR "9101184" OR "9105413" OR "9123483" OR "9134807" OR "9141087" OR "9176577" OR "9176598" OR "9202372" OR "9213409" OR "9223296" OR "9241635" OR "9244438" OR "9256209" OR "9277156" OR "9350850" OR "9367146" OR "9386932" OR "9426275" OR "9430042" OR "9437357" OR					

		"9449770" OR "9501044" OR "9520100" OR "9532723" OR "9542016" OR "9545541" OR "9552023" OR "9599964" OR "9600071" OR "9607505" OR "9620312" OR "9627163" OR "9632318" OR "9632537" OR "9638587" OR "9651922" OR "9659482" OR "9680831").pn.					
L311	25	("9709956" OR "9753436" OR "9800717" OR "9836025" OR "9873711" OR "9874945" OR "9886006" OR "9891590" OR "9891651" OR "9891667" OR "9898032" OR "9913591" OR "9921548" OR "9927902" OR "9939923" OR "9946297" OR "9952558" OR "9952682" OR "9971305" OR "9971405" OR "9971407" OR "9979426" OR "D717679" OR "D800172" OR "RE41637").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:32 AM
L312	10893500	@ad<="20140902"	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:33 AM
L313	0	L309 AND L310	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:33 AM
L314	103	L309 AND L312	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:34 AM
L315	240	L310 AND L312	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:41 AM
L316	0	"18075253"	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 11:59 AM
L317	1	"17951973"	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/06 12:02 PM

L318	6	"20150366098"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/02/09 10:24 AM
L319	2	"20150366098".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/02/09 10:31 AM
L320	250	("0000002" OR "10001817" OR "10002731" OR "10012550" OR "10018966" OR "10019097" OR "10025399" OR "10037006" OR "10037081" OR "10041813" OR "10048802" OR "10055030" OR "10057470" OR "10061399" OR "10061404" OR "10066970" OR "10092203" OR "10095394" OR "10108016" OR "10114342" OR "10114450" OR "10145711" OR "10145712" OR "10175652" OR "10187364" OR "10190891" OR "10194271" OR "10203662" OR "10209148" OR "10216147" OR "10222755" OR "10222756" OR "10222909" OR "10234828" OR "10241593" OR "10290440" OR "10296125" OR "10331081" OR "10331082" OR "10332111" OR "10353487" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/09 10:44 AM

		"10379629" OR "10386940" OR "10401961" OR "10429959" OR "10444862" OR "10444941" OR "10447748" OR "10474194" OR "10503258" OR "10503388" OR "10509486" OR "10520768" OR "10524671" OR "10534320" OR "10534900" OR "10545657" OR "10551798" OR "10561035" OR "10572053" OR "10579090" OR "10593617" OR "10599101" OR "10610157" OR "10613485" OR "10613685" OR "10620591" OR "10627783" OR "10655988" OR "10664074" OR "10685626" OR "10732571" OR "10747467" OR "10765019" OR "10782925" OR "10845764" OR "10852700" OR "10852855" OR "10871385" OR "10884549" OR "10936071" OR "10942491" OR "10948880" OR "10955937" OR "10962930" OR "10962935" OR "10987054" OR "11000193" OR "11002572" OR "11029831" OR "11036318" OR "11148292" OR "11163362" OR "11181863" OR "11194298" OR "11194299" OR "11221590" OR "11347189" OR "11347351" OR					

		"11360440" OR "11385599" OR "11429256" OR "11432766" OR "11451084" OR "11474483" OR "11513613" OR "20020101457" OR "20030174590" OR "20040047244" OR "20040082414" OR "20040130971" OR "20040264301" OR "20050075558" OR "20050088417" OR "20060250377" OR "20070013775" OR "20070050054" OR "20070182708" OR "20070211042" OR "20070222756" OR "20070229671" OR "20070247421" OR "20080130914" OR "20090051649" OR "20090073119" OR "20090122656" OR "20090146975" OR "20090152452" OR "20090217207" OR "20090285443" OR "20090312051" OR "20090312655" OR "20100033430" OR "20100053468" OR "20100081375" OR "20100149099" OR "20110007468" OR "20110090148" OR "20110158057" OR "20110242064" OR "20110270358" OR "20120067711" OR "20120068857" OR "20120075082" OR "20120112859" OR "20120113044" OR "20120206248" OR "20120272784" OR "20130037396" OR "20130087443" OR "20130191220" OR "20130235704" OR "20130261405" OR "20130335196" OR "20140009397" OR "20140045547" OR "20140071098" OR					

		"20140073486" OR "20140132516" OR "20140197936" OR "20140368442" OR "20140375579" OR "20150049059" OR "20150098309" OR "20150124415" OR "20150186609" OR "20150293592" OR "20150320346" OR "20150366098" OR "20160018846" OR "20160147432" OR "20160170624" OR "20160241688" OR "20160320583" OR "20160327911" OR "20160338642" OR "20170027461" OR "20170031449" OR "20170069443" OR "20170069444" OR "20170216519" OR "20170216668" OR "20180059624" OR "20180225701" OR "20190056700" OR "20190072911" OR "20190278232" OR "20200041962" OR "20200064779" OR "20200159172" OR "20210181682" OR "20210181691" OR "20210181692" OR "20210255590" OR "20210303081" OR "20210373501" OR "20210405594" OR "20220043397" OR "20220043402" OR "20220075328" OR "20220261111" OR "20220299944" OR "20220326660" OR "2237860" OR "2288215" OR "2497935" OR "2771734" OR "2788236" OR "2797592" OR "3040514" OR "3056030" OR "3130539" OR "3355873" OR "3362154" OR "3410247" OR					

		"3495398" OR "3577876" OR "3621649" OR "3662618" OR "3733803" OR "3937002" OR "4007347" OR "4031341" OR "4037068" OR "4051665" OR "4077200" OR "4133404" OR "4170104" OR "4258096" OR "4274152" OR "4287400" OR "4289400" OR "4311026" OR "4311990" OR "4324956" OR "4345119" OR "4364674" OR "4379642" OR "4395134" OR "4396298" OR "4417824" OR "4448199" OR "4520306" OR "4581509" OR "4600316" OR "4617461" OR "4634861" OR "4641026" OR "4670737" OR "4766642").pn.					
L321	250	("4783772" OR "4884073" OR "4914831" OR "4922070" OR "4931794" OR "4952799" OR "4980685" OR "4987299" OR "5034602" OR "5177355" OR "5214278" OR "5258592" OR "5288993" OR "5347123" OR "5383166" OR "5471054" OR "5477508" OR "5509174" OR "5559761" OR "5572314" OR "5583560" OR "5631881" OR "5726645" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/09 10:44 AM

		"5738104" OR "5748111" OR "5825353" OR "5841050" OR "5847335" OR "5867082" OR "5943233" OR "5953001" OR "5960366" OR "5963332" OR "5999168" OR "6069567" OR "6128006" OR "6134189" OR "6154201" OR "6175679" OR "6203190" OR "6241684" OR "6246050" OR "6252825" OR "6304247" OR "6355891" OR "6361502" OR "6377239" OR "6392640" OR "6396006" OR "6422740" OR "6477117" OR "6502982" OR "6525278" OR "6556222" OR "6575618" OR "6587400" OR "6636197" OR "6646635" OR "6661438" OR "6672758" OR "6794992" OR "6809275" OR "6834430" OR "6846998" OR "6882596" OR "6888076" OR "6896403" OR "6909378" OR "6914551" OR "6950695" OR "6961099" OR "6963039" OR "6967903" OR "6977868" OR "6982930" OR "6985107" OR "6987568" OR "6998553" OR "7009915" OR "7016263" OR "7021442" OR					

		"7031228" OR "7034237" OR "7081905" OR "7102626" OR "7111365" OR "7113450" OR "7119289" OR "7135673" OR "7167083" OR "7187359" OR "7244927" OR "7255473" OR "7265336" OR "7274303" OR "7285738" OR "7286063" OR "7292741" OR "7358481" OR "7369308" OR "7371745" OR "7385874" OR "7404667" OR "7465917" OR "7468036" OR "7506269" OR "7520664" OR "7528824" OR "7545367" OR "7591582" OR "7593755" OR "7605846" OR "7634263" OR "7646677" OR "7655874" OR "7682070" OR "7708457" OR "7710456" OR "7732724" OR "7761246" OR "7763819" OR "7772507" OR "7778115" OR "7781726" OR "7791587" OR "7791588" OR "7791597" OR "7822469" OR "7856255" OR "7858583" OR "7865324" OR "7894957" OR "7946758" OR "8063892" OR "8138488" OR "8143981" OR "8167126" OR "8169402" OR "8188989" OR					

		"8195313" OR "8229535" OR "8248815" OR "8263886" OR "8263889" OR "8275327" OR "8294670" OR "8312495" OR "8318340" OR "8368677" OR "8371745" OR "8373661" OR "8405618" OR "8410971" OR "8432368" OR "8439559" OR "8441450" OR "8446713" OR "8456430" OR "8477118" OR "8493190" OR "8508511" OR "8525777" OR "8562489" OR "8568313" OR "8576044" OR "8593598" OR "8607662" OR "8614881" OR "8666682" OR "8677285" OR "8704787" OR "8711093" OR "8717151" OR "8724087" OR "8730167" OR "8743088" OR "8783944" OR "8797153" OR "8804993" OR "8816962" OR "8824245" OR "8847741" OR "8851372" OR "8859971" OR "8860674" OR "8863219" OR "8878657" OR "8885856" OR "8895911" OR "8905631" OR "8908477" OR "8920022" OR "8922399" OR "8928452" OR "8948832" OR "8954135" OR "8975543" OR					

		"8994827" OR "9001625" OR "9024733" OR "9028134" OR "9030446" OR "9034666" OR "9039614" OR "9041663" OR "9042971" OR "9049998" OR "9052696" OR "9086717" OR "9086738" OR "9091309" OR "9100493" OR "9101184" OR "9105413" OR "9123483" OR "9134807" OR "9141087" OR "9176577" OR "9176598" OR "9202372" OR "9213409" OR "9223296" OR "9241635" OR "9244438" OR "9256209" OR "9277156" OR "9350850" OR "9367146" OR "9386932" OR "9426275" OR "9430042" OR "9437357" OR "9449770" OR "9501044" OR "9520100" OR "9532723" OR "9542016" OR "9545541" OR "9552023" OR "9599964" OR "9600071" OR "9607505" OR "9620312" OR "9627163" OR "9632318" OR "9632537" OR "9638587" OR "9651922" OR "9659482" OR "9680831").pn.					
L322	25	("9709956" OR "9753436" OR "9800717" OR "9836025" OR "9873711" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/09 10:44 AM

		"9874945" OR "9886006" OR "9891590" OR "9891651" OR "9891667" OR "9898032" OR "9913591" OR "9921548" OR "9927902" OR "9939923" OR "9946297" OR "9952558" OR "9952682" OR "9971305" OR "9971405" OR "9971407" OR "9979426" OR "D717679" OR "D800172" OR "RE41637").pn.					
L323	7	(11567457|11474483|10942491|10613485|10620591|10627783|10599101).pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/09 10:47 AM
L324	1	"17951973"	(US-PGPUB; USPAT)	OR	ON	ON	2023/02/09 11:00 AM
L325	5	(11567457|11474483|10942491).pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/02/10 02:19 PM
L326	3	(11567457|11474483|10942491).pn.	(USPAT)	OR	ON	ON	2023/02/10 02:20 PM
L327	1	("6721540").pn.	(US-PGPUB; USPAT)	OR	ON	ON	2023/04/19 11:55 AM
L328	31	("0000002" OR "10060788" OR "10231629" OR "11531306" OR "20010056243" OR "20050116820" OR "20070276270" OR "20080208009" OR "20120221254" OR "20140135594" OR "20150214749" OR "20150355604" OR "20160073914" OR "20160228064" OR "20190025940" OR "20210353226" OR "20230012897" OR "20230013283" OR	(US-PGPUB; USPAT)	OR	ON	ON	2023/04/19 11:57 AM

		"20230028554" OR "20230077241" OR "4129124" OR "4163447" OR "4224948" OR "4248244" OR "4375219" OR "5613008" OR "6075755" OR "6091530" OR "6265789" OR "8810514" OR "9277880").pn.					
L329	104	((US-9507459-B2 OR US-9680205-B2 OR US-9591913-B2 OR US-9791833-B1 OR US-8596860-B2 OR US-9288294-B2 OR US-D790517-S OR US-9547425-B2 OR US-7654732-B2 OR US-D768634-S OR US-9459781-B2 OR US-D758363-S OR US-D758219-S OR US-D752044-S OR US-D741726-S OR US-D737159-S OR US-D728624-S OR US-D727198-S OR US-9575591-B2 OR US-9781984-B2 OR US-9627163-B2 OR US-7932893-B1 OR US-9651922-B2 OR US-9971405-B2 OR US-6882596-B2 OR US-7034237-B2 OR US-8908477-B2 OR US-5738104-A OR US-4448199-A OR US-7286063-B2 OR US-9625944-B2 OR US-9615476-B2 OR US-9300344-B2 OR US-3577876-A OR US-D647107-S OR US-D578922-S OR US-8766805-B2 OR US-4903253-A OR US-7682070-B2 OR US-8630633-B1 OR US-5722397-A OR US-6694158-B2 OR US-7474592-B2 OR US-7674231-B2 OR US-8527038-B2 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 12:56 PM

		8617069-B2 OR US-8727977-B2 OR US-8738118-B2 OR US-9622214-B2 OR US-9629120-B2 OR US-9704154-B2 OR US-9737212-B2 OR US-9737221-B2 OR US-9848825-B2 OR US-6158884-A OR US-6255951-B1 OR US-6350055-B1 OR US-6431455-B1 OR US-9091715-B2 OR US-9423418-B2 OR US-9288836-B1 OR US-6443906-B1 OR US-9386932-B2 OR US-9141087-B2 OR US-9049998-B2 OR US-8948832-B2 OR US-7385874-B2 OR US-11527824-B2 OR US-6825751-B1 OR US-11567457-B2 OR US-11526034-B1).did. AND USPT.dbnm.) OR ((US-20090124062-A1 OR US-20130236699-A1 OR US-20150085429-A1 OR US-20160064800-A1 OR US-20030174590-A1 OR US-20150351690-A1 OR US-20160064804-A1 OR US-20150124415-A1 OR US-20140107493-A1 OR US-20140278139-A1 OR US-20160091965-A1 OR US-20160198996-A1 OR US-20160367987-A1 OR US-20110003665-A1 OR US-20150313542-A1 OR US-20160274726-A1 OR US-20140366123-A1 OR US-20160313703-A1 OR US-20030175993-A1 OR US-20130234850-A1 OR US-20140139486-A1 OR US-20140276244-A1 OR US-20160350514-A1 OR US-20150186609-					

		A1 OR US-20160379205-A1 OR US-20170011210-A1 OR US-20170039358-A1 OR US-20170071483-A1 OR US-20140275852-A1 OR US-20140378777-A1 OR US-20150026647-A1 OR US-20100292599-A1 OR US-20150366098-A1).did. AND PGPB.dbnm.)					
L330	540716	(touch NEAR sensitive)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 12:56 PM
L331	34	L329 AND L330	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 12:56 PM
L332	4	"20140135594".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 01:02 PM
L333	2	"20140214749".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 01:41 PM
L334	2	"20150214749".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 01:42 PM
L335	5	"6265789".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP,	OR	ON	ON	2023/04/19 02:03 PM

			AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L336	5	"5316008".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 02:26 PM
L337	8014731	green	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 02:30 PM
L338	22	L337 AND L329	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/19 02:30 PM
L339	104	((US-9507459-B2 OR US-9680205-B2 OR US-9591913-B2 OR US-9791833-B1 OR US-8596860-B2 OR US-9288294-B2 OR US-D790517-S OR US-9547425-B2 OR US-7654732-B2 OR US-D768634-S OR US-9459781-B2 OR US-D758363-S OR US-D758219-S OR US-D752044-S OR US-D741726-S OR US-D737159-S OR US-D728624-S OR US-D727198-S OR US-9575591-B2 OR US-9781984-B2 OR US-9627163-B2 OR US-7932893-B1 OR US-9651922-B2 OR US-9971405-B2 OR US-6882596-B2 OR US-7034237-B2 OR US-8908477-B2 OR US-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 09:32 AM

		5738104-A OR US-4448199-A OR US-7286063-B2 OR US-9625944-B2 OR US-9615476-B2 OR US-9300344-B2 OR US-3577876-A OR US-D647107-S OR US-D578922-S OR US-8766805-B2 OR US-4903253-A OR US-7682070-B2 OR US-8630633-B1 OR US-5722397-A OR US-6694158-B2 OR US-7474592-B2 OR US-7674231-B2 OR US-8527038-B2 OR US-8617069-B2 OR US-8727977-B2 OR US-8738118-B2 OR US-9622214-B2 OR US-9629120-B2 OR US-9704154-B2 OR US-9737212-B2 OR US-9737221-B2 OR US-9848825-B2 OR US-6158884-A OR US-6255951-B1 OR US-6350055-B1 OR US-6431455-B1 OR US-9091715-B2 OR US-9423418-B2 OR US-9288836-B1 OR US-6443906-B1 OR US-9386932-B2 OR US-9141087-B2 OR US-9049998-B2 OR US-8948832-B2 OR US-7385874-B2 OR US-11527824-B2 OR US-6825751-B1 OR US-11567457-B2 OR US-11526034-B1).did. AND USPT.dbnm.) OR ((US-20090124062-A1 OR US-20130236699-A1 OR US-20150085429-A1 OR US-20160064800-A1 OR US-20030174590-A1 OR US-20150351690-A1 OR US-20160064804-A1 OR US-20150124415-A1 OR US-20140107493-A1 OR US-20140278139-A1 OR					

		US-20160091965-A1 OR US-20160198996-A1 OR US-20160367987-A1 OR US-20110003665-A1 OR US-20150313542-A1 OR US-20160274726-A1 OR US-20140366123-A1 OR US-20160313703-A1 OR US-20030175993-A1 OR US-20130234850-A1 OR US-20140139486-A1 OR US-20140276244-A1 OR US-20160350514-A1 OR US-20150186609-A1 OR US-20160379205-A1 OR US-20170011210-A1 OR US-20170039358-A1 OR US-20170071483-A1 OR US-20140275852-A1 OR US-20140378777-A1 OR US-20150026647-A1 OR US-20100292599-A1 OR US-20150366098-A1).did. AND PGPB.dbnm.)					
L340	503912	("ECG" OR "EKG" OR electrocardiogra$5)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 09:32 AM
L341	31	L339 AND L340	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 09:35 AM
L342	5	"5738104".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 09:47 AM
L343	5	"5316008".pn.	(US-PGPUB; USPAT;	OR	ON	ON	2023/04/20

			USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				09:48 AM
L344	4	"20150026647".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 09:54 AM
L345	2	"20140275852".pn.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 10:59 AM
L346	2	"18075253"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/04/20 11:03 AM
L347	3	"18119175"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/18 01:37 PM
L348	0	"18075253".pn.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/18 01:38 PM
L349	2	"18075253"	(US-PGPUB; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO))	OR	ON	ON	2023/05/18 01:39 PM
L350	104	((US-9507459-B2 OR US-9680205-B2 OR US-9591913-B2 OR US-9791833-B1 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR,	OR	ON	ON	2023/05/18 02:01 PM

		US-8596860-B2 OR US-9288294-B2 OR US-D790517-S OR US-9547425-B2 OR US-7654732-B2 OR US-D768634-S OR US-9459781-B2 OR US-D758363-S OR US-D758219-S OR US-D752044-S OR US-D741726-S OR US-D737159-S OR US-D728624-S OR US-D727198-S OR US-9575591-B2 OR US-9781984-B2 OR US-9627163-B2 OR US-7932893-B1 OR US-9651922-B2 OR US-9971405-B2 OR US-6882596-B2 OR US-7034237-B2 OR US-8908477-B2 OR US-5738104-A OR US-4448199-A OR US-7286063-B2 OR US-9625944-B2 OR US-9615476-B2 OR US-9300344-B2 OR US-3577876-A OR US-D647107-S OR US-D578922-S OR US-8766805-B2 OR US-4903253-A OR US-7682070-B2 OR US-8630633-B1 OR US-5722397-A OR US-6694158-B2 OR US-7474592-B2 OR US-7674231-B2 OR US-8527038-B2 OR US-8617069-B2 OR US-8727977-B2 OR US-8738118-B2 OR US-9622214-B2 OR US-9629120-B2 OR US-9704154-B2 OR US-9737212-B2 OR US-9737221-B2 OR US-9848825-B2 OR US-6158884-A OR US-6255951-B1 OR US-6350055-B1 OR US-6431455-B1 OR US-9091715-B2 OR US-9423418-B2 OR US-9288836-B1 OR US-6443906-B1 OR US-	GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				

		9386932-B2 OR US-9141087-B2 OR US-9049998-B2 OR US-8948832-B2 OR US-7385874-B2 OR US-11527824-B2 OR US-6825751-B1 OR US-11567457-B2 OR US-11526034-B1).did. AND USPT.dbnm.) OR ((US-20090124062-A1 OR US-20130236699-A1 OR US-20150085429-A1 OR US-20160064800-A1 OR US-20030174590-A1 OR US-20150351690-A1 OR US-20160064804-A1 OR US-20150124415-A1 OR US-20140107493-A1 OR US-20140278139-A1 OR US-20160091965-A1 OR US-20160198996-A1 OR US-20160367987-A1 OR US-20110003665-A1 OR US-20150313542-A1 OR US-20160274726-A1 OR US-20140366123-A1 OR US-20160313703-A1 OR US-20030175993-A1 OR US-20130234850-A1 OR US-20140139486-A1 OR US-20140276244-A1 OR US-20160350514-A1 OR US-20150186609-A1 OR US-20160379205-A1 OR US-20170011210-A1 OR US-20170039358-A1 OR US-20170071483-A1 OR US-20140275852-A1 OR US-20140378777-A1 OR US-20150026647-A1 OR US-20100292599-A1 OR US-20150366098-A1).did. AND PGPB.dbnm.)				
L351	47175008	(temperature)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD,	OR	ON	ON	2023/05/18 02:01 PM

			DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L352	60	L350 AND L351	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/18 02:01 PM
L353	1779782	payment	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/18 02:20 PM
L354	10	L350 AND L353	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/18 02:20 PM
L355	4	"20150026647".pn.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, CA, CH, CN, DD, DE, EA, EP, ES, FR, GB, JP, KR, OA, RU, SU, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/05/18 03:07 PM

PE2E SEARCH - Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
N153	0	(wearable AND housing AND band AND display AND (touch NEAR sensor) AND crown AND (rotatable OR rotational OR rotat$4) AND switch AND haptic).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/12 07:07 AM
N154	0	(wearable AND housing AND band AND display AND (touch NEAR sensor) AND crown AND (rotatable OR rotational OR rotat$4)	(US-PGPUB; USPAT)	OR	ON	ON	2018/12/12 07:08 AM

		AND switch AND vibrat$4).clm.					
N234	0	(watch AND housing AND cover AND (touch NEAr display) AND dielectric AND optical AND coil AND wireless AND (heart NEAR rate) AND (electrocardiog$4 OR "ECG" OR "EKG")).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2020/10/22 03:24 PM
N242	1	(housing AND watch AND (band OR strap) AND cover AND dielectric AND coil AND charg$4 AND surface AND electrode AND (heart NEAr rate)).clm.	(US-PGPUB; USPAT)	OR	ON	ON	2020/10/29 01:39 PM

PTO/SB/08A (08-03) U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** *(Use as many sheets as necessary)*	**APPLICATION NO.:** 18/119,175	**FILING DATE:** March 8, 2023
	INVENTOR(S): Fletcher Rothkopf et al.	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P22914USC12

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PATENT NUMBER Number – Kind Code[2] (if known)	ISSUE DATE MM-DD-YYYY	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1.	4,129,124	12/12/1978	Thalmann	
	A2.	4,163,447	8/7/1979	Orr	
	A3.	4,224,948	9/30/1980	Cramer et al.	
	A4.	4,248,244	2/3/1981	Charnitski et al.	
	A5.	4,375,219	3/1/1983	Schmid	
	A6.	5,613,008	05/31/1994	Suga et al.	
	A7.	6,075,755	06/13/2000	Zarchan	
	A8.	6,091,530	06/18/2000	Duckworth	
	A9.	6,265,789	7/24/2001	Honda et al.	
	A10.	9,277,880	3/8/2016	Poeze et al.	
	A11.	10,231,629	3/19/2019	Pei et al.	
	A12.	10,060,788	8/28/2018	Fei	

U.S. PUBLICATION DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PUBLICATION NUMBER Number – Kind Code[2] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Inventor(s) of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	B1.	2001/0056243	12/27/2001	Ohsaki et al.	
	B2.	2005/0116820	6/5/2005	Goldreich	
	B3.	2007/0276270	11/29/2007	Tran	
	B4.	2008/0208009	8/28/2008	Shklarski	
	B5.	2012/0221254	8/30/2012	Kateraas et al.	
	B6.	2014/0135594	5/15/2014	Yuen et al.	
	B7.	2015/0214749	7/30/2015	Park et al.	
	B8.	2015/0355604	12/10/2015	Fraser et al.	
	B9.	2016/0073914	3/17/2016	Lapetina et al.	
	B10.	2016/0228064	8/11/2016	Jung et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.T.G/

FOREIGN PATENT DOCUMENTS						
EXAMINER INITIALS*	Cite No.[1]	DOCUMENT NUMBER Country Code[3] – Number[4] – Kind Code[5] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	C1.	WO1982/00088	1/21/1982	Prime Microelectronic Instruments, Inc.		
	C2.	WO2005/092182	10/6/2005	Seiko Instr Inc		
	C3.	WO2012/140559	10/18/2012	Medic4All		
	C4.	WO2015/116111	8/6/2015	Hewlett-Packard Development Co, L.P.		
	C5.	WO2015/150199	10/8/2015	Koninklijke Philips N.V.		
	C6.	WO2017/165532	9/28/2017	Neumitra Inc		
	C7.	JP2005270543	10/6/2005	Seiko Instr Inc		

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS			
EXAMINER INITIALS*	Cite No.[1]	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T[6]
	D1.	ALDINGER, F. and Weberruβ, V.A., "An Introduction to Structures, Properties, Technologies, Methods" (2010) In: Advanced Ceramics and Future Materials 17 pages	
	D2.	BERBARI, E.J., "Principles of Electrocardiology" (2015) In: The Biomedical Engineering Handbook -4th Edition (Eds: J.D. Bronzin & D.R. Peterson) 5 pages	
	D3.	CANFIELD, D., "Drying and Curing Inks and Coatings on Glass" (March 16, 2013) Glass Magazine 5 pages	
	D4.	DOREMUS, R.H., "Structure, Properties, and Processing" (2008) In: Ceramic and Glass Materials (Eds: J.F. Shackelford & R.H. Doremus) 33 pages	
	D5.	KINGERY, W.D., "Introduction to Ceramics" (1960) Eds: John Wiley & Sons, Inc. 23 pages	
	D6.	FRANCIS, J., "ECG monitoring leads and special leads" (2016) Indian Pacing and Electrophysiology Journal 16:92-95.	
	D7.	LOEHMAN, R.E., "Surfaces, Interfaces, Thin Films" (1993) In: Characterization of Ceramics, Materials Characterization Series (Eds: R.E. Loehman, J.E. Fitzpatrick) 13 pages	
	D8.	MENDELSON, Y. et al., "A Wearable Reflectance Pulse Oximeter for Remote Physiological Monitoring" (Aug 30-Sept 3, 2006) Proceedings of the 28th IEEE, EMBS Annual International Conference New York City 4 pages	
	D9.	MENDELSON, Y., "Wearable Wireless Pulse Oximetry for Physiological Monitoring" (Aug 4, 2008) Presentation - PPL Workshop 34 pages	
	D10.	MEZIANE, N. et al. "Dry Electrodes for Electrocardiography" (2013) Physiol. Meas. 34:R47-R69.	
	D11.	SHI, F., "Progress in Modern Ceramics" (2012) In: Ceramic Materials (Ed: Feng Shi) 6 pages	
	D12.	Declaration of R. James Duckworth, Ph.D, Filed February 27, 2023 in Case No. IPR2023-00634, 187 Pages	
	D13.	Defendant Masimo Corporation's Answer To Complaint and Counterclaims, dated December 12, 2022, Filed in District Court Case 1:22-cv-01378-MN, Masimo Corporation and Sound United, LLC vs. Apple Inc., 904 pages	

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

[1] Applicant's unique citation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

1.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.T.G/

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS			
	D14.	Complaint For Patent Infringement, dated October 20, 2022, Filed in District Court Case 1:22-cv-01378-UNA, Masimo Corporation and Sound United, LLC vs. Apple Inc., 672 pages	
	D15.	Declaration of Sylvia D. Hall-Ellis, Ph.D., Filed February 27, 2023 in Case No. IPR2023-00634, 40 pages	
	D16.	Declaration of Jamie L. Kringstein In Support Of Plaintiff And Counterclaim-Defendant Apple Inc.'s Motion To Dismiss Masimo Corporation's Counterclaims And Strike Its Inequitable Conduct Affirmative Defense, dated February 21, 2023, Filed in District Court Case 1:22-cv-01378-MN-JLH, *Masimo Corporation and Sound United, LLC vs. Apple Inc.*, 52 pages	
	D17.	Plaintiff And Counterclaim-Defendant Apple Inc.'s Memorandum Of Law In Support Of Its Motion To Dismiss Masimo Corporation's Counterclaims And Strike Its Inequitable Conduct Affirmative Defense, dated February 21, 2023, Filed in District Court Case 1:22-cv-01378-MN, *Masimo Corporation and Sound United, LLC vs. Apple Inc.*, 28 pages	
	D18.	Petition For Inter Partes Review Of U.S. Patent No. 10,627,783, Filed February 27, 2023, in Case No. IPR2023-00634, 124 pages	

EXAMINER	DATE CONSIDERED
/BRIAN T GEDEON/	05/18/2023

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

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.T.G/

PTO/SB/08A (08-03) U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** *(Use as many sheets as necessary)*	**APPLICATION NO.:** 18/119,175	**FILING DATE:** March 8, 2023
	INVENTOR(S): Fletcher R. Rothkopf	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P22914USC12

U.S. PATENT DOCUMENTS

EXAMINER INITIALS	Cite No.[1]	PATENT NUMBER Number – Kind Code[2] (if known)	ISSUE DATE MM-DD-YYYY	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1.	2,288,215	06/1942	Taubert et al.	
	A2.	2,237,860	04/1941	Bolle	
	A3.	2,497,935	02/1950	Feurer	
	A4.	2,771,734	11/1956	Morf	
	A5.	2,788,236	04/1957	Kafowi	
	A6.	2,797,592	07/1957	Marrapese	
	A7.	3,040,514	06/1962	Dinstman	
	A8.	3,056,030	09/1962	Kelchner	
	A9.	3,130,539	04/1964	Davis	
	A10.	3,355,873	12/1967	Morf	
	A11.	3,362,154	01/1968	Perret	
	A12.	3,410,247	11/1968	Dronberger	
	A13.	3,495,398	02/1970	Widmer et al.	
	A14.	3,577,876	05/1971	Spadini	
	A15.	3,621,649	11/1971	Vulcan et al.	
	A16.	3,662,618	05/1972	Kroll et al.	
	A17.	3,733,803	05/1973	Hiraga	
	A18.	3,937,002	02/1976	Van Haften	
	A19.	4,007,347	02/1977	Haber	
	A20.	4,031,341	06/1977	Wuthrich et al.	
	A21.	4,037,068	07/1977	Gaynor	
	A22.	4,051,665	10/1977	Arn	
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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.T.G/

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EXAMINER INITIALS	Cite No.[1]	DOCUMENT NUMBER Country Code[3] – Number[4] – Kind Code[5] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.T.G/

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EXAMINER INITIALS	Cite No.[1]	DOCUMENT NUMBER Country Code[3] – Number[4] – Kind Code[5] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
	C198.	WO2020173085	09/2020	Guangdong Lemovt Intelligent Co. Ltd.		

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS			
EXAMINER INITIALS	Cite No.[1]	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T[6]
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EXAMINER	DATE CONSIDERED
/BRIAN T GEDEON/	05/18/2023

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PTO/SB/08A (08-03) U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** *(Use as many sheets as necessary)*	**APPLICATION NO.:** 18/119,175	**FILING DATE:** March 8, 2023
	INVENTOR(S): Fletcher Rothkopf et al.	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P22914USC12

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PATENT NUMBER Number – Kind Code[2] (if known)	ISSUE DATE MM-DD-YYYY	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1.	6,721,540	04/2004	Motomu Hayakawa	

U.S. PUBLICATION DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PUBLICATION NUMBER Number – Kind Code[2] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Inventor(s) of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

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Wed May 24 07:30:58 EDT 2023

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Application	Document	Mailroom Date	Attorney Docket No.
18119175	CTNF	05/24/2023	P22914USC12
18119175	892	05/24/2023	P22914USC12
18119175	1449	05/24/2023	P22914USC12
18119175	1449	05/24/2023	P22914USC12
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Application	Document	Mailroom Date	Attorney Docket No.
18119175	TRACK1.GRANT	04/21/2023	P22914USC12

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/119,175	03/08/2023	Fletcher R. Rothkopf	P22914USC12	4975

62579 7590 04/21/2023

APPLE INC./BROWNSTEIN
c/o Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, CO 80202

EXAMINER	
ART UNIT	PAPER NUMBER

NOTIFICATION DATE	DELIVERY MODE
04/21/2023	ELECTRONIC

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

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patentdocket@bhfs.com

Decision Granting Request for Prioritized Examination (Track I)	**Application No.** 18/119,175	**Applicant(s)** Rothkopf et al.	
	Examiner FIKIRTE A GEREMEW	**Art Unit** OMBL	**AIA (FITF) Status** Yes

1. THE REQUEST FILED 08 March 2023 IS **GRANTED** .

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

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

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

A. filing a **petition for extension of time** to extend the time period for filing a reply;

B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims** , or a multiple dependent claim;

C. filing a **request for continued examination** ;

D. filing a notice of appeal;

E. filing a request for suspension of action;

F. mailing of a notice of allowance;

G. mailing of a final Office action;

H. completion of examination as defined in 37 CFR 41.102; or

I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to FIKIRTE GEREMEW at (703) 756-1930. In his/her absence, calls may be directed to Petition Help Desk at (571) 272-3282.

/FIKIRTE A GEREMEW/ PROGRAM SUPPORT ASSISTANT, OMBL	

PTO/SB/08A (08-03) U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** *(Use as many sheets as necessary)*	**APPLICATION NO.:** 18/119,175	**FILING DATE:** March 8, 2023
	INVENTOR(S): Fletcher Rothkopf et al.	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P22914USC12

U.S. PATENT DOCUMENTS

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	A1.	6,721,540	04/2004	Motomu Hayakawa	

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EXAMINER INITIALS*	Cite No.[1]	PUBLICATION NUMBER Number – Kind Code[2] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Inventor(s) of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

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Electronic Acknowledgement Receipt

EFS ID:	47815706
Application Number:	18119175
International Application Number:	
Confirmation Number:	4975
Title of Invention:	WEARABLE ELECTRONIC DEVICE
First Named Inventor/Applicant Name:	Fletcher R. Rothkopf
Customer Number:	62579
Filer:	Peter James Nagle/Sonya Domingo
Filer Authorized By:	Peter James Nagle
Attorney Docket Number:	P22914USC12
Receipt Date:	10-APR-2023
Filing Date:	08-MAR-2023
Time Stamp:	12:58:01
Application Type:	Utility under 35 USC 111(a)

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1	Transmittal Letter	P22914USC12_IDS_Transmittal.pdf	16015 6ea62c1362dee79d2c0d3f5239853776 7a627f6a	no	2
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Docket No. P22914USC12

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:		
Fletcher R. Rothkopf et al.	Examiner:	Not Yet Assigned
Application No. 18/119,175	Art Unit:	Not Yet Assigned
Filed: March 8, 2023	Confirmation No.	4975
For: WEARABLE ELECTRONIC DEVICE		

INFORMATION DISCLOSURE STATEMENT TRANSMITTAL

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
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Sir:

The Examiner is requested to consider the references noted on the enclosed Form PTO/SB/08A and B during examination of the above-identified patent application. These references are submitted for the Examiner's consideration and are submitted pursuant to the duty of disclosure under 37 C.F.R. § 1.56. In submitting these references, no representation is made or implied that the references are or are not material to the examination of the application. The Examiner is requested to review the cited references and is encouraged to make his or her own determination of materiality of the references cited.

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In accordance with **37 CFR 1.97(b),** the information disclosure statement is being filed before the mailing of a first Office Action on the merits.

FEE AUTHORIZATION

No fee is believed due. However, the Director is hereby authorized to charge any deficiency or credit any overpayment to Deposit Account No. 50-4621.

If the Examiner has any questions, please contact the undersigned attorney.

Dated: April 10, 2023

Respectfully submitted,

/Peter J. Nagle/
Peter J. Nagle, Registration No. 70361
Attorney for Assignee
USPTO Customer No. 62579

Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
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Denver, Colorado 80202
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Application	Document	Mailroom Date	Attorney Docket No.
18119175	APP.FILE.REC	03/30/2023	P22914USC12

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
18/119,175	03/08/2023		1820	P22914USC12	20	3

CONFIRMATION NO. 4975

FILING RECEIPT

62579
APPLE INC./BROWNSTEIN
c/o Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, CO 80202

Date Mailed: 03/30/2023

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Fletcher R. Rothkopf, Los Altos, CA;
Jonathan Ive, San Francisco, CA;
Julian Hoenig, San Francisco, CA;
Rico Zorkendorfer, San Francisco, CA;

Applicant(s)

Apple Inc., Cupertino, CA;

Power of Attorney: The patent practitioners associated with Customer Number 62579

Domestic Priority data as claimed by applicant

This application is a CON of 18/075,253 12/05/2022
which is a CON of 17/951,973 09/23/2022
which is a CON of 17/672,653 02/15/2022 PAT 11,474,483
which is a CON of 17/188,966 03/01/2021
which is a CON of 16/826,130 03/20/2020 PAT 10,942,491
which is a CON of 14/842,617 09/01/2015 PAT 10,599,101
which claims benefit of 62/044,974 09/02/2014
and said 16/826,130 03/20/2020 is a CON of 15/261,917 09/10/2016 PAT 10,627,783
which is a CON of 14/842,617 09/01/2015 PAT 10,599,101
which claims benefit of 62/044,974 09/02/2014
and said 16/826,130 03/20/2020 is a CON of 15/261,914 09/10/2016 PAT 10,613,485
which is a CON of 14/842,617 09/01/2015 PAT 10,599,101
which claims benefit of 62/044,974 09/02/2014

and said 16/826,130 03/20/2020 is a CON of 15/261,912 09/10/2016 PAT 10,620,591
which is a CON of 14/842,617 09/01/2015 PAT 10,599,101
which claims benefit of 62/044,974 09/02/2014
and said 17/672,653 02/15/2022 is a CON of 17/188,995 03/01/2021
which is a CON of 16/826,130 03/20/2020 PAT 10,942,491
which is a CON of 14/842,617 09/01/2015 PAT 10,599,101
which claims benefit of 62/044,974 09/02/2014
and said 16/826,130 03/20/2020 is a CON of 15/261,917 09/10/2016 PAT 10,627,783
which is a CON of 14/842,617 09/01/2015 PAT 10,599,101
which claims benefit of 62/044,974 09/02/2014
and said 16/826,130 03/20/2020 is a CON of 15/261,914 09/10/2016 PAT 10,613,485
which is a CON of 14/842,617 09/01/2015 PAT 10,599,101
which claims benefit of 62/044,974 09/02/2014
and said 16/826,130 03/20/2020 is a CON of 15/261,912 09/10/2016 PAT 10,620,591
which is a CON of 14/842,617 09/01/2015 PAT 10,599,101
which claims benefit of 62/044,974 09/02/2014
This application is a CON of 17/188,966 03/01/2021
and is a CON of 17/188,995 03/01/2021
and is a CON of 17/951,973 09/23/2022

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

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 03/28/2023
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 18/119,175**
Projected Publication Date: 07/06/2023
Non-Publication Request: No
Early Publication Request: No
Title

WEARABLE ELECTRONIC DEVICE

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international

application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

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

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

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

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NOT GRANTED

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 18/119,175

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	320
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	700
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	800
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	* 0			OR	x =	0
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x =	0
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1820

APPLICATION AS AMENDED - PART II

AMENDMENT A

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

AMENDMENT B

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

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

PTO/SB/08A (08-03) U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** *(Use as many sheets as necessary)*	**APPLICATION NO.:** 18/119,175	**FILING DATE:** March 8, 2023
	INVENTOR(S): Fletcher Rothkopf et al.	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P22914USC12

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PATENT NUMBER Number – Kind Code[2] (if known)	ISSUE DATE MM-DD-YYYY	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1.	8,810,514	08/2014	Zhao et al.	

U.S. PUBLICATION DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PUBLICATION NUMBER Number – Kind Code[2] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Inventor(s) of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	B1.	2021/0353226	11/2021	Hiemstra	
	B2.	2023/0077241	03/01/2023	Pandya et al.	

FOREIGN PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	DOCUMENT NUMBER Country Code[3] – Number[4] – Kind Code[5] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T[6]

EXAMINER	DATE CONSIDERED

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

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

[1] Applicant's unique citation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

1.

Electronic Acknowledgement Receipt

EFS ID:	47761069
Application Number:	18119175
International Application Number:	
Confirmation Number:	4975
Title of Invention:	WEARABLE ELECTRONIC DEVICE
First Named Inventor/Applicant Name:	Fletcher R. Rothkopf
Customer Number:	62579
Filer:	Peter James Nagle/Sonya Domingo
Filer Authorized By:	Peter James Nagle
Attorney Docket Number:	P22914USC12
Receipt Date:	29-MAR-2023
Filing Date:	08-MAR-2023
Time Stamp:	14:58:18
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	Transmittal Letter	P22914USC12_IDS_Transmittal.pdf	15971 e41c39a0f7c05f3a5c26ea370c996ba2482c3cda	no	2
Warnings:					

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	P22914USC12_PTO-SB-08_1.pdf	56138 eafb1e177be4d37616dbad25336b4ecc9de9cb3e	no	3
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Information Disclosure Statement (IDS) Form (SB08)	P22914USC12_PTO-SB-08_2.pdf	30939 9b11febfc91b5dea29c8d2bd61eaeb020c7360c2	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
4	Foreign Reference	WO1982000088A1.pdf	3744911 f2d19d518b86eb5e9c6d9dadb14da0dfe6d0cd73	no	28
Warnings:					
Information:					
5	Foreign Reference	WO2005092182.pdf	885621 9a6e3bea797cc41a2bd4f38245a86ac56f3ad635	no	32
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Information:					
6	Foreign Reference	WO2015116111.pdf	2582628 62468d76883230d15849403a4beb2c2421c08abd	no	21
Warnings:					
Information:					
7	Foreign Reference	WO2015150199.pdf	3683369 ab038f1ad0623711098e184f6e9c97bcdb49d576	no	31
Warnings:					
Information:					
8	Foreign Reference	WO2017165532A1.pdf	9974139 86bb062f223739e0273545edc8dfeef3f15641fd	no	101
Warnings:					

Information:					
9	Foreign Reference	JP2005270543A.pdf	891984 d41c301fbf413de1b6783d53a5e6a9c185ded629	no	30
Warnings:					
Information:					
10	Foreign Reference	WO2012140559.pdf	3227809 18a9b9d24d14e049f22e1c7b70bbd7a972f449dc	no	32
Warnings:					
Information:					
11	Non Patent Literature	NPL_Aldinger_2010.pdf	24469916 c88f7e4a5a6fc79d40d6602b4d9381e3b597b53b	no	17
Warnings:					
Information:					
12	Non Patent Literature	NPL_Berbari.pdf	6211276 d093987e7255d996fe7dfd4e89f16ca684ec75c2	no	5
Warnings:					
Information:					
13	Non Patent Literature	NPL_Canfield.pdf	717939 e5fc4daf4ff23ebc7a656786f49a1f0772a656a4	no	5
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Information:					
14	Non Patent Literature	NPL_Doremus_2008.pdf	7338532 dfc8d25b60569baed75d932a8da8b5849601c781	no	33
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Information:					
15	Non Patent Literature	NPL_Kingery_1960.pdf	4492677 b0a0a456ecf26b0cecbfa7652fe60ef02dd0fbce	no	23
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Information:					

16	Non Patent Literature	NPL_Francis_2016.pdf	711964 e5388aad88f25b8cec52995f888512192850 09cb	no	4
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Information:					
17	Non Patent Literature	NPL_Loehman_1993.pdf	8036638 ffdd0b5d72f596bd991577089813630e978 277b5	no	13
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Information:					
18	Non Patent Literature	NPL_Mendelson_2006.pdf	700906 8ff0a4ec82962505677036c94a32cd7493ce c022	no	4
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Information:					
19	Non Patent Literature	NPL_Mendelson_2008.pdf	4012122 07913dadce5e379f3043abb1f1adc154545 2a2b4	no	34
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Information:					
20	Non Patent Literature	NPL_Meziane_2013.pdf	773020 d03c6620b18df6db163a85f4aa5888719c0 6827e	no	23
Warnings:					
Information:					
21	Non Patent Literature	NPL_Shi_2012.pdf	4241760 5225e7989fd89abee40670ac6502f96095a7 a05b	no	6
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Information:					
22	Non Patent Literature	NPL_Declaration_Duckworth.pdf	10439097 1e433bd69161c4574bb18e00cc7dff5be48 6bbe7	no	187
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Information:					

23	Non Patent Literature	NPL-Answer_to_Complaint_904-pgs_part-1.pdf	12340918 810f7723935e0836bc32e331ebc7af04f168de0a	no	300
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24	Non Patent Literature	NPL-Answer_to_Complaint_904_pgs_part-2.pdf	22261319 b4d6f7e37ac5cb72c44068ec88d115a1899-8322d	no	300
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Information:					
25	Non Patent Literature	NPL-Answer_to_Complaint_904_pgs-part-3.pdf	22725767 cab3aef79674e751de365c6362f4e408222ff000	no	304
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26	Non Patent Literature	NPL-Complaint_For_Patent_Infringement_672_pgs-part_1.pdf	14390056 87e402a399d7bc6de9b9e180eb306f2ba9cfccdf	no	200
Warnings:					
Information:					
27	Non Patent Literature	NPL-Complaint_For_Patent_Infringement_672_pgs-part_2.pdf	22990115 2c19fadaeb25f0cd993ddf84147c1b3b18e23737	no	200
Warnings:					
Information:					
28	Non Patent Literature	NPL-Complaint_For_Patent_Infringement_672_pgs-part_3.pdf	19501764 17cea3e7ab0a22da8ea7492a7c80b65bbe0e6f03	no	272
Warnings:					
Information:					
29	Non Patent Literature	NPL_Declaration_Hall-Ellis.pdf	2825812 5bee98ac8a266f5f69980565755 64faabbf27b539	no	40
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Information:					

30	Non Patent Literature	NPL_Declaration_Kringstein_52_pgs.pdf	6359698 687ff29904d4ee2c73a2b6872b2a7eb3b31accf3	no	52
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Information:					
31	Non Patent Literature	NPL-Plantiff_and_Counterclaim_28_pgs.pdf	321245 3c247c3cff0e79187cbc73c76bd856266a7d46a5	no	28
Warnings:					
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32	Non Patent Literature	NPL-Petition_for_IPR_124_pages.pdf	15600498 87a86aa68085ed41f75f6dddcd003474db455fc1	no	124
Warnings:					
Information:					
		Total Files Size (in bytes):	236556548		

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.

<u>New Applications Under 35 U.S.C. 111</u>
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.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
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.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
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.

Docket No. P22914USC12

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:		
Fletcher R. Rothkopf et al.	Examiner:	Not Yet Assigned
Application No. 18/119,175	Art Unit:	Not Yet Assigned
Filed: March 8, 2023	Confirmation No.	4975
For: WEARABLE ELECTRONIC DEVICE		

INFORMATION DISCLOSURE STATEMENT TRANSMITTAL

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

Sir:

The Examiner is requested to consider the references noted on the enclosed Form PTO/SB/08A and B during examination of the above-identified patent application. These references are submitted for the Examiner's consideration and are submitted pursuant to the duty of disclosure under 37 C.F.R. § 1.56. In submitting these references, no representation is made or implied that the references are or are not material to the examination of the application. The Examiner is requested to review the cited references and is encouraged to make his or her own determination of materiality of the references cited.

Pursuant to the requirements of 37 C.F.R. § 1.98(a)(2)(ii), only copies of the foreign references and non-patent literature documents are provided. Copies of the U.S. patent and U.S. patent application publication references are not provided, unless required by the Office.

In accordance with **37 CFR 1.97(b),** the information disclosure statement is being filed before the mailing of a first Office Action on the merits.

FEE AUTHORIZATION

No fee is believed due. However, the Director is hereby authorized to charge any deficiency or credit any overpayment to Deposit Account No. 50-4621.

If the Examiner has any questions, please contact the undersigned attorney.

Dated: March 29, 2023.

Respectfully submitted,

/Peter J. Nagle/

Peter J. Nagle, Registration No. 70361
Attorney for Assignee
USPTO Customer No. 62579

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410 Seventeenth Street
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Fax: (303) 223-1111

PTO/SB/08A (08-03) U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** *(Use as many sheets as necessary)*	**APPLICATION NO.:** 18/119,175	**FILING DATE:** March 8, 2023
	INVENTOR(S): Fletcher Rothkopf et al.	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P22914USC12

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PATENT NUMBER Number – Kind Code[2] (if known)	ISSUE DATE MM-DD-YYYY	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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	A2.	4,163,447	8/7/1979	Orr	
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	C1.	WO1982/00088	1/21/1982	Prime Microelectronic Instruments, Inc.		
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	C7.	JP2005270543	10/6/2005	Seiko Instr Inc		

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS			
EXAMINER INITIALS*	Cite No.[1]	Include name of Author, title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), volume-issue number(s), publisher, page(s) and date.	T[6]
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	D12.	Declaration of R. James Duckworth, Ph.D, Filed February 27, 2023 in Case No. IPR2023-00634, 187 Pages	
	D13.	Defendant Masimo Corporation's Answer To Complaint and Counterclaims, dated December 12, 2022, Filed in District Court Case 1:22-cv-01378-MN, Masimo Corporation and Sound United, LLC vs. Apple Inc., 904 pages	

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

[1] Applicant's unique citation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3) [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.
1.

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS			
	D14.	Complaint For Patent Infringement, dated October 20, 2022, Filed in District Court Case 1:22-cv-01378-UNA, Masimo Corporation and Sound United, LLC vs. Apple Inc., 672 pages	
	D15.	Declaration of Sylvia D. Hall-Ellis, Ph.D., Filed February 27, 2023 in Case No. IPR2023-00634, 40 pages	
	D16.	Declaration of Jamie L. Kringstein In Support Of Plaintiff And Counterclaim-Defendant Apple Inc.'s Motion To Dismiss Masimo Corporation's Counterclaims And Strike Its Inequitable Conduct Affirmative Defense, dated February 21, 2023, Filed in District Court Case 1:22-cv-01378-MN-JLH, *Masimo Corporation and Sound United, LLC vs. Apple Inc.*, 52 pages	
	D17.	Plaintiff And Counterclaim-Defendant Apple Inc.'s Memorandum Of Law In Support Of Its Motion To Dismiss Masimo Corporation's Counterclaims And Strike Its Inequitable Conduct Affirmative Defense, dated February 21, 2023, Filed in District Court Case 1:22-cv-01378-MN, *Masimo Corporation and Sound United, LLC vs. Apple Inc.*, 28 pages	
	D18.	Petition For Inter Partes Review Of U.S. Patent No. 10,627,783, Filed February 27, 2023, in Case No. IPR2023-00634, 124 pages	

EXAMINER	DATE CONSIDERED

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

United States Patent and Trademark Office

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I20233RG07336117	1830	PROCESSING FEE, EXCEPT PROV. APPLS.	$140.00	Deposit Account

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor(s):	Fletcher R. Rothkopf et al.		
App. No.:	18/119,175	Con. No.:	4975
Filed:	March 8, 2023	Art Unit:	Not Yet Assigned
Title:	WEARABLE ELECTRONIC DEVICE	Examiner:	Not Yet Assigned

PRELIMINARY AMENDMENT

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

Commissioner:

Please amend the above-identified application as follows:

Amendments to the Claims begin on page 2 of this paper.

Remarks begin on page 6 of this paper.

Amendments to the Claims:

1–20. (Cancelled)

21. (New) An electronic watch comprising:

a touch-sensitive display;

a housing at least partially surrounding the touch-sensitive display;

a front cover positioned over the touch-sensitive display at a front of the housing;

a rear cover positioned at a rear of the housing;

a light source positioned below the rear cover and configured to emit light through the rear cover;

a photodetector positioned below the rear cover and configured to produce a first signal in response to receiving a reflected portion of the light emitted by the light source;

a first electrode positioned at the rear of the housing and configured to produce a second signal;

a second electrode positioned at a side of the housing and configured to produce a third signal; and

a processing unit operably coupled to the photodetector and the first and second electrodes, the processing unit configured to compute a first health metric using the first signal produced by the photodetector and configured to compute a second health metric using the second and third signals produced by the first and second electrodes, respectively.

22. (New) The electronic watch of claim 21, wherein:

the light source and the photodetector are configured to operate as a photoplethysmography sensor; and

the first health metric is a heart rate.

23. (New) The electronic watch of claim 21, wherein:

the first electrode and the second electrode are configured to operate as an electrocardiographic sensor; and

the second health metric is an electrocardiograph.

24. (New) The electronic watch of claim 21, wherein:

the photodetector is a first photodetector of a set of photodetectors; and

the set of photodetectors is arranged around a central region of the rear cover.

25. (New) The electronic watch of claim 21, wherein:

the housing defines a rear housing surface;

the rear cover defines a cover surface that extends outward from the rear housing surface of the housing;

the rear cover defines a first window positioned over the light source and a second window positioned over the photodetector; and

the first window and the second window are positioned along the cover surface that extends outward from the rear housing surface of the housing.

26. (New) The electronic watch of claim 21, wherein the electronic watch further comprises a temperature sensor configured to measure body temperature.

27. (New) The electronic watch of claim 21, wherein:

the electronic watch further comprises a speaker; and

the speaker is configured to produce an audio output in response to a touch detected by the touch-sensitive display.

28. (New) The electronic watch of claim 21, further comprising a power interface positioned at the rear of the housing and configured to receive power from an external charging device.

29. (New) The electronic watch of claim 21 wherein:

the electronic watch further comprises a near-field communication interface configured to communicate wirelessly with an external payment device; and

the electronic watch is configured to authorize a purchase with the external payment device using the near-field communication interface.

30. (New) A wearable electronic device comprising:

a housing defining a first portion of a rear surface and aside surface of the wearable electronic device;

a front cover coupled to the housing and defining a front surface of the wearable electronic device;

a touch-sensitive display positioned below the front cover;

a rear cover coupled to the housing and defining a second portion of the rear surface of the wearable electronic device;

a light source configured to emit light through the rear cover;

a photodetector configured to detect reflected light in response to the emission of the light by the light source;

a first electrode positioned at the rear surface of the wearable electronic device;

a second electrode positioned at the side surface of the wearable electronic device; and

a processing unit operably coupled to the photodetector and configured to compute a first health metric in response to the reflected light detected by the photodetector and configured to compute a second health metric in response to signals received by the first and second electrodes.

31. (New) The wearable electronic device of claim 30, wherein:

the first health metric is a heart rate of a user; and

the second health metric is an electrocardiogram of the user.

32. (New) The wearable electronic device of claim 30, wherein the second portion of the rear surface defined by the rear cover protrudes with respect to the first portion of the rear surface defined by the housing.

33. (New) The wearable electronic device of claim 32, wherein:

the rear cover defines a set of windows arranged along the second portion of the rear surface;

the light source is positioned below a first window of the set of windows; and

the photodetector is positioned below a second window of the set of windows.

34. (New) The wearable electronic device of claim 33, wherein:

the photodetector is a first photodetector of a set of photodetectors; and

each photodetector of the set of photodetectors is positioned below a respective window of the set of windows.

35. (New) A wearable electronic device comprising:

a housing;

a touch-sensitive display at least partially surrounded by the housing;

a rear cover coupled to the housing;

a light source configured to emit a light through the rear cover;

a photodetector configured to produce a first output in response to an emission of the light by the light source;

a first electrode positioned along a rear surface of the wearable electronic device and configured to produce a second output;

a second electrode positioned along a side surface of the wearable electronic device and configured to produce a third output; and

a processing unit operably coupled to the photodetector, the first electrode, and the second electrode, the processing unit configured to compute a first health metric in response to the first output and a second health metric in response to the second and third outputs.

36. The wearable electronic device of claim 35, wherein the photodetector is configured to measure a change in light absorption by a region of skin of a user.

37. The wearable electronic device of claim 35, wherein:

the first health metric is a heart rate of a user based on a detected blood perfusion of the user; and

the second health metric is an electrocardiogram based on an electrical response of the user.

38. The wearable electronic device of claim 35, wherein the first health metric is a blood oxygenation level of a user.

39. The wearable electronic device of claim 35, wherein the first health metric is a respiration rate of a user.

40. The wearable electronic device of claim 35, wherein the wearable electronic device further comprises a temperature sensor configured to measure a body temperature of a user.

REMARKS

This preliminary amendment cancels claims 1-20 without prejudice or disclaimer of the subject matter therein and adds new claims 21-40. No new matter is added.

The Assignee believes no additional fees or petitions are due with this filing. However, should any such fees or petitions be required, please consider this a request therefor and authorization to charge Deposit Account No. 504621 as necessary.

If the Examiner should require any additional information or amendment, please contact the undersigned attorney.

Dated: March 9, 2023

Respectfully submitted,

/Benno M. Guggenheimer/

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Electronic Acknowledgement Receipt	
EFS ID:	47659651
Application Number:	18119175
International Application Number:	
Confirmation Number:	4975
Title of Invention:	WEARABLE ELECTRONIC DEVICE
First Named Inventor/Applicant Name:	Fletcher R. Rothkopf
Customer Number:	62579
Filer:	Benno Maxim Guggenheimer/Sonya Domingo
Filer Authorized By:	Benno Maxim Guggenheimer
Attorney Docket Number:	P22914USC12
Receipt Date:	09-MAR-2023
Filing Date:	
Time Stamp:	16:50:24
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	Transmittal Letter	P22914USC12_IDS_Transmittal.pdf	20047 ac7bb65655b17835e80b9f3c4997957604d0a285	no	2
Warnings:					

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	P22914USC12_PTO-SB-08.pdf	178000 fd5e9fe6149194d4bc30855353ef571f52cc9278	no	19
Warnings:					
Information:					
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3	Foreign Reference	CN103919536.pdf	3822739 0a6ab4735dc25f02b6e76ee9cd33ef072102d812	no	62
Warnings:					
Information:					
4	Foreign Reference	CN114220694A_w_Translation.pdf	1377667 5189ffdb3e00727c434330da6b054b0476e66ab0	no	35
Warnings:					
Information:					
5	Foreign Reference	JP2017219448A.pdf	778692 dcb08de3cffa8641adf44e9f350e8a66a72c3282	no	18
Warnings:					
Information:					
6		P22914USC12_Preliminary_Amendment.pdf	34207 37c28bcf41c6e869a83d87926b243579c22b736b	yes	6

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Preliminary Amendment	1	1
	Claims	2	5
	Applicant Arguments/Remarks Made in an Amendment	6	6

Warnings:	
Information:	
Total Files Size (in bytes):	6211352

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.

Docket No. P2294USC12

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:		
Fletcher R. Rothkopf et al.	Examiner:	Not Yet Assigned
Application No. 18/119,175	Art Unit:	Not Yet Assigned
Filed: March 8, 2023	Confirmation No.	4975
For: WEARABLE ELECTRONIC DEVICE		

INFORMATION DISCLOSURE STATEMENT TRANSMITTAL

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

Sir:

The Examiner is requested to consider the references noted on the enclosed Form PTO/SB/08A and B during examination of the above-identified patent application. These references are submitted for the Examiner's consideration and are submitted pursuant to the duty of disclosure under 37 C.F.R. § 1.56. In submitting these references, no representation is made or implied that the references are or are not material to the examination of the application. The Examiner is requested to review the cited references and is encouraged to make his or her own determination of materiality of the references cited.

Pursuant to the requirements of 37 C.F.R. § 1.98(a)(2)(ii), only copies of the foreign references and non-patent literature documents are provided. Copies of the U.S. patent and U.S. patent application publication references are not provided, unless required by the Office.

Pursuant to 37 C.F.R. § 1.98(d), copies of all foreign and non-patent literature references cited on the attached Form PTO/SB/08A and B were previously furnished to or cited by the Patent Office in parent Application No. 18/075,253, filed December 5, 2022. Any references not previously provided are provided herewith.

In accordance with **37 CFR 1.97(b),** the information disclosure statement is being filed before the mailing of a first Office Action on the merits.

STATEMENT OF RELATEDNESS UNDER M.P.E.P. § 2001.06(b)

In satisfaction of the duty of disclosure under 37 C.F.R. § 1.56, and as required by M.P.E.P §2001.06(b), the Examiner is requested to consider the pending application(s) listed below which are owned by the Assignee of the present application. The pending application(s) may include subject matter similar to that of the present application.

- U.S. Patent Application Serial No. 17/840,222; filed June 14, 2022; pending
- U.S. Patent Application Serial No. 17/989,057; filed November 17, 2022; pending
- U.S. Patent Application Serial No. 18/074,358; filed December 2, 2022; pending
- U.S. Patent Application Serial No. 18/075,253; filed December 5, 2023; pending
- U.S. Patent Application Serial No. 18/094,930; filed January 8, 2023; pending
- U.S. Patent Application Serial No. 18/106,912; filed February 7, 2023; pending

FEE AUTHORIZATION

No fee is believed due. However, the Director is hereby authorized to charge any deficiency or credit any overpayment to Deposit Account No. 50-4621.

If the Examiner has any questions, please contact the undersigned attorney.

Dated: March 9, 2021.

Respectfully submitted,

/Benno M. Guggenheimer/

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PTO/SB/08A (08-03) U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE Substitute for Form 1449A/PTO **INFORMATION DISCLOSURE STATEMENT BY APPLICANT** *(Use as many sheets as necessary)*	**APPLICATION NO.:** 18/119,175	**FILING DATE:** March 8, 2023
	INVENTOR(S): Fletcher R. Rothkopf	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P22914USC12

U.S. PATENT DOCUMENTS

EXAMINER INITIALS	Cite No.[1]	PATENT NUMBER Number – Kind Code[2] (if known)	ISSUE DATE MM-DD-YYYY	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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EXAMINER INITIALS	Cite No.[1]	PATENT NUMBER Number – Kind Code[2] (if known)	ISSUE DATE MM-DD-YYYY	Name of Patentee of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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	A64.	5,477,508	12/1995	Will	
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Portable Biometric Monitoring Devices And Methods Of Operating Same

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Abstract of CN103919536 (A)

The present inventions, in one aspect, are directed to portable biometric monitoring device including a housing having a physical size and shape that is adapted to couple to the user's body, at least one band to secure the monitoring device to the user, a physiological sensor, disposed in the housing, to generate data which is representative of a physiological condition of the user data. The physiological sensor may include a light source to generate and output light having at least a first wavelength, and a photodetector to detect scattered light (e.g., from the user). A light pipe is disposed in the housing and optically coupled to the light source directs/transmits light therefrom along a predetermined path to an outer surface of the housing. Processing circuitry calculates a heart rate of the user using data which is representative of the scattered light.

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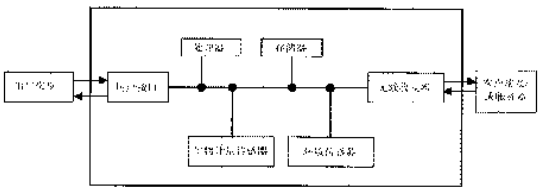
(54)发明名称

便携式生物计量监测装置及其操作方法

(57)摘要

本申请案针对于便携式生物计量监测装置及其操作方法。在一个方面中，本发明针对于便携式生物计量监测装置，其包含：壳体，其具有适于耦合到用户的身体的物理大小及形状；至少一个带，其用以将所述监测装置紧固到所述用户；生理传感器，其安置于所述壳体中以产生表示用户数据的生理条件的数据。所述生理传感器可包含：光源，其用以产生且输出具有至少第一波长的光；及光电检测器，其用以检测（例如，来自所述用户的）所散射光。光管安置于所述壳体中且光学耦合到所述光源以沿预定路径将光从所述光源引导/透射到所述壳体的外表面。处理电路使用表示所述所散射光的数据来计算所述用户的心率。



CN 103919536 A

1. 一种便携式生物计量监测装置，其包括：

壳体，其具有适于耦合到用户的身体的物理大小及形状；

至少一个带，其耦合到所述壳体以将所述便携式生物计量监测装置紧固到所述用户；

生理传感器，其安置于所述壳体中以产生表示用户数据的生理条件的数据，所述生理传感器包含：

第一光源，其安置于所述壳体中以产生且输出具有至少第一波长的光，及

光电检测器，其安置于所述壳体中以检测所散射光；

第一光管，其安置于所述壳体中且光学耦合到所述第一光源以沿预定路径将光从所述第一光源引导或透射到所述壳体的外表面；及

处理电路，其安置于所述壳体中以使用表示所述所散射光的数据来计算所述用户的心率。

2. 根据权利要求 1 所述的便携式生物计量监测装置，其中所述第一光管包含光学滤波材料以选择性地透射具有所述至少第一波长的光。

3. 根据权利要求 2 所述的便携式生物计量监测装置，其中具有所述至少第一波长的所述光是对应于绿色光谱的光。

4. 根据权利要求 3 所述的便携式生物计量监测装置，其中具有所述至少第一波长的所述光是对应于红外光谱的光。

5. 根据权利要求 1 所述的便携式生物计量监测装置，其中所述壳体包含窗，其中所述窗包含具有第一光学性质的第一部分及具有第二光学性质的第二部分，其中所述第一光管为所述第一部分。

6. 根据权利要求 1 所述的便携式生物计量监测装置，其中所述壳体包含提供所述便携式生物计量监测装置的外表面且经配置以啮合或接触所述用户的皮肤的窗，其中所述窗包含具有第一光学性质的第一部分及具有第二光学性质的第二部分，其中所述第一光管安置于所述第一部分中或为所述第一部分的一部分。

7. 根据权利要求 6 所述的便携式生物计量监测装置，其中所述窗的所述第二部分至少对具有所述至少第一波长的光是光学上不透明的。

8. 根据权利要求 6 所述的便携式生物计量监测装置，其中所述窗对可见光谱中的光是光学上不透明的。

9. 根据权利要求 6 所述的便携式生物计量监测装置，其进一步包含第二光管，所述第二光管安置于所述壳体中且光学耦合到所述光电检测器以沿预定路径将光从所述壳体的外表面引导或透射到所述光电检测器。

10. 根据权利要求 9 所述的便携式生物计量监测装置，其中所述窗进一步包含具有第三光学性质的第三部分，其中所述第二光管安置于所述第三部分中或为所述第三部分的一部分。

11. 根据权利要求 9 所述的便携式生物计量监测装置，其中所述窗的所述第一部分及所述窗的所述第三部分由所述窗的第二部分间隔开及分离。

12. 根据权利要求 1 所述的便携式生物计量监测装置，其中所述壳体包含具有弯曲外表面的窗，其中所述窗的所述弯曲外表面安置于所述装置的内部或皮肤侧上，且其中所述装置的所述内部或皮肤侧经配置以啮合或接触所述用户的所述皮肤。

13. 根据权利要求 1 所述的便携式生物计量监测装置，其中所述壳体包含所述装置的内部或皮肤侧的外表面上的多个隆起或凹陷区域，其中所述装置的所述内部或皮肤侧经配置以啮合或接触所述用户的所述皮肤。

14. 根据权利要求 1 所述的便携式生物计量监测装置，其中所述壳体包含所述装置的内部或皮肤侧的外表面上的摩擦增强材料，其中所述装置的所述内部或皮肤侧经配置以啮合或接触所述用户的所述皮肤。

15. 根据权利要求 1 所述的便携式生物计量监测装置，其中所述壳体包含位于所述装置的内部或皮肤侧的外表面上的顺应部分，所述顺应部分经配置以啮合或接触所述用户的所述皮肤，其中所述顺应部分经配置以使其形状符合所述生物计量监测装置在操作期间耦合或附接到的所述用户的身体部分的形状。

16. 一种便携式生物计量监测装置，其包括：

壳体，其具有适于耦合到用户的身体的物理大小及形状，其中所述壳体的皮肤或内部侧包含突出部分，所述突出部分 (i) 经配置以啮合或接触所述用户的皮肤且 (ii) 包含弯曲外部表面；

至少一个带，其耦合到所述壳体以将所述便携式生物计量监测装置紧固到所述用户；

生理传感器，其安置于所述壳体中以产生表示用户数据的生理条件的数据，所述生理传感器包含：

第一光源，其安置于所述壳体中以产生且输出具有至少第一波长的光，及

光电检测器，其安置于所述壳体中以检测所散射光；

第一光管，其安置于所述壳体的所述突出部分中且光学耦合到所述第一光源以沿预定路径将光从所述第一光源引导或透射到所述壳体的所述皮肤或内部侧的外表面；及

处理电路，其安置于所述壳体中以使用表示所述所散射光的数据来计算所述用户的心率。

17. 根据权利要求 16 所述的便携式生物计量监测装置，其中所述壳体的所述突出部分包含提供所述壳体的外表面的窗，其中所述窗包含具有第一光学性质的第一部分及具有第二光学性质的第二部分，其中所述第一光管安置于所述第一部分中或为所述第一部分的一部分。

18. 根据权利要求 17 所述的便携式生物计量监测装置，其中所述窗的所述第二部分至少对具有所述第一波长的光是光学上不透明的。

19. 根据权利要求 17 所述的便携式生物计量监测装置，其中所述窗对可见光谱中的光是光学上不透明的。

20. 根据权利要求 16 所述的便携式生物计量监测装置，其进一步包含第二光管，所述第二光管安置于所述壳体的所述突出部分中且光学耦合到所述光电检测器以沿预定路径将光从所述壳体的外表面引导或透射到所述光电检测器。

21. 根据权利要求 20 所述的便携式生物计量监测装置，其中所述窗进一步包含具有第三光学性质的第三部分，其中所述第二光管安置于所述第三部分中或为所述第三部分的一部分。

22. 根据权利要求 16 所述的便携式生物计量监测装置，其中所述壳体的所述突出部分包含所述装置的内部或皮肤侧上的多个隆起或凹陷区域，其中所述装置的所述内部或皮肤

侧经配置以啮合或接触所述用户的所述皮肤。

23. 根据权利要求 16 所述的便携式生物计量监测装置，其进一步包含垫圈，所述垫圈与所述突出部分的端部分并置且与所述突出部分的端部分压缩在一起。

24. 一种便携式生物计量监测装置，其包括：

壳体，其具有适于耦合到用户的身体的物理大小及形状，所述壳体包含装置主体及经配置以啮合或接触所述用户的皮肤的突出部分，其中所述突出部分啮合垫圈；

至少一个带，其耦合到所述壳体以将所述便携式生物计量监测装置紧固到所述用户；

生理传感器，其安置于所述壳体中以产生表示用户数据的生理条件的数据，所述生理传感器包含：

光源，其安置于所述壳体中以产生且输出具有至少第一波长的光，及

光电检测器，其安置于所述壳体中以检测所散射光；

其中所述突出部分包含所述壳体的皮肤或内部侧的外表面以借此啮合或接触所述用户的所述皮肤，其中所述突出部分包含具有第一光学性质的第一部分及具有第二光学性质的第二部分，且其中所述突出部分的所述第一部分光学耦合到所述光源以沿预定路径将光从所述光源引导或透射到所述壳体的所述皮肤或内部侧的所述外表面；及

处理电路，其安置于所述壳体中以使用表示所述所散射光的数据来计算所述用户的心率。

25. 根据权利要求 24 所述的便携式生物计量监测装置，其中所述突出部分的所述第二部分至少对具有所述第一波长的光是光学上不透明的。

26. 根据权利要求 24 所述的便携式生物计量监测装置，其中所述突出部分对可见光谱中的光是光学上不透明的。

27. 根据权利要求 24 所述的便携式生物计量监测装置，其中所述突出部分进一步包含第三部分，所述第三部分光学耦合到所述光电检测器以沿预定路径将光从所述壳体的外表面引导或透射到所述光电检测器。

28. 根据权利要求 27 所述的便携式生物计量监测装置，其中所述壳体的所述突出部分经由粘合剂附接到所述装置主体，且其中所述垫圈及所述粘合剂提供不透液密封。

29. 根据权利要求 24 所述的便携式生物计量监测装置，其中提供所述壳体的所述皮肤或内部侧的所述外表面的突出部分包含弯曲外部表面。

30. 根据权利要求 24 所述的便携式生物计量监测装置，其中所述装置主体包含安置于其上的硬涂漆层、硬浸涂层或抗反射光学涂层。

便携式生物计量监测装置及其操作方法

技术领域

[0001] 本发明针对于一种生物计量监测装置以及用以从嵌入式或常驻传感器及/或外部装置收集一种或一种以上类型的生理及/或环境数据并将此信息传递或转送到其它装置或其它因特网可视源的方法及技术。(参见,举例来说,图1)。

背景技术

[0002] 当用户正佩戴或操纵生物计量监测装置时,所述装置可经由一个或多个传感器检测到生理度量中的一个生理度量或许多生理度量,包含但不限于用户的心率。

[0003] 所述装置可具有直接在所述装置上的用户接口,所述用户接口指示可获得及/或正跟踪/获取的数据类型中的一者或一者以上的状态。所述用户接口还可用于显示来自其它装置或因特网源的数据。

[0004] 所述装置可实施无线通信,使得当用户及装置进入无线基站或接入点的范围内时,所存储数据自动上传到因特网可视源,例如网站。

发明内容

[0005] 在一个实施例中,一种便携式生物计量监测装置包括:壳体,其具有适于耦合到用户的身体的物理大小及形状;至少一个带,其耦合到所述壳体以将所述便携式生物计量监测装置紧固到所述用户;生理传感器,其安置于所述壳体中以产生表示用户数据的生理条件的数据,所述生理传感器包含:第一光源,其安置于所述壳体中以产生且输出具有至少第一波长的光,及光电检测器,其安置于所述壳体中以检测所散射光;第一光管,其安置于所述壳体中且光学耦合到所述第一光源以沿预定路径将光从所述第一光源引导或透射到所述壳体的外表面;及处理电路,其安置于所述壳体中以使用表示所述所散射光的数据来计算所述用户的心率。

[0006] 在另一实施例中,一种便携式生物计量监测装置包括:壳体,其具有适于耦合到用户的身体的物理大小及形状,其中所述壳体的皮肤或内部侧包含突出部分,所述突出部分(i)经配置以啮合或接触所述用户的皮肤且(ii)包含弯曲外部表面;至少一个带,其耦合到所述壳体以将所述便携式生物计量监测装置紧固到所述用户;生理传感器,其安置于所述壳体中以产生表示用户数据的生理条件的数据,所述生理传感器包含:第一光源,其安置于所述壳体中以产生且输出具有至少第一波长的光,及光电检测器,其安置于所述壳体中以检测所散射光;第一光管,其安置于所述壳体的所述突出部分中且光学耦合到所述第一光源以沿预定路径将光从所述第一光源引导或透射到所述壳体的所述皮肤或内部侧的外表面;及处理电路,其安置于所述壳体中以使用表示所述所散射光的数据来计算所述用户的心率。

[0007] 在又一实施例中,一种便携式生物计量监测装置包括:壳体,其具有适于耦合到用户的身体的物理大小及形状,所述壳体包含装置主体及经配置以啮合或接触所述用户的皮肤的突出部分,其中所述突出部分啮合垫圈;至少一个带,其耦合到所述壳体以将所述便携

式生物计量监测装置紧固到所述用户；生理传感器，其安置于所述壳体中以产生表示用户数据的生理条件的数据，所述生理传感器包含：光源，其安置于所述壳体中以产生且输出具有至少第一波长的光，及光电检测器，其安置于所述壳体中以检测所散射光；其中所述突出部分包含所述壳体的皮肤或内部侧的外表面以借此啮合或接触所述用户的所述皮肤，其中所述突出部分包含具有第一光学性质的第一部分及具有第二光学性质的第二部分，且其中所述突出部分的所述第一部分光学耦合到所述光源以沿预定路径将光从所述光源引导或透射到所述壳体的所述皮肤或内部侧的所述外表面；及处理电路，其安置于所述壳体中以使用表示所述所散射光的数据来计算所述用户的心率。

附图说明

[0008] 在以下详细说明的过程中，将参考附图。这些图式展示本发明的不同方面，且在适当的情况下，类似地标记图解说明不同图中的相似结构、组件、材料及／或元件的元件符号。在附图中的各图中以实例方式且不以限制方式图解说明本文中所揭示的各种实施例，且其中相似元件符号是指相同及／或类似结构／组件／特征／元件。应理解，结构、组件、特征及／或元件的各种组合（特定展示的那些组合除外）均涵盖于本发明的范围内。

[0009] 此外，本文中描述及图解说明许多发明。本发明既不限于本发明的任何单一方面或实施例，也不限于此些方面及／或实施例的任何组合及／或置换。此外，可单独地或结合本发明的其它方面及／或其实施例中的一者或一者以上一起采用本发明的方面及／或其实施例中的每一者。为简洁起见，本文中未分别论述及／或图解说明特定置换及组合。

[0010] 在附图中的各图中以实例方式且不以限制方式图解说明本文中所揭示的各种实施例，且其中相似元件符号是指类似元件，且其中：

[0011] 图 1 图解说明经由用户接口而实现用户交互的示范性便携式监测装置，其中便携式监测装置可具有用户接口、处理器、生物计量传感器、存储器、环境传感器及／或可与外部装置（举例来说，客户端及／或服务器）通信的无线收发器；

[0012] 图 2 图解说明可经由带的使用而紧固到用户的示范性便携式生物计量监测装置；所述示范性便携式生物计量监测装置可具有显示器、按钮、电子封装及／或带或附接带；明显地，采用所述带或附接带来将便携式生物计量监测装置（举例来说）经由钩与环（例如，维可牢（Velcro））、卡环及／或具有带形状记忆的带（例如，经由（举例来说）弹簧金属带、弹性带、“橡胶”带及／或手表样带的使用）紧固到用户，举例来说，用户的附肢；

[0013] 图 3 图解说明（举例来说）图 2 的便携式生物计量监测装置的面向皮肤的部分的视图；明显地，在此实施例中，所述便携式监测装置包含用于配合充电器及／或数据传输电缆的传感器突出部及凹部；明显地，所述突出部可较稳固地维持传感器与用户的皮肤接触（举例来说，与用户的皮肤的预定或固定关系接触）；

[0014] 图 4 图解说明示范性便携式生物计量监测装置的（穿过电子封装的）横截面图；

[0015] 图 5 图解说明示范性便携式生物计量监测装置的传感器突出部的横截面图；明显地，两个光源（例如 LED）可位于光电检测器的一个或一个以上侧（举例来说，光电检测器的任一侧或相对侧）上以实现光电容积描记法（PPG）感测，其中光阻挡材料可放置于光源与光电检测器之间以防止来自光源的任何光通过装置主体及被光电检测器检测到（在一个实施例中，光源及光电检测器放置于柔性 PCB 上）；柔性透明层可放置于传感器突出部的

下表面上以形成密封，其中所述透明层可提供（例如）防止液体进入安置或放置光源或光电检测器的装置的其它功能；明显地，所述透明层可经由模内贴标或“IML”而形成；

[0016] 图 6 图解说明示范性便携式生物计量监测装置的传感器突出部的横截面图；明显地，所述突出部类似于图 5 的示范性便携式生物计量监测装置中所图解说明的突出部；然而，光源及光电检测器放置于扁平及 / 或刚性 PCB 上；

[0017] 图 7 图解说明 PPG 传感器的另一横截面图，其中在此实施例中，所述 PPG 传感器不包含突出部；此外，可采用垫圈及 / 或压敏粘合剂来抵抗、抑制及 / 或防止液体进入装置的主体；

[0018] 图 8 图解说明 PPG 光源及光电检测器的示范性几何形状，其中在此实施例中，两个光源放置于光电检测器的任一侧上；明显地，所述光源及光电检测器可安置于或位于还可操作为智能手表的便携式生物计量监测装置的背部（面向用户的皮肤的侧）上的突出部中；

[0019] 图 9 图解说明具有可安置于或位于具有突出部的便携式生物计量监测装置中的一光电检测器及两个 LED 光源的示范性 PPG 传感器；明显地，在此实施例中，光管将 LED 及光电检测器光学连接到用户的皮肤的表面，其中在操作中，来自光源的光从身体中的血液散射 / 反射，所述光中的一些光经由光管到达光电检测器；明显地，光管优先地沿（举例来说）由光管的几何形状及 / 或材料界定的预定路径来引导或透射光；

[0020] 图 10 图解说明具有突出部的示范性 PPG 检测器，所述突出部具有弯曲侧以减小用户在操作期间及 / 或较稳固地维持传感器与用户的皮肤接触（举例来说，与用户的皮肤的预定或固定关系接触）的任何不适及 / 或使所述不适最小化；在此实施例中，光管的表面将光电检测器及 LED 连接到用户的皮肤且经轮廓化以增强 LED 及光电检测器到光管之间的光通量耦合及 / 或使所述光通量耦合最大化；明显地，还可将光管面向用户的皮肤的端部轮廓化，其中此轮廓可提供聚焦或散焦以增强及 / 或优化 PPG 信号（举例来说，所述轮廓可将光聚焦到与可能发生血液流动的区一致的特定深度及位置）；另外，这些焦点的顶点重叠或极紧密地靠在一起，使得光电检测器可接收（举例来说）最大可能量的所散射 / 所反射光；

[0021] 图 11 图解说明具有带及安置于其中的光学传感器及光发射器的示范性便携式生物计量监测装置；

[0022] 图 12 图解说明具有显示器及腕带的便携式生物计量监测装置；光学 PPG（例如心率）检测传感器及 / 或发射器可安置于或位于所述装置的侧上；明显地，在一个实施例中，所述传感器及 / 或发射器安置于或位于安装于所述装置的侧上的按钮中；

[0023] 图 13 图解说明通过按压便携式生物计量监测装置的侧而输入用户输入的用户，其中作为响应，所述装置从侧装式光学心率检测传感器获得心率测量；所述装置的显示器此后可显示是否已检测心率及 / 或显示用户的心率；

[0024] 图 14 图解说明便携式生物计量监测装置智能报警特征的功能性，其中在此实施例中，所述监测装置可能够检测可检测用户的睡眠阶段或状态（例如轻度睡眠或深度睡眠）的装置或可与所述装置通信；所述用户可设定其想要醒来的时间窗（例如 6:15am 到 6:45am）；所述智能报警可在报警窗期间通过用户进入轻度睡眠状态而触发；

[0025] 图 15 以流程图形式图解说明便携式生物计量监测装置基于装置正经历的移动的

多少而改变装置检测用户的心率的方式的操作；在此实施例中，（例如经由加速度计的使用）检测到运动，所述用户可被认识是活动的且可发生高取样速率心率检测以减小心率测量中的运动伪影；所述数据可被保存及/或显示；明显地，在用户不移动的情况下，低取样心率检测（其不消耗太多的电力）可足以测量心率；

[0026] 图16图解说明具有自行车应用（常驻于自行车上）的示范性便携式监测装置，除其它度量外，所述示范性便携式监测装置还可显示速度及/或节奏；无论何时监测装置接近于无源或有源NFC标签，所述应用均可被激活，所述无源或有源NFC标签可附接到自行车或安置于自行车上，举例来说，自行车车把、车架及/或踏板；

[0027] 图17图解说明具有光源、光检测器、ADC、处理器、DAC/GPIO以及光源强度及接通/关断控制的示范性PPG传感器；

[0028] 图18图解说明类似于图17中所图解说明的实施例的示范性PPG传感器；然而，在此实施例中，传感器采用取样与保持电路以及模拟信号调节；

[0029] 图19图解说明类似于图17中所图解说明的实施例的示范性PPG传感器；然而，在此实施例中，传感器采用取样与保持电路（且在一个实施例中，对信号进行过取样）；

[0030] 图20图解说明具有多个可切换光源及检测器、光源强度及接通/关断控制以及信号调节电路的示范性PPG传感器；

[0031] 图21图解说明使用同步检测的示范性PPG传感器；明显地，在此实施例中，采用解调器来检测/恢复信号；

[0032] 图22图解说明类似于图17中所图解说明的实施例的示范性PPG传感器；然而，在此实施例中，传感器在信号检测路径中采用差分放大器；

[0033] 图23图解说明具有图17到22中所图解说明的许多特征/电路的示范性PPG传感器；

[0034] 图24图解说明具有连接到处理器的心率或PPG传感器、运动传感器、显示器、振打电机/振动电机及通信电路的示范性便携式生物计量监测装置的特定电路/元件；

[0035] 图25图解说明具有连接到处理器的心率或PPG传感器、运动传感器、显示器、振打电机/振动电机、位置传感器、海拔传感器、皮肤电导/湿传感器及通信电路的示范性便携式生物计量监测装置的特定电路/元件；

[0036] 图26图解说明具有连接到处理器的生理传感器、环境传感器及/或位置传感器的示范性便携式监测装置的特定电路/元件；

[0037] 图27以框图形式图解说明用于测量用户的心率的运动信号及光学PPG信号的示范性信号流；

[0038] 图28以框图形式图解说明用于测量用户的心率的运动信号及光学PPG信号的示范性信号流；

[0039] 图29图解说明具有到传感器处理器的模拟连接的传感器，所述传感器处理器又具有到应用处理器的数字连接；

[0040] 图30图解说明具有连接到应用处理器的一个或多个传感器的传感器装置；且

[0041] 图31图解说明具有连接到传感器处理器的一个或多个传感器的传感器装置，所述传感器处理器又连接到应用处理器。

[0042] 再次，本文中描述及图解说明许多发明。本发明既不限于本发明的任何单一方面

或实施例，也不限于此些方面及／或实施例的任何组合及／或置换。可单独地或结合本发明的其它方面及／或其实施例中的一者或一者以上一起采用本发明的方面及／或其实施例中的每一者。为简洁起见，本文中未分别论述那些组合及置换中的许多组合及置换。

[0043] 此外，依据以下说明、图解及权利要求书将明了可不同于及／或类似于图式中所图解说明的方面、发明及实施例的许多其它方面、发明及实施例。另外，尽管各种特征及属性已在图式中图解说明及／依据图式而明了，但应理解，此些特征及属性以及其优点无论在本发明的实施例中的一个实施例、一些实施例还是全部实施例中均不是必需的，且实际上，未必存在于本发明的实施例中的任一者中。

具体实施方式

[0044] 起初，应注意，本文中描述及图解说明许多发明。本发明既不限于本发明的任何单一方面或实施例，也不限于此些方面及／或实施例的任何组合及／或置换。此外，可单独地或结合本发明的其它方面及／或其实施例中的一者或一者以上一起采用本发明的方面及／或其实施例中的每一者。为简洁起见，本文中将不分别论述那些置换及组合中的许多置换及组合。

[0045] 此外，在描述及图解说明本发明的过程中，陈述各种电路、架构、结构、组件、功能及／或元件以及其组合及／或置换。应理解，电路、架构、结构、组件、功能及／或元件（特定描述及图解说明的那些除外）以及其组合及／或置换均涵盖于且在本发明的范围内。

[0046] 生理传感器

[0047] 本发明的便携式生物计量监测装置可使用以下传感器中的一个传感器、一些传感器或全部传感器来获取生理数据，包含下表中所概述的生理数据。生理传感器及／或生理数据的所有组合及置换均打算归属于本发明的范围内。本发明的便携式生物计量监测装置可包含但不限于以下类型：下文指定用以获取对应生理数据的传感器中的一个传感器、一些传感器或全部传感器；实际上，可采用其它类型的传感器来获取对应生理数据，所述其它类型的传感器打算归属于本发明的范围内。另外，所述装置可从对应传感器输出数据导出所述生理数据，但不限于可从所述传感器导出的生理数据的数目及类型。

[0048]

生理传感器	所获取的生理数据

[0049]

光学反射计	心率、心率变异性
可能实施例：	SpO2 (血氧饱和度)
-光发射器及接收器	呼吸
-多个或单个 LED 及光电二极管布置	应激
-针对特定生理信号而调谐的波长	血压
-同步检测/振幅调制	动脉僵硬度
	血糖水平
	血量
	心率恢复
	心脏健康
运动检测器	活动水平检测
可能实施例：	坐/站检测
-惯性、陀螺仪或加速度计	跌倒检测
- GPS	
皮肤温度	应激
EMG	肌张力
EKG	心率、心率变异性、心率恢复
可能实施例：	应激
- 1 导联	心脏健康
- 2 导联	
磁力计	基于旋转的活动水平
激光多普勒	
功率计	
超声波	血流量
音频	心率、心率变异性、心率恢复
	笑检测
	呼吸
	呼吸类型-打鼾、喘气、喘气问题
	用户的语音
应变计	心率、心率变异性

[0050]

可能实施例：	应激
-在腕带中	
湿传感器	应激
可能实施例：	游泳检测
-皮电反应	淋浴检测

[0051] 在一个示范性实施例中，便携式生物计量监测装置包含光学传感器以检测、感测、取样及/或产生可用于确定表示（举例来说）用户的应激（或其水平）、血压及/或心率的信息的数据。（参见，举例来说，图2到7及17到23）。在此实施例中，生物计量监测装置包含光学传感器，所述光学传感器具有用以将光发射或输出到用户的身体中的一个或一个以上光源（LED、激光等）及/或用以取样、测量及/或检测响应或反射且提供用于确定表示用户的应激（或其水平）、血压及/或心率的数据（例如，使用光电容积描记法，即“PPG”）的数据的光检测器（光电二极管、光电晶体管等）。

[0052] 在一个示范性实施例中，用户的心率测量可由一个或一个以上传感器（或连接到其的处理电路）确定的准则触发。举例来说，当来自运动传感器的数据指示静止或极少运动的周期时，生物计量监测装置可触发、获取及/或获得心率测量或数据。（参见，举例来说，图15、24及25）。在一个实施例中，当运动传感器指示用户活动或运动（举例来说，不适合或适宜触发、获取及/或获得所要心率测量或数据（举例来说，用于确定用户的静息心率的数据）的运动）时，用于获取及/或获得所要心率测量或数据的生物计量监测装置及/或传感器可置于或保持处于低功率状态中。明显地，在运动期间采取的测量可为不可靠的且可被运动伪影（举例来说，传感器与用户之间的相对运动）损坏。

[0053] 在另一实施例中，本发明的生物计量监测装置可采用指示用户活动或运动的数据（举例来说，来自一个或一个以上运动传感器）来调整或修改触发、获取及/或获得所要心率测量或数据的特性（举例来说，以改进运动伪影的稳健性）。举例来说，可采用指示用户活动或运动的数据来调整或修改获取心率数据的传感器的取样速率及/或分辨率模式（举例来说，在用户运动量超出特定阈值的情况下，生物计量监测装置可增加用于获取心率测量或数据的传感器的取样速率及/或增加所述传感器的取样分辨率模式）。此外，生物计量监测装置可调整或修改运动传感器在用户活动或运动的此些周期（举例来说，用户运动量超出特定阈值的周期）期间的取样速率及/或分辨率模式。以此方式，当生物计量监测装置确定或检测到此用户活动或运动时，运动传感器可置于较高取样速率及/或较高取样分辨率模式中以（举例来说）实现对心率信号的较准确自适应滤波。（参见，举例来说，图15）。

[0054] 明显地，在生物计量监测装置采用光学技术来获取心率测量或数据（例如，光电容积描记法）的情况下，可采用运动信号来确定或建立用以数据获取或测量（例如，同步检测，而非非振幅调制的方法或技术）及/或其分析的特定方法或技术。（参见，举例来说，图21）。以此方式，指示用户运动或活动量的数据建立或调整通过光学心率数据获取传感器的数据获取或测量的类型或技术。

[0055] 举例来说，在一个优选实施例中，当运动检测器电路检测到或确定用户的运动低

于阈值（举例来说，生物计量监测装置确定用户正静坐或睡着）时，本发明的生物计量监测装置及技术可调整及／或减小光学心率取样的取样速率。（参见，举例来说，图 15）。以此方式，生物计量监测装置可控制其功率消耗（举例来说，通过减小取样速率而减小功率消耗），举例来说，生物计量监测装置可每 10 分钟一次或每 1 分钟 10 秒地对心率（经由心率传感器）进行取样。明显地，除此之外或代替此，生物计量监测装置可根据运动检测经由控制数据处理电路分析及／或数据分析技术而控制功率消耗。因此，用户的运动可影响心率数据获取参数及／或其数据分析或处理。

[0056] 在又一实施例中，当装置确定用户（举例来说）静坐或睡着时，生物计量监测装置可采用传感器来计算心率变异性。此处，装置可以较高速率取样模式（相对于非静坐周期或超出预定阈值的用户活动周期）操作传感器以计算心率变异性。生物计量监测装置（或外部装置）可采用心率变异性作为心脏健康或应激的指示符。

[0057] 实际上，在优选实施例中，当用户静坐及／或睡着（举例来说，如由生物计量监测装置所检测到及／或确定（举例来说，自动地））时，生物计量监测装置测量及／或确定用户的应激水平及／或心脏健康。本发明的生物计量监测装置可使用指示心率变异性、皮电反应、皮肤温度、身体温度及／或心率的传感器数据来确定用户的应激水平、健康状态（例如，发烧或感冒的风险、开始或恶化）及／或心脏健康。以此方式，生物计量监测装置的处理电路可确定及／或跟踪用户随时间的“基线”应激水平及／或随时间的心脏“健康”。在另一实施例中，装置测量用户在用户不运动（或用户的运动低于预定阈值）、坐着、平躺、睡着或处于特定睡眠阶段（例如，深度睡眠）中的一个或一个以上周期期间的生理参数。此数据还可用作应激相关参数、健康相关参数（例如，发烧或感冒的风险或开始）、心脏健康、心率变异性、皮电反应、皮肤温度、身体温度及／或心率的“基线”。

[0058] 明显地，在一个实施例中，生物计量监测装置可自动检测或确定用户何时正试图去睡觉、进入睡眠、睡着及／或从睡眠周期醒来。在此实施例中，生物计量监测装置可采用生理传感器来获取生理数据（如本文中所描述的类型且以如本文中所描述的方式），其中数据处理电路使心率、心率变异性、呼吸速率、皮电反应、运动及／或皮肤及／或身体温度感测的组合相关以检测或确定用户是否正试图去睡觉、进入睡眠、睡着及／或从睡眠周期醒来。作为响应，生物计量监测装置可（举例来说）获取生理数据及／或确定用户的生理条件（如本文中所描述的类型且以如本文中所描述的方式）。举例来说，与用户心率的减小及／或心率变异性的改变组合的用户运动的减少或停止可指示用户已睡着。心率变异性的后续改变及皮电反应可用于确定用户的睡眠状态及／或两个或两个以上睡眠阶段（举例来说，进入轻度及／或深度睡眠阶段）之间的转变。用户的运动及／或经提升心率及／或心率变异性的改变可用于确定用户已醒来。

[0059] 在一个实施例中，生物计量监测装置是用于监测睡眠的系统的一个组件，其中所述系统包括能够与生物计量监测装置通信且适于接近睡眠者放置的辅助装置（例如，闹钟）。所述辅助装置可具有用以接受生物计量监测装置的形状以及机械及／或磁性接口以用于安全保护、通信及／或充电。明显地，生物计量监测装置与辅助装置之间的通信可经由无线通信技术／方法及协议（例如蓝牙、蓝牙 4.0、RFID、NFC 或 WLAN）而提供。所述辅助装置可包括传感器以帮助睡眠或环境监测，例如，举例来说，测量周围光、噪音及／或声音（例如，以检测打鼾）、温度、湿度及空气质量（粉、尘、CO2 等）的传感器。在一个实施例中，

辅助装置可与外部服务（例如www.fitbit.com或服务器（例如，个人计算机））通信。通信可经由有线（例如，以太网、USB）或无线（例如，WLAN、蓝牙、RFID、NFC、蜂窝）电路及协议而实现以将数据传送到辅助装置及/或从辅助装置传送数据。所述辅助装置还可充当继电器以将数据传送到生物计量监测装置及/或将数据从生物计量监测装置传送到外部服务，例如www.fitbit.com或其它服务（例如，新闻、社交网络更新、电子邮件、日历通知）或服务器（例如，个人计算机、移动电话、平板计算机）。可使用来自一个或两个装置的数据对一个或两个装置或外部服务（例如，云服务器）执行用户的睡眠数据的计算。

[0060] 所述辅助装置可配备有显示器以输出由辅助装置获得的数据或由生物计量监测装置、外部服务传送到其的数据或者来自生物计量监测装置、辅助装置及/或外部服务的数据的组合。举例来说，辅助装置可显示指示用户的心率、当日的总步数、活动及/或睡眠目标实现、当日的天气（由辅助装置所测量或由外部服务针对位置所报告）等的数据。在另一实例中，辅助装置可显示（例如）在用户活动（举例来说，每周总步数计数）的情境中与所述用户相对于其它用户的排名有关的数据。在又一实施例中，所述生物计量监测装置可配备有显示器以显示由生物计量监测装置、辅助装置、外部服务或三个源的组合获得的数据。在其中第一装置配备有唤醒报警（例如，振打电机/振动电机、扬声器）的实施例中，辅助装置可充当备份报警（例如，使用音频扬声器）。辅助装置还可具有接口（例如，显示器及按钮或触摸屏）以形成、删除、修改或实现第一装置及/或辅助装置上的报警。

[0061] 在另一实施例中，生物计量监测装置可自动检测或确定其是否附接到用户、安置于用户上及/或被用户佩戴。响应于检测到或确定生物计量监测装置未附接到用户、未安置于用户上及/或未被用户佩戴，生物计量监测装置（或其选定部分）可实施低功率操作模式或置于低功率操作模式中，举例来说，光学心率传感器及/或电路可置于关断或停用状态或者较低功率或睡眠模式中。举例来说，在一个实施例中，生物计量监测装置包含一个或一个以上光检测器（光电二极管、光电晶体管等），其中如果在给定光强度设定下，一个或一个以上光检测器提供低返回信号，那么生物计量监测装置可解释数据指示未被佩戴的装置。在此确定后，装置可即刻减小其功率消耗，举例来说，“停用”或调整应激及/或心率检测传感器及/或电路的操作条件（举例来说，减小光源及/或检测器的工作循环或停用光源及/或检测器及/或停用或衰减其相关联电路或部分）。另外，生物计量监测装置可周期性地确定（例如，每秒一次）是否应将应激及/或心率检测传感器及/或相关联电路的操作条件还原到正常操作条件（举例来说，光源、检测器及/或相关联电路应返回到用于心率检测的正常操作模式）。在另一实施例中，生物计量监测装置在检测到可触发事件后（举例来说，在检测到装置的运动（举例来说，基于来自一个或一个以上运动传感器的数据）及/或检测到经由用户接口（举例来说，轻敲、碰撞或猛击）的用户输入后）即刻还原应激及/或心率检测传感器及/或相关联电路的操作条件。在相关实施例中，出于电力节省目的，生物计量监测装置可在用户并非高度活动时将其心率测量收集的速率减小到（举例来说）每分钟一次测量。在一个实施例中，用户可（举例来说）经由接口（例如通过推动按钮）将装置放入到按需产生测量或以较快速率（例如，每秒一次）产生测量的操作模式中。

[0062] 在一个实施例中，光学传感器（源及/或检测器）可安置于生物计量监测装置的内部或皮肤侧（即，装置的表面接触、触碰及/或面向用户的皮肤的侧（下文中“皮肤侧”））

上。(参见,举例来说,图 2 到 7)。在另一实施例中,光学传感器可安置于装置的一个或一个以上侧上,包含皮肤侧及装置面向或暴露于周围环境的一个或一个以上侧(环境侧)。(参见,举例来说,图 11 到 13)。明显地,来自此些光学传感器的数据可表示生理数据及/或环境数据。实际上,在一个实施例中,无论光学传感器是否安置于多个侧中的一者或一者以上上,所述传感器均提供、获取及/或检测来自生物计量监测装置的多个侧的信息。举例来说,光学传感器可获得与环境的周围光条件有关的数据。

[0063] 在光学传感器安置或布置于生物计量监测装置的皮肤侧上的情况下,在操作中,光源将光发射于用户的皮肤上,且作为响应,光检测器取样、获取及/或检测来自皮肤(及/或来自身体内)的反应或所散射/所反射光。所述一个或一个以上源及检测器可以增强或优化 SNR 及/或减小光源及检测器的功率消耗或使所述功率消耗最小化的阵列或型式布置。所述光学检测器取样、获取及/或检测生理数据,所述生理数据可接着(举例来说,由常驻处理电路)处理或分析以获得表示(举例来说)用户的心率、呼吸、心率变异性、氧饱和度 (SpO2)、血量、血糖、皮肤水分及/或皮肤色素水平的数据。

[0064] 所述源可发射具有将收集的生理数据的类型所特有或与所述类型相关的一个或一个以上波长的光。所述光学检测器可取样、测量及/或检测将收集的生理数据的类型及将评估或确定的(用户的)生理参数所特有或与所述生理数据的类型及所述生理参数相关的一个或一个以上波长。举例来说,在一个实施例中,发射具有绿色光谱中的波长的光的光源(举例来说,发射具有对应于绿色光谱的波长的光的 LED)及经定位以取样、测量及/或检测响应或反射的光电二极管可提供用于确定或检测心率的数据。相比之下,发射具有红色光谱中的波长的光的光源(举例来说,发射具有对应于红色光谱的波长的光的 LED)及发射具有红外光谱中的波长的光的光源(举例来说,发射具有对应于 IR 光谱的波长的光的 LED)及经定位以取样、测量及/或检测响应或反射的光电二极管可提供用于确定或检测 SpO2 的数据。

[0065] 实际上,在一个实施例中,可根据被获取的预定类型的生理数据或操作条件而修改、调整及/或控制由 LED(或一组 LED)发射的光的色彩或波长。此处,调整及/或控制由 LED 发射的光的波长以优化及/或增强由检测器获得及/或进行取样的生理数据的“质量”。举例来说,由 LED 发射的光的色彩可在用户的皮肤温度或周围温度较凉时从红外线切换到绿色以便增强对应于心脏活动的信号。(参见,举例来说,图 20)。

[0066] 在一个实施例中,生物计量监测装置在壳体中包含窗(举例来说,视觉上不透明的窗)以促进光学传感器与用户之间的光学传输。此处,所述窗可准许光(举例来说,选定波长的实质部分)由(举例来说)一个或一个以上 LED 发射到用户的皮肤上且准许传递到壳体中的响应或反射由(举例来说)一个或一个以上光电二极管进行取样、测量及/或检测。在一个实施例中,与发射及接收光有关的电路可安置于装置壳体的内部中且在(举例来说,涂有红外线油墨的)塑料或玻璃层或准许红外线光而非人可见光谱中的光通过的红外线透镜下方。以此方式,光透射对于人眼是不可见的。

[0067] 在一个实施例中,生物计量监测装置可采用光管或其它透光结构。(参见,举例来说,图 8 到 10)。就此来说,在一个实施例中,将光经由光管或其它透光结构从光源引导到用户的皮肤。来自用户的身体的所散射或所反射光可经由相同或类似结构被往回引导到光学电路且由所述光学电路检测。实际上,透射结构可采用材料及/或光学设计来促进低光

损失（举例来说，透镜），借此改进光电检测器的 SNR 及 / 或减小光发射器及 / 或光检测器的功率消耗。在一个实施例中，光管或其它透光结构可包含比其它材料更高效率地选择性透射具有一个或一个以上特定或预定波长的光的材料，借此充当带通滤波器。此带通滤波器可经调谐以改进特定生理数据类型的信号。举例来说，在一个实施例中，可实施模内贴标或“IML”透光结构，其中所述结构使用具有预定或所要光学特性的材料来形成特定带通特性（举例来说）以使红外线光比其它波长的光（举例来说，具有人可见光谱中的波长的光）更高效率地通过。

[0068] 在另一实施例中，生物计量监测装置可采用具有光学上不透明的部分（包含特定光学性质）及光学上透明的部分（包含不同于光学上不透明的部分的光学性质）的透光结构。此结构可经由双射或两步模制处理而提供，其中注入光学上不透明的材料且注入光学上透明的材料。取决于行进穿过所述结构的光的方向，实施此透光结构的生物计量监测装置针对不同波长可包含不同透射性质。举例来说，在一个实施例中，光学上不透明的材料可包含对特定波长范围具反射性的性质以便较高效地将光从光发射器及从用户的身体往回传输到检测器（其相对于所发射光的波长可具有不同波长）且由所述检测器检测。

[0069] 在实施透光结构（举例来说，经由 IML 而产生或形成的结构）的另一实施例中，此些结构可包含由限制光源及 / 或检测器中的一个光源及 / 或检测器、一些光源及 / 或检测器或全部光源及 / 或检测器的孔口的不透明的材料组成的掩模。以此方式，透光结构选择性地“定义”光被发射到其中及 / 或从其检测到的主体的优先体积。明显地，可结合本文中所描述及 / 或所图解说明的发明一起采用或实施其它掩模配置；用以（举例来说）改进光电容积描记法信号且结合本文中所描述及 / 或所图解说明的发明一起实施的所有此些掩模配置均打算归属于本发明的范围内。

[0070] 在本文中所描述的透光结构中的任一者中，光学器件的表面或装置主体可包含硬涂漆层、硬浸涂层或光学涂层（例如抗反射）、抗划伤性、防雾及 / 或波长带块（例如阻挡紫外线光）。此些特性或材料可改进生物计量监测装置的操作、准确性及 / 或寿命。

[0071] 在一个实施例中，生物计量监测装置在装置的皮肤侧上包含凹形或凸形形状以在皮肤中以特定深度朝向特定体积聚焦光且增加将光从所述点收集到光电检测器中的效率。（参见，举例来说，图 8 到 10）。在此生物计量监测装置还采用光管来选择性地且可控制地路由光的情况下，将所述光管的端部塑形为具有一定程度的圆柱度（举例来说，而非径向对称）可是有利的。此配置可通过增加将光从发射器传送到用户的皮肤上或中的效率同时减少由光电检测器检测到或收集的“杂散”光而改进 SNR。以此方式，由光电检测器进行取样、测量及 / 或检测的信号由较少杂散光及较多用户对此所发射光的反应（表示对所发射光的反应的信号或数据）组成。

[0072] 在一个实施例中，光学传感器的组件定位于装置的皮肤侧上且经布置或定位以减小 (i) 光源及 / 或相关联检测器与 (ii) 用户的皮肤之间的距离或使所述距离最小化。（参见，举例来说，图 5）。此配置可改进光学传感器的组件与用户的身体之间的光通量耦合的效率。举例来说，在一个实施例中，光源及 / 或相关联检测器安置于柔性或柔韧衬底上，此促进装置的皮肤侧符合（举例来说，在不具有额外处理的情况下）或能够经塑形（或顺应）以符合生物计量监测装置在正常操作期间耦合或附接到的用户的身体部分（举例来说，手腕、手臂、踝及 / 或腿）的形状，使得光源及 / 或相关联检测器靠近于用户的皮肤（即，装置

的皮肤侧与用户的皮肤的并置表面之间几乎没有间隙）。（参见，图 11）。在一个实施例中，光源及 / 或相关联检测器安置于扁平柔性电缆或“FFC”或者柔性 PCB 上。在此实施例中，柔性或柔韧衬底（举例来说，FFC 或柔性 PCB）可连接到装置内的其上安置有其它组件（举例来说，数据处理电路）的第二衬底（举例来说，PCB）。不同高度的光学组件可被安装到柔性衬底的不同“指状物”且被按压或紧固到壳体表面，使得光学组件与所述壳体表面齐平。在一个实施例中，第二衬底可为固定于装置内的其上安置有其它电路及组件（无源及 / 或有源）的相对非柔性或非柔韧衬底。

[0073] 生物计量监测装置经调适（举例来说，包含大小及形状）以被佩戴或装戴于用户的身体（举例来说，手臂、手腕、腿及 / 或踝）上。在包含光学心率监测器的优选实施例中，所述装置可为腕戴式或臂装式附件，例如手表或手镯。（参见，举例来说，图 2 到 13）。在一个实施例中，当生物计量监测装置为腕装式时，光学心率监测器的光学元件安置于或位于所述生物计量监测装置（举例来说，面向手腕的顶部）的内部或皮肤侧上（即，将光学心率监测器与手腕并置）。（参见，举例来说，图 2 到 7）。

[0074] 在另一实施例中，光学心率监测器安置于或位于生物计量监测装置的一个或一个以上外部或环境侧表面上。（参见，举例来说，图 12 到 13）。在此实施例中，用户可用另一只手的手指触摸光学窗（光学心率监测器的光学元件位于其后面）以起始心率测量（及 / 或与心率有关的其它度量，例如心率变异性）及 / 或收集可用于确定用户的心率（及 / 或与心率有关的其它度量）的数据。（参见，举例来说，图 12）。在一个实施例中，举例来说，当用户的手指放置于光学窗上方时，生物计量监测装置可通过检测光电二极管上的入射光的（突然）下降而触发或起始测量。除此之外或代替此，心率测量（或其它此度量）可由基于 IR 的接近检测器及 / 或电容性触摸 / 接近检测器（其可与其它检测器分离）触发。此基于 IR 的接近检测器及 / 或电容性触摸 / 接近检测器可安置于光学窗中或上及 / 或功能性地耦合、电耦合及 / 或物理耦合到所述光学窗以检测或确定（举例来说）用户的手指的存在。

[0075] 在又一实施例中，生物计量监测装置可包含在按下时触发或起始心率测量（及 / 或与心率有关的其它度量）的一个或一个以上按钮。所述按钮可紧接近于光学窗而安置以促进用户在将手指安置于光学窗上时按压按钮。（参见，举例来说，图 13）。在一个实施例中，光学窗可嵌入推动按钮中。因此，当用户按压所述按钮时，其可经由用户啮合及按下所述按钮的手指而触发测量。实际上，所述按钮可被赋予增强或优化抵抗手指的压力量变曲线的形状及 / 或对按压的阻力以在测量或数据获取期间提供高 SNR。在其它实施例（未图解说明）中，生物计量监测装置可采取适于佩戴于身体上、夹持或安装到衣物、放置于衣服（例如，口袋）中或放置于附件（例如，手提包）中的夹子、光滑物件、挂件、踝套、腰带等的形式。

[0076] 在一个特定实施例中，生物计量监测装置在装置的皮肤或内部侧上包含突出部。（参见，图 2 到 11）。当耦合到用户时，突出部以比周围装置主体大的力啮合皮肤。在此实施例中，光学窗或透光结构（上文详细论述了两者）可形成突出部的一部分或并入突出部的一部分中。光学传感器的光发射器及 / 或检测器可安置或布置于与窗或透光结构并置的突出部中。（参见，举例来说，图 3 及 11）。因此，当附接到用户的身体时，生物计量监测装置的突出部的窗部分以比周围装置主体大的力啮合用户的皮肤，借此提供用户的皮肤与光

学窗之间的较紧固物理连接。即，突出部改进生物计量监测装置与用户的皮肤（举例来说，用户的身体的预定部分的皮肤）之间的持续及/或固定接触，此可减小由光电检测器测量的杂散光的量、减少生物计量监测装置与用户之间的运动及/或提供对用户的皮肤的改进的局部压力；此全部可增加所关注的心脏信号的质量。明显地，突出部可含有受益于紧接近于用户的皮肤及/或紧固接触用户的皮肤的其它传感器。除心率传感器之外或代替心率传感器，这些传感器可被包含且包含例如皮肤温度传感器（例如，利用与到突出部的外表面的热环氧树脂结合的光学窗或热敏电阻的非接触性热电堆）、脉动血氧计、血压传感器、EMG或皮电反应传感器的传感器。

[0077] 除此之外或代替此，生物计量监测装置的皮肤侧的一部分可包含摩擦增强机构或材料。举例来说，生物计量监测装置的皮肤侧可包含多个隆起或凹陷区域部分（举例来说，小凸块、脊、凹槽及/或凹坑）。此外，摩擦增强材料（举例来说，凝胶类材料，例如硅酮）可安置于皮肤侧上。实际上，由凝胶制成的装置背部也可提供摩擦，同时还改进用户舒适度及防止杂散光进入。如上所述，摩擦增强机构或材料可单独使用或连同具有如本文中所描述的突出部的生物计量监测装置一起使用。就此来说，生物计量监测装置在装置的突出部分中或上可包含多个隆起或凹陷区域部分（举例来说，小凸块、脊、凹槽及/或凹坑）。实际上，此些隆起或凹陷区域部分可并入/嵌入突出部的窗部分中或上。除此之外或代替此，突出部分可由摩擦增强材料（举例来说，凝胶类材料，例如硅酮）组成或涂覆有所述摩擦增强材料。明显地，突出部及/或摩擦的使用可通过减小传感器在操作期间（尤其在用户运动时）相对于用户的皮肤的运动而改进对应于特定参数（例如，心率、心率变异性、皮电反应、皮肤温度、皮肤颜色、热通量、血压、血糖等）的数据获取的测量准确性。

[0078] 生物计量监测装置的壳体的内部或皮肤侧中的一些或全部还可由金属材料（举例来说，钢、不锈钢、铝、镁或钛）组成。此配置可提供结构刚性。（参见，举例来说，图3）。在此实施例中，经由低变应原“无镍”不锈钢的使用，装置主体可经设计为低变应原的。明显地，采用（至少在特定位置中）为含铁性质的金属类型（举例来说，含铁的不锈钢等级）可是有利的。在此情况下，便携式生物计量监测装置（在其包含可再充电能源（举例来说，可再充电电池）的情况下）可使用磁性性质与充电器互连以紧固到所述充电器。另外，便携式生物计量监测装置还可啮合使用此磁性性质的坞或坞站以促进数据传送。此外，此壳体可提供将增强光学心率传感器及数据获取处理/操作的完整性及可靠性的增强型电磁屏蔽。此外，皮肤温度传感器可物理耦合及热耦合（举例来说，借助热环氧树脂）到金属主体以检测或感测用户的温度。在包含突出部的实施例中，传感器可定位在所述突出部附近或中以提供到用户的皮肤的紧固接触及集中热耦合。

[0079] 在优选实施例中，光学传感器的一个或一个以上组件（在一个实施例中，其可位于突出部中，及/或在另一实施例中，其可经安置或经放置与装置的表面齐平）经由不透液密封（即，防止液体进入到生物计量监测装置的主体中的方法/机构）而附接、固定、包含及/或紧固到便携式生物计量监测装置。举例来说，在一个实施例中，由金属（包含但不限于不锈钢、铝、镁或钛）或刚性塑料制成的装置背部可提供足够坚硬以在容纳用于传感器封装的防水密封时维持装置的结构完整性的结构。（参见，图3到7）。

[0080] 在优选实施例中，光学传感器的封装或模块将连接到具有压敏粘合剂及液体垫圈的装置。（参见，图7）。举例来说，如果光学传感器封装/模块与装置主体之间需要较强

或较耐久性连接，那么还可使用螺钉、铆钉等等。明显地，本发明还可使用防水胶、疏水膜（例如戈尔特斯 (Gore-Tex)）、O 型环、密封剂、脂膏或环氧树脂来紧固或附接光学传感器封装 / 模块及装置主体。

[0081] 如上文所暗示，便携式生物计量监测装置可包含安置于皮肤或内部侧上的包含高反射特性的材料，举例来说，经抛光的不锈钢、反射涂料及经抛光的塑料。以此方式，从装置的皮肤侧所散射 / 所反射的光可被往回散射 / 反射到皮肤中以便（举例来说）改进 SNR。实际上，与为非反射性的装置主体背部相比，此有效地增加输入光信号。明显地，在一个实施例中，选择生物计量监测装置的皮肤或内部侧的色彩来提供特定光学特性（举例来说，反射特定或预定波长的光）以便改进特定生理数据类型的信号。举例来说，在生物计量监测的皮肤或内部侧为绿色的情况下，心率的测量可因对应于绿色光谱的波长的光的优先发射而增强。在生物计量监测的皮肤或内部侧为红色的情况下，SpO2 的测量可因对应于红色光谱的波长的光的优先发射而增强。在一个实施例中，可根据被获取的预定类型的生理数据而修改、调整及 / 或控制生物计量监测装置的皮肤或内部侧的色彩。

[0082] 图 17 描绘光学传感器的示范性示意性框图，其中从光源朝向用户的皮肤发射光且由光检测器感测反射，其中随后由模 / 数转换器 (ADC) 将检测器的输出数字化。可修改（例如，经由光源强度控制模块）光源的强度以维持所要所散射 / 所反射强度信号。举例来说，可减小光源的输出的强度以避免来自光检测器的输出信号的饱和。作为另一实例，可增加光源强度以将来自光检测器的输出信号维持在输出值的所要范围内。明显地，传感器装置的有源控制可经由线性或非线性控制方法（例如比例积分微分 (PID) 控制、固定步长控制、预测控制、神经网络、滞后等等）而实现，且还可采用从装置中的其它传感器导出的信息，例如运动、皮电反应等。图 17 是出于图解说明目的而提供且就此来说，并不将此系统的实施方案限制于（举例来说）集成于 MCU 内的 ADC 或 MCU 的使用。其它可能实施方案包含一个或一个以上内部或外部 ADC、FPGA、ASIC 等的使用。

[0083] 在另一实施例中，传感器装置可并入有取样与保持电路（或等效物）的使用以在关断或衰减光源以节省电力时维持光检测器的输出。在其中光检测器输出的相对改变是最重要（例如，心率测量）的本发明的实施例中，取样与保持电路可不必维持光检测器的输出的准确拷贝。在此些情形中，取样与保持电路可（举例来说）为二极管（例如，肖特基 (Schottky) 二极管）及电容器。取样与保持的输出可呈现给模拟信号调节电路（例如，萨伦 - 凯 (Sallen-Key) 带通滤波器、电平移位器及 / 或增益电路）以调节及放大所关注的频带（例如，对于心脏或呼吸功能为 0.1Hz 到 10Hz）内的信号，所述信号接着被 ADC 数字化。（参见，举例来说，图 18）。

[0084] 在操作中，此移除信号的 DC 及低频率分量且帮助解决与心率及 / 或呼吸有关的 AC 分量。此实施例还可包含用于可变增益设定的模拟信号调节电路（未图解说明），所述模拟信号调节电路可经控制以提供适合信号（例如，不饱和的）。光源、光检测器及 / 或取样与保持的性能特性（例如，转换速率及 / 或增益带宽乘积）及功率消耗可显著高于模拟信号调节电路以实现光源的快速工作循环。在一个实施例中，可与提供到模拟信号调节电路的电力分开地控制提供到光源及光检测器的电力以提供额外电力节省。在另一实施例中，举例来说，当模拟信号调节电路在对光强度设定进行改变之后尚不稳定时，除模拟信号调节电路之外或代替模拟信号调节电路，光检测器及 / 或取样与保持的输出可由 ADC 获取

或取样以控制光源的光强度或测量所关注的生理参数。明显地，由于所关注的生理信号相对于 ADC 的固有分辨率通常较小，因此在一些实施例中，可调整 ADC 的参考电压及 / 或增益以增强信号质量，或可对 ADC 进行过取样。在又一实施例中，装置可通过（举例来说）过取样、调整 ADC 的参考电压及 / 或增益或使用高分辨率 ADC 而将仅取样与保持电路的输出数字化。（参见，举例来说，图 19）。

[0085] 在另一实施例中，传感器装置可并入有差分放大器以放大光检测器输出中的输出的相对改变。（参见，举例来说，图 22）。在一个实施例中，数字平均或数字低通滤波信号被从光检测器输出中的输出减去且在其由 ADC 数字化之前被放大。在另一实施例中，模拟平均或模拟低通滤波信号经由（举例来说）取样与保持电路及模拟信号调节电路的使用而被从光检测器的输出减去。可与提供到模拟信号调节电路的电力分开地控制提供到光源、光检测器及差分放大器的电力以改进电力节省。

[0086] 在一个实施例中，光检测器模块可并入有具有可变增益的跨阻抗放大器级。此配置可避免来自光源的亮周围光及 / 或亮所发射光的饱和或使所述饱和最小化。举例来说，在跨阻抗放大器的负反馈路径中可借助可变电阻器及 / 或一组多路复用电阻器来自动调整及 / 或减小跨阻抗放大器的增益。在本发明的实施例中，装置可通过对光源的强度进行振幅调制及对光检测器（例如，同步检测）的输出进行解调而几乎不并入对周围光的光学屏蔽。（参见，举例来说，图 21）。在其它方面，如果周围光具有足以获得心率信号的亮度，那么光源可减小亮度及 / 或完全关断。

[0087] 在又一实施例中，可以组合形式使用前述处理技术以光学测量用户的生理参数。（参见，举例来说，图 23）。此拓扑可允许传感器装置以低功率测量状态及电路拓扑（适用时）操作且如需要，适于较高功率测量状态及电路拓扑。举例来说，传感器装置可在用户不动或静坐时使用模拟信号调节电路来测量所关注的生理参数（例如，心率）以减小功率消耗，但在用户活动时直接切换到光检测器输出的过取样取样。

[0088] 本文中在生理传感器 / 检测器的上下文中描述及图解说明许多发明。虽然已描述及图解说明本发明的特定实施例、特征、属性及优点，但应理解，本发明的许多其它以及不同及 / 或类似实施例、特征、属性及优点依据说明及图解变得显而易见。因此，本发明的上述实施例仅是示范性的。其不打算为穷尽性的或将本发明限制于所揭示的确切形式、技术、材料及 / 或配置。根据本发明可做出许多修改及变化。

[0089] 举例来说，在其中装置包含心率监测器的实施例中，用以获得心率测量的信号的处理可包括滤波及 / 或信号调节，例如带通滤波（例如，巴特沃斯 (Butterworth) 滤波器）。为抵消信号中可能发生的大瞬变及 / 或为改进所述滤波的收敛，可采用非线性方法，例如神经网络或转换速率限制。可使用来自便携式生物计量监测装置上的传感器中的一者或一者以上的数据（例如对应于运动、皮电反应、皮肤温度等的数据）来调整及 / 或确定由装置实施的信号调节方法。在特定操作条件下，用户的心率可通过计数时间窗内的信号峰值的数目或利用信号的基本频率或第二谐波（例如，经由快速傅里叶变换 (FFT)）而测量。在其它情形（例如运动）中，可对信号及所提取的频谱峰值执行 FFT，所述频谱峰值随后由开始、继续、合并及删除频谱的轨迹的多个目标跟踪器处理。

[0090] 在一个实施例中，对运动信号执行一组类似操作且使用输出来进行活动鉴别（例如，静坐、行走、跑步、睡觉、平躺、坐着、骑自行车、打字、椭圆训练、举重训练），此用于辅助

多个目标跟踪器。举例来说，可确定用户曾是静止的及已开始移动，且此信息可用于优先地使轨迹延续偏向增加的频率。类似地，活动鉴别器可确定用户已停止跑动或正较缓慢地跑动，且此信息可用于优先地使轨迹延续偏向减小的频率。跟踪可借助单扫描或多扫描多目标跟踪器拓扑而实现，例如联合概率数据互联跟踪器、多个假设跟踪、最近邻等。跟踪器中的估计及预测可经由卡尔曼（Kalman）滤波器、样条回归、粒子滤波器、交互式多个模型滤波器等进行。轨迹选择器模块使用来自多频谱跟踪器的输出轨迹且估计用户的心率。所述估计可被认为是最大似然轨迹、轨迹对其为心率的概率的加权和等。此外，活动鉴别器可影响得到心率估计的选择及/或融合。举例来说，如果用户正睡觉、坐着、平躺或静坐，那么先验概率可朝向40bpm到80bpm范围中的心率偏斜；而如果用户正跑步、慢跑或做其它剧烈锻炼，那么先验概率可朝向90bpm到180bpm范围中的经提升心率偏斜。活动鉴别器的影响可基于用户的速度。当用户不移动时，所述估计可朝向信号的基本频率移位（或全部通过信号的基本频率获得）。对应于用户的心率的轨迹可基于指示活动改变的准则而选择，举例来说，如果用户从静止开始行走，那么可优先地选择图解说明朝向较高频率的移位的轨迹。

[0091] 良好心率信号的获取可经由生物计量监测装置上的显示器或与生物计量监测装置通信（举例来说，有线或无线通信（例如，配备蓝牙低功耗的移动电话））的另一装置指示给用户。在优选实施例中，生物计量监测装置包含由用户可视的LED的脉冲表示的信号强度指示符。所述脉冲可被定时为或关联为与用户的心跳一致。可修改或调整LED的强度、脉冲速率及/或色彩以表明信号强度。举例来说，较亮LED强度可表示较强信号，或在RGB类型LED配置中，绿色的LED可表示较强信号。

[0092] 在优选实施例中，心率信号的强度可通过（举例来说）0.5Hz到4Hz的频带中的信号的能量（例如，平方积累和）而确定。在另一实施例中，本发明的生物计量监测装置可具有可并入到壳体中及/或并入带中或构造成壳体及/或带的应变计、压力传感器及/或力传感器（在那些实施例中，其中生物计量监测装置附接到像手表、手镯及/或臂带的带或安装有像手表、手镯及/或臂带的带，所述带可接着被紧固到用户）。信号质量度量可借助这些接触传感器（单独地或结合来自心率信号的数据一起）而计算。

[0093] 在另一实施例中，生物计量监测装置可经由光电检测器的阵列（例如光电二极管的栅格或CCD摄像机）而以光学方式监测心率。光学装置相对于皮肤的运动可使用加速度计及陀螺仪经由皮肤的特征跟踪及/或自适应运动校正而跟踪。检测器阵列可与皮肤接触或在远离皮肤的小距离处偏移。可有源地控制（例如，借助电机）检测器阵列及其相关联光学器件以维持目标的稳定图像及获取心率信号。此光机械稳定性可使用来自运动传感器（例如，陀螺仪）的信息或图像特征而实现。在一个实施例中，生物计量监测装置可使用用以照射皮肤的相干或不相干光源及光电检测器阵列（其中每一光电检测器与用于比较邻近检测器之间的强度的比较器相关联）来实施相对运动取消，从而获得可使用多种图像跟踪技术跟踪的所谓的斑点图案，例如，举例来说，光流、模板匹配、边缘跟踪等。在此实施例中，用于运动跟踪的光源可不同于光学心率监测器中所使用的光源。

[0094] 在另一实施例中，生物计量监测装置可由沿装置触碰用户的皮肤的表面（即，生物计量监测装置的皮肤侧）分布的多个光电检测器及光发射器组成。（参见，举例来说，图2到11）。在手镯的实例中，举例来说，可存在沿带的内部的周长放置的多个光电检测器及光发射器。（参见，举例来说，图11）。可计算每一站点处的心率信号质量度量以确定用于估

计用户的心率的最佳站点或一组最佳站点。随后，所述站点中的一些站点可被停用或关断以（举例来说）减小功率消耗。装置可在所述站点中的一些站点或全部站点处周期性地检查心率信号质量以（i）选择/启用一个或一个以上传感器及/或检测器及/或（ii）确定一个或一个以上优选传感器/检测器以（举例来说）借此增强、监测及/或优化信号及/或功率效率。

[0095] 在另一实施例中，本发明的生物计量监测装置可包含包含多个传感器（例如光学、声学、压力、电（例如，EKG）及运动）的心率监测系统并融合来自这些传感器中的两者或两者以上的信息以提供心率的估计及/或减轻从运动诱发的噪声。

[0096] 除心率监测（或其它生物计量监测）之外或代替心率监测（或其它生物计量监测），在一个实施例中，生物计量监测装置包含光学传感器以跟踪或检测紫外线曝光的时间及持续时间、总室外曝光、光源类型以及所述光源（荧光灯曝光、白炽灯泡曝光、卤素灯等）的持续时间及强度、暴露于电视（基于灯类型及闪烁速率）（无论用户在室内还是在室外）、当日时间及基于光条件的位置。在一个实施例中，紫外线检测传感器可由作为光检测器驱动的反向偏置的 LED 发射器组成。由此检测器产生的光电流可通过（举例来说）测量 LED 的电容（或者，并联电容器）放电所花费的时间来表征。

[0097] 所有光学传感器均可连同其它传感器一起使用以改进上文所描述的数据的检测或用于扩增其它类型的生理或环境数据的检测。

[0098] 在生物计量监测装置包含音频或无源声传感器的情况下，所述装置可含有一个或一个以上无源声传感器，所述无源声传感器检测声音及压力且可包含但不限于麦克风、压电薄膜等。所述声传感器可安置于所述装置的一个或一个以上侧上，包含触碰或面向皮肤的侧（皮肤侧）及面向环境的侧（环境侧）。

[0099] 本发明的生物计量监测装置还可包含皮电反应（GSR）电路以测量用户的皮肤对情绪及物理刺激或生理改变（例如，睡眠阶段的转变）的反应。在一个实施例中，本发明是并入有由导电橡胶或织物构成的带的腕或臂装式装置，使得皮电反应电极可隐藏于带中。由于皮电反应电路可经受改变的温度及环境条件，因此其还可包含启用自动校准的电路，例如与允许已知电阻器的实时测量以表征皮电反应电路的响应的人皮肤/电极路径并联或串联的两个或两个以上可切换参考电阻器。参考电阻器可切换到测量路径中和外，使得其独立地及/或与人皮肤同时地测量。

[0100] 皮肤侧传感器将检测经由身体传输的任何类型的声音，且传感器可布置成优化 SNR 及功率消耗两者的阵列或型式。这些传感器可检测呼吸（通过听肺）、呼吸声音（喘气、打鼾）及问题、心率（听心跳）、用户的语音（经由从身体内的声带所传输的声音）。

[0101] 环境传感器

[0102] 本发明的监测装置可使用以下环境传感器中的一个环境传感器、一些环境传感器或全部环境传感器来（举例来说）获取环境数据，包含下表中所概述的环境数据。所述监测装置不限于下文指定的传感器的数目或类型，而可采用获取下表中所概述的环境数据的其它传感器。环境传感器及/或环境数据的所有组合及置换均打算归属于本发明的范围内。另外，所述装置可从对应传感器输出数据导出环境数据，但不限于可从所述传感器导出的环境数据的类型。

[0103] 明显地，本发明的监测装置可为本文中所描述的环境传感器中的一者或一者以上

或者全部环境传感器及本文中所描述的生理传感器中的一者或一者以上或者全部生理传感器。实际上，生物计量监测装置可使用现在已知或稍后开发的任何传感器来获取本文中所描述的环境数据及生理数据中的任何或全部环境数据及生理数据，所有环境数据及生理数据均打算归属于本发明的范围内。

[0104]

环境传感器	所获取的环境数据

[0105]

运动检测器	位置
可能实施例：	
-惯性、陀螺仪或加速度计	
- GPS	
压力/高度计传感器	高程
周围温度	温度
光传感器	室内对室外
	看 TV (光谱/闪烁速率检测)
	光学数据传送-起始、QR 码等
	紫外线曝光
音频	室内对室外
指南针	位置
可能实施例：	
-三轴指南针	

[0106] 在一个实施例中，举例来说，监测装置可包含安置于或位于装置壳体的内部中的高度计传感器。(参见，举例来说，图 25 及 26)。在此情形中，装置壳体可具有允许装置的内部测量、检测、取样及 / 或经历外部压力的任何改变的通气孔。在一个实施例中，所述通气孔防止水进入装置同时促进经由高度计传感器对压力的改变进行测量、检测及 / 或取样。举例来说，生物计量监测装置的外部表面可包含通气孔类型配置或架构 (例如，Gore™ 通气孔)，此允许周围空气进出装置的壳体 (此允许高度计传感器测量、检测及 / 或取样压力的改变)，但减小、防止到装置壳体中的水及其它液体渗透及 / 或使所述渗透最小化。

[0107] 在一个实施例中，高度计传感器可填充有凝胶，此允许传感器在凝胶外侧经历压力改变。凝胶填充的高度计的使用可在具有或不具有环境密封的通气孔的情况下赋予装置较高水平的环境保护。所述装置可借助凝胶填充的高度计在以下位置中具有较高耐受率，所述位置包含但不限于具有高湿度的那些位置、洗衣机、洗碗机、干衣机、蒸汽房、淋浴室、

游泳池及所述装置可能暴露于水分、暴露于液体或浸没于液体中的任何位置。

[0108] 传感器集成 / 信号处理

[0109] 本发明的生物计量监测装置可使用来自两个或两个以上传感器的数据来计算对应生理或环境数据，如在下表中可见（举例来说，来自以组合形式使用的两个或两个以上传感器的数据）。所述装置可包含但不限于下文指定的传感器的数目、类型或组合。另外，所述装置可从对应传感器组合导出所包含的数据，但不限于可依据对应传感器组合计算的数据的数目或类型。

[0110]

传感器集成	从多个传感器的信号处理导出的数据
皮肤温度及周围温度	热通量
心率及运动	高程增益
运动检测器及其它用户的运动检测器	接近的用户
运动、任何心率传感器、皮电反应	坐/站检测
任何心率、心率变异性传感器、呼吸、运动	睡眠相位检测
	睡眠呼吸暂停检测
任何心率传感器及/或湿度传感器、及/或运动检测器	静息心率
	活动心率
	睡着时的心率
	静坐时的心率
任何心率检测器	心脏问题的早期检测：
	-心律失常
	-心跳停止
多个心率检测器	脉搏传导时间
音频及/或应变计	打字检测
GPS 及光电容积描记法(PPG)	位置-应激相关：
	-应激区域的确定
	-低应激区域的确定
	活动特定心率
	-静息心率
	-活动心率
	自动活动分类及活动心率确定
心率、皮电反应、加速度计及呼吸	用户疲劳，举例来说在锻炼时

[0111] 在一个实施例中，装置还可包含近场通信 (NFC) 接收器 / 传输器以检测另一装置的接近，例如移动电话。当使装置紧密或可检测接近于第二装置时，其可触发第二装置上的新功能性的开始（例如，移动电话上的“应用”的开启及生理数据从装置到第二装置的无线电同步）。（参见，举例来说，图 16）。实际上，本发明的生物计量监测装置可实施 2012 年 3 月 5 日提出申请的美国临时专利申请案 61 / 606,559 中所描述及 / 或所图解说明的电路及技术中的任一者，所述美国临时专利申请案标题为“近场通信系统及其操作方法 (Near Field Communication System,and Method of Operating S ame)”，发明人为：詹姆斯帕克

(James Park)(所述美国临时专利申请案的内容以引用的方式并入本文中)。

[0112] 在另一实施例中,生物计量监测装置包含位置传感器(举例来说,GPS 电路)及心率传感器(举例来说,光电容积描记法电路)以分别产生 GPS 或位置相关数据及心率相关数据。(参见,举例来说,图 25 及 26)。所述生物计量监测装置可接着融合、处理及/或组合来自这两个传感器/电路的数据以根据生理数据(举例来说,心率、应激、活动水平、睡眠长短及/或热量摄取)(举例来说)确定、关联及/或"映射"地理区域。以此方式,生物计量监测装置可识别增加或减少可测量用户度量的地理区域,所述可测量用户度量包含但不限于心率、应激、活动水平、睡眠长短及/或热量摄取。

[0113] 除此之外或代替此,生物计量监测装置可采用 GPS 相关数据及光电容积描记法相关数据(明显地,其中的每一者均可认为是数据流)来根据活动水平确定或关联用户的心率,举例来说,如由用户的加速度、速度、位置及/或行进的距离所确定(如由 GPS 所测量及/或依据 GPS 相关数据所确定)。(参见,举例来说,图 25 及 26)。此处,在一个实施例中,可针对用户"标绘"或关联作为速度的函数的心率,或可将数据分解成不同层级,包含但不限于睡觉、休息、静坐、中等活动、活动及高度活动。

[0114] 实际上,生物计量监测装置还可使 GPS 相关数据与针对一组预定条件具有与其相关联的活动的预定地理位置的数据库相关。举例来说,活动确定及对应生理分类(举例来说,心率分类)可包含使对应于锻炼设施、健康俱乐部及/或健身房的位置的用户的 GPS 坐标与生理数据相关。在这些情况下,可自动测量及显示在(举例来说)健身房练习期间的用户的心率。明显地,许多生理分类可是基于 GPS 相关数据的,包含位置、加速度、海拔、距离及/或速度。包含地理数据及生理数据的此数据库可编译、发展及/或存储于生物计量监测装置及/或外部计算装置上。实际上,在一个实施例中,用户可形成其自己的位置数据库或添加或修改位置数据库以较好地对其活动进行分类。

[0115] 在另一实施例中,用户可同时佩戴多个生物计量监测装置(具有本文中所描述的特征中的任一者)。此实施例的装置可使用有线或无线电路彼此通信或与远程装置通信以计算(举例来说)可难以或不准确地以其它方式计算的(举例来说)生物计量或生理质量或数量,例如脉搏传导时间。多个传感器的使用还可将生物计量测量的准确性及/或精确性改进为优于单个传感器的准确性及/或精确性。举例来说,在腰部、手腕及踝上具有装置可将对用户迈步的检测改进为优于那些位置中的仅一者中的单个装置的检测。可以分布式或集中式方法对所述装置执行信号处理以提供优于单个装置的测量的改进的测量。此信号处理还可远程地执行且在处理之后往回传递到装置。

[0116] 处理任务授权

[0117] 生物计量监测装置可包含一个或一个以上处理器。(参见,举例来说,图 29 到 31)。举例来说,独立应用处理器可用于存储及执行利用由一个或一个以上传感器处理器(处理来自生理传感器、环境传感器及/或活动传感器的数据的处理器)获取及处理的传感器数据的应用。在其中存在多个传感器的情形中,还可存在多个传感器处理器。应用处理器还可具有直接连接到其的传感器。传感器及应用处理器可作为单独离散芯片存在或存在于相同经封装芯片(多核心)内。一装置可具有一单个应用处理器,或一应用处理器及传感器处理器,或者多个应用处理器及传感器处理器。

[0118] 在一个实施例中,传感器封装可放置于包含模拟组件的子板上。此板可具有通常

以主 PCB 为基础的电子器件中的一些电子器件，例如但不限于：跨阻抗放大器、滤波电路、电平移位器、取样与保持电路及微控制器单元。此配置可允许子板经由（除任何必需电力或接地连接之外）数字连接而非模拟连接的使用而被连接到主 PCB。数字连接可具有优于模拟子 PCB 连接或主 PCB 连接的多种优点，包含但不限于：噪声的减小及所需电缆的数目的减小。子板可经由柔性电缆或一组电线的使用而连接到主板。

[0119] 多个应用可存储于应用处理器上。应用可由用于所述应用的可执行码及数据组成，但不限于这些可执行码及数据。数据可由执行应用所需的图形或其它信息及 / 或由所述应用产生的信息输出组成。用于所述应用的可执行码及数据两者均可驻存于应用处理器上，或用于所述应用的数据可存储于外部存储器且自外部存储器检索。外部存储器可包含但不限于 NAND 快闪、NOR 快闪、另一处理器上的快闪、其它固态存储装置、机械硬盘或光盘及 / 或 MRAM。

[0120] 用于应用的可执行码还可存储于外部存储器上。当请求执行应用时，应用处理器从外部存储装置检索可执行码及 / 或数据并执行其。可执行码可暂时地或永久地存储于应用处理器的存储器或存储装置上。此允许对下一执行请求较快地执行所述应用，这是因为消除了检索步骤。当请求执行应用时，应用处理器可检索应用的所有可执行码或可执行码的部分。在检索可执行码的部分的情形中，仅检索当时所需的可执行码的一部分。此允许执行大于应用处理器的存储器或存储装置的应用。

[0121] 应用处理器还可具有存储器保护特征以防止应用重写、损坏、中断、阻塞或以其他方式干扰其它应用、传感器系统、应用处理器或系统及 / 或传感器装置的其它组件。

[0122] 应用可经由多种有线、无线、光学、电容性机构（包含但不限于：USB、Wi-Fi、蓝牙、蓝牙低功耗、NFC、RFID 及 Zigbee）加载到应用处理器或任何外部存储装置上。

[0123] 在一个实施例中，应用可与电子签名加密地签订。因此，应用处理器可将应用的执行约束于具有正确签名的那些应用。

[0124] 佩戴装置的方法

[0125] 生物计量监测装置可包含具有在正常操作期间促进将装置固定到用户的身体（或衣服）的大小及形状的壳体，其中当耦合到用户时，所述装置不可测量地或不明显地影响用户的活动。取决于集成到所述装置中的特定传感器封装及用户想要获取的数据，可以不同方式佩戴装置。

[0126] 用户可借助为柔性的且借此易于装配到用户的带的使用将本发明的生物计量监测装置中的一者或一者以上佩戴于其手腕或踝（或手臂或腿）上。所述带可具有可调整周长，从而允许其装配到用户。所述带可由在暴露于热时收缩的材料构造，从而允许用户形成定制装配。所述带可与生物计量监测装置的“电子”部分拆开，且需要时，可替换。

[0127] 在优选实施例中，生物计量监测装置由两个主要组件组成：主体（含有“电子器件”）及带（促进将装置附接到用户）。所述主体可包含壳体（举例来说，由塑料或塑料类材料制成）及从主体突出的扩展突片（举例来说，由金属或金属类材料制成）。（参见，举例来说，图 4 到 7）。所述带（举例来说，由热塑性氨基甲酸乙酯制成）可机械地或粘着地附接到主体。所述带可延伸出用户的手腕的周长一小部分。氨基甲酸乙酯带的远端可与维可牢、钩及 / 或在一侧上以环缠绕 D 形环且接着往回附接到其自身的环形弹性织物带连接。在此实施例中，闭合机构将允许用户进行无限带长度调整（与分度孔及机械扣封不同）。维可牢

或织物可以允许其被替换（举例来说，如果其被磨损或者在装置的有效期或寿命终止之前不想要佩戴）的方式附接到带。在一个实施例中，维可牢或织物将借助螺钉或铆钉及/或胶、粘合剂及/或卡环附接到带。

[0128] 本发明的生物计量监测装置还可集成且佩戴于项链、胸带、胸罩、眼罩、眼镜、耳环或脚带中。所述装置可以此方式构建：生物计量监测装置的传感器封装/部分是可拆卸的且可以任何数目种方式佩戴，包含但不限于上文所列的那些方式。

[0129] 在另一实施例中，本发明的生物计量监测装置可被夹持到衣物或放置于衣服（例如，口袋）或附件（例如，手提包、背包、钱包）中。由于生物计量监测装置可不接近用户的皮肤，因此在包含心率测量的实施例中，所述测量可通过用户手动地将装置至于特定模式（例如，可能在心率传感器嵌入按钮/传感器中的情况下，按下按钮、覆盖电容性触摸传感器等）中或一旦用户抵靠皮肤而放置装置（例如，将手指放到光学心率传感器）便自动地以离散“按需”情境获得。

[0130] 装置的用户接口

[0131] 生物计量监测装置可包含与装置本地或远程地交互的一种或一种以上方法。

[0132] 在一个实施例中，生物计量监测装置可经由数字显示器直观地输送数据。此显示器的物理实施例可使用任何一种或多种显示器技术，包含但不限于：LED、LCD、AMOLED、电子墨水、夏普（Sharp）显示器技术、图形显示器及其它显示器技术（例如 TN、HTN、STN、FSTN、TFT、IPS 及 OLET）中的一者或一者以上。此显示器可展示所述装置上本地所获取或所存储的数据或者可显示其它装置或因特网服务远程所获取的数据。所述装置可使用传感器（举例来说，周围光传感器，即“ALS”）来控制或调整屏幕背光。举例来说，在暗照明情形中，所述显示器可为暗淡的以节约电池寿命，而在亮照明情形中，显示器可增加其亮度，使得其较易于被用户读取。

[0133] 在另一实施例中，装置可使用单色或多色 LED 来指示装置的状态。装置指示的状态可包含但不限于生物计量状态（例如心率）或应用状态（例如已实现目标的传入消息）。这些状态可经由 LED 的色彩、接通、关断、中间强度、脉冲（及/或其速率）及/或从完全关断到最大亮度的光强度的型式而指示。在一个实施例中，LED 可借助用户的心率的相位及频率来调制其强度及/或色彩。

[0134] 在优选实施例中，电子墨水类型显示器或技术的使用将允许显示器保持继续而不会出现非反射显示器的电池耗尽。此“总是接通”功能性可在（举例来说）其中用户可仅瞥一眼装置来看时间的手表应用的情形中提供令人愉快的用户经历。电子墨水显示器总是在不使装置的电池寿命受损的情况下显示内容，从而允许用户就像其带传统手表一样看时间。

[0135] 装置可通过调制以用户的心率的频率发射的光的振幅使用灯（例如 LED）来显示用户的心率。所述装置可根据心率的改变（例如，进度条）经由 LED 的色彩（例如，绿色、红色）或 LED 点亮的顺序而描绘心率区（例如，有氧、无氧）。所述装置可集成或并入到另一装置或结构（举例来说，眼镜或护目镜）中或与眼镜或护目镜通信以将此信息显示给用户。

[0136] 生物计量监测装置还可经由装置的物理运动将信息输送给用户。物理移动装置的方法的一个此实施例是振动诱发电机（举例来说，振打电机/振动电机）的使用。该装置

可单独地或结合多个运动诱发技术一起使用此方法。

[0137] 所述装置可经由音频将信息输送给用户。扬声器可经由音频音调、语音、歌曲或其它声音的使用输送信息。

[0138] 这三个信息通信方法（即，视觉、运动及听觉）可单独地或结合彼此或另一通信方法一起使用以传递以下信息中的任一者或多者：

[0139] • 用户需要在特定时间唤醒

[0140] • 用户应在其处于特定睡眠阶段时唤醒

[0141] • 用户应在特定时间时去睡觉

[0142] • 用户应在其处于特定睡眠阶段及处于由用户希望唤醒的最早及最晚时间限定的预选时间窗中时唤醒。

[0143] • 接收电子邮件

[0144] • 用户已不活动达特定时间周期。明显地，此可与像（举例来说）会议日历或睡眠跟踪应用的其它应用集成在一起以阻拦、减小或调整不活动警告的行为。

[0145] • 用户已活动达特定时间周期

[0146] • 用户具有约定或日历事件

[0147] • 用户已达到特定活动度量

[0148] • 用户已行进特定距离

[0149] • 用户已达到特定英里速度

[0150] • 用户已达到特定速度

[0151] • 用户已积累特定高程增益

[0152] • 用户已进行特定步数

[0153] • 用户近期已得到心率测量

[0154] • 用户的心率已达到特定水平

[0155] • 用户具有特定值的或在特定范围内的正常心率、活动心率或静息心率

[0156] • 用户的心率已进入或超出特定目标范围或训练区

[0157] • 用户具有要实现的新心率“区”目标，如在针对跑步、骑自行车、游泳等活动进行心率区训练的情形中

[0158] • 用户已在游泳池中游了一圈或已完成特定圈数

[0159] • 外部装置具有需要传递到用户的信息，例如呼入电话或以上警告中的任一者

[0160] • 用户已达到特定疲劳目标或极限。在一个实施例中，疲劳可经由心率、皮电反应、运动传感器及/或呼吸数据的组合而确定

[0161] 这些实例是出于图解说明目的而提供且并不打算限制可由装置传递（举例来说，到用户）的信息的范围。注意，可从第一装置及/或一个或一个以上辅助装置获取用于确定是否满足警告的数据。所述装置自身可确定是否已满足警告的准则。或者，与所述装置通信的计算装置（例如服务器及/或移动电话）可确定何时应发生警告。鉴于本发明，所属领域的技术人员可设想装置可传递到用户的其它信息。举例来说，当满足目标时，装置可与用户通信。用于满足此目标的准则可是基于第一装置上的生理、情境及环境传感器及/或来自一个或一个以上辅助装置的其它传感器数据。所述目标可由用户设定或可由装置自身及/或与所述装置通信的另一计算装置（例如服务器）设定。在示范性实施例中，当满

足生物计量目标时，装置可振动。

[0162] 本发明的生物计量监测装置可配备有无线及/或有线通信电路以在辅助装置上实时地显示数据。举例来说，本发明可能够经由蓝牙低功耗与移动电话通信以便向用户给出心率、心率变异性及/或应激的实时反馈。本发明可指导或授用户以缓和应激的特定方式喘气的“点”。应激可经由心率、心率变异性、皮肤温度、运动-活动数据的改变及/或皮电反应而量化或评估。

[0163] 生物计量监测装置可经由一个或一个以上本地或远程输入方法接收来自用户的输入。本地用户输入的一个此实施例可使用一传感器或一组传感器来将用户的移动转变成到装置的命令。此些运动可包含但可不限于轻敲、转动手腕、使一个或一个以上肌肉收缩及游泳。另一用户输入方法可是经由按钮的类型的使用，但不限于以下类型：电容性触摸按钮、电容性屏幕及机械按钮。在一个实施例中，用户接口按钮可由金属制成。在屏幕使用电容性触摸检测的情形中，其可在不具有介入事件（例如推动物理按钮）的情况下总是对任何手势或输入进行取样且易于对任何手势或输入做出响应。所述装置还可经由音频命令的使用而得到输入。所有这些输入方法可在本地集成到装置中或集成到可经由有线或无线连接与所述装置通信的远程装置中。另外，用户还可能够经由远程装置操纵所述装置。在一个实施例中，此远程装置可具有因特网连接。

[0164] 在一个实施例中，本发明的生物计量监测装置可操作为腕装式振动报警以静静地将用户从睡眠中唤醒。生物计量监测装置可经由心率、心率变异性、皮电反应、运动感测（例如，加速度计、陀螺仪、磁力计）及皮肤温度中的一者或其组合跟踪用户的睡眠质量、唤醒周期、入眠时间、睡眠效率、睡眠阶段（例如，深度睡眠对REM）及/或其它睡眠相关度量。用户可指定所要报警时间且本发明可使用睡眠度量中的一者或一者以上来确定唤醒用户的优选时间。在一个实施例中，当振动报警作用时，用户可通过拍打或轻敲装置（举例来说，此经由装置中的运动传感器、压力/力传感器及/或电容性触摸传感器而检测到）而致使其休眠或关断。在一个实施例中，装置可试图通过在报警设定之前的特定用户睡眠阶段或时间开始小振动而在睡眠循环中的最优点处唤起用户。当用户朝向醒觉或朝向报警设定逐渐前进时，其可逐渐增加振动的强度或显著性。（参见，举例来说，图14）。

[0165] 在另一方面中，生物计量监测装置可使用板上光学传感器（例如光学心率监测器中的组件）而配置或通信。

[0166] 无线连接及数据传输

[0167] 本发明的生物计量监测装置可包含用于传输及接收来自因特网及/或其它装置的信息的无线通信手段。所述无线通信可由一个或一个以上手段（例如蓝牙、ANT、WLAN、电力线网络连接及移动电话网络）组成。这些是作为实例而提供且不排除现存或尚未发明的其它无线通信方法。

[0168] 无线连接为两种方式。装置可将其数据传输、传递及/或推动到其它外围装置及/或因特网。装置还可从其它外围装置及/或因特网接收、请求及/或拉动数据。

[0169] 生物计量监测装置可充当继电器以提供其它装置到彼此间或到因特网的通信。举例来说，装置可经由WLAN连接到因特网，但还配备有ANT无线电。ANT装置可与所述装置通信以经由所述装置的WLAN将其数据传输到因特网（且反之亦然）。作为另一实例，所述装置可配备有蓝牙。如果启用蓝牙的智能电话触及装置，那么所述装置可经由智能电话的移

动电话网络将数据传输到因特网或从因特网接收数据。来自另一装置的数据还可被传输到所述装置并被存储（且反之亦然）或在稍后时间进行传输。

[0170] 本发明还可包含流动式接收或传输网页内容以供在生物计量监测装置上显示。以下是典型实例：

[0171] • 由装置测量但远程地存储的心率及/或其它数据的历史图表

[0172] • 由其它装置测量及/或远程地（例如，fitbit.com）存储的用户活动及/或所消耗的食物及/或睡眠数据的历史图表

[0173] • 远程地存储的其它跟踪用户的数据的历史图表。实例包含心率、血压、动脉僵硬度、血糖水平、胆固醇、TV 观看持续时间、玩视频游戏的持续时间、情绪等

[0174] • 基于用户的心率、当前体重、体重目标、食物摄取、活动、睡眠及其它数据中的一者或一者以上的指导及/或节食数据。

[0175] • 用户朝向心率、体重、活动、睡眠及/或其它目标逐渐前进。

[0176] • 用以描述前述数据的概括统计、图形、标志及/或度量（例如，“等级”）

[0177] • 借助类似装置及/或跟踪方法显示给用户及其“朋友”的前述数据

[0178] • 社交内容，例如推特源（Twitter feed）、即时消息及/或脸谱网（Facebook）更新

[0179] • 其它在线内容，例如报纸文章、星座物语、天气报告、RSS 源、漫画、填字游戏、分类广告、股票报告及网站

[0180] • 电子邮件消息及日程表

[0181] 内容可根据不同情境递送到生物计量监测装置。举例来说，在早晨，可连同用户前一夜的睡眠数据一起显示新闻及天气报告。在晚上，可显示当日活动的每日总结。

[0182] 本发明还可包含 NFC、RFID 或可用于起始其它装置中的功能性的其它短程无线通信电路。举例来说，本发明可配备有 NFC 天线，使得当用户将其放到紧接近于移动电话时，移动电话上自动开启应用。

[0183] 这些实例是出于图解说明目的而提供且并不打算限制可由所述装置传输、接收或显示的数据的范围或在此传送及显示期间可能发生的任何中间处理。鉴于本发明/申请案，所属领域的技术人员可设想许多其它数据。

[0184] 充电及数据传输

[0185] 生物计量监测装置可使用有线连接来对内部可再充电电池进行充电及/或将数据传送到主机装置，例如膝上型计算机或移动电话。在一个实施例中，所述装置可使用磁铁来帮助用户将装置与坞或电缆对准。坞或电缆中的磁铁及装置自身中的磁铁的磁场策略上可经定向以迫使装置自对准且提供保持装置与坞或电缆对准的力。所述磁铁还可用作用于充电或数据传输的导电触点。在另一实施例中，永久性磁铁仅用于坞或电缆侧中，而不用于装置自身中。此可在生物计量监测装置采用磁力计的情况下改进所述装置的性能。在装置中具有磁铁的情况下，附近永久性磁铁的强场可增加磁力计准确地测量地球磁场的困难。

[0186] 在另一实施例中，所述装置可在装置主体中含有一个或一个以上电磁铁。用于充电及数据传输的充电器或坞还将含有电磁铁及/或永久性磁铁。所述装置可仅在其靠近充电器或坞时接通其电磁铁。其可通过使用磁力计寻找充电器或坞中的永久性磁铁的磁场信号而检测坞的接近。或者，其可通过测量来自充电器或坞的无线信号的所接收信号强度指

示或 RSSI 而检测充电器的接近。所述电磁铁可被反向，从而形成在装置不需要充电、同步时或在其已完成同步或充电时从充电电缆或坞排斥所述装置的力。

[0187] 可配置应用功能性

[0188] 在一些实施例中，本发明的生物计量监测装置可包含手表样外观尺寸及 / 或手镯、臂章或踝套外观尺寸且可编程有开启特定功能性及 / 或显示特定信息的“应用”。应用可通过多种手段或技术而开启或关闭，借此在装置内侧形成高度计检测到的压力信号或靠近与一应用或一组应用相关联的 NFC 标签放置装置，所述多种手段或技术包含但不限于按压按钮、使用电容性触摸传感器、执行加速度计检测到的手势、移动到 GPS 或运动传感器检测到的位置、压紧装置主体。应用还可通过特定环境或生理条件自动触发开启或关闭，包含但不限于：高心率、使用湿传感器的对水的检测（举例来说，以开启游泳应用）、当日的特定时间（举例来说，以在晚上开启睡眠跟踪应用）、压力的改变及飞机起飞或降落的运动特性以开启或关闭“飞机”模式应用。应用还可通过同时满足多个条件而开启或关闭。举例来说，如果加速度计检测到用户正跑动且用户按压按钮，那么其可开启计步器应用、高度计数据收集应用及 / 或显示器。在其中加速度计检测到游泳且用户按压相同按钮的另一情形中，其可开启圈计数应用。

[0189] 在一个实施例中，所述装置可具有可通过开始游泳应用而开启的游泳跟踪模式。在此模式中，装置的运动传感器及 / 或磁力计可用于检测游泳姿势、对游泳姿势类型进行分类、检测游泳圈数及其它相关度量，例如姿势效率、单圈时间、速度、距离及卡路里燃烧。由磁力计指示的方向改变可用于检测圈转弯方法的差异。在优选实施例中，来自运动传感器及 / 或压力传感器的数据可用于检测姿势。

[0190] 在另一实施例中，骑自行车应用可通过接近位于自行车上、自行车上的座架上或与自行车相关联的位置（包含但不限于自行车停车架或自行车存放设施）中的 NFC 或 RFID 标签移动装置而开启。（参见，举例来说，图 16）。所开启的应用可使用与通常用于确定包含但不限于燃烧的卡路里、行进的距离及获得的高程的度量不同的算法。所述应用还可在检测到无线自行车传感器（包含但不限于车轮传感器、GPS、节奏传感器或功率计）时被开启。所述装置可接着显示及 / 或记录来自无线自行车传感器或自行车传感器的数据。

[0191] 额外应用包含但不限于可编程或可定制手表面、秒表、音乐播放器控制器（例如，mp3 播放器远程控制）、文字消息及 / 或电子邮件显示器或“通知器”、导航指南针、自行车计算机显示器（当与单独或集成 GPS 装置、车轮传感器或功率计通信时）、举重跟踪器、仰卧起坐代表跟踪器、引体向上代表跟踪器、阻力训练形式 / 练习跟踪器、高尔夫挥杆动作分析器、网球（或其它有球拍运动）挥杆动作 / 发球分析器、网球比赛挥杆动作检测器、棒球挥杆动作分析器、掷球分析器（例如，足球、棒球）、组织的体育活动强度跟踪器（例如，足球、棒球、篮球、排球、英式足球）、飞盘投掷分析器、食物咀嚼检测器、打字分析器、倾斜传感器、睡眠质量跟踪器、闹钟、应力计、应激 / 放松生物反馈游戏（例如，可能与提供听觉及 / 或视觉提示的移动电话组合以在放松锻炼中训练用户喘气）、刷牙跟踪器、吃饭速率跟踪器（例如，以针对食物摄取计数或跟踪将餐具拿到嘴边的速率及持续时间）、醉态或驾驶机动车辆适宜性指示器（例如，经由心率、心率变异性、皮电反应、步伐分析、解谜等等）、过敏跟踪器（例如，使用皮电反应、心率、皮肤温度、花粉感测等等，可能结合来自（举例来说）因特网的外部季节性过敏原跟踪；可能确定用户对特定形式的过敏原（例如，树花粉）的反应

且警告用户此些过敏原的存在（例如，来自季节信息、花粉跟踪数据库或装置中的或用户所采用的本地环境传感器））、发烧跟踪器（例如，测量发烧、感冒或其它病的风险、开始或恶化，可能结合季节数据、疾病数据库、用户位置及/或用户提供的反馈一起来评估关于用户的特定疾病（例如，流感）的传播，且可能作为响应规定或建议工作或活动的节制）、电子游戏、咖啡因影响跟踪器（例如，响应于咖啡、茶、功能饮料及/或其它含咖啡因的饮品的摄取或节制而短期或长期监测例如心率、心率变异性、皮电反应、皮肤温度、血压、应激、睡眠及/或活动的生理反应）、药物影响跟踪器（例如，类似于先前所提及咖啡因跟踪器，但与其它介入有关，无论其它介入是医疗药物还是保健药物，例如酒精、烟草制品等）、耐力运动指导（例如，利用来自（举例来说）历史锻炼活动（例如，长跑、步速）、心率、心率变异性、健康/病症/应激/发烧状态的数据根据用户指定目标（例如马拉松、三项全能或定制目标）而推荐或规定跑步/骑自行车/游泳练习的强度、持续时间或量变曲线，或建议练习的节制或延迟）、体重及/或身体组成、血压、血糖、食物摄取或卡路里平衡跟踪器（例如，通知用户其可消耗多少卡路里以维持或实现体重）、计步器及咬指甲检测器。在一些情形中，所述应用可仅依赖于本发明的处理能力及传感器。在其它情形中，所述应用可融合或仅显示来自一外部装置或一组外部装置的信息，包含但不限于心率带、GPS距离跟踪器、身体组成比例、血压监测器、血糖监测器、手表、智能手表、移动通信装置（例如智能电话或平板计算机）或服务器。

[0192] 在一个实施例中，所述便携式监测装置可控制辅助装置上的音乐播放器。可控制的音乐播放器的方面包含但不限于音量、音轨选择及/或播放列表、向前跳过或向后跳过、音轨的快进或后退、音轨的节奏及音乐播放器均衡器。音乐播放器的控制可是经由用户输入的或基于生理、环境或情境数据自动的。举例来说，用户可能够通过经由装置上的用户接口选择音轨而选择及播放其智能电话上的音轨。在另一实例中，便携式监测装置可基于用户的活动水平（依据装置传感器数据计算的活动水平）而自动挑选适当音轨。此可用于帮助激励用户维持特定活动水平。举例来说，如果用户继续跑步或希望将其心率保持在特定范围中，那么在其心率低于其为目标的范围的情况下，所述装置可播放上升或较高节奏的音轨。

[0193] 本文中描述及图解说明许多发明。虽然已描述及图解说明本发明的特定实施例、特征、属性及优点，但应理解，本发明的许多其它以及不同及/或类似实施例、特征、属性及优点依据说明及图解变得显而易见。因此，本发明的上述实施例仅是示范性的。其不打算为穷尽性的或将本发明限制于所揭示的确切形式、技术、材料及/或配置。根据本发明可做出许多修改及变化。应理解，可利用其它实施例且可在不背离本发明的范围的情况下做出操作改变。因此，本发明的范围不仅限于上述说明，这是因为已出于图解及说明的目的呈现上述实施例的说明。

[0194] 重要地，本发明既不限于任何单一方面或实施例，也不限于此些方面及/或实施例的任何组合及/或置换。此外，可单独地或结合本发明的其它方面及/或实施例中的一者或一者以上一起采用本发明的方面及/或其实施例中的每一者。为简洁起见，本文中将不再分别详细地论述及/或图解说明那些置换及组合中的许多置换及组合。

[0195] 除其它外，权利要求书中的术语“计算（calculate）”及其它形式（即，计算（calculating、calculated及calculation））意指计算（calculate）、评估（assesses）、确

定（determine）及/或估计（estimate）及其等的其它形式。另外，除其它外，权利要求书中的术语“光管”（或其复数形式）意指光管、导光管、光路径或优先地沿预定路径（举例来说，由光管的几何形状及/或材料界定的路径）引导或透射光的其它透光结构。此外，在权利要求书中，除其它外，“经散射”意指经散射及/或经反射。

[0196] 明显地，本文中的术语“第一”、“第二”等等并不表示任何次序、数量或重要性，而是用于区分一个元件与另一元件。此外，在权利要求书中，本文中的术语“一（a及an）”不表示对数量的限制，而是表示存在所提及物项中的至少一者。

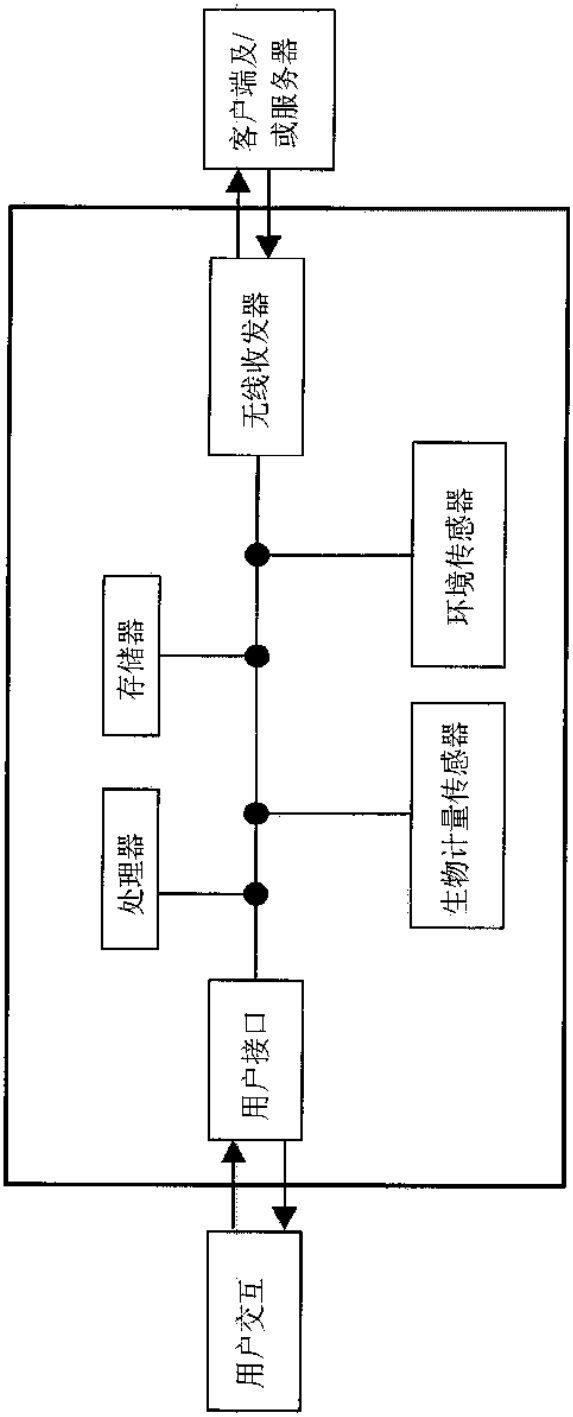


图 1

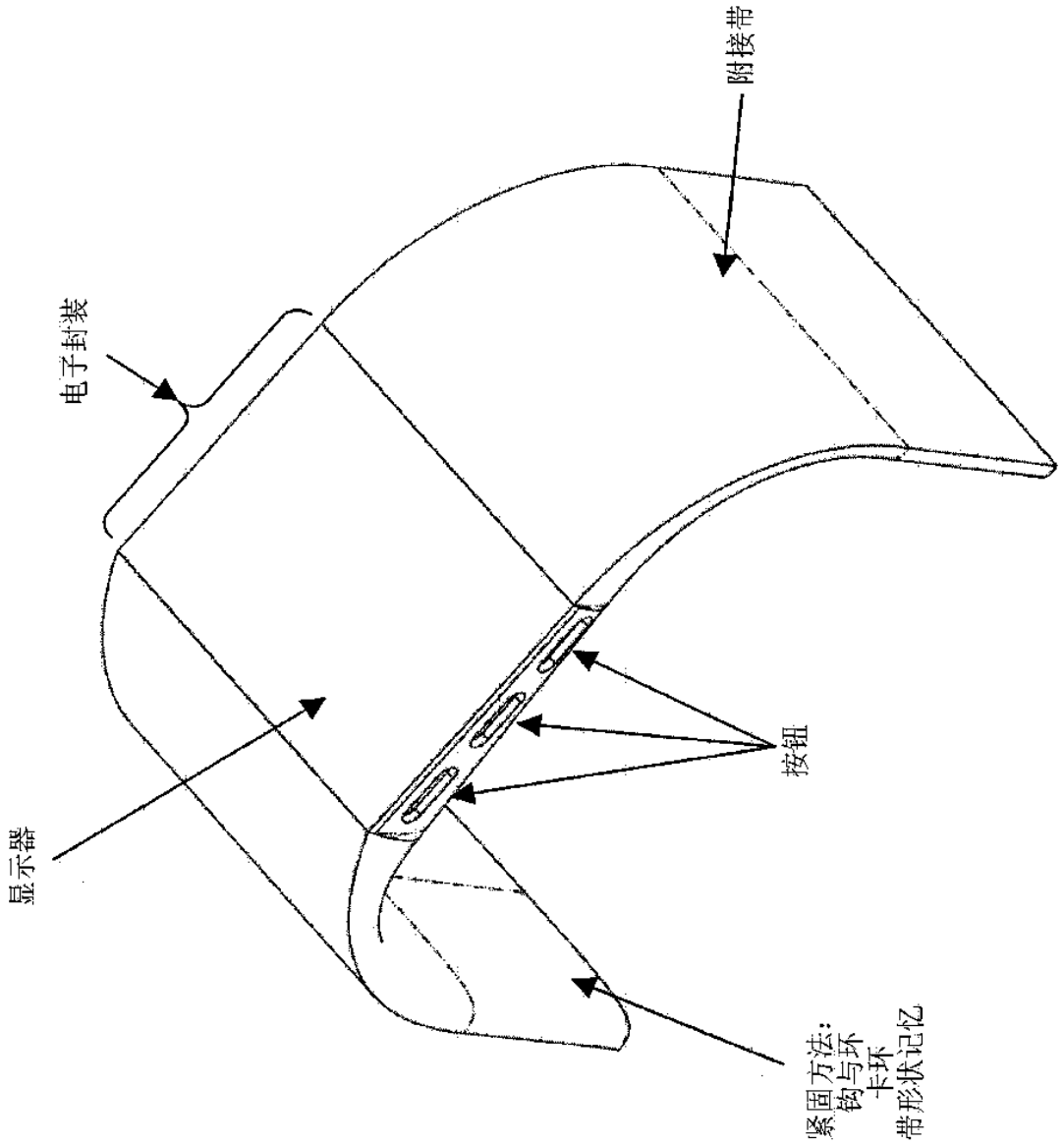


图 2

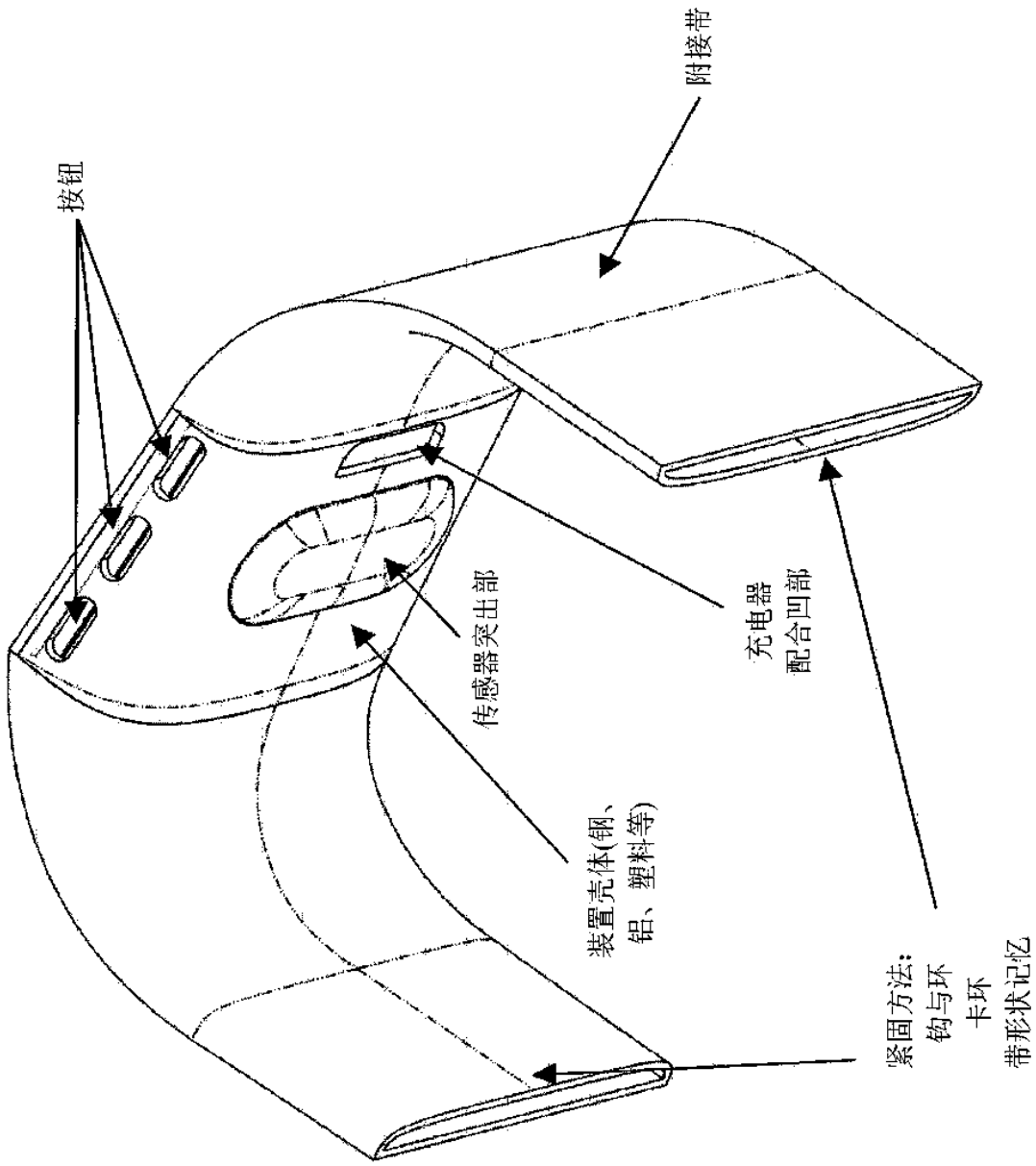


图 3

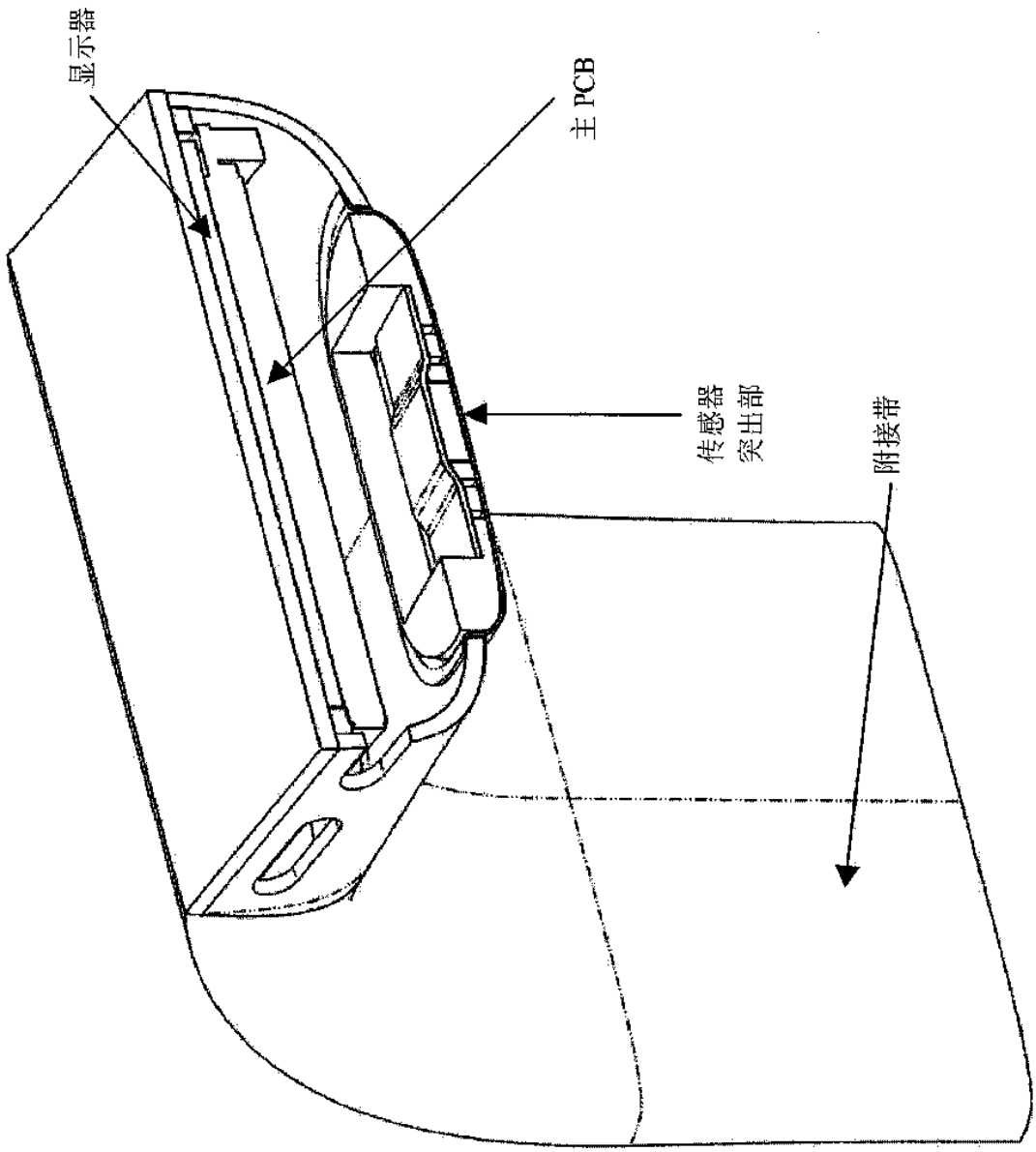


图 4

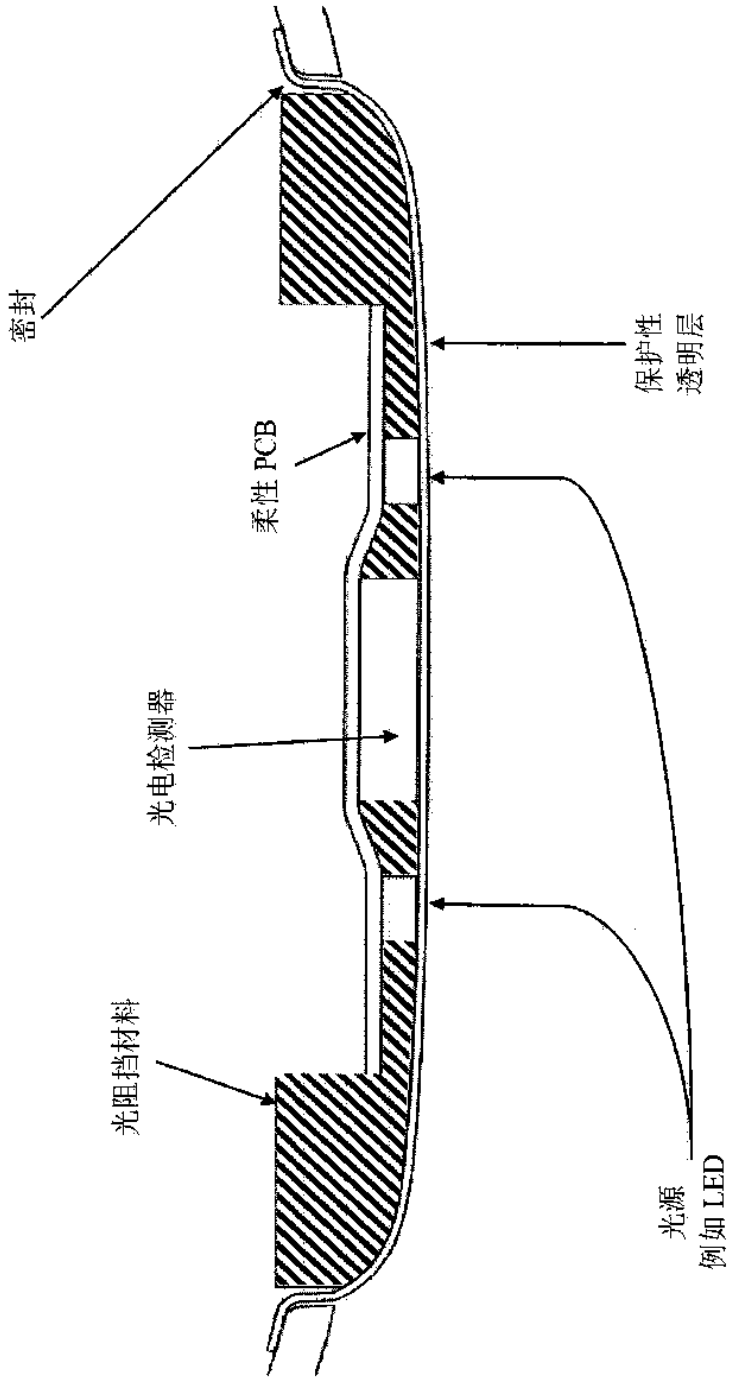


图 5

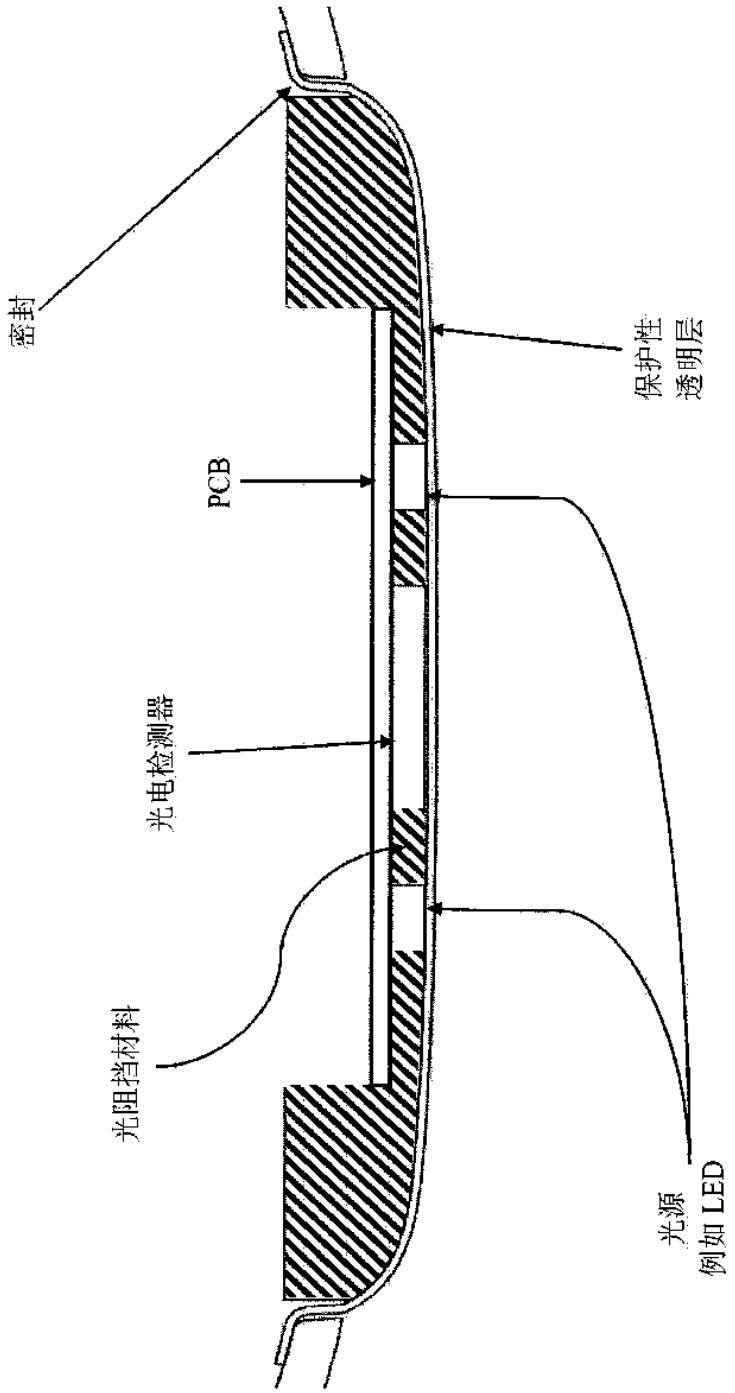


图 6

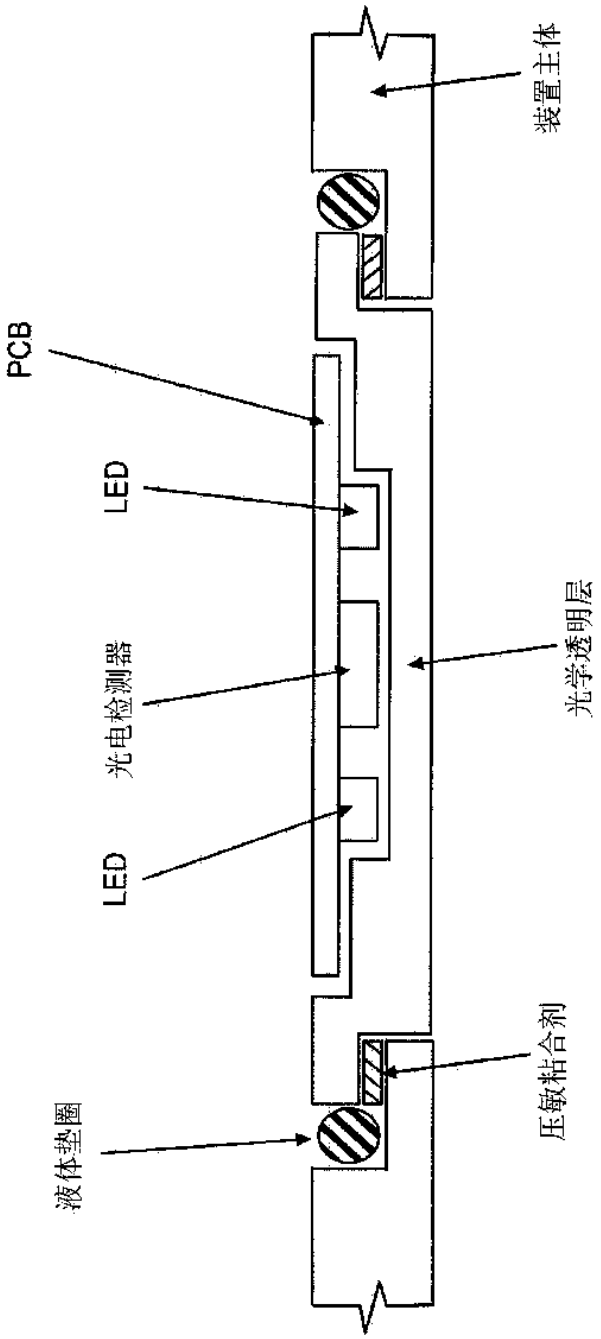


图 7

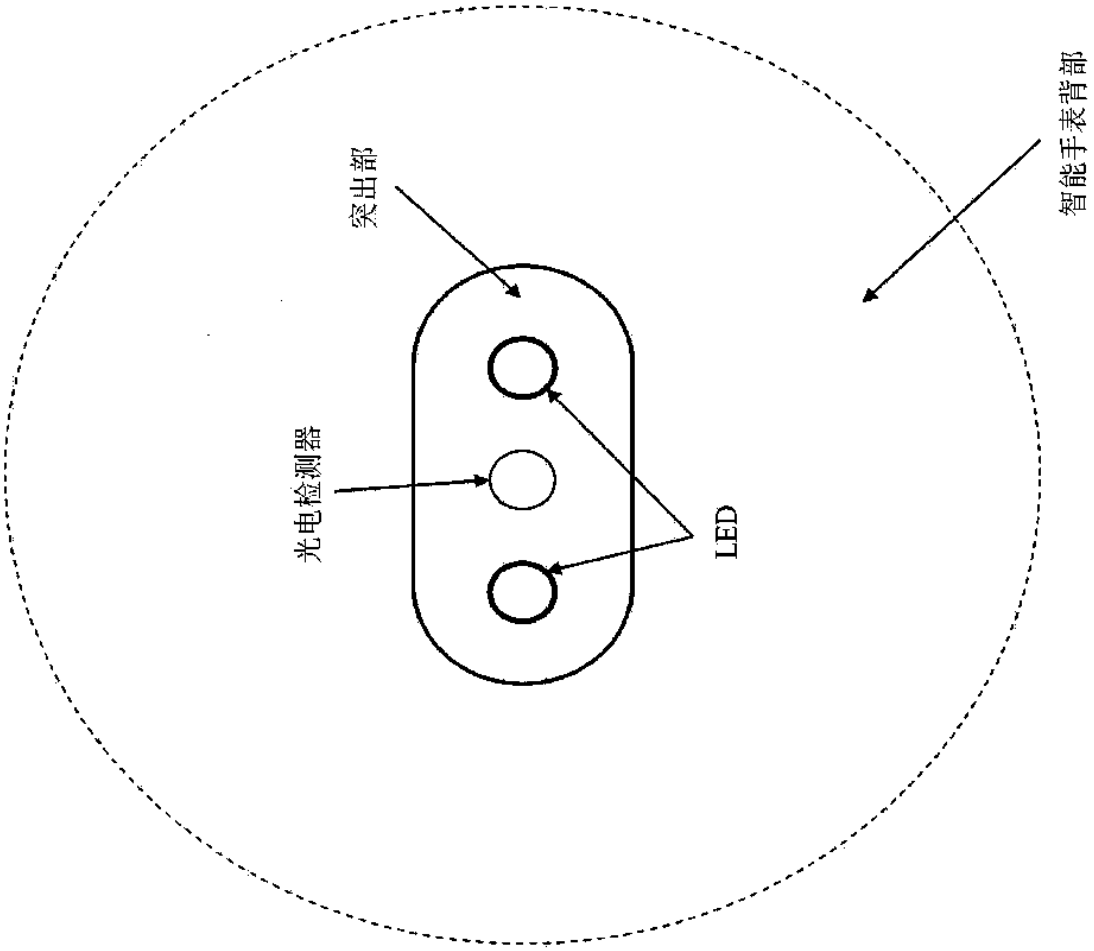


图 8

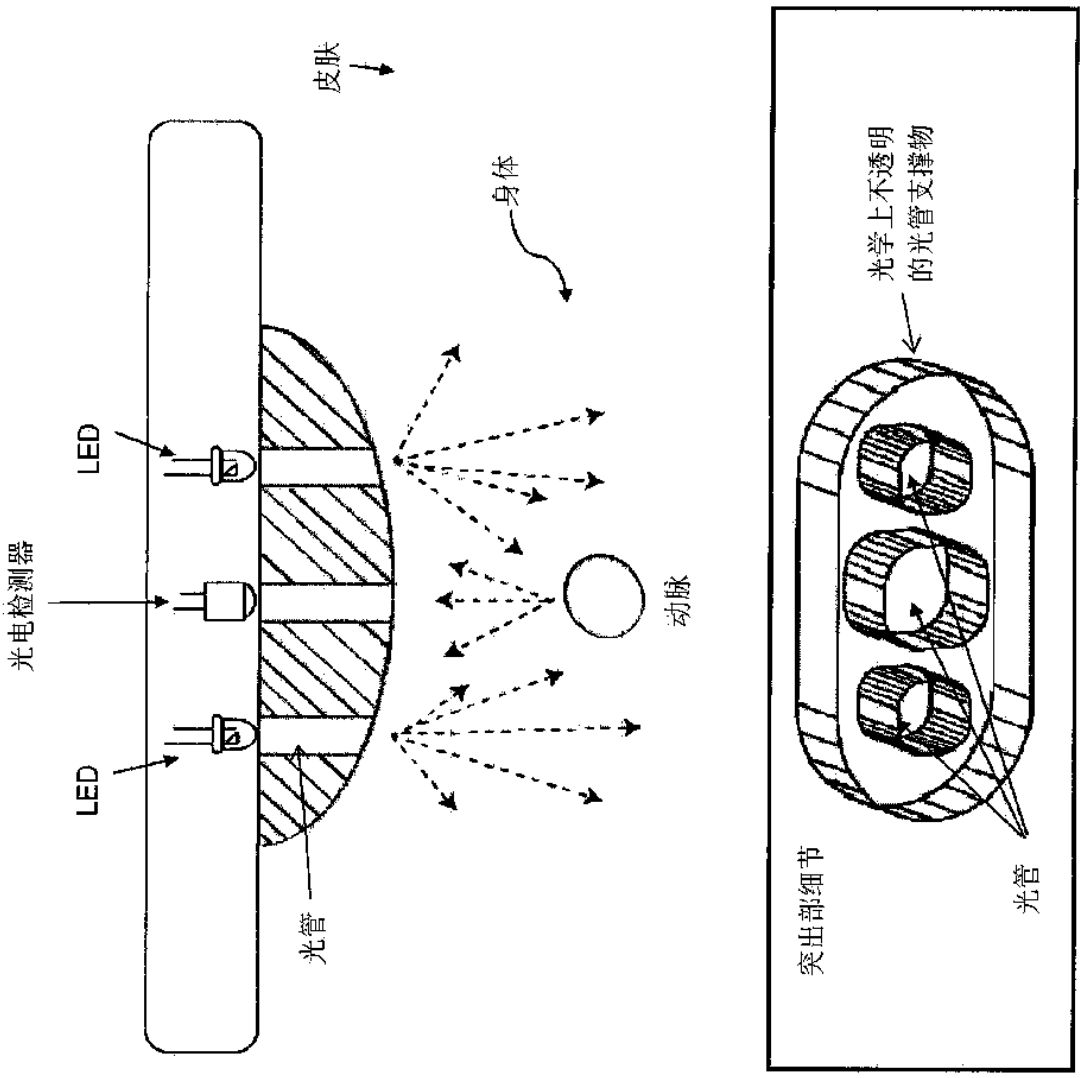


图 9

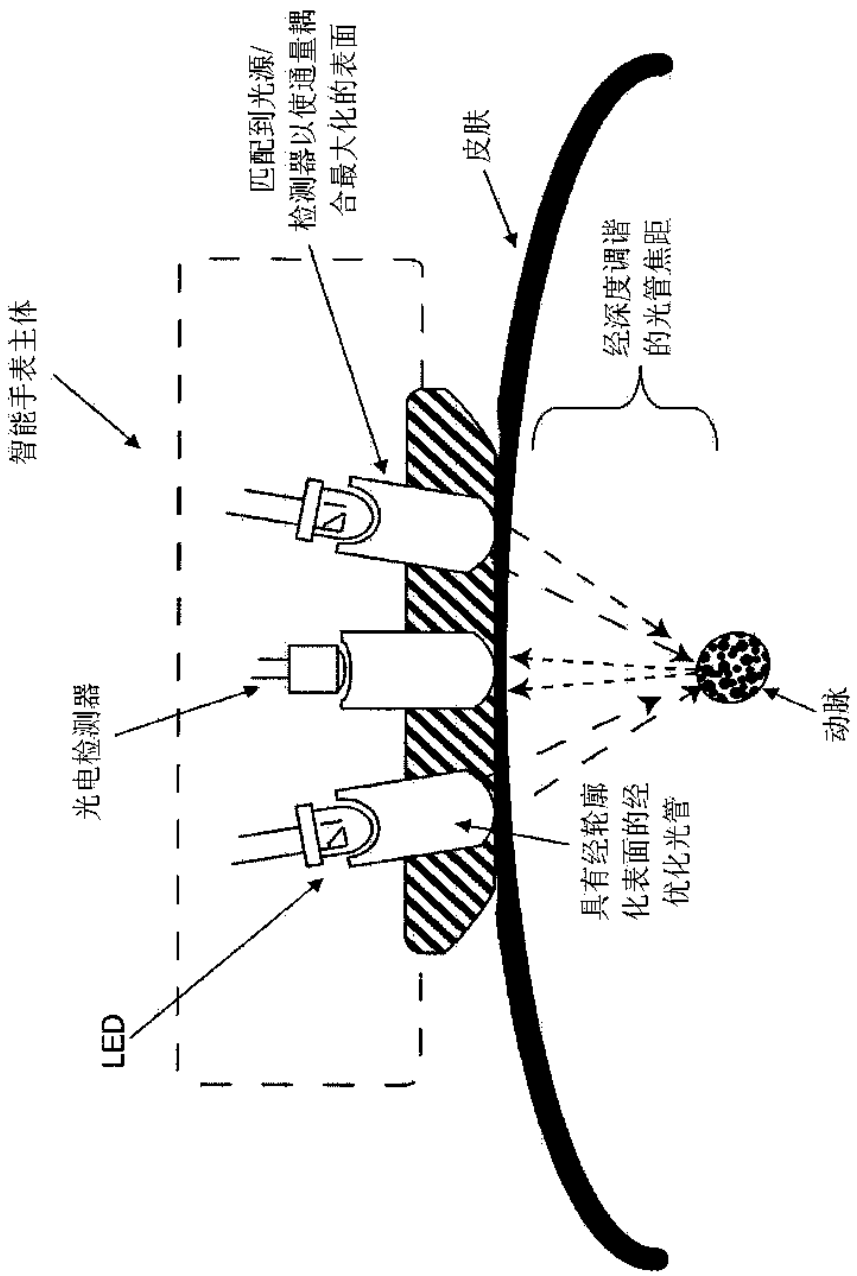

智能手表主体
匹配到光源/
检测器以使通量耦
合最大化的表面
皮肤
经深度调谐
的光管焦距
光电检测器
LED
具有经轮廓
化表面的经
优化光管
动脉

图 10

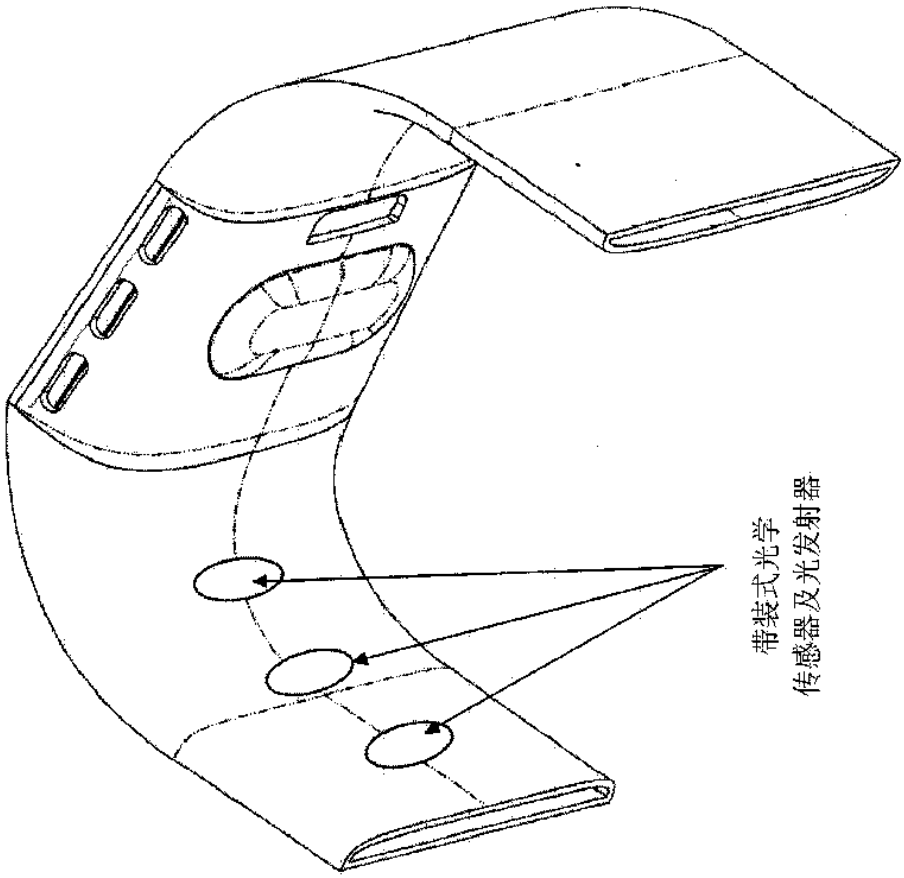


图 11

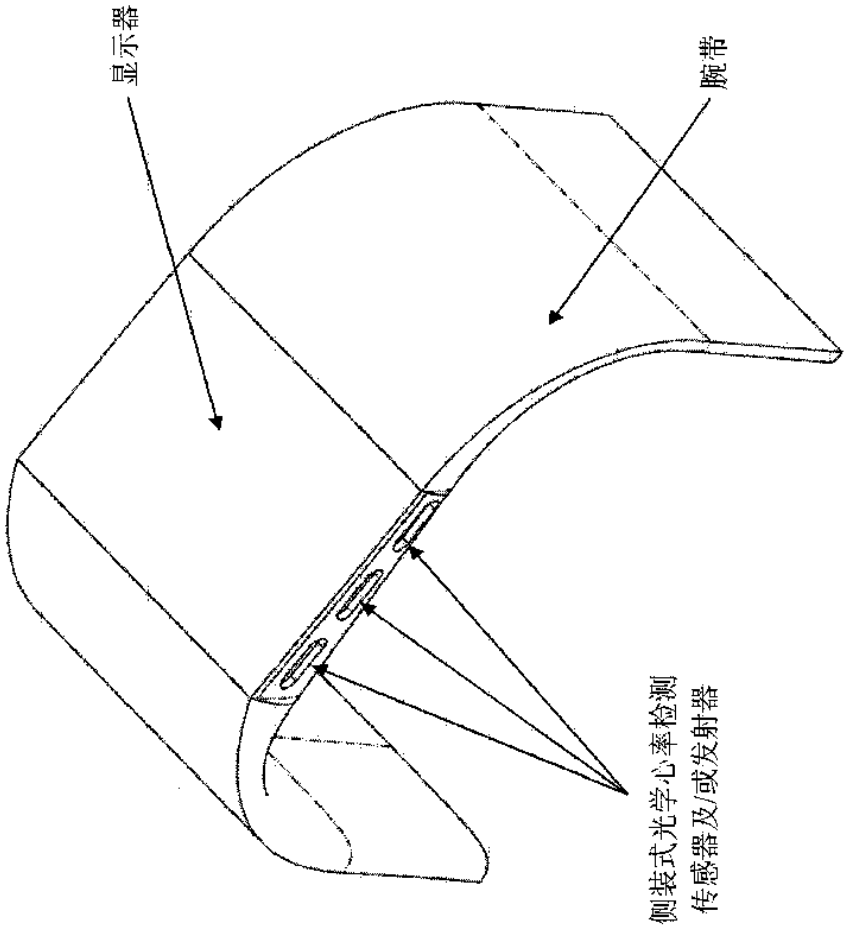


图 12

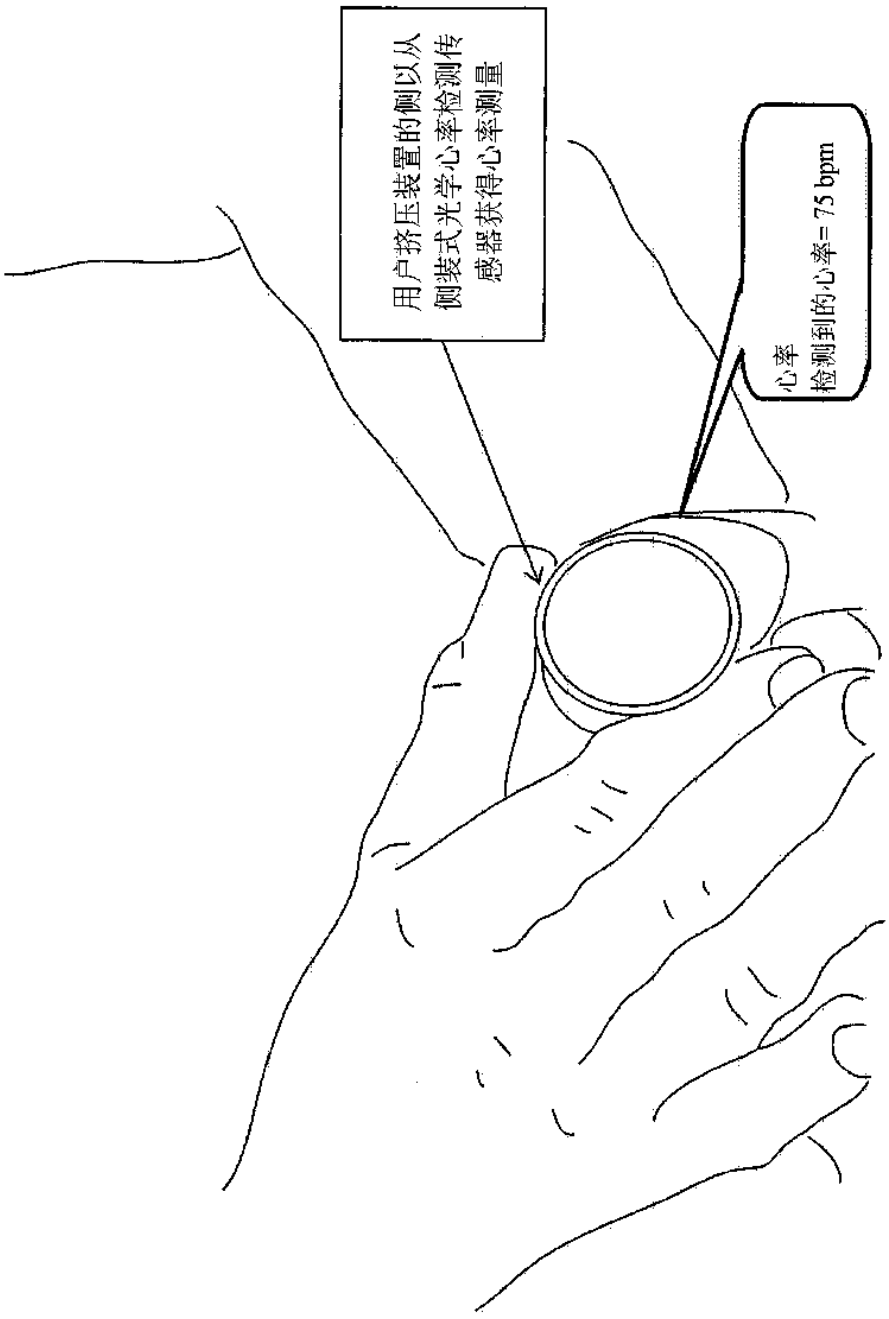


图 13

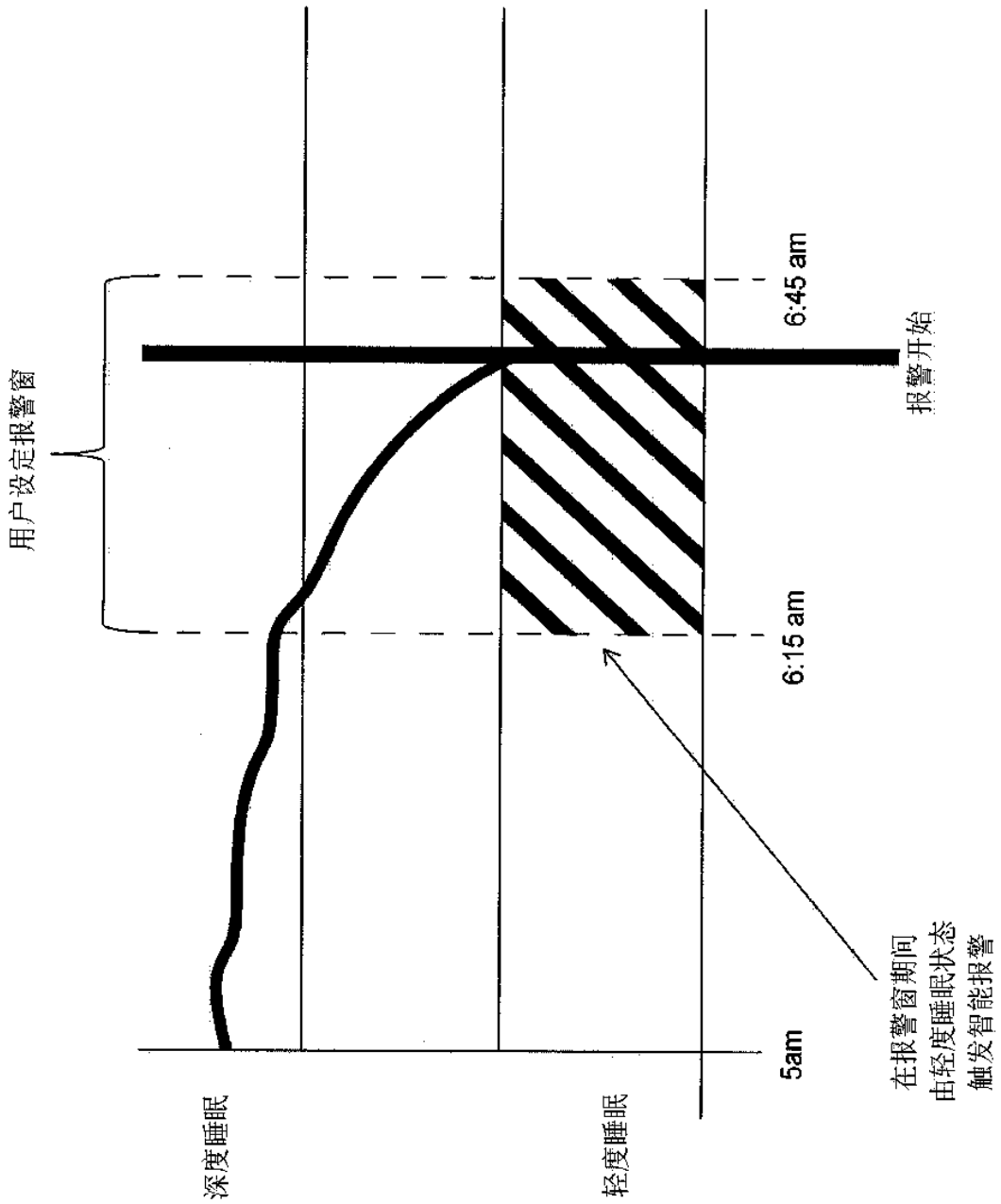

用户设定报警窗
6:45 am
报警开始
6:15 am
5am
深度睡眠
轻度睡眠
在报警窗期间
由轻度睡眠状态
触发智能报警

图 14

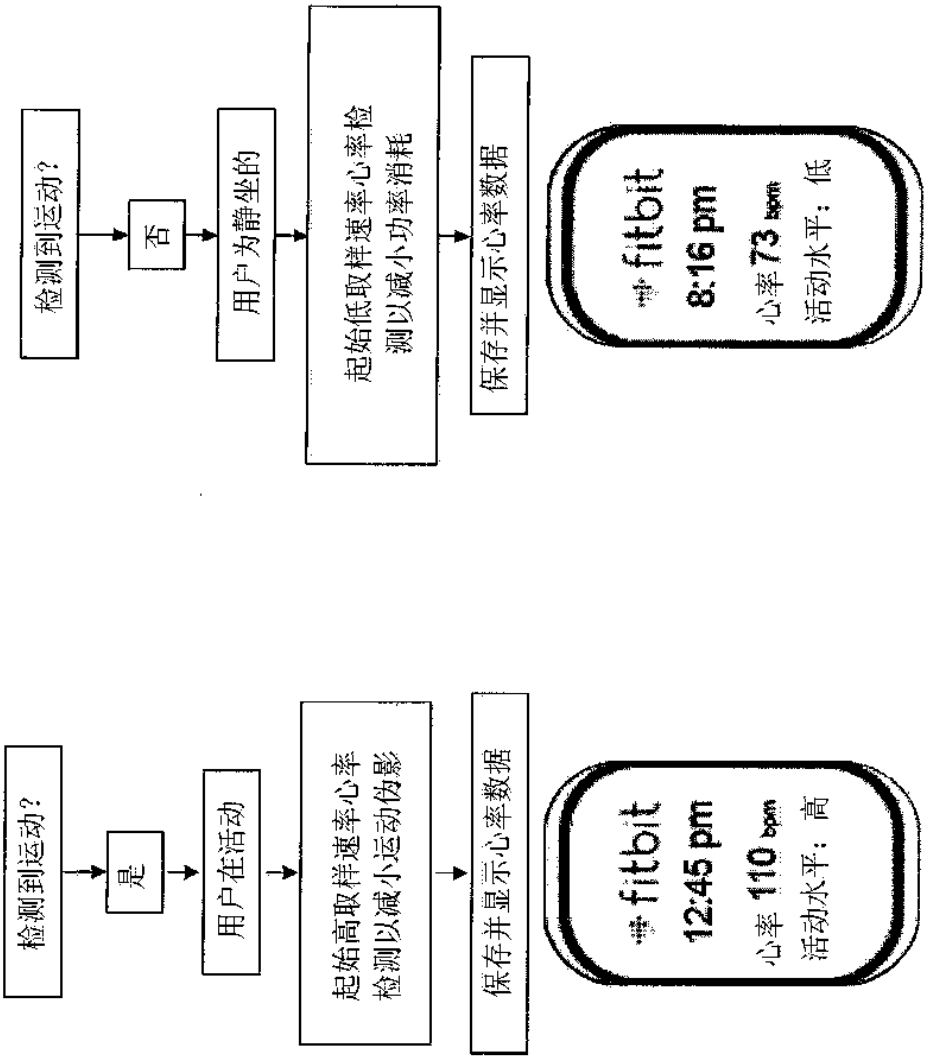

检测到运动?
否
用户为静坐的
起始低取样速率心率检测以减小功率消耗
保存并显示心率数据
fitbit
8:16 pm
心率 73 bpm
活动水平：低
检测到运动?
是
用户在活动
起始高取样速率心率检测以减小运动伪影
保存并显示心率数据
fitbit
12:45 pm
心率 110 bpm
活动水平：高

图 15

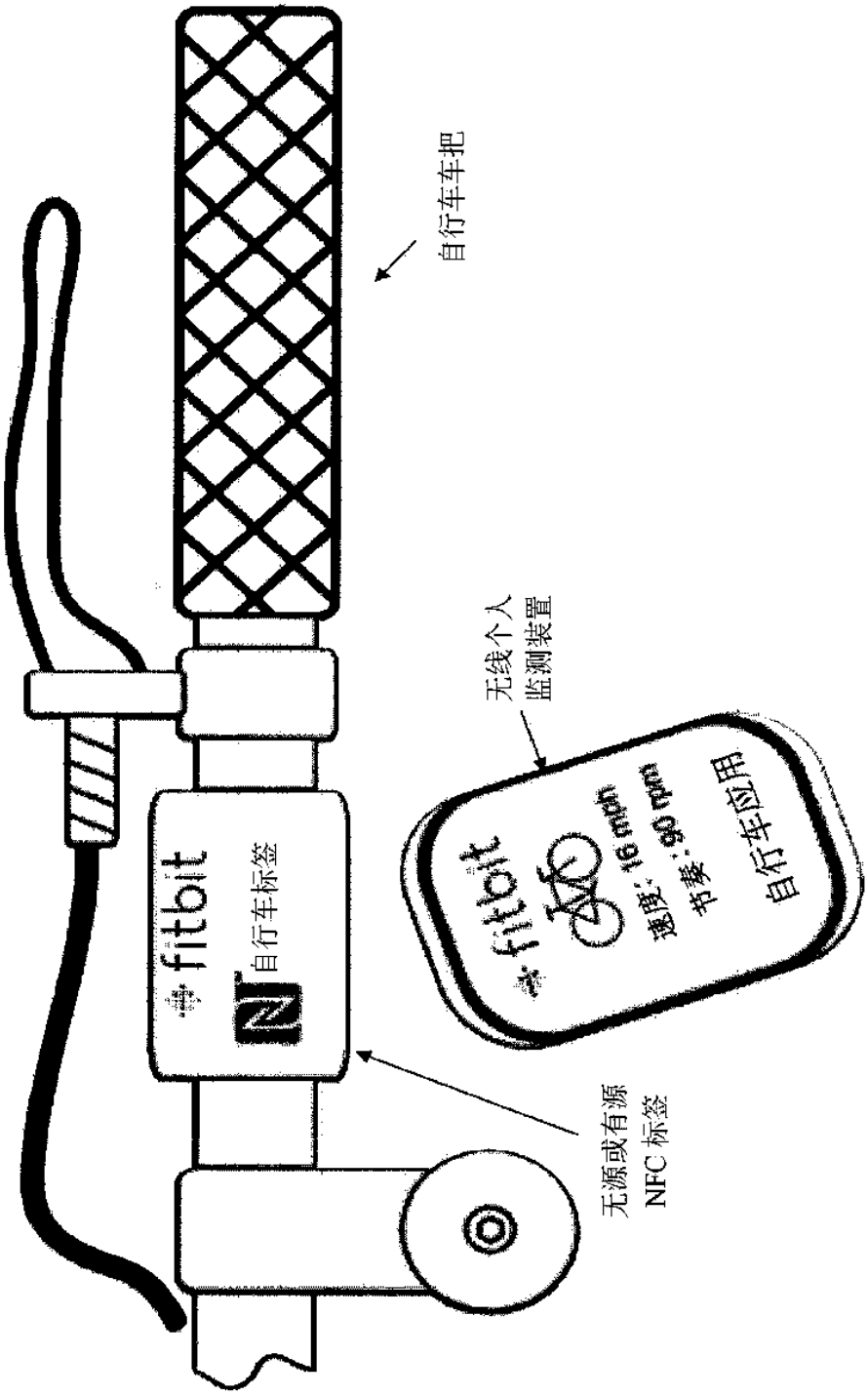

自行车车把
无线个人
监测装置
fitbit
自行车标签
fitbit
速度：16 mph
节奏：90 rpm
自行车应用
无源或有源
NFC 标签

图 16

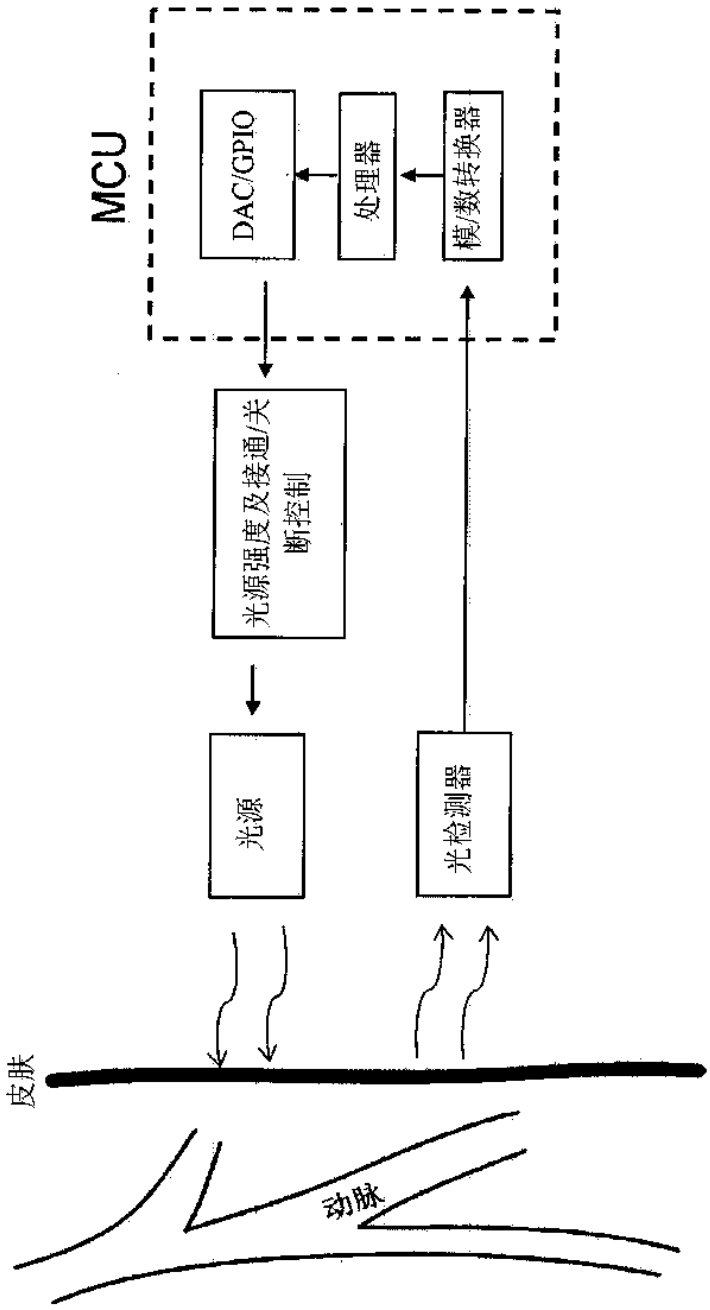


图 17

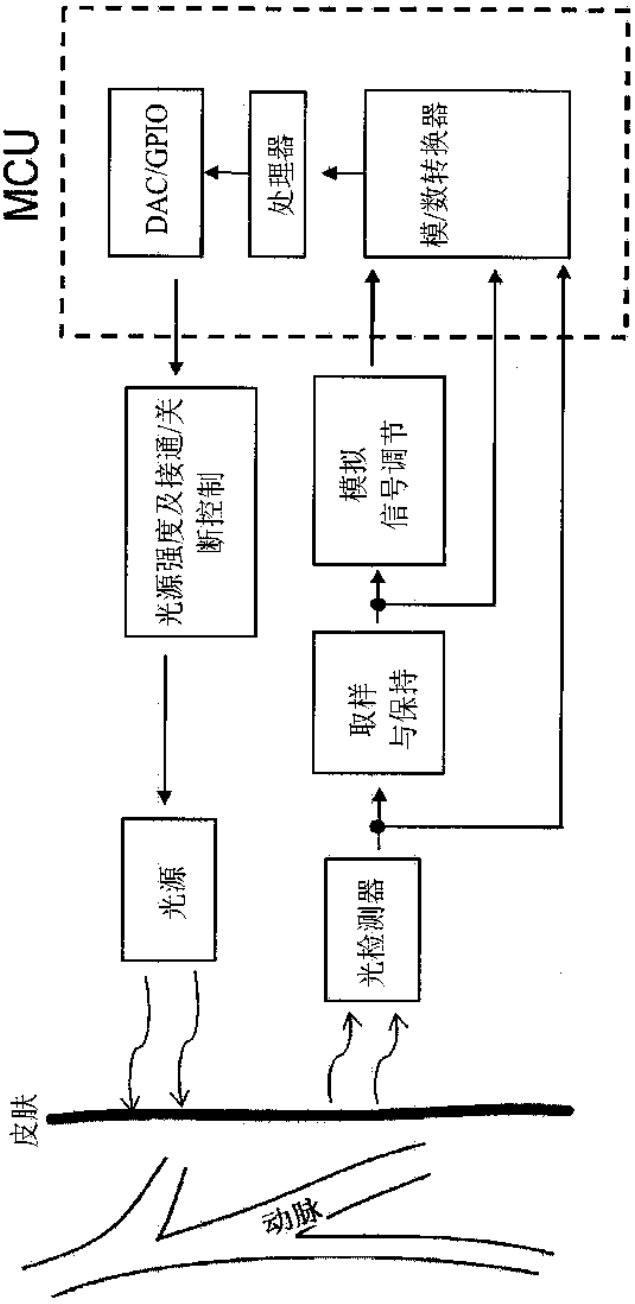

MCU
DAC/GPIO
处理器
模/数转换器
光源强度及接通/关断控制
模拟信号调节
取样与保持
光源
光检测器
皮肤
动脉

图 18

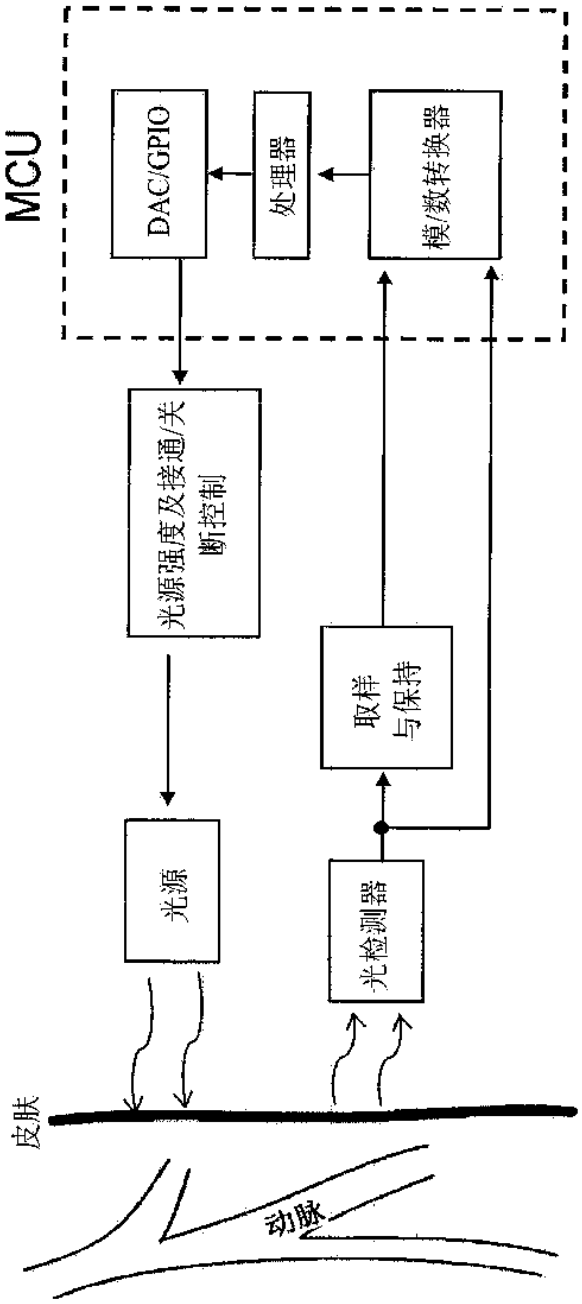


图 19

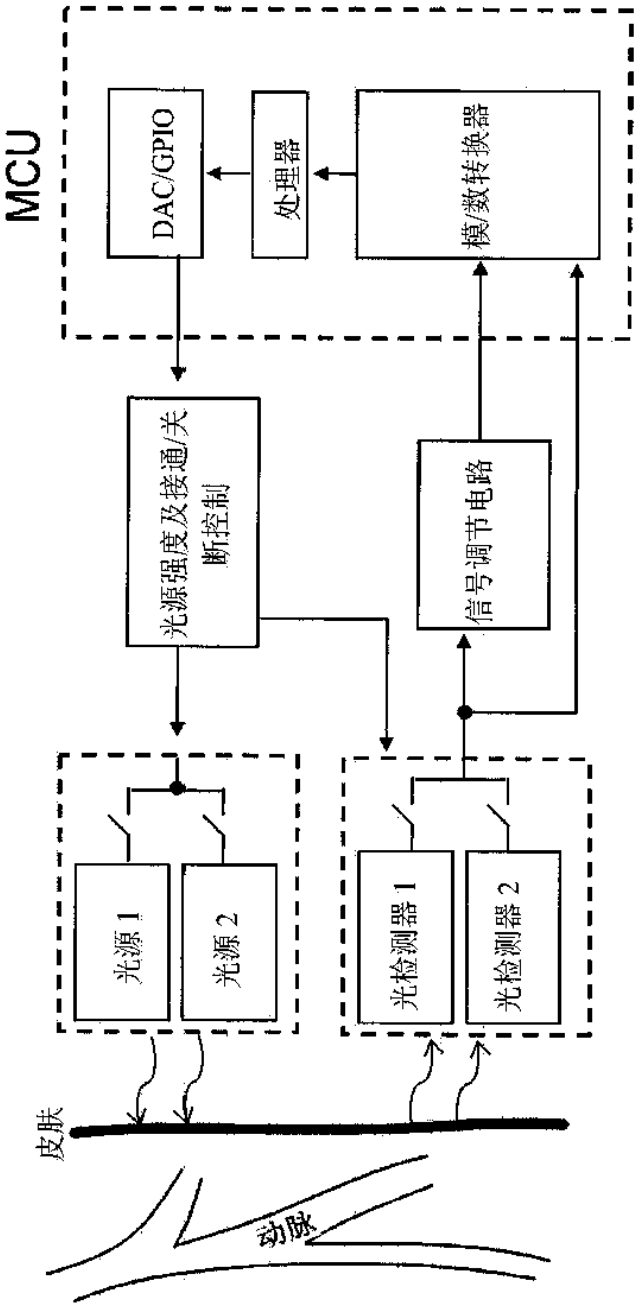

MCU
DAC/GPIO
处理器
模/数转换器
光源强度及接通/关断控制
信号调节电路
光源 1
光源 2
光检测器 1
光检测器 2
皮肤
动脉

图 20

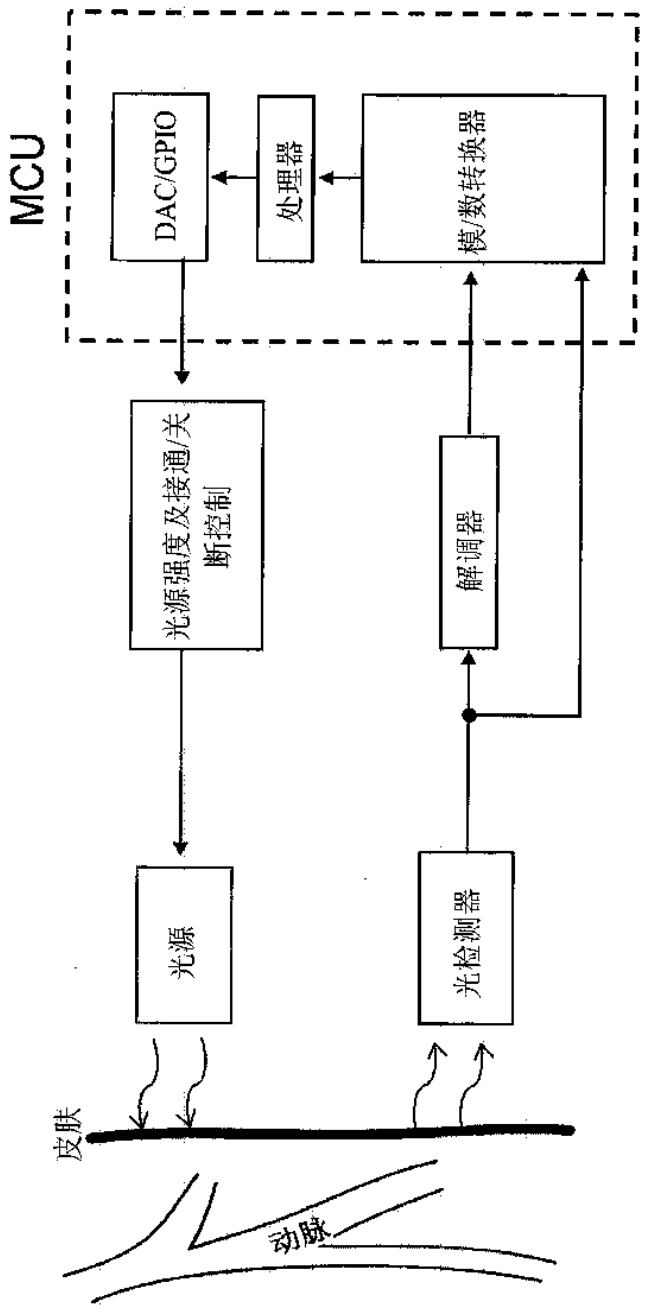


图 21

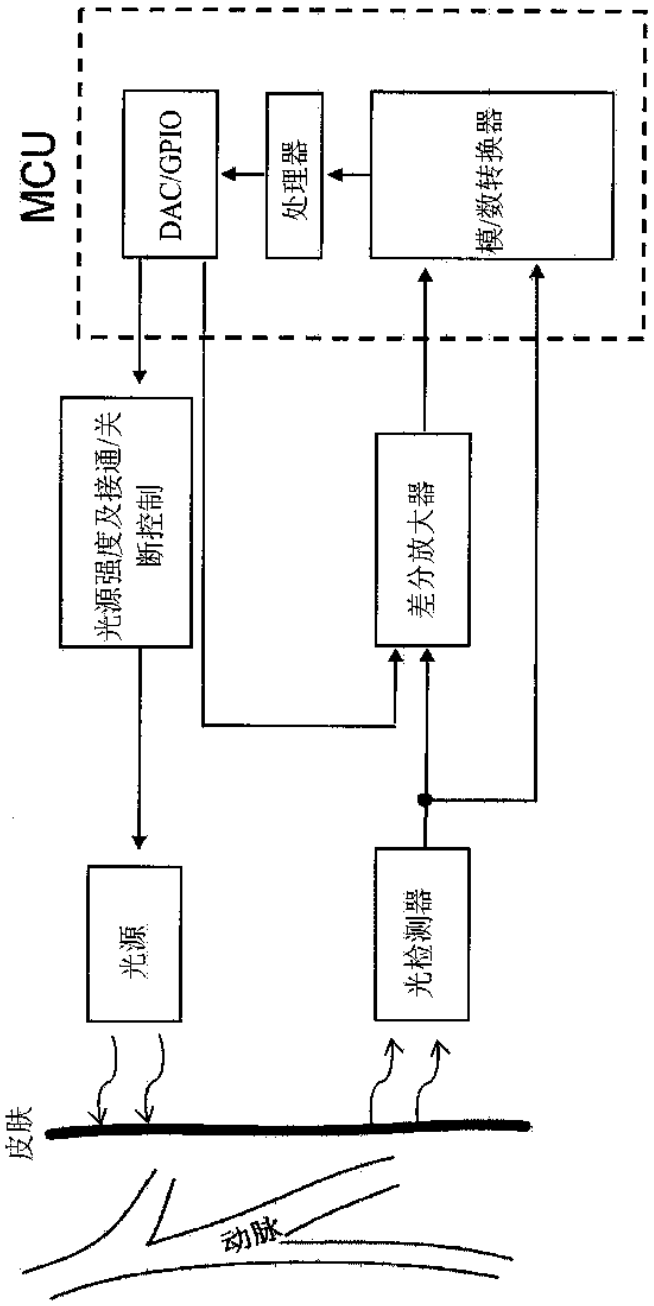


图 22

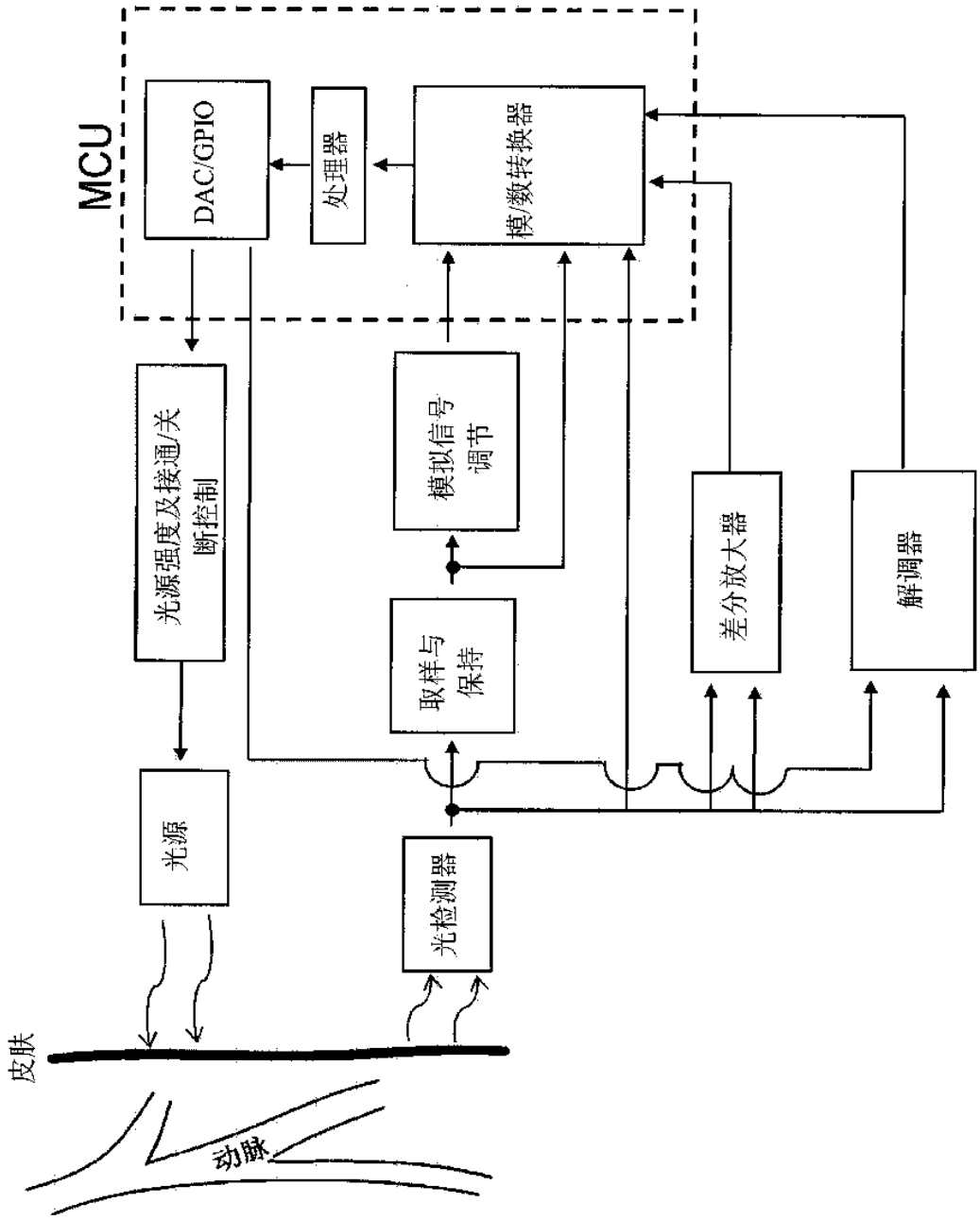

MCU
DAC/GPIO
处理器
模/数转换器
光源强度及接通/关断控制
模拟信号调节
差分放大器
解调器
取样与保持
光源
光检测器
皮肤
动脉

图 23

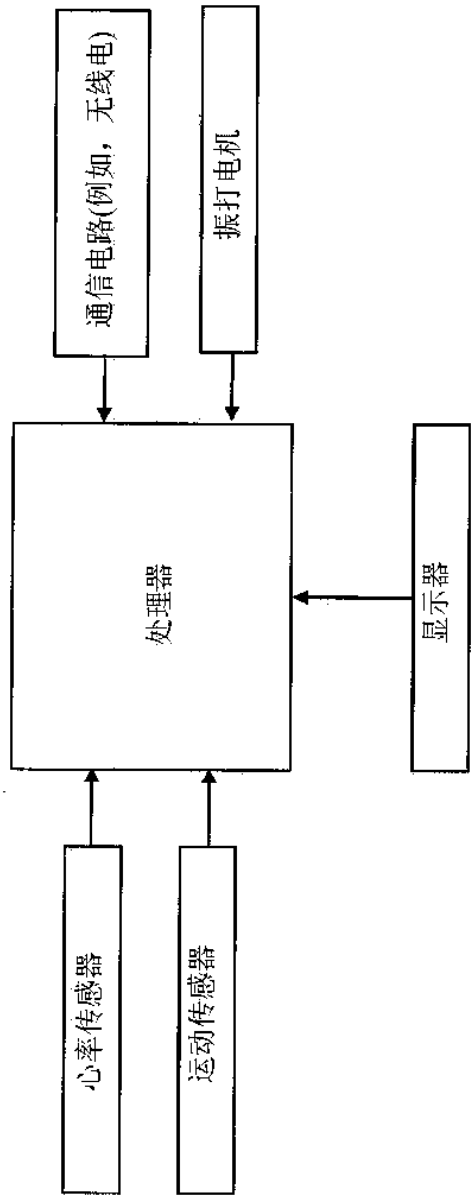


图 24

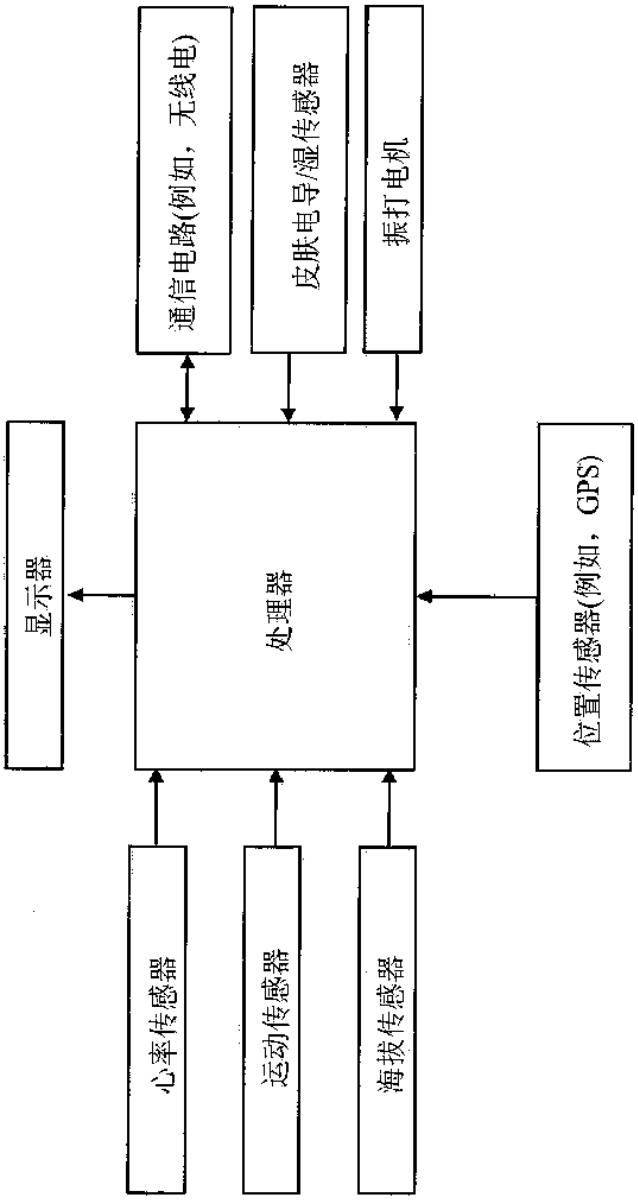

通信电路(例如，无线电)
皮肤电导/湿传感器
振打电机
显示器
处理器
位置传感器(例如，GPS)
心率传感器
运动传感器
海拔传感器

图 25

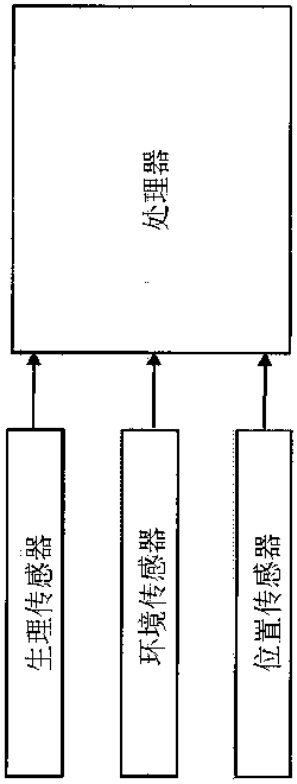

处理器
生理传感器
环境传感器
位置传感器

图 26

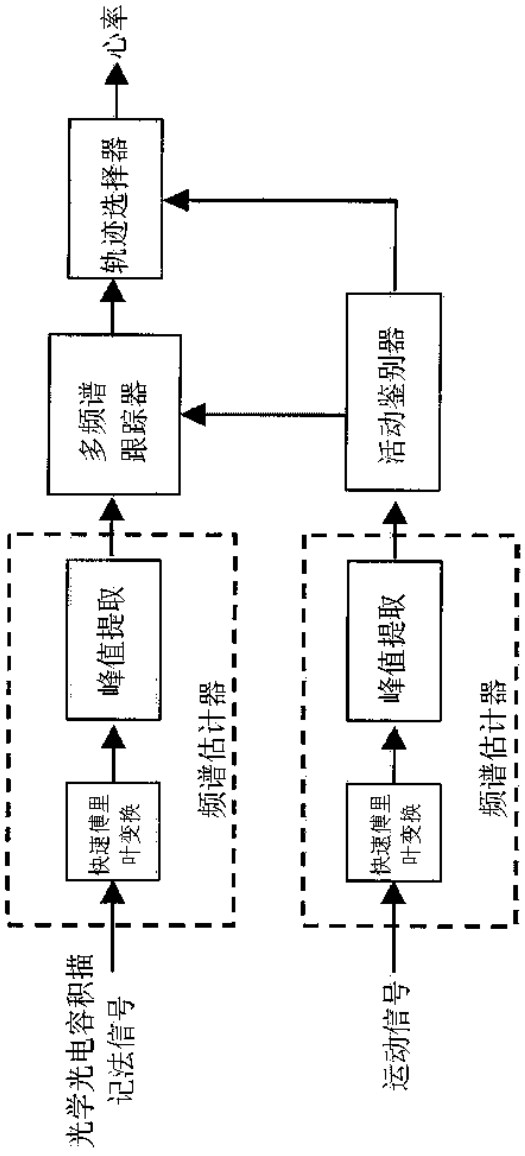

心率
轨迹选择器
多频谱跟踪器
活动鉴别器
峰值提取
快速傅里叶变换
频谱估计器
光学光电容积描记法信号
运动信号

图 27

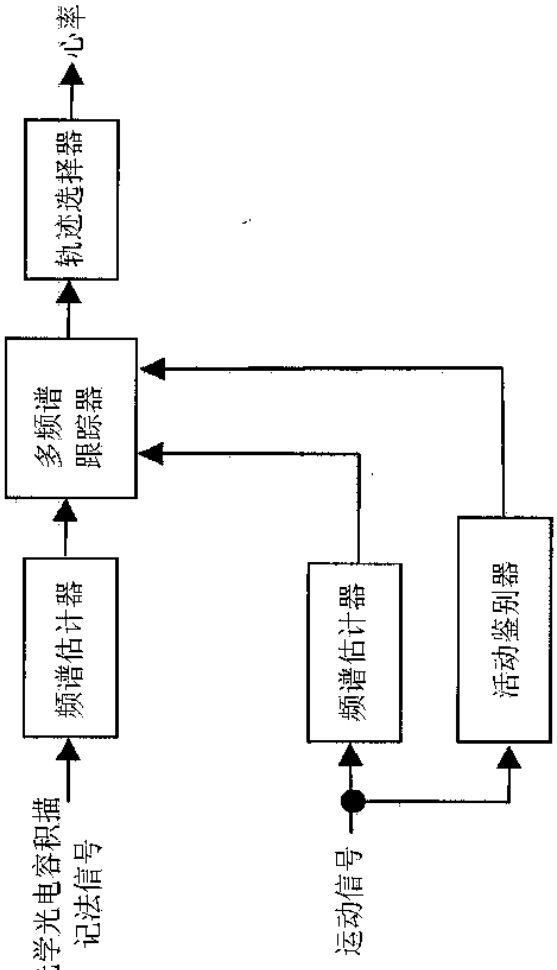

心率
轨迹选择器
多频谱跟踪器
频谱估计器
光学光电容积描记法信号
运动信号
活动鉴别器

图 28

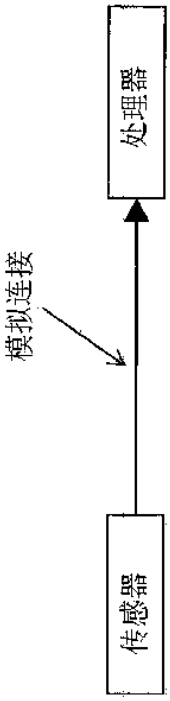
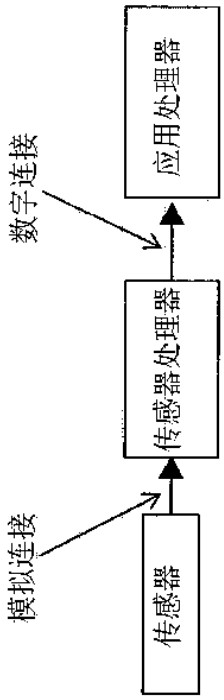

处理器
模拟连接
传感器

图 29


应用处理器
数字连接
传感器处理器
模拟连接
传感器

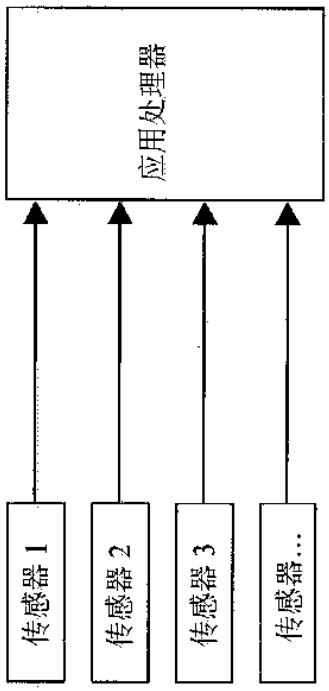

应用处理器
传感器 1
传感器 2
传感器 3
传感器...

图 30

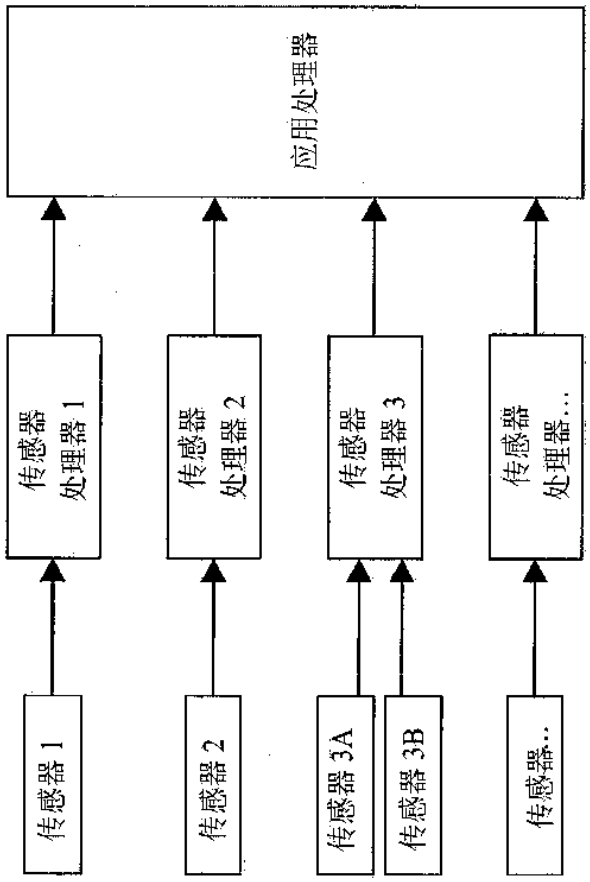

应用处理器
传感器处理器 1
传感器处理器 2
传感器处理器 3
传感器处理器...
传感器 1
传感器 2
传感器 3A
传感器 3B
传感器...

图 31

1 Document

Publication numbers	Title	Current assignees
CN114220694 A	Key structure and wearable device	GOERTEK

Key structure and wearable device
CN114220694 A

Current assignees
GOERTEK*

Inventors
NAN FEIYAN

Priority data including date
2021CN-1550802 2021-12-17

IPC - International classification

G06F-001/16	H01H-013/06	H01H-013/14
H01H-013/28	H01H-019/14	H01H-025/06*

CPC - Cooperative classification

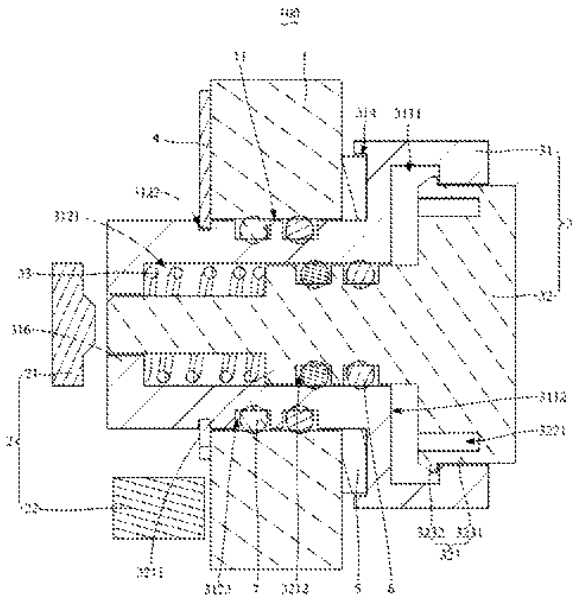
G06F-001/16/3	H01H-013/06	H01H-013/14
H01H-013/28/5	H01H-019/14	H01H-025/06/5*

Family

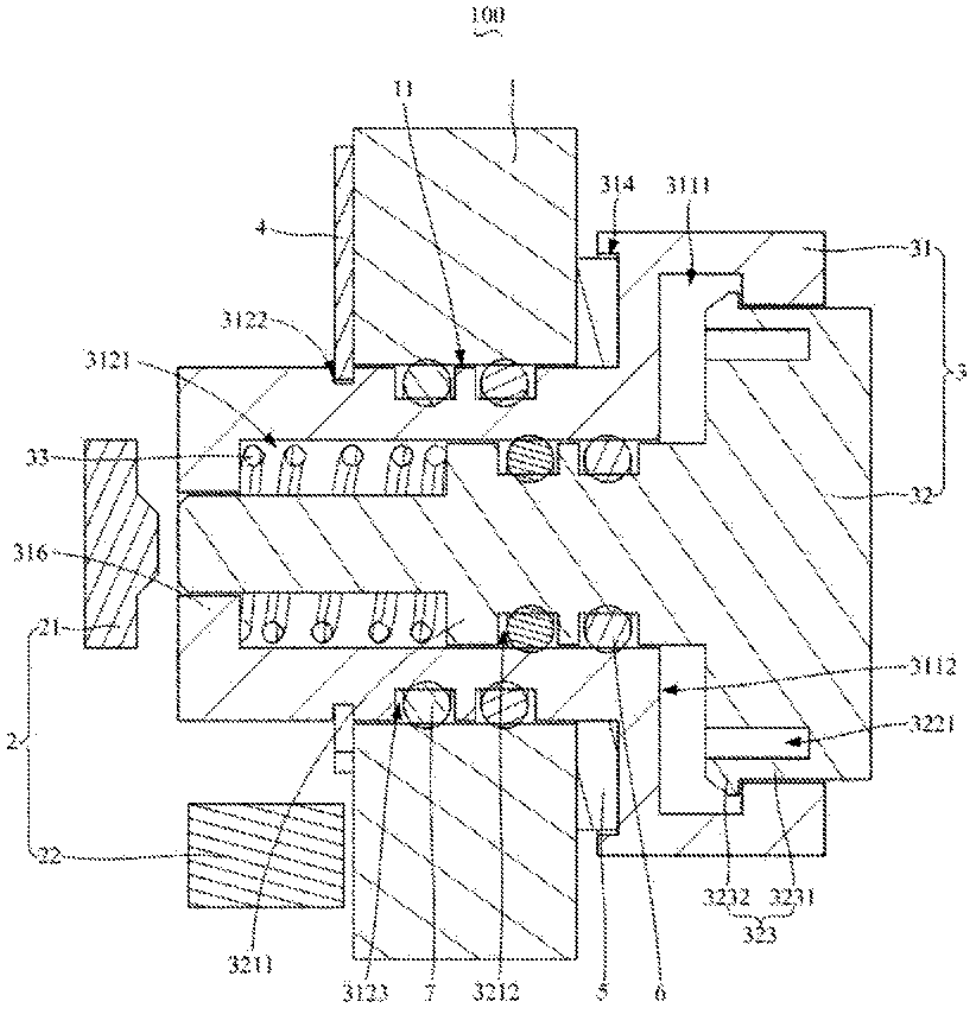
CN114220694	A	2022-03-22

(CN114220694)

The invention discloses a key structure and wearable equipment, the key structure comprises a trigger assembly and a key assembly, the key assembly comprises a rotary crown and a pressing piece, the rotary crown is rotatably arranged in a key hole of a shell in a penetrating manner, a sliding cavity is formed in the rotary crown, and the pressing piece is slidably arranged in the sliding cavity in a penetrating manner; when the pressing piece is pressed, the pressing piece moves along the sliding cavity so as to trigger the triggering assembly; and/or, when the rotary watch crown is rotated, the rotary watch crown drives the pressing piece to rotate so as to trigger the triggering assembly. According to the key structure, the good rotating hand feeling can be guaranteed, the rotating service life of the watch crown is prolonged, the key structure is applied to equipment, the thickness of an equipment shell can be effectively reduced, and the internal space of the equipment is saved.



PR.§1	2021CN-1550802
AP.§1	CN202111550802
PN.PN	CN114220694
FAN	99216558
FAMILY_PN	CN114220694 A 2022-03-22 CN114220694
PRD	2021-12-17
APD	2021-12-17
PN.PD	2022-03-22
TI	Key structure and wearable device
AB	(CN114220694) The invention discloses a key structure and wearable equipment, the key structure comprises a trigger assembly and a key assembly, the key assembly comprises a rotary crown and a pressing piece, the rotary crown is rotatably arranged in a key hole of a shell in a penetrating manner, a sliding cavity is formed in the rotary crown, and the pressing piece is slidably arranged in the sliding cavity in a penetrating manner; when the pressing piece is pressed, the pressing piece moves along the sliding cavity so as to trigger the triggering assembly; and/or, when the rotary watch crown is rotated, the rotary watch crown drives the pressing piece to rotate so as to trigger the triggering assembly. According to the key structure, the good rotating hand feeling can be guaranteed, the rotating service life of the watch crown is prolonged, the key structure is applied to equipment, the thickness of an equipment shell can be effectively reduced, and the internal space of the equipment is saved.
PA	GOERTEK
IN	NAN FEIYAN
RP	(CN114220694) GAO SHA ; CENFO INTELLECTUAL PROPERTY AGENCY Reg. Nb: 44287
IMG	



CLMS

(CN114220694)

1. A key structure, comprising:

a trigger component; and

the key assembly comprises a rotary crown and a pressing piece, the rotary crown is rotatably arranged in a key hole of the shell in a penetrating manner, a sliding cavity is arranged in the rotary crown, and the pressing piece is slidably arranged in the sliding cavity in a penetrating manner;

when the pressing piece is pressed, the pressing piece moves along the sliding cavity to trigger the trigger assembly; and/or, when the rotating crown is rotated, the rotating crown drives the pressing piece to rotate so as to trigger the trigger assembly.

2. The key structure of claim 1, wherein the press member comprises a key stem and a key cap connected;

the sliding cavity comprises a first section and a second section which are communicated, the aperture of the second section is larger than that of the first section, the key rod penetrates through the first section in a sliding mode, and part of the key cap protrudes out of one end, far away from the first section, of the second section.

3. The key structure according to claim 2, further comprising at least one first seal ring interposed between said key rod and said first section aperture wall.

4. The key structure according to claim 2, wherein a first clamping member is convexly arranged on the cavity wall of the second section, and a second clamping member which is clamped and matched with the first clamping member is arranged on the outer wall of the key

cap;

the key assembly further comprises an elastic piece arranged in the first section, and the elastic piece is elastically abutted with the key rod;

when the key cap is pressed, the key rod compresses or stretches the elastic piece.

5. The key structure of claim 4, wherein an abutting table is protruded from an outer wall of the key rod, a supporting table is protruded from an inner wall of the first section away from one end of the second section, and two ends of the elastic member are elastically abutted against the abutting table and the supporting table, respectively;

and/or the outer wall of the key cap is provided with an avoidance groove corresponding to the second clamping piece, the second clamping piece comprises an elastic arm and a clamping protrusion, one end of the elastic arm is connected with the outer wall of the key cap, and the clamping protrusion is arranged at the other end of the elastic arm and is positioned on one side of the elastic arm, which is opposite to the avoidance groove;

and/or an abutting surface is formed at the communication position of the first section and the second section, and when the key cap is pressed, the key cap abuts against the abutting surface.

6. The key structure according to any one of claims 1 to 5, wherein the rotary crown includes a rotary part and a rotary part connected to each other, the sliding cavity penetrates through the rotary part and the rotary part, a limiting surface is formed at a connection portion of the rotary part and the rotary part, and the rotary part is rotatably inserted into the key hole, so that the limiting surface is in limiting abutment with an outer wall of the case.

7. The key structure according to claim 6, wherein a snap groove is formed in an outer wall of one end of the rotating shaft portion, which penetrates through the key hole, and the key structure further comprises a snap spring arranged in the housing, and the snap spring is movably snapped in the snap groove.

8. The key structure according to claim 7, wherein the slot is circumferentially disposed along the outer wall of the rotation shaft portion and forms a circular groove, the clamp spring has a clamping portion, the clamping portion is U-shaped, and the clamping portion is movably clamped in the slot.

9. The key structure according to claim 6, further comprising a wear pad, wherein the wear pad is sleeved on the rotation shaft portion and clamped between the limiting surface and the outer wall of the housing.

10. The key structure according to claim 6, further comprising at least one second seal ring interposed between an outer wall of the rotation shaft portion and a wall of the key hole.

11. The key structure of claim 1, wherein the activation component comprises:

the trigger element is arranged in the shell and is opposite to the key hole; and

and the optical sensor is arranged in the shell and is opposite to the side wall of the rotary crown.

12. Wearable device, characterized in that it comprises a device body comprising a housing provided with a key hole and a key structure according to any of claims 1 to 11, said key structure being connected to said housing.

DESC

(CN114220694)

TECHNICAL FIELD

The invention relates to the technical field of intelligent wearable equipment, in particular to a key structure and wearable equipment applying the key structure.

BACKGROUND ART

With the continuous development of material technology, the thickness of the watch case of the watch is thinner and thinner, but the crown needs a certain stroke for pressing, so the further reduction of the thickness of the watch case is limited, the partial thickness of the

crown is thicker, and more internal space of the watch case is occupied. Meanwhile, in the related art, the crown can rub against the spring when rotating, so that the rotating hand feeling is poor, and the rotating service life is short.

DISCLOSURE

Disclosure of Invention

The invention mainly aims to provide a key structure and wearing equipment, aiming at improving the key structure which can ensure good rotating hand feeling and prolong the rotating life of a crown.

In order to achieve the above object, the present invention provides a key structure, including:

a trigger component; and

the key assembly comprises a rotary crown and a pressing piece, the rotary crown is rotatably arranged in a key hole of the shell in a penetrating manner, a sliding cavity is arranged in the rotary crown, and the pressing piece is slidably arranged in the sliding cavity in a penetrating manner;

when the pressing piece is pressed, the pressing piece moves along the sliding cavity to trigger the trigger assembly; and/or, when the rotating crown is rotated, the rotating crown drives the pressing piece to rotate so as to trigger the trigger assembly.

In one embodiment, the pressing piece comprises a key rod and a key cap which are connected;

the sliding cavity comprises a first section and a second section which are communicated, the aperture of the second section is larger than that of the first section, the key rod penetrates through the first section in a sliding mode, and part of the key cap protrudes out of one end, far away from the first section, of the second section.

In an embodiment, the key structure further includes at least one first sealing ring, and the first sealing ring is clamped between the key rod and the hole wall of the first section.

In one embodiment, a first clamping piece is convexly arranged on the cavity wall of the second section, and a second clamping piece in clamping fit with the first clamping piece is arranged on the outer wall of the key cap;

the key assembly further comprises an elastic piece arranged in the first section, and the elastic piece is elastically abutted with the key rod;

when the key cap is pressed, the key rod compresses or stretches the elastic piece.

In one embodiment, a butting table is convexly arranged on the outer wall of the key rod, a supporting table is convexly arranged on the inner wall of the first section, which is far away from one end of the second section, and two ends of the elastic piece are respectively and elastically butted against the butting table and the supporting table;

and/or the outer wall of the key cap is provided with an avoidance groove corresponding to the second clamping piece, the second clamping piece comprises an elastic arm and a clamping protrusion, one end of the elastic arm is connected with the outer wall of the key cap, and the clamping protrusion is arranged at the other end of the elastic arm and is positioned on one side of the elastic arm, which is opposite to the avoidance groove;

and/or an abutting surface is formed at the communication position of the first section and the second section, and when the key cap is pressed, the key cap abuts against the abutting surface.

In one embodiment, the rotating crown comprises a rotating part and a rotating part which are connected, the sliding cavity penetrates through the rotating part and the rotating part, a limiting surface is formed at the joint of the rotating part and the rotating part, and the rotating part is rotatably arranged in the key hole in a penetrating mode so that the limiting surface is in limiting abutting joint with the outer wall of the shell.

In an embodiment, the rotating shaft portion penetrates through an outer wall of one end of the key hole to be provided with a clamping groove, the key structure further comprises a clamp spring arranged in the shell, and the clamp spring is movably clamped in the clamping groove.

In an embodiment, the draw-in groove is followed the outer wall circumference of pivot portion sets up and forms the annular, the jump ring has joint portion, joint portion is the setting of U type, joint portion activity joint in the draw-in groove.

In an embodiment, the key structure further includes a wear pad, and the wear pad is sleeved on the rotating shaft portion and clamped between the limiting surface and the outer wall of the housing.

In an embodiment, the key structure further includes at least one second sealing ring, and the second sealing ring is clamped between the outer wall of the rotation shaft portion and the hole wall of the key hole.

In one embodiment, the trigger component comprises:

the trigger element is arranged in the shell and is opposite to the key hole; and

and the optical sensor is arranged in the shell and is opposite to the side wall of the rotary crown.

The invention further provides wearing equipment which comprises an equipment main body and the key structure, wherein the equipment main body comprises a shell, the shell is provided with a key hole, and the key structure is connected to the shell.

According to the key structure, the rotary crown of the key assembly is rotatably arranged in the key hole of the shell in a penetrating manner, and the sliding cavity is arranged in the rotary crown, so that the pressing piece can be slidably arranged in the sliding cavity in a penetrating manner, and therefore when the pressing piece is pressed, the pressing piece moves along the sliding cavity of the rotary crown, and the trigger assembly is triggered; and/or when the rotating crown is rotated, the rotating crown can drive the pressing piece to rotate so as to trigger the trigger assembly, namely the pressing piece and the rotating crown of the key assembly are arranged in a nested manner, so that the rotating function and the pressing function are separated, the shell does not need to ensure the stroke required by pressing, the thickness of the shell of the equipment can be further reduced, and the internal space of the equipment is saved; meanwhile, the pressing piece can be slidably arranged in the sliding cavity in a penetrating mode, so that the pressing piece can rotate along with the rotating crown when the rotating crown rotates and does not rub against the pressing piece, good rotating hand feeling can be guaranteed, and the rotating life of the crown is prolonged.

DRAWINGS DESCRIPTION

In order to more clearly illustrate the embodiments of the present invention or the technical solutions in the prior art, the drawings used in the description of the embodiments or the prior art will be briefly described below, it is obvious that the drawings in the following description are only some embodiments of the present invention, and for those skilled in the art, other drawings can be obtained according to the structures shown in the drawings without creative efforts.

FIG. 1 is a schematic structural diagram of a key structure according to an embodiment of the present invention;

FIG. 2 is a schematic structural diagram of another view angle of the key structure according to an embodiment of the present invention;

FIG. 3 is an exploded view of a key structure according to an embodiment of the present invention;

FIG. 4 is a schematic cross-sectional view of a key structure according to an embodiment of the present invention;

FIG. 5 is a schematic cross-sectional view of a rotating crown in accordance with an embodiment of the present invention;

fig. 6 is a schematic structural view of a pressing member according to an embodiment of the present invention.

The reference numbers illustrate:

the implementation, functional features and advantages of the objects of the present invention will be further explained with reference to the accompanying drawings.

INVENTION MODE

Detailed Description

The technical solutions in the embodiments of the present invention will be clearly and completely described below with reference to the drawings in the embodiments of the present invention, and it is obvious that the described embodiments are only a part of the embodiments of the present invention, and not all of the embodiments. All other embodiments, which can be derived by a person skilled in the art from the embodiments given herein without making any creative effort, shall fall within the protection scope of the present invention.

It should be noted that all the directional indicators (such as up, down, left, right, front, and rear ... ...) in the embodiment of the present invention are only used to explain the relative position relationship between the components, the movement situation, etc. in a specific posture (as shown in the drawing), and if the specific posture is changed, the directional indicator is changed accordingly.

Also, the meaning of "and/or" and/or "appearing throughout is meant to encompass three scenarios, exemplified by" A and/or B "including scenario A, or scenario B, or scenarios where both A and B are satisfied.

In addition, the descriptions related to "first", "second", etc. in the present invention are only for descriptive purposes and are not to be construed as indicating or implying relative importance or implicitly indicating the number of technical features indicated. Thus, a feature defined as "first" or "second" may explicitly or implicitly include at least one such feature. In addition, technical solutions between various embodiments may be combined with each other, but must be realized by a person skilled in the art, and when the technical solutions are contradictory or cannot be realized, such a combination should not be considered to exist, and is not within the protection scope of the present invention.

With the continuous development of material technology, the thickness of the watch case of the watch is thinner and thinner, but the crown needs a certain stroke for pressing, so the further reduction of the thickness of the watch case is limited, the partial thickness of the crown is thicker, and more internal space of the watch case is occupied. Meanwhile, in the related art, the crown can rub against the spring when rotating, so that the rotating hand feeling is poor, and the rotating service life is short.

Based on the above-mentioned conception and problems, the present invention provides a key structure 100. It is understood that the key structure 100 can be applied to a wearable device, an electronic device or other products using key functions, and is not limited thereto. When key structure 100 is applied to wearing equipment, wearing equipment includes casing 1, and also casing 1 can be wearing equipment's shell, and casing 1 is equipped with button hole 11, and button structure 100 is middle key assembly 3's rotatory table crown 31 and the button hole 11 of the part protrusion casing 1 of pressing piece 32, so can make things convenient for the rotatory table crown 31 and the pressing piece 32 of button assembly 3 to realize respectively rotatory and press the function.

Referring to fig. 1 to 6, in an embodiment of the present invention, the key structure 100 includes a trigger assembly 2 and a key assembly 3, wherein the key assembly 3 includes a

rotating crown 31 and a pressing member 32, the rotating crown 31 is rotatably disposed in the key hole 11 of the casing 1, a sliding cavity 31a is disposed in the rotating crown 31, and the pressing member 32 is slidably disposed in the sliding cavity 31 a; when the pressing piece 32 is pressed, the pressing piece 32 moves along the sliding cavity 31a to trigger the trigger assembly 2; and/or, when the rotating crown 31 is rotated, the rotating crown 31 rotates the pressing member 32 to trigger the trigger assembly 2.

In the present embodiment, the key structure 100 is applied to a device having a key function, the device including a housing 1, the housing 1 being provided with a key hole 11, so that the key structure 100 is fixedly installed by using the housing 1. Of course, the housing 1 may also be a mounting part of the key structure 100 for mounting and fixing the trigger assembly 2, the key assembly 3 and other parts, which is not limited herein. It can be understood that casing 1 provides the installation basis for triggering subassembly 2, button subassembly 3 and other parts, through set up the installation cavity in casing 1 to conveniently utilize the installation cavity installation, fixed trigger subassembly 2, not only realize the protection to triggering subassembly 2, can also play effects such as waterproof.

It can be understood that, through set up the button hole 11 of intercommunication installation cavity on casing 1 to make things convenient for the part of button subassembly 3 to pass through button hole 11 and stretch into the installation cavity, so that button subassembly 3 presses and/or rotatory button subassembly 3 under the exogenic action, so that the pressing member 32 and/or the rotatory crown 31 of button subassembly 3 trigger subassembly 2, in order to realize different button functions.

Optionally, the triggering assembly 2 is used for triggering of a key. The trigger assembly 2 may be a trigger element or an inductive element or a key or a spring piece disposed on the circuit board, and when the pressing piece 32 and/or the rotating crown 31 of the key assembly 3 triggers the trigger assembly 2, the trigger assembly 2 transmits a signal to the circuit board to implement a corresponding control operation, and the like, which is not limited herein.

In this embodiment, the one end of the rotatory crown 31 of button subassembly 3 protrudes in the outside of casing 1, the other end of rotatory crown 31 rotates and wears to locate in key hole 11, thereby convenience of customers realizes the rotation function through convex rotatory crown 31, the one end protrusion of the pressing piece 32 of button subassembly 3 is in the one end of protrusion in the outside rotatory crown 31 of casing 1 simultaneously, also the other end activity of pressing piece 32 wears to locate in sliding cavity 31a, so can convenience of customers realizes pressing the function through convex pressing piece 32. It can be understood that the rotary crown 31 can be rotatably disposed through the key hole 11 in a damping manner, so that the rotary crown 31 can rotate in the key hole 11 under the condition of applying an external force, and the rotary crown 31 is fixed in the key hole 11 under the condition of not applying the external force. Of course, in other embodiments, the rotating crown 31 can also be installed in the key hole 11 through a seal ring or a damping ring or other structures capable of realizing rotational installation, which is not limited herein.

In the present embodiment, the pressing member 32 is movable along the sliding cavity 31a of the rotary crown 31, for example, the pressing member 32 is slidably disposed in the sliding cavity 31a in a damping manner, so that the pressing member 32 can move in the sliding cavity 31a under the application of an external force, and the pressing member 32 is fixed in the sliding cavity 31a under the non-application of the external force. Of course, in other embodiments, the pressing member 32 may also be configured to perform a pressing return by using a spring or the like, or ensure that the pressing member 32 does not move along the sliding cavity 31a without an external force, and the like, which is not limited herein.

It is understood that the pressing member 32 and the rotating crown 31 are connected into a

whole structure by a detachable connection manner, such as a snap connection, a plug fit, a suction connection, etc., and are not limited herein.

In the key structure 100 of the present invention, the rotating crown 31 of the key assembly 3 is rotatably inserted into the key hole 11 of the casing 1, and the sliding cavity 31a is disposed in the rotating crown 31, so that the pressing member 32 is slidably inserted into the sliding cavity 31a, and thus when the pressing member 32 is pressed, the pressing member 32 moves along the sliding cavity 31a of the rotating crown 31, and the triggering assembly 2 is triggered; and/or, when the rotating crown 31 is rotated, the rotating crown 31 can drive the pressing piece 32 to rotate to trigger the trigger assembly 2, that is, the pressing piece 32 and the rotating crown 31 of the key assembly 3 are arranged in a nested manner, so that the rotating function and the pressing function are separated, therefore, the shell 1 does not need to ensure the stroke required by pressing, the thickness of the shell 1 of the device can be further reduced, and the internal space of the device can be saved; meanwhile, the pressing piece 32 is slidably arranged in the sliding cavity 31a in a penetrating manner, so that the pressing piece 32 can rotate along with the rotating crown 31 without friction with the pressing piece 32 when the rotating crown 31 rotates, good rotating hand feeling can be ensured, and the rotating life of the rotating crown 31 is prolonged.

In one embodiment, the wall of the sliding cavity 31a is convexly provided with a first clamping member 315, and the outer wall of the pressing member 32 is provided with a second clamping member 323 which is in clamping fit with the first clamping member 315; the key assembly 3 further includes an elastic member 33 sleeved on the outer wall of the pressing member 32, and two ends of the elastic member 33 are respectively elastically abutted against the pressing member 32 and the cavity wall of the sliding cavity 31 a.

In the present embodiment, as shown in fig. 3 to 6, by providing the first engaging member 315 on the wall of the sliding cavity 31a of the rotating crown 31 and providing the second engaging member 323 on the outer wall of the pressing member 32, the pressing member 32 is engaged with the rotating crown 31 by the engagement between the second engaging member 323 and the first engaging member 315; meanwhile, through setting up elastic component 33, make elastic component 33 be located the sliding cavity 31a, and the cover is located pressing piece 32 outer wall, make the both ends of elastic component 33 respectively with pressing piece 32 and the chamber wall elasticity butt in sliding cavity 31a, so when pressing piece 32 is connected with rotatory table crown 31 joint through the joint cooperation of second joint piece 323 with first joint piece 315, elastic component 33 is in compression state, thereby utilize the elasticity of elastic component 33 to make pressing piece 32 keep away from trigger subassembly 2, and make pressing piece 32 be connected with rotatory table crown 31 joint through the joint cooperation of second joint piece 323 with first joint piece 315, avoid pressing piece 32 to break away from rotatory table crown 31.

Alternatively, the elastic member 33 is a compression spring, a telescopic spring, or the like, and is not limited herein. It can be understood that, the two ends of the elastic member 33 are elastically abutted against the cavity walls of the pressing member 32 and the sliding cavity 31a, respectively, and a support table or an abutment table may be provided on the outer wall of the pressing member 32 and the cavity wall of the sliding cavity 31a, and the support table or the abutment table does not affect the movement of the pressing member 32 in the sliding cavity 31 a.

In the present embodiment, the rotating crown 31 may be a cylindrical structure with two open ends, that is, the two ends of the sliding cavity 31a have openings, which is not limited herein. The pressing member 32 may be a column or a rod, and the like, but is not limited thereto.

In one embodiment, the press piece 32 includes a key lever 321 and a key cap 322

connected; the sliding cavity 31a includes a first section 3121 and a second section 3111 which are communicated with each other, the aperture of the second section 3111 is larger than that of the first section 3121, the key lever 321 is slidably disposed through the first section 3121, and a portion of the key cap 322 protrudes from an end of the second section 3111 which is far away from the first section 3121.

In an embodiment, as shown in fig. 3 to 6, a first clamping member 315 is convexly disposed on a cavity wall of the second section 3111, and a second clamping member 323 clamped and matched with the first clamping member 315 is disposed on an outer wall of the key cap 322; the key assembly 3 further includes an elastic member 33 disposed in the first section 3121, the elastic member 33 elastically abuts against the key lever 321; when the key cap 322 is pressed, the key rod 321 compresses or stretches the elastic member 33.

In this embodiment, through setting up the pressing piece 32 into button pole 321 and button cap 322, and set up sliding cavity 31a into first section 3121 and second section 3111 that are linked together, make the button pole 321 of pressing piece 32 slide and wear to locate first section 3121, part button cap 322 is located second section 3111 through the cooperation of second joint spare 323 and first joint spare 315, the protruding second section 3111 of part button cap 322 is kept away from the one end of first section 3121, so can make things convenient for the user to press button cap 322, make button cap 322 drive button pole 321 to remove under the exogenic action, in order further to compress elastic component 33, and make button pole 321 support and press trigger component 2.

Alternatively, the first clamping member 315 and the second clamping member 323 may be a matching structure of a clamping platform and a buckle, or a matching structure of a clamping protrusion and a clamping groove, or a matching structure of a clamping protrusion and a clamping hole, which is not limited herein.

Optionally, the elastic element 33 is a spring, and the elastic element 33 is sleeved on an outer wall of the key lever 321. Of course, in other embodiments, the elastic element 33 is a spring, in which case, the elastic element 33 is located in the first section 3121, and the elastic element 33 is elastically connected to the key lever 321 in an abutting manner.

It can be understood that the diameter of the key cap 322 of the press 32 is larger than that of the key bar 321, and optionally, the aperture of the second section 3111 is larger than that of the first section 3121, so that the second section 3111 of the sliding cavity 31a is fitted with the key cap 322, and the first section 3121 of the sliding cavity 31a is fitted with the key bar 321. Of course, in order to avoid the elastic member 33 from affecting the movement of the key lever 321, the diameter of the first section 3121 is slightly larger than that of the elastic member 33.

In the present embodiment, the key rod 321 and the key cap 322 of the pressing member 32 are integrally formed, so that the structural strength of the pressing member 32 can be improved.

In an embodiment, an abutting table 3211 is protruded on an outer wall of the key lever 321, a supporting table 316 is protruded on an inner wall of the first section 3121 away from one end of the second section 3111, and two ends of the elastic member 33 are elastically abutted to the abutting table 3211 and the supporting table 316, respectively.

As shown in fig. 3 to 6, in the present embodiment, the abutting table 3211 is disposed on the outer wall of the key rod 321, and the supporting table 316 is disposed in the cavity wall of the rotating crown 31 adjacent to one end of the trigger assembly 2, so that two ends of the elastic element 33 elastically abut against the abutting table 3211 and the supporting table 316, respectively, thereby ensuring that the elastic element 33 is in a compressed state when the pressing element 32 and the rotating crown 31 are in snap fit through the second snap-fit element 323 and the first snap-fit element 315.

In an embodiment, the key structure 100 further includes at least one first sealing ring 6, and the first sealing ring 6 is sandwiched between the key rod 321 and the hole wall of the first section 3121.

In this embodiment, as shown in fig. 3 and 4, by providing the first sealing ring 6 between the key lever 321 and the hole wall of the first section 3121, the gap between the key lever 321 and the wall of the first section 3121 of the sliding cavity 31a is sealed by the first sealing ring 6, so that the sealing performance and the waterproof performance are improved. Optionally, the material of the first sealing ring 6 is NBR.

It is understood that the first sealing ring 6 includes a plurality of first sealing rings 6, and the plurality of first sealing rings 6 are arranged at intervals along the extending direction of the key lever 321.

In order to avoid the first sealing ring 6 from being displaced during the movement of the key rod 321, in an embodiment, as shown in fig. 3, 4 and 6, at least one of the hole walls of the key rod 321 and the first section 3121 is provided with a first groove 3212, and the first sealing ring 6 is accommodated in the first groove 3212 and partially protrudes from the notch of the first groove 3212.

In this embodiment, the first groove 3212 may be disposed on an outer wall of the key rod 321, or the first groove 3212 may be disposed on a cavity wall of the first segment 3121, or both the outer wall of the key rod 321 and the cavity wall of the first segment 3121 are disposed with the first groove 3212, and are disposed correspondingly, which is not limited herein. As can be appreciated, the first sealing ring 6 has elasticity and sealing performance, and the first sealing ring 6 is accommodated in the first groove 3212 and partially protrudes out of the notch of the first groove 3212, so that the first sealing ring 6 protruding out of the notch of the first groove 3212 can be in sealing abutment with the outer wall of the key lever 321 or the cavity wall of the first segment 3121.

Alternatively, the first groove 3212 may be a U-shaped groove, a wedge-shaped groove, a V-shaped groove, an arc-shaped groove, a semi-circular groove, or the like, which is not limited herein.

In an embodiment, an avoiding groove 3221 is formed in the outer wall of the key cap 322 corresponding to the second clamping member 323, the second clamping member 323 includes a resilient arm 3231 and a clamping protrusion 3232, one end of the resilient arm 3231 is connected to the outer wall of the key cap 322, the clamping protrusion 3232 is protruding from the other end of the resilient arm 3231 and is located on a side of the resilient arm 3231 facing away from the avoiding groove 3221, and the resilient arm 3231 is flush with the outer wall of the key cap 322.

In this embodiment, as shown in fig. 3 to 5, the avoiding groove 3221 is disposed on the outer wall of the key cap 322, so as to facilitate the elastic avoiding position of the second clip member 323, and ensure that the second clip member 323 smoothly extends into the second section 3111 and is clipped with the first clip member 315. It can be understood that, the bullet arm 3231 one end of second joint spare 323 is connected with the outer wall according to key cap 322, and the other end is the free end, and protruding 3232 of card locates the free end of bullet arm 3231 for bullet arm 3231 flushes with the outer wall according to key cap 322, thereby when exerting external force and pressing according to key cap 322, can slide along second section 3111 according to key cap 322, avoids second joint spare 323 to interfere the slip according to key cap 322.

Optionally, the first snap-in member 315 is disposed in an annular boss, that is, the first snap-in member 315 is disposed along the circumferential extension of the inner wall of the second section 3111. Of course, in other embodiments, the first engaging member 315 includes a plurality of boss structures, and the boss structures are spaced along the circumference of

the inner wall of the second section 3111, and each boss structure corresponds to one second engaging member 323.

It can be understood that the second clamping members 323 include a plurality of second clamping members 323, the plurality of second clamping members 323 are circumferentially arranged along the outer wall of the key cap 322 at intervals, and an avoiding groove 3221 is formed in the outer wall of the key cap 322 corresponding to each second clamping member 323, which is not limited herein. In this embodiment, in order to facilitate the protrusion 3232 of the second clip member 323 smoothly extending into the second section 3111 and clipping with the first clip member 315, the protrusion 3232 has a guiding surface 3233, that is, when the pressing member 32 is installed, the first clip member 315 moves along the guiding surface 3233 of the protrusion 3232, so that the protrusion 3232 slides into the second section 3111 and clips with the first clip member 315.

In one embodiment, as shown in fig. 3 to 5, an abutting surface 3112 is formed at a communication portion between the first segment 3121 and the second segment 3111, and when the key cap 322 is pressed, the key cap 322 abuts against the abutting surface 3112. It can be understood, so set up to utilize the extrusion of butt face 3112 restriction external force, avoid external force too big, make press key cap 322 to drive press key rod 321 transition to press and trigger subassembly 2, and then damage trigger subassembly 2. So when exerting external force and pressing button cap 322, the outer wall of button cap 322 slides along first joint spare 315 to with butt joint face 3112 butt joint, button pole 321 just can support to press and trigger subassembly 2 this moment.

In one embodiment, the rotating crown 31 includes a rotating portion 311 and a rotating portion 312 connected to each other, the sliding cavity 31a penetrates through the rotating portion 311 and the rotating portion 312, a limiting surface 313 is formed at a connection position of the rotating portion 311 and the rotating portion 312, and the rotating portion 312 is rotatably inserted into the key hole 11, so that the limiting surface 313 is in limiting contact with the outer wall of the case 1.

In the present embodiment, as shown in fig. 1 to 5, by providing the rotary crown 31 as the rotary portion 311 and the rotary shaft portion 312 connected, the sliding chamber 31a penetrates through the rotary portion 311 and the rotary shaft portion 312, that is, the second section 3111 is formed through the portion of the sliding chamber 31a of the rotary portion 311, and the first section 3121 is formed through the portion of the sliding chamber 31a of the rotary shaft portion 312. Through being formed with spacing face 313 in the outer wall junction of the outer wall of rotating part 311 and pivot portion 312 for pivot portion 312 rotationally wears to locate in the key hole 11, makes spacing face 313 and the spacing butt of casing 1's outer wall, thereby when ensureing to exert external force and press down pressure piece 32, rotatory crown 31 avoids moving along key hole 11 through the spacing butt of face 313 and casing 1's outer wall.

It is understood that the outer diameter of the rotating portion 311 of the rotary crown 31 is larger than the outer diameter of the rotating shaft portion 312. Alternatively, the rotation shaft portion 312 of the rotary crown 31 has a cylindrical structure. In the present embodiment, the rotary portion 311 and the rotary shaft portion 312 of the rotary crown 31 are formed integrally, so that the structural strength of the rotary crown 31 can be improved.

In an embodiment, the rotation shaft portion 312 penetrates through an outer wall of one end of the key hole 11 to be provided with a locking groove 3122, the key structure 100 further includes a snap spring 4 disposed in the housing 1, and the snap spring 4 is movably locked in the locking groove 3122.

In this embodiment, as shown in fig. 2 to 5, by providing the engaging groove 3122 on the rotating shaft portion 312 and providing the snap spring 4, the snap spring 4 is movably

engaged with the engaging groove 3122 and abuts against the inner wall of the housing 1 for limitation, so that the snap spring 4 can be used to further limit the rotating crown 31 in the key hole 11, and when the rotating crown 31 and/or the pressing member 32 of the key assembly 3 are prevented from being pulled out of the key hole 11 by applying an external force to pull the key assembly 3.

It can be understood that, by arranging the snap spring 4, the snap spring 4 is detachably clamped in the clamping groove 3122 of the rotary crown 31, so that the key assembly 3 is convenient to mount and dismount. Of course, in other embodiments, the rotation shaft 312 may be protruded from an outer wall of one end of the key hole 11 to abut against an inner wall of the casing 1, that is, the rotation shaft 312, the rotation part 311 and the rotation part 312 enclose to form an H-shaped limit groove structure, so as to ensure the installation and the limit of the rotation crown 31, which is not limited herein.

In this embodiment, the engaging groove 3122 is circumferentially disposed along the outer wall of the rotating shaft 312 and forms an annular groove, the snap spring 4 has a locking portion 41, the locking portion 41 is disposed in a U shape, and the locking portion 41 is movably locked in the engaging groove 3122. Also jump ring 4 has the installation department of joint portion 41 and connection joint portion 41, and jump ring 4 is spacing through the spacing installation of installation department and casing 1's inner wall or butt, and the joint portion 41 of jump ring 4 is the setting of U type for U type jump ring 4 joint is in rotatory crown 31 in the draw-in groove 3122 of pivot portion 312, can spacing rotatory crown 31 along the axial removal of key hole 11 on the one hand, and on the other hand has and can realize that rotatory crown 31 follows the rotation of key hole 11 circumference.

In an embodiment, as shown in fig. 1 and fig. 3 to fig. 5, the key structure 100 further includes a wear-resistant plate 5, and the wear-resistant plate 5 is sleeved on the rotating shaft portion 312 and clamped between the limiting surface 313 and the outer wall of the housing 1. It will be appreciated that this is so arranged that friction with the outer wall of the case 1 when the rotary crown 31 rotates is reduced by the wear-resistant pieces 5, thereby reducing the rotational damping force. Optionally, the wear-resistant sheet 5 is made of PEEK.

In this embodiment, as shown in fig. 4 and 5, the stopper surface 313 is provided with a stopper groove 314, and a portion of the wear-resistant plate 5 is accommodated in the stopper groove 314. It can be understood that through setting up spacing groove 314 to conveniently utilize spacing groove 314 to realize location and spacing installation to wear pad 5, partial wear pad 5 protrudes the notch of spacing groove 314 simultaneously, so can make wear pad 5 and casing 1's outer wall butt, avoids spacing 313 direct and casing 1's outer wall direct contact, thereby effectively reduces the friction.

In an embodiment, the key structure 100 further includes at least one second sealing ring 7, and the second sealing ring 7 is interposed between the outer wall of the rotation shaft portion 312 and the hole wall of the key hole 11.

In the present embodiment, as shown in fig. 3 to 5, by providing the second seal ring 7, the gap between the rotating shaft portion 312 of the rotary crown 31 and the hole wall of the key hole 11 is sealed by the second seal ring 7, and the sealing performance and the waterproof performance are improved. Optionally, the second sealing ring 7 is made of NBR.

It is understood that the second seal ring 7 is located between the catching groove 3122 of the rotation shaft portion 312 in the rotation crown 31 and the rotation part 311. Optionally, the second sealing ring 7 includes a plurality of second sealing rings 7, and the plurality of second sealing rings 7 are arranged at intervals along the extending direction of the rotating shaft portion 312.

In order to avoid the problem of the displacement of the second sealing ring 7 during the rotation of the rotary crown 31, which may cause the reduction of the sealing performance, in

an embodiment, as shown in fig. 3 to 5, at least one of the outer wall of the rotating shaft portion 312 and the hole wall of the key hole 11 is provided with a second groove 3123, and the second sealing ring 7 is accommodated in the second groove 3123 and partially protrudes out of the notch of the second groove 3123.

It is understood that the second groove 3123 may be disposed on the outer wall of the rotating shaft portion 312 of the rotating crown 31, or the second groove 3123 may be disposed on the hole wall of the key hole 11, or the second groove 3123 is disposed on both the outer wall of the rotating shaft portion 312 and the hole wall of the key hole 11, and in this case, the two second grooves 3123 correspond, which is not limited herein.

In this embodiment, the second sealing ring 7 has elasticity and sealing performance, and the second sealing ring 7 is accommodated in the second groove 3123 and partially protrudes from the notch of the second groove 3123, so that the second sealing ring 7 protruding from the notch of the second groove 3123 can be in sealing abutment with the outer wall of the rotating shaft portion 312 and the hole wall of the key hole 11.

Alternatively, the second groove 3123 may be a U-shaped groove, a wedge-shaped groove, a V-shaped groove, an arc-shaped groove, a semi-circular groove, or the like, which is not limited herein.

In one embodiment, as shown in fig. 1 to 4, the trigger assembly 2 includes a trigger element 21 and an optical sensor 22, wherein the trigger element 21 is disposed in the casing 1 and is opposite to the key hole 11, and the optical sensor 22 is disposed in the casing 1 and is opposite to the sidewall of the rotary crown 31.

In this embodiment, the triggering element 21 is provided with a contact corresponding to the key hole 11, and the contact is opposite to the end of the key rod 321 far away from the key cap 322. It will be understood that the trigger element 21 and the optical sensor 22 are electrically connected to the circuit board, such that the circuit board is configured to receive the trigger signals of the trigger element 21 and the optical sensor 22 for implementing the corresponding control functions of the trigger signals. Optionally, the circuit board is a flexible circuit board or a rigid circuit board, which is not limited herein.

It can be understood that the triggering element 21 can be welded on the flexible circuit board, so that the triggering element 21 is provided with a contact corresponding to the key hole 11, the contact is opposite to one end of the key rod 321 far away from the key cap 322, and thus when an external force is applied to press the key cap 322, the key rod 321 is abutted to the contact and presses the triggering signal.

In the present embodiment, the optical sensor 22 is provided, so that the rotation of the rotating shaft portion 312 is driven to trigger a signal or a function different from the pressing of the trigger triggering member 21 when the user rotates the rotating crown 31 is detected and recognized by the optical sensor 22, which is not limited herein. It will be appreciated that the optical sensor 22 is disposed on the circuit board and adjacent to and spaced from the trigger member 21, and the optical sensor 22 is used for sensing the rotation of the shaft portion 312 of the rotary crown 31 to trigger the trigger assembly 2.

It can be understood that the arrangement is such that the movement stroke of the pressing member 32 is arranged in the rotary crown 31, so that the case 1 does not need to ensure the stroke required for pressing the pressing member 32, the thickness of the case 1 of the device can be further reduced, and the internal space of the device can be saved. Simultaneously, all set up elastic component 33 and pressing member 32 in the slip chamber 31a of rotatory crown 31 to when making rotatory crown 31 rotatory, drive elastic component 33 and pressing member 32 rotatory in the lump, effectively avoided the friction between elastic component 33 and the pressing member 32, improve and to guarantee that good rotatory is felt, improve rotatory crown 31's rotatory life-span.

In the present embodiment, when the key structure 100 is assembled, the elastic member 33, the first sealing ring 6 and the pressing member 32 are assembled, and then the assembled pressing member 32 is installed in the sliding cavity 31a of the rotating crown 31, so that the second fastening member 323 on the key cap 322 is fastened with the first fastening member 315 in the sliding cavity 31a of the rotating crown 31; then the wear-resistant sheet 5 and the second seal ring 7 are arranged at the corresponding positions of the rotary crown 31, the assembled rotary crown 31 is arranged in the key hole 11 of the shell 1, the wear-resistant snap spring 4 is inserted from the inner side of the shell 1, and the snap spring 4 and the shell 1 are welded and fixed. The optical sensor 22 and the triggering element 21 of the triggering assembly 2 are then mounted at corresponding positions inside the housing 1. In the installed key structure 100, since the elastic member 33 is in a pre-compressed state when the key cap 322 is installed, the rotating crown 31 and the key cap 322 are supported with each other, and when the rotating crown 31 rotates, the key rod 321 and the elastic member 33 of the sliding cavity 31a rotate synchronously with the rotating crown 31. The optical sensor 22 installed inside the case 1 receives a rotation signal of the rotary crown 31, thereby realizing the input of the rotation signal; by manually pressing the key cap 322 of the pressing member 32, the key rod 321 is axially moved to trigger the triggering member 21, thereby inputting a switch signal. When the external force is removed and the external force is released, the elastic member 33 rebounds and pushes the key lever 321 to return to the initial position. The second sealing ring 7 and the first sealing ring 6 which are arranged outside the rotating crown 31 and the key rod 321 can ensure 5 ATM-level water resistance while ensuring the movement of the key assembly 3.

It can be understood that, in the key structure 100, since the rotating crown 31 does not move in the axial direction of the key hole 11, the thickness of the case 1 can be reduced, thereby saving the internal space of the case 1 and facilitating the stacking of internal devices; because the rotary crown 31 is not stressed in the axial direction of the key hole 11, the rotary damping is small, the rotary hand feeling is good, the abrasion is not easy to occur, and the service life is prolonged; the key assembly 3 has high part integration level, can assemble materials, and has low material management cost and convenient and fast assembly.

The present invention further provides a wearable device, which includes a device main body and the key structure 100, and the specific structure of the key structure 100 refers to the foregoing embodiments, and since the wearable device adopts all technical solutions of all the foregoing embodiments, the wearable device at least has all beneficial effects brought by the technical solutions of the foregoing embodiments, and details are not repeated herein.

In this embodiment, the device main body includes a housing, the housing is provided with a key hole, and the key structure 100 is connected to the housing. It can be understood that the wearing device can be a watch, a bracelet, a head-mounted display and the like, and when the wearing device is the watch, the shell can be a watch shell of the watch.

The above description is only an alternative embodiment of the present invention, and not intended to limit the scope of the present invention, and all modifications and equivalents of the present invention, which are made by the contents of the present specification and the accompanying drawings, or directly/indirectly applied to other related technical fields, are included in the scope of the present invention.

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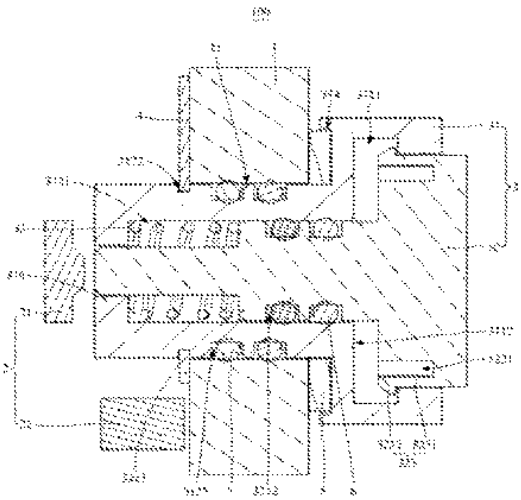
(54) 发明名称

按键结构和穿戴设备

(57) 摘要

本发明公开一种按键结构和穿戴设备，所述按键结构包括触发组件和按键组件，所述按键组件包括旋转表冠和按压件，所述旋转表冠可转动地穿设于壳体的按键孔内，所述旋转表冠内设有滑动腔，所述按压件可滑动地穿设于所述滑动腔内；其中，按压所述按压件时，所述按压件沿所述滑动腔移动以触发所述触发组件；和/或，旋转所述旋转表冠时，所述旋转表冠带动所述按压件旋转以触发所述触发组件。本发明旨在提高一种能够保证良好的旋转手感，并提高表冠旋转寿命的按键结构，该按键结构应用于设备中，能够有效减薄设备壳体厚度，节省设备内部空间。



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1.一种按键结构，其特征在于，所述按键结构包括：

触发组件；和

按键组件，所述按键组件包括旋转表冠和按压件，所述旋转表冠可转动地穿设于壳体的按键孔内，所述旋转表冠内设有滑动腔，所述按压件可滑动地穿设于所述滑动腔内；

其中，按压所述按压件时，所述按压件沿所述滑动腔移动以触发所述触发组件；和/或，旋转所述旋转表冠时，所述旋转表冠带动所述按压件旋转以触发所述触发组件。

2.根据权利要求1所述的按键结构，其特征在于，所述按压件包括相连接的按键杆和按键帽；

所述滑动腔包括相连通的第一段和第二段，所述第二段的孔径大于所述第一段的孔径，所述按键杆滑动穿设于所述第一段，部分所述按键帽凸出所述第二段远离所述第一段的一端。

3.根据权利要求2所述的按键结构，其特征在于，所述按键结构还包括至少一个第一密封圈，所述第一密封圈夹设于所述按键杆和所述第一段的孔壁之间。

4.根据权利要求2所述的按键结构，其特征在于，所述第二段的腔壁凸设有第一卡接件，所述按键帽的外壁设有与所述第一卡接件卡接配合的第二卡接件；

所述按键组件还包括设于所述第一段内的弹性件，所述弹性件与所述按键杆弹性抵接；

其中，按压所述按键帽时，所述按键杆压缩或拉伸所述弹性件。

5.根据权利要求4所述的按键结构，其特征在于，所述按键杆的外壁凸设有抵接台，所述第一段远离所述第二段一端的内壁凸设有支撑台，所述弹性件的两端分别与所述抵接台和所述支撑台弹性抵接；

且/或，所述按键帽的外壁对应所述第二卡接件设有避让槽，所述第二卡接件包括弹臂和卡凸，所述弹臂的一端与所述按键帽的外壁连接，所述卡凸凸设于所述弹臂的另一端，并位于所述弹臂背向所述避让槽的一侧；

且/或，所述第一段与所述第二段的连通处形成有抵接面，按压所述按键帽时，所述按键帽与所述抵接面抵接。

6.根据权利要求1至5中任一项所述的按键结构，其特征在于，所述旋转表冠包括相连接的旋转部和转轴部，所述滑动腔贯穿所述旋转部和所述转轴部，所述旋转部与所述转轴部的连接处形成有限位面，所述转轴部可转动地穿设于所述按键孔内，使所述限位面与所述壳体的外壁限位抵接。

7.根据权利要求6所述的按键结构，其特征在于，所述转轴部穿过所述按键孔的一端外壁设有卡槽，所述按键结构还包括设于所述壳体内的卡簧，所述卡簧活动卡接于所述卡槽内。

8.根据权利要求7所述的按键结构，其特征在于，所述卡槽沿所述转轴部的外壁周向设置并形成环槽，所述卡簧具有卡接部，所述卡接部呈U型设置，所述卡接部活动卡接于所述卡槽内。

9.根据权利要求6所述的按键结构，其特征在于，所述按键结构还包括耐磨片，所述耐磨片套设于所述转轴部，并夹设于所述限位面和所述壳体的外壁之间。

10.根据权利要求6所述的按键结构，其特征在于，所述按键结构还包括至少一个第二

密封圈，所述第二密封圈夹设于所述转轴部的外壁和所述按键孔的孔壁之间。

11.根据权利要求1所述的按键结构，其特征在于，所述触发组件包括：

触发元件，所述触发元件设于所述壳体内，并与所述按键孔正对设置；和

光学传感器，所述光学传感器设于所述壳体内，并与所述旋转表冠的侧壁正对设置。

12.一种穿戴设备，其特征在于，包括设备主体和如权利要求1至11中任一项所述的按键结构，所述设备主体包括壳体，所述壳体设有按键孔，所述按键结构连接于所述壳体。

按键结构和穿戴设备

技术领域

[0001] 本发明涉及智能穿戴设备技术领域，特别涉及一种按键结构和应用该按键结构的穿戴设备。

背景技术

[0002] 随着材料工艺的不断发展，手表的表壳厚度做的越来越薄，但由于表冠按压需要一定的行程，所以表壳厚度的进一步缩小受到了限制，导致表冠处局部厚度较厚，占用较多的表壳内部空间。同时，相关技术中表冠旋转时会与弹簧摩擦，导致旋转手感较差，旋转寿命较短。

发明内容

[0003] 本发明的主要目的是提供一种按键结构和穿戴设备，旨在提高一种能够保证良好的旋转手感，并提高表冠旋转寿命的按键结构，该按键结构应用于设备中，能够有效减薄设备壳体厚度，节省设备内部空间。

[0004] 为实现上述目的，本发明提出一种按键结构，所述按键结构包括：

[0005] 触发组件；和

[0006] 按键组件，所述按键组件包括旋转表冠和按压件，所述旋转表冠可转动地穿设于壳体的按键孔内，所述旋转表冠内设有滑动腔，所述按压件可滑动地穿设于所述滑动腔内；

[0007] 其中，按压所述按压件时，所述按压件沿所述滑动腔移动以触发所述触发组件；和/或，旋转所述旋转表冠时，所述旋转表冠带动所述按压件旋转以触发所述触发组件。

[0008] 在一实施例中，所述按压件包括相连接的按键杆和按键帽；

[0009] 所述滑动腔包括相连通的第一段和第二段，所述第二段的孔径大于所述第一段的孔径，所述按键杆滑动穿设于所述第一段，部分所述按键帽凸出所述第二段远离所述第一段的一端。

[0010] 在一实施例中，所述按键结构还包括至少一个第一密封圈，所述第一密封圈夹设于所述按键杆和所述第一段的孔壁之间。

[0011] 在一实施例中，所述第二段的腔壁凸设有第一卡接件，所述按键帽的外壁设有与所述第一卡接件卡接配合的第二卡接件；

[0012] 所述按键组件还包括设于所述第一段内的弹性件，所述弹性件与所述按键杆弹性抵接；

[0013] 其中，按压所述按键帽时，所述按键杆压缩或拉伸所述弹性件。

[0014] 在一实施例中，所述按键杆的外壁凸设有抵接台，所述第一段远离所述第二段一端的内壁凸设有支撑台，所述弹性件的两端分别与所述抵接台和所述支撑台弹性抵接；

[0015] 且/或，所述按键帽的外壁对应所述第二卡接件设有避让槽，所述第二卡接件包括弹臂和卡凸，所述弹臂的一端与所述按键帽的外壁连接，所述卡凸凸设于所述弹臂的另一端，并位于所述弹臂背向所述避让槽的一侧；

[0016] 且/或，所述第一段与所述第二段的连通处形成有抵接面，按压所述按键帽时，所述按键帽与所述抵接面抵接。

[0017] 在一实施例中，所述旋转表冠包括相连接的旋转部和转轴部，所述滑动腔贯穿所述旋转部和所述转轴部，所述旋转部与所述转轴部的连接处形成有限位面，所述转轴部可转动地穿设于所述按键孔内，使所述限位面与所述壳体的外壁限位抵接。

[0018] 在一实施例中，所述转轴部穿过所述按键孔的一端外壁设有卡槽，所述按键结构还包括设于所述壳体内的卡簧，所述卡簧活动卡接于所述卡槽内。

[0019] 在一实施例中，所述卡槽沿所述转轴部的外壁周向设置并形成环槽，所述卡簧具有卡接部，所述卡接部呈U型设置，所述卡接部活动卡接于所述卡槽内。

[0020] 在一实施例中，所述按键结构还包括耐磨片，所述耐磨片套设于所述转轴部，并夹设于所述限位面和所述壳体的外壁之间。

[0021] 在一实施例中，所述按键结构还包括至少一个第二密封圈，所述第二密封圈夹设于所述转轴部的外壁和所述按键孔的孔壁之间。

[0022] 在一实施例中，所述触发组件包括：

[0023] 触发元件，所述触发元件设于所述壳体内，并与所述按键孔正对设置；和

[0024] 光学传感器，所述光学传感器设于所述壳体内，并与所述旋转表冠的侧壁正对设置。

[0025] 本发明还提出一种穿戴设备，包括设备主体和上述所述的按键结构，所述设备主体包括壳体，所述壳体设有按键孔，所述按键结构连接于所述壳体。

[0026] 本发明技术方案的按键结构通过将按键组件的旋转表冠可转动地穿设于壳体的按键孔内，并在旋转表冠内设置滑动腔，使得按压件可滑动地穿设于滑动腔内，如此在按压按压件时，按压件沿旋转表冠的滑动腔移动，进而触发触发组件；和/或，旋转旋转表冠时，旋转表冠能够带动按压件旋转以触发触发组件，也即将按键组件的按压件和旋转表冠采用嵌套式设置，使得旋转和按压功能分离，如此壳体不需要保证按压所需要的行程，可使得设备的壳体厚度进一步减薄，节省设备内部空间；同时，按压件可滑动地穿设于滑动腔内，使得旋转表冠旋转时按压件可跟随旋转，不与按压件摩擦，可以保证良好的旋转手感，提高表冠旋转寿命。

附图说明

[0027] 为了更清楚地说明本发明实施例或现有技术中的技术方案，下面将对实施例或现有技术描述中所需要使用的附图作简单地介绍，显而易见地，下面描述中的附图仅仅是本发明的一些实施例，对于本领域普通技术人员来讲，在不付出创造性劳动的前提下，还可以根据这些附图示出的结构获得其他的附图。

[0028] 图1为本发明一实施例中按键结构的结构示意图；

[0029] 图2为本发明一实施例中按键结构另一视角的结构示意图；

[0030] 图3为本发明一实施例中按键结构的分解示意图；

[0031] 图4为本发明一实施例中按键结构的剖面示意图；

[0032] 图5为本发明一实施例中旋转表冠的剖面示意图；

[0033] 图6为本发明一实施例中按压件的结构示意图。

[0034] 附图标号说明：

[0035]

标号	名称	标号	名称
100	按键结构	315	第一卡接件

[0036]

1	壳体	316	支撑台
11	按键孔	32	按压件
2	触发组件	321	按键杆
21	触发元件	3211	抵接台
22	光学传感器	3212	第一凹槽
3	按键组件	322	按键帽
31	旋转表冠	3221	避让槽
31a	滑动腔	323	第二卡接件
311	旋转部	3231	弹臂
3111	第二段	3232	卡凸
3112	抵接面	3233	导向面
312	转轴部	33	弹性件
3121	第一段	4	卡簧
3122	卡槽	41	卡接部
3123	第二凹槽	5	耐磨片
313	限位面	6	第一密封圈
314	限位槽	7	第二密封圈

[0037] 本发明目的的实现、功能特点及优点将结合实施例，参照附图做进一步说明。

具体实施方式

[0038] 下面将结合本发明实施例中的附图，对本发明实施例中的技术方案进行清楚、完整地描述，显然，所描述的实施例仅仅是本发明的一部分实施例，而不是全部的实施例。基于本发明中的实施例，本领域普通技术人员在没有作出创造性劳动前提下所获得的所有其他实施例，都属于本发明保护的范围。

[0039] 需要说明，本发明实施例中所有方向性指示(诸如上、下、左、右、前、后……)仅用于解释在某一特定姿态(如附图所示)下各部件之间的相对位置关系、运动情况等，如果该特定姿态发生改变时，则该方向性指示也相应地随之改变。

[0040] 同时，全文中出现的“和/或”或“且/或”的含义为，包括三个方案，以“A和/或B”为例，包括A方案，或B方案，或A和B同时满足的方案。

[0041] 另外，在本发明中如涉及“第一”、“第二”等的描述仅用于描述目的，而不能理解为指示或暗示其相对重要性或者隐含指明所指示的技术特征的数量。由此，限定有“第一”、“第二”的特征可以明示或者隐含地包括至少一个该特征。另外，各个实施例之间的技术方

案可以相互结合，但是必须是以本领域普通技术人员能够实现为基础，当技术方案的结合出现相互矛盾或无法实现时应当认为这种技术方案的结合不存在，也不在本发明要求的保护范围之内。

[0042] 随着材料工艺的不断发展，手表的表壳厚度做的越来越薄，但由于表冠按压需要一定的行程，所以表壳厚度的进一步缩小受到了限制，导致表冠处局部厚度较厚，占用较多的表壳内部空间。同时，相关技术中表冠旋转时会与弹簧摩擦，导致旋转手感较差，旋转寿命较短。

[0043] 基于上述构思和问题，本发明提出一种按键结构100。可以理解的，按键结构100可应用于穿戴设备、电子设备或其他使用按键功能的产品上，在此不做限定。按键结构100应用于穿戴设备中时，穿戴设备包括壳体1，也即壳体1可以是穿戴设备的外壳，壳体1设有按键孔11，按键结构100中按键组件3的旋转表冠31和按压件32的部分凸出壳体1的按键孔11，如此可方便按键组件3的旋转表冠31和按压件32分别实现旋转和按压功能。

[0044] 请结合参照图1至图6所示，在本发明实施例中，该按键结构100包括触发组件2和按键组件3，其中，按键组件3包括旋转表冠31和按压件32，旋转表冠31可转动地穿设于壳体1的按键孔11内，旋转表冠31内设有滑动腔31a，按压件32可滑动地穿设于滑动腔31a内；其中，按压按压件32时，按压件32沿滑动腔31a移动以触发触发组件2；和/或，旋转旋转表冠31时，旋转表冠31带动按压件32旋转以触发触发组件2。

[0045] 在本实施例中，按键结构100应用于具有按键功能的设备中，该设备包括壳体1，壳体1设有按键孔11，从而利用壳体1安装固定按键结构100。当然，壳体1也可以是按键结构100的安装部件，用于安装和固定触发组件2、按键组件3及其他部件，在此不做限定。可以理解的，壳体1为触发组件2、按键组件3及其他部件提供安装基础，通过在壳体1内设置安装腔，从而方便利用安装腔安装、固定触发组件2，不仅对触发组件2实现保护，还能起到防水等效果。

[0046] 可以理解的，通过在壳体1上设置连通安装腔的按键孔11，从而方便按键组件3的部分穿过按键孔11伸入安装腔，以使得按键组件3在外力作用下按压和/或旋转按键组件3，以使得按键组件3的按压件32和/或旋转表冠31触发触发组件2，以实现不同的按键功能。

[0047] 可选地，触发组件2用于按键的触发。触发组件2可以是设置于电路板上的触发元件或感应元件或按键或弹片等结构，在按键组件3的按压件32和/或旋转表冠31触发触发组件2时，触发组件2将信号传输至电路板以实现相应的控制操作等，在此不做限定。

[0048] 在本实施例中，按键组件3的旋转表冠31的一端凸出在壳体1的外部，旋转表冠31的另一端转动穿设于按键孔11内，从而方便用户通过凸出的旋转表冠31实现旋转功能，同时按键组件3的按压件32的一端凸出在凸出于壳体1外部的旋转表冠31的一端，也即按压件32的另一端活动穿设于滑动腔31a内，如此可方便用户通过凸出的按压件32实现按压功能。

[0049] 可以理解的，旋转表冠31可通过阻尼方式可转动地穿设于按键孔11内，如此可使得旋转表冠31在施加外力的情况下能够在按键孔11内转动，在不施加外力的作用下，旋转表冠31固定在按键孔11内。当然，在其他实施例中，旋转表冠31还可通过密封圈或阻尼环或采用其他能够实现转动安装的结构装设于按键孔11内，在此不做限定。

[0050] 在本实施例中，按压件32能够沿旋转表冠31的滑动腔31a移动，例如按压件32可通过阻尼方式滑动设于滑动腔31a内，如此可使得按压件32在施加外力的情况下能够在滑动

腔31a内移动，在不施加外力的作用下，按压件32固定在滑动腔31a内。当然，在其他实施例中，按压件32还可通过采用弹簧等结构实现按压复位，或确保按压件32在无外力的作用下不沿滑动腔31a内移动等，在此不做限定。

[0051] 可以理解的，按压件32与旋转表冠31采用可拆卸连接方式连接为一体结构，例如采用卡扣连接、插接配合、吸合连接等，在此不做限定。

[0052] 本发明的按键结构100通过将按键组件3的旋转表冠31可转动地穿设于壳体1的按键孔11内，并在旋转表冠31内设置滑动腔31a，使得按压件32可滑动地穿设于滑动腔31a内，如此在按压按压件32时，按压件32沿旋转表冠31的滑动腔31a移动，进而触发触发组件2；和/或，旋转旋转表冠31时，旋转表冠31能够带动按压件32旋转以触发触发组件2，也即将按键组件3的按压件32和旋转表冠31采用嵌套式设置，使得旋转和按压功能分离，如此壳体1不需要保证按压所需要的行程，可使得设备的壳体1厚度进一步减薄，节省设备内部空间；同时，按压件32可滑动地穿设于滑动腔31a内，使得旋转表冠31旋转时按压件32可跟随旋转，不与按压件32摩擦，可以保证良好的旋转手感，提高旋转表冠31的旋转寿命。

[0053] 在一实施例中，滑动腔31a的腔壁凸设有第一卡接件315，按压件32的外壁设有与第一卡接件315卡接配合的第二卡接件323；按键组件3还包括套设于按压件32外壁的弹性件33，弹性件33的两端分别与按压件32和滑动腔31a的腔壁弹性抵接。

[0054] 在本实施例中，如图3至图6所示，通过在旋转表冠31的滑动腔31a腔壁设置第一卡接件315，并在按压件32的外壁设置第二卡接件323，使得按压件32通过第二卡接件323和第一卡接件315的卡接配合与旋转表冠31卡接连接；同时，通过设置弹性件33，使得弹性件33位于滑动腔31a内，并套设于按压件32外壁，使得弹性件33的两端分别与按压件32和滑动腔31a的腔壁弹性抵接，如此在按压件32通过第二卡接件323与第一卡接件315的卡接配合与旋转表冠31卡接连接时，弹性件33处于压缩状态，从而利用弹性件33的弹力使得按压件32远离触发组件2，且使得按压件32通过第二卡接件323与第一卡接件315的卡接配合与旋转表冠31卡接连接，避免按压件32脱离旋转表冠31。

[0055] 可选地，弹性件33为压缩弹簧或伸缩弹簧等，在此不做限定。可以理解的，弹性件33的两端分别与按压件32和滑动腔31a的腔壁弹性抵接，可以通过在按压件32的外壁和滑动腔31a的腔壁设置支撑台或抵接台，且支撑台或抵接台不影响按压件32在滑动腔31a内的移动。

[0056] 在本实施例中，旋转表冠31可选为呈两端开口的筒状结构，也即滑动腔31a的两端具有开口，在此不做限定。按压件32可选为柱状或杆状结构等，在此不做限定。

[0057] 在一实施例中，按压件32包括相连接的按键杆321和按键帽322；滑动腔31a包括相连通的第一段3121和第二段3111，第二段3111的孔径大于第一段3121的孔径，按键杆321滑动穿设于第一段3121，部分按键帽322凸出第二段3111远离第一段3121的一端。

[0058] 在一实施例中，如图3至图6所示，第二段3111的腔壁凸设有第一卡接件315，按键帽322的外壁设有与第一卡接件315卡接配合的第二卡接件323；按键组件3还包括设于第一段3121内的弹性件33，弹性件33与按键杆321弹性抵接；其中，按压按键帽322时，按键杆321压缩或拉伸弹性件33。

[0059] 在本实施例中，通过将按压件32设置为按键杆321和按键帽322，并将滑动腔31a设置为相连通的第一段3121和第二段3111，使得按压件32的按键杆321滑动穿设于第一段

3121，部分按键帽322通过第二卡接件323和第一卡接件315的配合位于第二段3111内，部分按键帽322凸出第二段3111远离第一段3121的一端，如此可方便用户按压按键帽322，使得按键帽322在外力作用下带动按键杆321移动，以进一步压缩弹性件33，并使得按键杆321抵压触发组件2。

[0060] 可选地，第一卡接件315和第二卡接件323可以是卡台和卡扣的配合结构或卡凸和卡槽的配合结构或卡凹和卡孔的配合结构，在此不做限定。

[0061] 可选地，弹性件33为弹簧，弹性件33套设于按键杆321的外壁。当然，在其他实施例中，弹性件33为弹片，此时，弹性件33位于第一段3121内，且弹性件33与按键杆321弹性抵接连接。

[0062] 可以理解的，按压件32的按键帽322的直径大于按键杆321的直径，可选地，第二段3111的孔径大于第一段3121的孔径，使得滑动腔31a的第二段3111与按键帽322相适配，滑动腔31a的第一段3121与按键杆321相适配。当然，为了避免弹性件33影响按键杆321的移动，第一段3121的直径略大于弹性件33的直径。

[0063] 在本实施例中，按压件32的按键杆321和按键帽322为一体成型结构，如此可提高按压件32的结构强度。

[0064] 在一实施例中，按键杆321的外壁凸设有抵接台3211，第一段3121远离第二段3111一端的内壁凸设有支撑台316，弹性件33的两端分别与抵接台3211和支撑台316弹性抵接。

[0065] 如图3至图6所示，在本实施例中，通过在按键杆321的外壁设置抵接台3211，并在旋转表冠31邻近触发组件2一端的腔壁内设置支撑台316，使得弹性件33的两端分别与抵接台3211和支撑台316弹性抵接，从而确保弹性件33在按压件32与旋转表冠31通过第二卡接件323和第一卡接件315卡接配合时处于压缩状态。

[0066] 在一实施例中，按键结构100还包括至少一个第一密封圈6，第一密封圈6夹设于按键杆321和第一段3121的孔壁之间。

[0067] 在本实施例中，如图3和图4所示，通过在按键杆321和第一段3121的孔壁之间设置第一密封圈6，从而利用第一密封圈6密封按键杆321和滑动腔31a的第一段3121腔壁之间的缝隙，提高密封性能和防水性能。可选地，第一密封圈6的材质为NBR。

[0068] 可以理解的，第一密封圈6包括多个，多个第一密封圈6沿按键杆321的延长方向间隔排布。

[0069] 为了避免按键杆321移动过程中，第一密封圈6发生移位等现象，在一实施例中，如图3、图4和图6所示，按键杆321和第一段3121的孔壁中至少一个设有第一凹槽3212，第一密封圈6容纳于第一凹槽3212内，并部分凸出第一凹槽3212的槽口。

[0070] 在本实施例中，第一凹槽3212可设置于按键杆321的外壁，或者第一凹槽3212可设置于第一段3121的腔壁，或者按键杆321的外壁和第一段3121的腔壁上均设有第一凹槽3212，且呈对应设置，在此不做限定。可以理解的，第一密封圈6具有弹性和密封性，第一密封圈6容纳于第一凹槽3212内，并部分凸出第一凹槽3212的槽口，使得凸出第一凹槽3212的槽口的第一密封圈6能够与按键杆321的外壁或第一段3121的腔壁密封抵接。

[0071] 可选地，第一凹槽3212可以使U型凹槽、楔形槽、V型槽、弧形槽、半圆型槽等，在此不做限定。

[0072] 在一实施例中，按键帽322的外壁对应第二卡接件323设有避让槽3221，第二卡接

件323包括弹臂3231和卡凸3232，弹臂3231的一端与按键帽322的外壁连接，卡凸3232凸设于弹臂3231的另一端，并位于弹臂3231背向避让槽3221的一侧，弹臂3231与按键帽322的外壁齐平。

[0073] 在本实施例中，如图3至图5所示，通过在按键帽322的外壁设置避让槽3221，从而方便第二卡接件323的弹性避位，确保第二卡接件323顺利伸入第二段3111内并与第一卡接件315卡接。可以理解的，第二卡接件323的弹臂3231一端与按键帽322的外壁连接，另一端为自由端，卡凸3232凸设于弹臂3231的自由端，使得弹臂3231与按键帽322的外壁齐平，从而在施加外力按压按键帽322时，按键帽322能够沿第二段3111滑动，避免第二卡接件323干涉按键帽322的滑动。

[0074] 可选地，第一卡接件315呈环形凸台设置，也即第一卡接件315沿第二段3111内壁的周向延伸设置。当然，在其他实施例中，第一卡接件315包括多个凸台结构，多个凸台结构沿第二段3111内壁的周向间隔设置，此时每一凸台结构与一第二卡接件323对应。

[0075] 可以理解的，第二卡接件323包括多个，多个第二卡接件323沿按键帽322的外壁周向间隔设置，按键帽322的外壁对应每一第二卡接件323设有一避让槽3221，在此不做限定。在本实施例中，为了方便第二卡接件323的卡凸3232顺利伸入第二段3111内并与第一卡接件315卡接，卡凸3232设有导向面3233，也即在安装按压件32时，第一卡接件315沿卡凸3232的导向面3233移动，以使得卡凸3232滑入第二段3111，并与第一卡接件315卡接。

[0076] 在一实施例中，如图3至图5所示，第一段3121与第二段3111的连通处形成有抵接面3112，按压按键帽322时，按键帽322与抵接面3112抵接。可以理解的，如此设置，从而利用抵接面3112限制外力的挤压，避免外力过大，使得按键帽322带动按键杆321过渡抵压触发组件2，进而损坏触发组件2。如此在施加外力按压按键帽322时，按键帽322的外壁沿第一卡接件315滑动，并与抵接面3112抵接，此时按键杆321刚好可以抵压触发触发组件2。

[0077] 在一实施例中，旋转表冠31包括相连接的旋转部311和转轴部312，滑动腔31a贯穿旋转部311和转轴部312，旋转部311与转轴部312的连接处形成有限位面313，转轴部312可转动地穿设于按键孔11内，使限位面313与壳体1的外壁限位抵接。

[0078] 在本实施例中，如图1至图5所示，通过将旋转表冠31设置为相连接的旋转部311和转轴部312，使得滑动腔31a贯穿旋转部311和转轴部312，也即贯穿旋转部311的滑动腔31a部分形成第二段3111，贯穿转轴部312的滑动腔31a部分形成第一段3121。通过在旋转部311的外壁与转轴部312的外壁连接处形成有限位面313，使得转轴部312可转动地穿设于按键孔11内，使限位面313与壳体1的外壁限位抵接，从而确保施加外力按压按压件32时，旋转表冠31通过限位面313与壳体1的外壁限位抵接，避免沿按键孔11移动。

[0079] 可以理解的，旋转表冠31的旋转部311外径大于转轴部312的外径。可选地，旋转表冠31的转轴部312呈圆柱状的筒形结构。在本实施例中，旋转表冠31的旋转部311和转轴部312为一体成型结构，如此可提高旋转表冠31的结构强度。

[0080] 在一实施例中，转轴部312穿过按键孔11的一端外壁设有卡槽3122，按键结构100还包括设于壳体1内的卡簧4，卡簧4活动卡接于卡槽3122内。

[0081] 在本实施例中，如图2至图5所示，通过在转轴部312上设置卡槽3122，并设置卡簧4，利用卡簧4活动卡接于卡槽3122内，并与壳体1的内壁抵接限位，如此可利用卡簧4进一步将旋转表冠31限定于按键孔11内，避免施加外力拉动按键组件3的旋转表冠31和/或按压件

32时，避免将按键组件3从按键孔11内拉出。

[0082] 可以理解的，通过设置卡簧4，使得卡簧4可拆卸地卡接于旋转表冠31的卡槽3122内，从而方便按键组件3的安装与拆卸。当然，在其他实施例中，也可通过在转轴部312穿过按键孔11的一端外壁凸设限位台，使得限位台与壳体1的内壁限位抵接，也即限位台、转轴部312及旋转部311围合形成H型限位槽结构，从而确保旋转表冠31的安装和限位，在此不做限定。

[0083] 在本实施例中，卡槽3122沿转轴部312的外壁周向设置并形成环槽，卡簧4具有卡接部41，卡接部41呈U型设置，卡接部41活动卡接于卡槽3122内。也即卡簧4具有卡接部41和连接卡接部41的安装部，卡簧4通过安装部与壳体1的内壁限位安装或抵接限位，卡簧4的卡接部41呈U型设置，使得U型卡簧4卡接于旋转表冠31中转轴部312的卡槽3122内，一方面能够限位旋转表冠31沿按键孔11轴向的移动，另一方面有可以实现旋转表冠31沿按键孔11周向的转动。

[0084] 在一实施例中，如图1、图3至图5所示，按键结构100还包括耐磨片5，耐磨片5套设于转轴部312，并夹设于限位面313和壳体1的外壁之间。可以理解的，如此设置，从而利用耐磨片5降低旋转表冠31旋转时与壳体1外壁的摩擦，从而降低旋转阻尼力。可选地，耐磨片5的材质为PEEK材质。

[0085] 在本实施例中，如图4和图5所示，限位面313设有限位槽314，耐磨片5的部分容纳于限位槽314内。可以理解的，通过设置限位槽314，从而方便利用限位槽314对耐磨片5实现定位和限位安装，同时部分耐磨片5凸出限位槽314的槽口，如此可使得耐磨片5与壳体1的外壁抵接，避免限位面313直接与壳体1的外壁直接接触，从而有效降低摩擦。

[0086] 在一实施例中，按键结构100还包括至少一个第二密封圈7，第二密封圈7夹设于转轴部312的外壁和按键孔11的孔壁之间。

[0087] 在本实施例中，如图3至图5所示，通过设置第二密封圈7，从而利用第二密封圈7密封旋转表冠31的转轴部312和按键孔11的孔壁之间的缝隙，提高密封性能和防水性能。可选地，第二密封圈7的材质为NBR。

[0088] 可以理解的，第二密封圈7位于旋转表冠31中的转轴部312的卡槽3122和旋转部311之间。可选地，第二密封圈7包括多个，多个第二密封圈7沿转轴部312的延长方向间隔排布。

[0089] 为了避免旋转表冠31旋转过程中第二密封圈7发生移位现象，导致密封性降低等问题，在一实施例中，如图3至图5所示，转轴部312的外壁和按键孔11的孔壁中至少一个设有第二凹槽3123，第二密封圈7容纳于第二凹槽3123内，并部分凸出第二凹槽3123的槽口。

[0090] 可以理解的，第二凹槽3123可设置于旋转表冠31的转轴部312的外壁，或者第二凹槽3123可设于按键孔11的孔壁，或者第二凹槽3123同时设置于转轴部312的外壁和按键孔11的孔壁，此时两个第二凹槽3123对应，在此不做限定。

[0091] 在本实施例中，第二密封圈7具有弹性和密封性，第二密封圈7容纳于第二凹槽3123内，并部分凸出第二凹槽3123的槽口，使得凸出第二凹槽3123的槽口的第二密封圈7能够与转轴部312的外壁和按键孔11的孔壁密封抵接。

[0092] 可选地，第二凹槽3123可以使U型凹槽、楔形槽、V型槽、弧形槽、半圆型槽等，在此不做限定。

[0093] 在一实施例中，如图1至图4所示，触发组件2包括触发元件21和光学传感器22，其中，触发元件21设于壳体1内，并与按键孔11正对设置，光学传感器22设于壳体1内，并与旋转表冠31的侧壁正对设置。

[0094] 在本实施例中，触发元件21对应按键孔11设有触片，触片与按键杆321远离按键帽322的一端正对。可以理解的，触发元件21和光学传感器22与电路板电连接，从而使得电路板用于接收触发元件21和光学传感器22的触发信号，用于实现触发信号相应的控制功能。可选地，电路板为柔性电路板或硬质电路板，在此不做限定。

[0095] 可以理解的，触发元件21可焊接于柔性电路板上，以使得触发元件21对应按键孔11设有触片，触片与按键杆321远离按键帽322的一端正对，如此在施加外力按压按键帽322时，按键杆321与触片抵接并按压触发信号。

[0096] 在本实施例中，通过设置光学传感器22，从而利用光学传感器22检测和识别用户旋转旋转表冠31时带动转轴部312旋转，以触发不同于按压触发触发元件21的信号或功能，在此不做限定。可以理解的，光学传感器22设于电路板，并与触发元件21相邻且间隔设置，光学传感器22用于感应旋转表冠31的转轴部312旋转，以触发触发组件2。

[0097] 可以理解的，如此设置，使得按压按压件32的移动行程设置在旋转表冠31内，如此可使得壳体1不需要保证按压按压件32所需要的行程，可使得设备的壳体1厚度进一步减薄，节省设备内部空间。同时，将弹性件33和按压件32均设置于旋转表冠31的滑动腔31a内，从而使得旋转表冠31旋转时，一并带动弹性件33和按压件32旋转，有效避免了弹性件33与按压件32之间的摩擦，提高可以保证良好的旋转手感，提高旋转表冠31的旋转寿命。

[0098] 本实施例中按键结构100组装时，将弹性件33和第一密封圈6与按压件32组装，再将组装好的按压件32装入旋转表冠31的滑动腔31a内，使按键帽322上的第二卡接件323与旋转表冠31滑动腔31a内的第一卡接件315扣合；再将耐磨片5、第二密封圈7安装于旋转表冠31的相依相应位置，将组装好的旋转表冠31安装于壳体1的按键孔11内，从壳体1内侧插入耐磨卡簧4，再将卡簧4与壳体1焊接固定。再将触发组件2的光学传感器22和触发元件21安装于壳体1内部相应位置。

[0099] 安装后的按键结构100中，由于按键帽322安装时弹性件33处于预压缩状态，旋转表冠31与按键帽322相互支撑，旋转表冠31转动时，其滑动腔31a的按键杆321和弹性件33会与旋转表冠31同步转动。安装于壳体1内部的光学传感器22接受旋转表冠31的旋转信号，从而实现旋转信号输入；手动按压按压件32的按键帽322，按键杆321轴向运动，触发触发元件21，从而输入开关信号。撤去外力松开后，弹性件33回弹，并推动按键杆321复位到初始位置。安装在旋转表冠31和按键杆321外侧的第二密封圈7和第一密封圈6在保证按键组件3运动的同时，可保证了5ATM级别的防水。

[0100] 可以理解的，按键结构100由于旋转表冠31在按键孔11轴向不运动，所以壳体1的厚度可减小，从而节省壳体1内部空间，有利于内部器件堆叠；由于旋转表冠31在按键孔11的轴向不受力，所以旋转阻尼小，旋转手感较好，并且不易磨损，使用寿命提高；按键组件3零件集成度高，可组件化来料，物料管理成本低，组装便捷。

[0101] 本发明还提出一种穿戴设备，该穿戴设备包括设备主体和上述的按键结构100，该按键结构100的具体结构参照前述实施例，由于本穿戴设备采用了前述所有实施例的全部技术方案，因此至少具有前述实施例的技术方案所带来的所有有益效果，在此不再一一赘

述。

[0102] 在本实施例中，设备主体包括壳体，壳体设有按键孔，按键结构100连接于壳体。可以理解的，穿戴设备可以是手表、手环、头戴显示器等，穿戴设备为手表时，壳体可以是手表的表壳。

[0103] 以上所述仅为本发明的可选实施例，并非因此限制本发明的专利范围，凡是在本发明的构思下，利用本发明说明书及附图内容所作的等效结构变换，或直接/间接运用在其他相关的技术领域均包括在本发明的专利保护范围内。

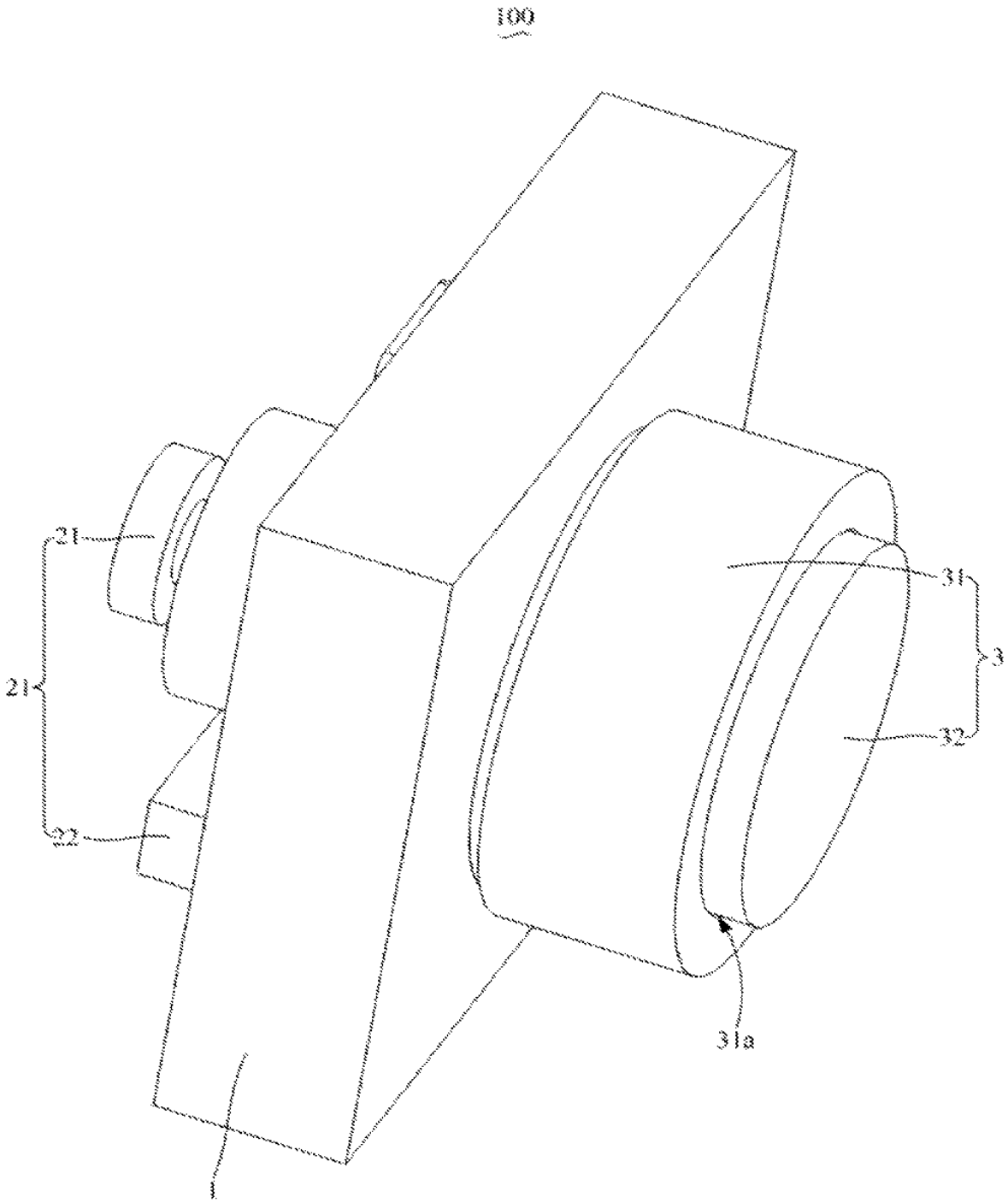

图1

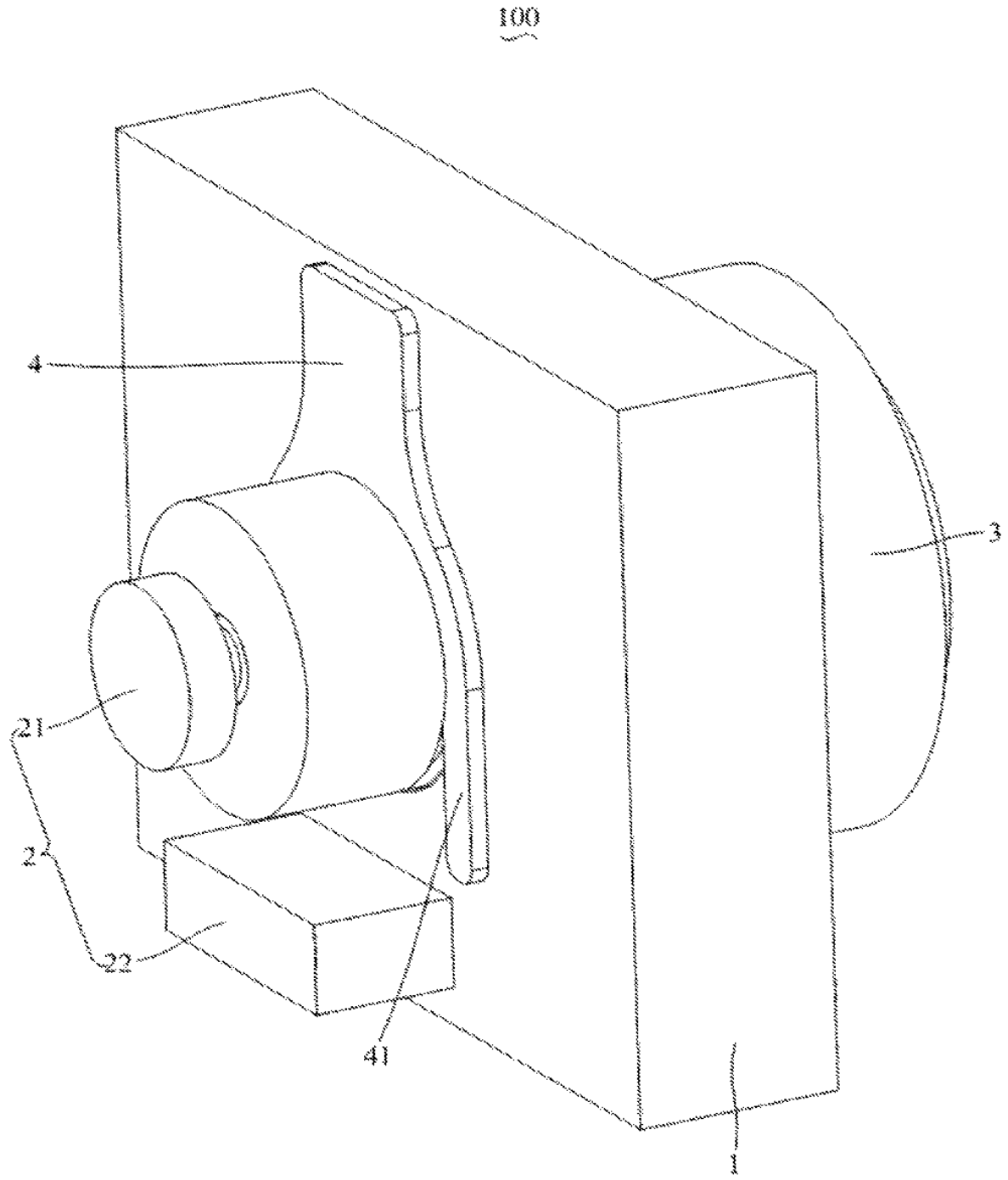

图2

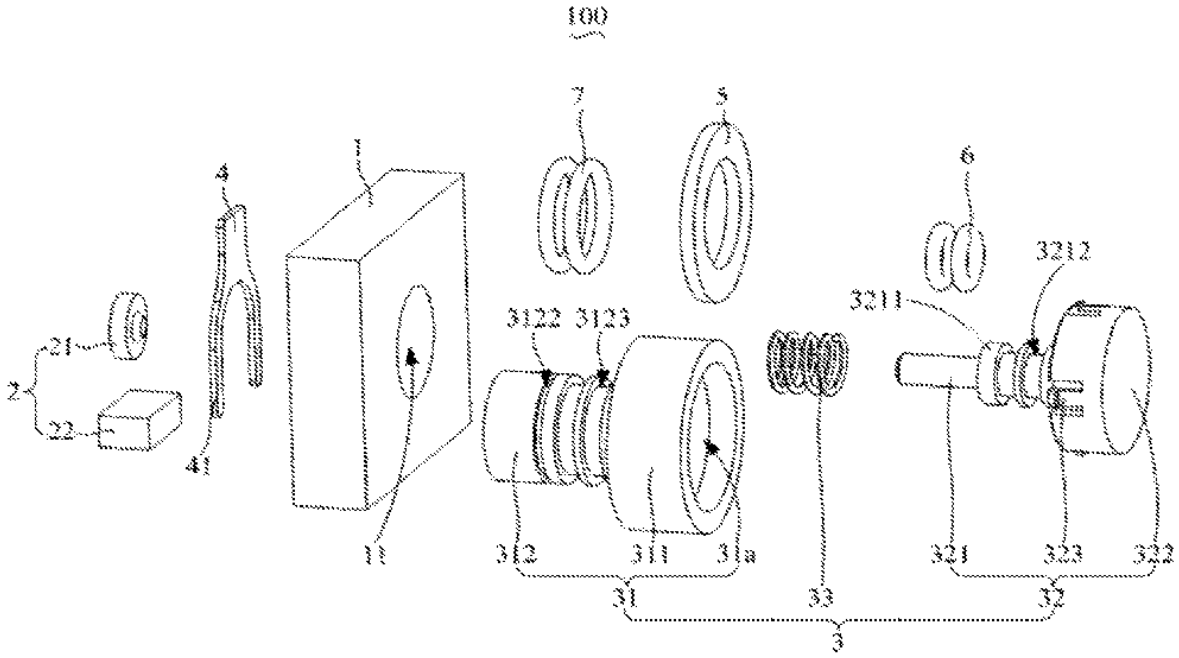
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图3

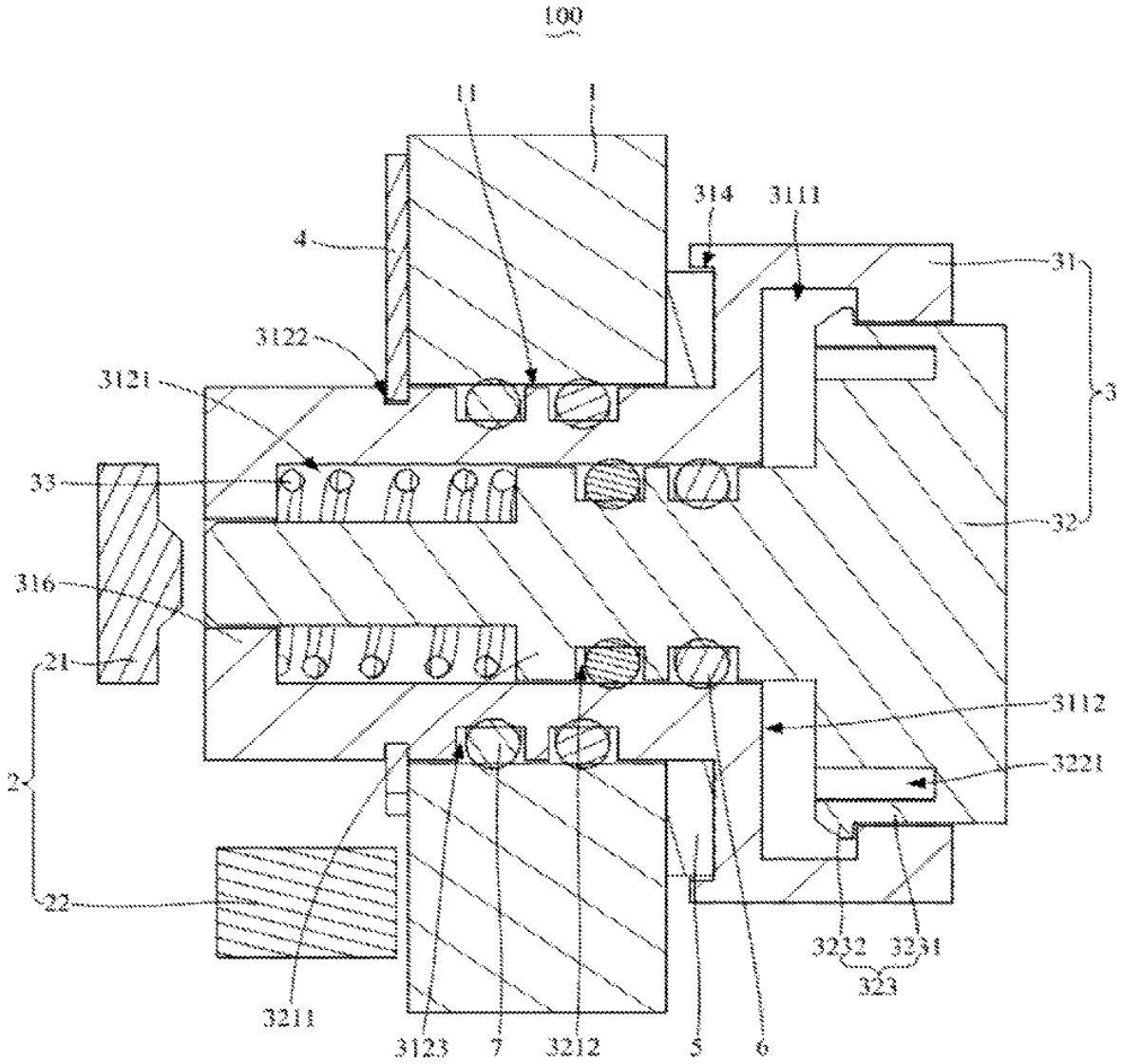
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图4

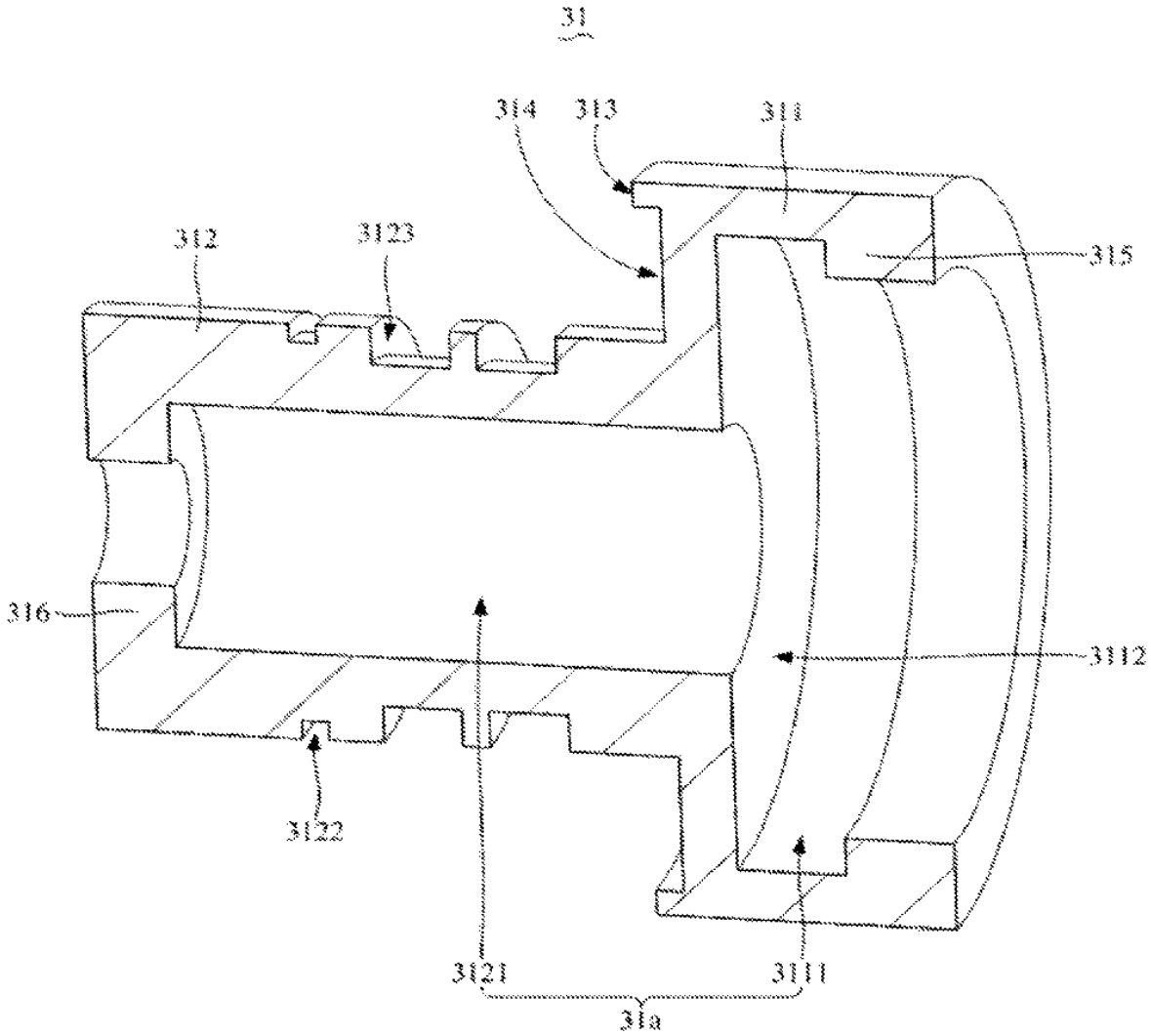

图5

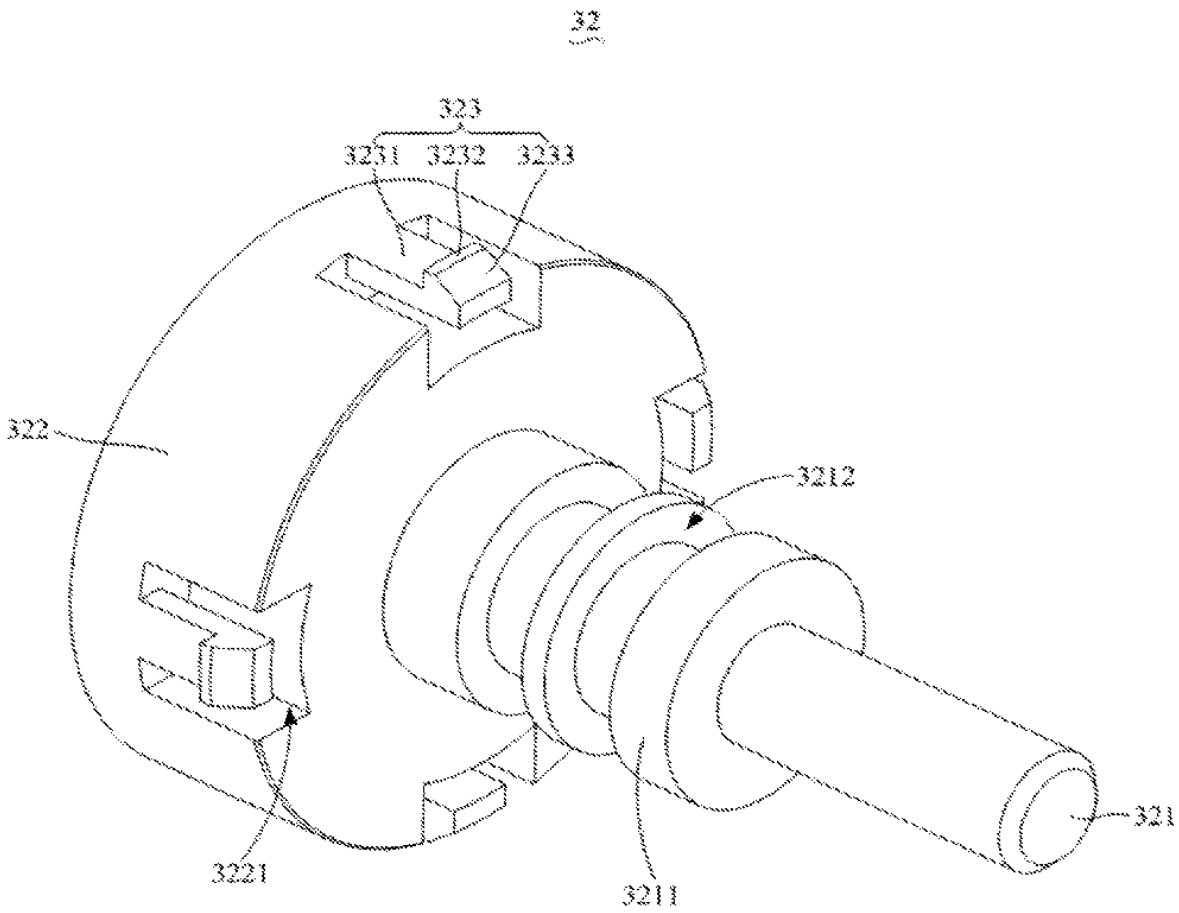

图6

Espacenet

Bibliographic data: JP2017219448 (A) — 2017-12-14

SWITCH DEVICE AND WATCH

Inventor(s): MARUYAMA YOSHIHIRO ± (丸山 善弘)

Applicant(s): CASIO COMPUTER CO LTD ± (カシオ計算機株式会社)

Classification: **- international:** ***G04B3/04; G04B43/00; G04G21/00; H01H13/12***

- cooperative:

Application number: JP20160114613 20160608 Global Dossier

Priority number(s): JP20160114613 20160608

Also published as: JP6818228 (B2)

Abstract of JP2017219448 (A)

PROBLEM TO BE SOLVED: To provide a switch device and a watch which have good operability and can secure impact resistance.SOLUTION: A switch device has: a shaft portion 18 provided so as to slid with respect to a through hole 11 of a body case 2; an operation member 14 having a head portion 19 which is provided on the outer end portion of the shaft portion 18 and is arranged outside of the body case 2; and a cushioning protective member 15 provided on the body case 2 so as to slid in a slide direction of the operation member 14 in a state of covering the outer periphery of the head portion 19 of the operation member 14. Accordingly, when the operation member 14 is pushed in, the cushioning protective member 15 is slid together with the head portion 19, and only the operation member 14 can be slid and pushed in, and accordingly operability of the operation member 14 is good, and when the cushioning protective member 15 receives impact from the outside, the cushioning protective member 15 is slid together with the operation member 14 and the impact can be cushioned.SELECTED DRAWING: Figure 2

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G04B 3/04	(2006.01)	G04B	3/04	G	5G206
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H01H 13/12	(2006.01)	H01H	13/12		

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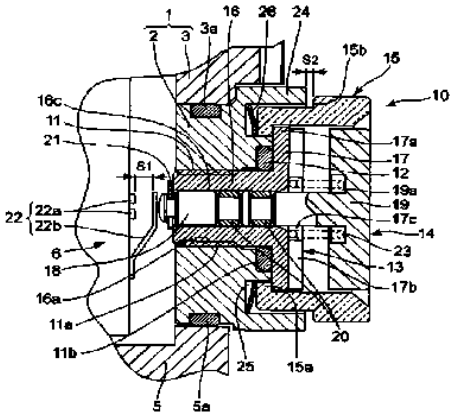
5G206 AS16H AS16N AS31H AS31N CS01H
CS01N CS11H CS11N GS02 GS06
KS16 KS40 NS07

(54)【発明の名称】スイッチ装置および時計

(57)【要約】
【課題】　操作性が良く、かつ耐衝撃性を確保できるスイッチ装置および時計を提供する。
【解決手段】　本体ケース２の貫通孔１１に対してスライド可能に設けられた軸部１８、およびこの軸部１８の外端部に設けられて本体ケース２の外部に配置された頭部１９を備えた操作部材１４と、この操作部材１４の頭部１９の外周を覆った状態で、本体ケース２に、操作部材１４のスライド方向にスライド可能に設けられた緩衝保護部材１５と、を備えている。従って、操作部材１４を押し込む際に、緩衝保護部材１５を頭部１９と共にスライドさせた上、操作部材１４のみをスライドさせて押し込むことができるので、操作部材１４の操作性が良く、また緩衝保護部材１５が外部から衝撃を受けた際に、緩衝保護部材１５を操作部材１４と共にスライドさせて、衝撃を緩衝できる。
【選択図】　図2



【特許請求の範囲】
【請求項１】
貫通孔が設けられたケースと、
前記ケースの前記貫通孔に対してスライド可能に設けられた軸部、および前記軸部の外端部に設けられて前記ケースの外部に配置された頭部を備えた操作部材と、
前記操作部材の前記頭部の外周を覆った状態で、前記ケースに、前記操作部材のスライド方向にスライド可能に設けられた緩衝保護部材と、
を備えていることを特徴とするスイッチ装置。
【請求項２】
請求項１に記載のスイッチ装置において、前記緩衝保護部材のスライドの長さが前記操作部材のスライドの長さよりも短く設定されていることを特徴とするスイッチ装置。
【請求項３】
請求項１または請求項２に記載のスイッチ装置において、前記ケースには、前記緩衝保護部材の外周に位置した状態で、前記緩衝保護部材をスライド可能に保持する保持筒部が、前記ケースの外部に突出して設けられていることを特徴とするスイッチ装置。
【請求項４】
請求項３に記載のスイッチ装置において、前記保持筒部は、前記緩衝保護部材の軸方向の長さの半分ぐらいまで延出して設けられていることを特徴とするスイッチ装置。
【請求項５】
請求項１～請求項４のいずれかに記載のスイッチ装置において、前記操作部材を前記ケースの外部に向けて付勢する第１の付勢部材と、前記緩衝保護部材を前記ケースの外部に向けて付勢する第２の付勢部材と、を備えていることを特徴とするスイッチ装置。
【請求項６】
請求項５に記載のスイッチ装置において、前記第２の付勢部材は、ばね部材であることを特徴とするスイッチ装置。
【請求項７】
請求項５に記載のスイッチ装置において、前記第２の付勢部材は、弾力性を有する弾性部材であることを特徴とするスイッチ装置。
【請求項８】
請求項１～請求項７のいずれかに記載のスイッチ装置において、前記緩衝保護部材は、前記ケースの外部に前記操作部材と共に押し出された際に、前記緩衝保護部材の外端面と前記操作部材の外端面とがほぼ同一面上に位置することを特徴とするスイッチ装置。
【請求項９】
請求項１～請求項８のいずれかに記載のスイッチ装置において、前記ケース内に設けられて、前記操作部材が前記緩衝保護部材のスライド長さよりも長いスライド長さで押し込まれた際に、オン状態になるスイッチ部を備えていることを特徴とするスイッチ装置。
【請求項１０】
請求項９に記載のスイッチ装置において、前記操作部材のスライド長さは、前記操作部材が押し出された第１の位置と前記操作部材が押し込まれて前記スイッチ部がオン状態になった第２の位置との間の長さに設定され、前記緩衝保護部材のスライド長さは、前記緩衝保護部材が押し出されてその外端部と前記操作部材の外端面とがほぼ同一面上に位置する前記第１の位置と前記緩衝保護部材が前記操作部材と共に押し込まれても前記スイッチ部がオン状態にならない第３の位置との間の長さに設定されていることを特徴とするスイッチ装置。
【請求項１１】
請求項１～請求項１０のいずれかに記載されたスイッチ装置を備えていることを特徴とする時計。

【発明の詳細な説明】
【技術分野】
【０００１】
この発明は、腕時計や携帯電話機、携帯情報端末機などの電子機器に用いられるスイッチ装置およびそれを備えた時計に関する。
【背景技術】
【０００２】
例えば、腕時計においては、特許文献１に記載されているように、腕時計ケースに取り付けられて外部に突出した竜頭などの釦頭部の外端部を覆って保護する釦保護装置を備えた構成のものが知られている。
【先行技術文献】
【特許文献】
【０００３】
【特許文献１】特開２０１２－１６３３４０号公報
【０００４】
この種の釦保護装置は、釦頭部の両側に位置する腕時計ケースの外面に２つの保護突起部を釦頭部よりも突出させて設け、この保護突起部の一方に可動保護部の一端部を回転可能に取り付け、この可動保護部の他端部を他方向の保護突起部に着脱可能に取り付けることにより、これら２つの保護突起部と可動保護部とで釦頭部の外周を覆って保護するように構成されている。
【発明の概要】
【発明が解決しようとする課題】
【０００５】
このような腕時計の釦保護装置では、腕時計ケースの外部に突出する釦頭部の両側に２つの保護突起部を釦頭部よりも突出させて設け、これら２つの保護突起部に可動保護部を梁渡す構成であるから、釦頭部を操作する際に、一方の保護突起部に対して可動保護部を回転させて、釦頭部を開放させなければ、釦頭部を操作することができないため、操作性が悪いという問題がある。
【０００６】
この発明が解決しようとする課題は、操作性が良く、かつ耐衝撃性を確保することができるスイッチ装置およびそれを備えた時計を提供することである。
【課題を解決するための手段】
【０００７】
この発明は、貫通孔が設けられたケースと、前記ケースの前記貫通孔に対してスライド可能に設けられた軸部、および前記軸部の外端部に設けられて前記ケースの外部に配置された頭部を備えた操作部材と、前記操作部材の前記頭部の外周を覆った状態で、前記ケースに、前記操作部材のスライド方向にスライド可能に設けられた緩衝保護部材と、を備えていることを特徴とするスイッチ装置である。
【発明の効果】
【０００８】
この発明によれば、操作部材の頭部を押し込む際に、緩衝保護部材を操作部材の頭部と共にスライドさせた上、操作部材のみをスライドさせて押し込むことができるので、操作部材の押し込み感覚が良く、操作部材の操作性を向上させることができ、また緩衝保護部材が外部から衝撃を受けた際に、緩衝保護部材を操作部材の頭部と共にスライドさせることができるので、緩衝保護部材によって衝撃を緩衝することができると共に、操作部材の頭部を保護することができ、これにより耐衝撃性を確保することができる。
【図面の簡単な説明】
【０００９】
【図１】この発明を腕時計に適用した一実施形態を示した拡大正面図である。
【図２】図１に示された腕時計のＡ－Ａ矢視における要部を示した拡大断面図である。

[図３]図２に示されたスイッチ装置の緩衝保護部材が外部から衝撃を受けた状態を示した要部の拡大断面図である。
[図４]図３に示されたスイッチ装置の操作部材が更に押し込まれてスイッチ部をオン動作させた状態を示した要部の拡大断面図である。
[図５]この発明のスイッチ装置における第２の付勢部材の変形例を示した要部の拡大断面図である。
[発明を実施するための形態]
[００１０]
以下、図１～図４を参照して、この発明を腕時計に適用した一実施形態について説明する。
この腕時計は、図１および図２に示すように、腕時計ケース１を備えている。この腕時計ケース１は、本体ケース２と外装ケース３とで構成されている。
[００１１]
この場合、本体ケース２は、図２に示すように、金属または硬質の合成樹脂で形成されている。外装ケース３は、合成樹脂で形成され、本体ケース２の上部外周に防水パッキン３ａを介して取り付けられている。腕時計ケース１の上部開口部、つまり外装ケース３の上部開口部には、図１に示すように、時計ガラス４が取り付けられている。また、この腕時計ケース１の下部、つまり本体ケース２の下部には、図２に示すように、裏蓋５が防水リング５ａを介して取り付けられている。
[００１２]
この腕時計ケース１の内部、つまり本体ケース２の内部には、図２に示すように、時計モジュール６が配置されている。この時計モジュール６は、指針６ａを駆動するための時計ムーブメントや、時刻などの情報を電気光学的に表示する表示パネル、これらを電気的に駆動するための回路部などの時計機能に必要な各種の部品（いずれも図示せず）を備えている。この場合、時計モジュール６は、図１に示すように、その上部に文字板６ｂが配置され、この文字板６ｂの上方を指針６ａが運針するように構成されている。
[００１３]
一方、腕時計ケース１の１２時側と６時側との各側部には、図１に示すように、バンド取付部８がそれぞれ外部に突出して設けられている。これらバンド取付部８には、時計バンド７がそれぞれ取り付けられている。また、この腕時計ケース１の２時側、３時側、４時側、８時側、および１０時側の各側部には、スイッチ装置１０がそれぞれ設けられている。
[００１４]
これらスイッチ装置１０のうち、例えば２時側に位置するスイッチ装置１０は、図２～図４に示すように、腕時計ケース１の本体ケース２に設けられた貫通孔１１に防水リング１２を介して取り付けられた筒状部材１３と、この筒状部材１３にスライド可能に挿入されて腕時計ケース１の外部に突出する操作部材１４と、腕時計ケース１にスライド可能に取り付けられて操作部材１４の外端部を覆って保護する緩衝保護部材１５と、を備えている。
[００１５]
この場合、貫通孔１１は、図２～図４に示すように、本体ケース２にその内部と外部とに貫通して設けられている。この貫通孔１１の内周部には、雌ねじ部１１ａが設けられている。また、この貫通孔１１の外端部における縁部には、防水リング１２が配置される切欠き溝１１ｂが環状に設けられている。
[００１６]
筒状部材１３は、図２～図４に示すように、本体ケース２の貫通孔１１内に取り付けられる筒状部１６と、本体ケース２の外面に配置される鍔状部１７と、を備え、これらが金属や硬質の合成樹脂で一体に形成されている。筒状部１６は、その外径が本体ケース２の貫通孔１１の内径と同じ大きさで、その軸方向の長さが貫通孔１１の軸方向の長さとほぼ同じ長さに形成されている。また、この筒状部１６の外周部には、貫通孔１１の雌ねじ部

１１ａに螺合する雄ねじ部１６ａが設けられている。

［００１７］

これにより、筒状部１６は、図２～図４に示すように、本体ケース２の貫通孔１１内に挿入されて、雄ねじ部１６ａが貫通孔１１の雌ねじ部１１ａに螺合して締め付けられることにより、本体ケース２の貫通孔１１内に取り付けられるように構成されている。この場合、筒状部１６は、その軸方向の内端部が本体ケース２の内周面とほぼ同一面上に位置し、また軸方向の外端部が本体ケース２の外面とほぼ同一面上に位置するように形成されている。

［００１８］

また、鍔状部１７は、図２～図４に示すように、筒状部１６の軸方向に位置する外端部にリング状に形成された板部であり、その軸方向の内端面が本体ケース２の外面に配置されるように構成されている。この場合、鍔状部１７は、その内径が筒状部１６の内径と同じ大きさで、外径が貫通孔１１の切欠き溝１１ｂの外周側の内径よりも大きく形成されている。この場合、鍔状部１７の軸方向の外端面には、ドライバなどの工具が挿入する締付溝１７ｂが設けられている。

［００１９］

これにより、鍔状部１７は、図２～図４に示すように、筒状部１６の雄ねじ部１６ａが本体ケース２の貫通孔１１に設けられた雌ねじ部１１ａに螺合した状態で、締付溝１７ｂにドライバなどの工具を挿入させて、筒状部１６の雄ねじ部１６ａを貫通孔１１の雌ねじ部１１ａに締め付けることにより、鍔状部１７の内端面が本体ケース２の外面に押し当てられて、防水リング１２を本体ケース２の切欠き溝１１ｂ内に押し付けるように構成されている。

［００２０］

一方、操作部材１４は、図２～図４に示すように、筒状部材１３の筒状部１６内にスライド可能に挿入される軸部１８と、この軸部１８の外端部に設けられて筒状部材１３の鍔状部１７の外部側、つまり本体ケース２の外部に配置される頭部１９と、を備えている。軸部１８は、その外径が筒状部１６の軸挿入孔１６ｃの内径とほぼ同じ大きさで、軸方向の長さが筒状部材１３の軸方向の長さよりも長く形成されている。

［００２１］

これにより、軸部１８は、図２～図４に示すように、筒状部１６の軸挿入孔１６ｃ内に挿入された際に、その内端部が本体ケース２の内部に突出し、外端部が筒状部材１３の鍔状部１７から本体ケース２の外部に突出するように構成されている。この場合、軸部１８の外周部には、複数の防水リング２０が設けられている。これら複数の防水リング２０は、その外周部が筒状部材１３の筒状部１６の内周面に圧接した状態で摺動することにより、軸部１８の外周面と筒状部１６の内周面との間の防水を図るように構成されている。

［００２２］

また、本体ケース２の内部に突出する軸部１８の内端部には、図２～図４に示すように、Ｅリングなどの抜止め部材２１が取り付けられている。これにより、軸部１８は、抜止め部材２１が本体ケース２の貫通孔１１内に取り付けられた筒状部１６の内端部に接離可能に当接することにより、本体ケース２の外部に抜け出さないように構成されている。

［００２３］

さらに、この軸部１８は、図２～図４に示すように、その内端部が本体ケース２内の時計モジュール６に設けられたスイッチ部２２に接離可能に対応するように構成されている。この場合、スイッチ部２２は、時計モジュール６の外周部に設けられた接点部２２ａと、軸部１８の内端部で押されて接点部２２ａに接離可能に接触する接点ばね２２ｂと、を備えている。この接点ばね２２ｂは、板ばねであり、その一端部が時計モジュール６の外周部に設けられ、可変側の他端部が常に軸部１８の内端部に弾接するように構成されている。

［００２４］

これにより、スイッチ部２２は、図２～図４に示すように、操作部材１４が押されて軸

部１８の内端部が本体ケース２内に押し込まれた際に、軸部１８の内端部によって接点ばね２２ｂが押されて接点部２２ａに押し付けられることにより、オン動作するように構成されている。また、このスイッチ部２２は、操作部材１４が押し出されて軸部１８の内端部が接点部２２ａから離れた際に、接点ばね２２ｂが軸部１８の内端部に接触した状態で弾性復帰して接点部２２ａから離れることにより、オフ状態になるように構成されている。

［００２５］

一方、操作部材１４の頭部１９は、図２～図４に示すように、筒状部材１３の鍔状部１７から本体ケース２の外部に突出した軸部１８の外端部に設けられている。この頭部１９は、その外径が筒状部材１３の鍔状部１７の外径とほぼ同じ大きさで、全体が円板状に形成されている。また、この頭部１９は、筒状部材１３の鍔状部１７から本体ケース２の外部に向けて所定間隔（Ｓ１）だけ離れて配置されるように構成されている。

［００２６］

すなわち、この頭部１９は、図２～図４に示すように、軸部１８の内端部に設けられた抜止め部材２１が本体ケース２の内周面に位置する筒状部材１３の筒状部１６の内端面に当接した状態のときに、操作部材１４のスライド長さＳ１だけ、筒状部材１３の鍔状部１７から本体ケース２の外部に向けて離れるように構成されている。

［００２７］

この場合、操作部材１４のスライド長さＳ１は、図２～図４に示すように、操作部材１４が押し出された第１の位置（図２に示す位置）と操作部材１４が押し込まれて時計モジュール６のスイッチ部２２がオン状態になった第２の位置（図４に示す位置）との間の長さに設定されている。すなわち、この操作部材１４のスライド長さＳ１は、軸部１８の内端部に弾接する接点ばね２２ｂの可変側の端部からスイッチ部２２の接点部２２ａまでの長さである。

［００２８］

また、この操作部材１４は、図２～図４に示すように、第１の付勢部材である第１ばね部材２３によって本体ケース２の外部に向けて押し出される方向に付勢されるように構成されている。すなわち、この第１ばね部材２３は、コイルばねであり、軸部１８の外周に配置されている。

［００２９］

この場合、第１ばね部材２３は、図２～図４に示すように、その内端部が筒状部材１３の鍔状部１７の外面に環状に設けられた凹部１７ｃ内に配置されて弾接し、外端部が頭部１９の内端面に環状に設けられた凹部１９ａ内に配置されて弾接することにより、頭部１９を本体ケース２の外部に向けて押し出す方向に付勢するように構成されている。

［００３０］

これにより、操作部材１４は、図２に示すように、通常状態のときに、第１ばね部材２３のばね力によって頭部１９が本体ケース２の外部に向けて押し出されて、第１の位置に配置された際に、軸部１８の内端部の抜止め部材２１が本体ケース２内に位置する筒状部１６の内端面に当接して、軸部１８の内端部が時計モジュール６のスイッチ部２２の接点部２２ａから離れることにより、スイッチ部２２をオフ状態にするように構成されている。

［００３１］

また、この操作部材１４は、図４に示すように、第１ばね部材２３のばね力に抗して頭部１９が本体ケース２の内部に向けて押し込まれ、軸部１８の内端部の抜止め部材２１が本体ケース２内に位置する筒状部１６の内端面から離れて、軸部１８の内端部が本体ケース２の内部に向けて突出した際に、この突出した軸部１８の内端部が時計モジュール６のスイッチ部２２の接点ばね２２ｂを押圧して接点部２２ａに接触させた第２の位置に配置されることにより、スイッチ部２２をオン動作させるように構成されている。

［００３２］

ところで、緩衝保護部材１５は、図２～図４に示すように、操作部材１４の頭部１９の

外周を覆った状態で、本体ケース２に対してスライド可能に設けられている。すなわち、この緩衝保護部材１５は、ほぼ円筒状に形成され、その内部に操作部材１４の頭部１９がスライド可能に配置され、この状態で本体ケース２に設けられた保持筒部２４内にスライド可能に取り付けられるように構成されている。

［００３３］

この場合、保持筒部２４は、図２～図４に示すように、ほぼ円筒状をなし、本体ケース２にその外部に突出して設けられている。また、保持筒部２４は、緩衝保護部材１５の軸方向の長さの半分ぐらいまで延出して設けられている。すなわち、この保持筒部２４は、その内径が緩衝保護部材１５の外径とほぼ同じ大きさで、軸方向の長さが緩衝保護部材１５の軸方向の長さよりも短く、かつ筒状部材１３の鍔状部１７の軸方向の長さ（厚み）とほぼ同じ長さで形成されている。

［００３４］

また、この保持筒部２４内に位置する本体ケース２の外面には、図２～図４に示すように、緩衝保護部材１５の内端部が挿入する保持溝２５が、保持筒部２４の内周に沿って環状に設けられている。この保持溝２５は、その軸方向の長さ（深さ）が筒状部材１３の鍔状部１７の軸方向の長さ（厚み）とほぼ同じ長さに形成されている。これにより、緩衝保護部材１５は、その軸方向の長さにおける半分程度の部分が、保持筒部２４内に配置されてガイドされるように構成されている。

［００３５］

この場合、保持溝２５は、図２～図４に示すように、その径方向における外周側の内径が保持筒部２４の内径と同じ大きさで、径方向における内周側の内径が筒状部材１３の鍔状部１７の外径よりも小さく形成されている。このため、筒状部材１３の鍔状部１７は、その外周部１７ａが保持溝２５の内周側から外周側に位置する保持筒部２４に向けてストッパ部として突出するように構成されている。

［００３６］

一方、緩衝保護部材１５は、図２～図４に示すように、ほぼ円筒状に形成され、その外径が本体ケース２の保持筒部２４の内径とほぼ同じ大きさで、内径が操作部材１４の頭部１９の外径および筒状部材１３の鍔状部１７の外径とほぼ同じ大きさに形成されている。これにより、緩衝保護部材１５は、本体ケース２の保持筒部２４内にその軸方向にスライド可能に配置され、この状態で内部に操作部材１４の頭部１９がその軸方向にスライド可能に配置されるように構成されている。

［００３７］

また、この緩衝保護部材１５は、図２～図４に示すように、その軸方向の長さが、操作部材１４の頭部１９が押し出された第１の位置（図２に示す位置）の状態で、その頭部１９の外端面から筒状部材１３の鍔状部１７の内端面までの長さよりも長く、かつ頭部１９の外端面から本体ケース２の保持溝２５における軸方向の内端面（底面）までの長さよりも短い長さで形成されている。これにより、保持筒部２４の保持溝２５は、その内部に緩衝保護部材１５の内端部がスライドするための隙間が設けられるように構成されている。

［００３８］

この場合、緩衝保護部材１５の内端部には、図２～図４に示すように、本体ケース２の保持溝２５内にスライド可能に配置された状態で、筒状部材１３の鍔状部１７の外周部１７ａに接離可能に当接する当接部１５ａが、緩衝保護部材１５の中心軸側に向けて突出して設けられている。また、この緩衝保護部材１５の外周部には、本体ケース２の保持筒部２４の外端部に接離可能に当接する位置規制部１５ｂが設けられている。

［００３９］

これにより、緩衝保護部材１５は、図２に示すように、その内端部および当接部１５ａが本体ケース２の保持溝２５内にスライド可能に配置された状態で、本体ケース２の保持筒部２４から外部に向けて押し出されて、その内端部に設けられた当接部１５ａの外側面が鍔状部１７の外周部１７ａの内側面に当接した際に、緩衝保護部材１５の外周部の位置規制部１５ｂが本体ケース２の保持筒部２４の外端部から軸方向に所定間隔（Ｓ２）だけ

離れるように構成されている。

[００４０]

また、この緩衝保護部材１５は、図４に示すように、本体ケース２の保持筒部２４内に押し込まれて、その外周部の位置規制部１５ｂが本体ケース２の保持筒部２４の外端部に当接した際に、緩衝保護部材１５の内端部に設けられた当接部１５ａの外側面が鍔状部１７の外周部１７ａの内側面から軸方向に所定間隔（Ｓ２）だけ離れるように構成されている。

[００４１]

この場合、緩衝保護部材１５は、図２～図４に示すように、第２の付勢部材である第２ばね部材２６によって本体ケース２の保持筒部２４内から外部に向けて押し出される方向に付勢されるように構成されている。すなわち、この第２ばね部材２６は、リング形状の皿ばねであり、本体ケース２の保持溝２５内に配置されるように構成されている。

[００４２]

この場合、第２ばね部材２６は、図２～図４に示すように、その外周側の縁部が保持溝２５内における軸方向の内面（底面）に弾接し、第２ばね部材２６の内周側の縁部が緩衝保護部材１５の内端部に設けられた当接部１５ａの内端面に弾接することにより、緩衝保護部材１５を本体ケース２の保持筒部２４内から外部に向けて押し出す方向に付勢するように構成されている。

[００４３]

これにより、緩衝保護部材１５は、図２～図４に示すように、通常状態のときに、第２ばね部材２６のばね力によって本体ケース２の保持筒部２４内から外部に向けて押し出され、また第２ばね部材２６のばね力に抗して保持筒部２４の内部に向けて押し込まれるように構成されている。

[００４４]

この場合、第２ばね部材２６は、図２～図４に示すように、そのばね力が第１ばね部材２３のばね力とほぼ同じ強さに設定されていても良いが、第１ばね部材２３のばね力よりも強く設定されていることが望ましい。すなわち、この第２ばね部材２６は、緩衝保護部材１５が外部から衝撃を受けた際に、その衝撃に応じて緩衝保護部材１５がスライドして圧縮されることにより、衝撃を緩衝するために、第１ばね部材２３のばね力よりも強く設定されている。

[００４５]

また、この緩衝保護部材１５は、図２～図４に示すように、そのスライド長さＳ２が操作部材１４のスライド長さＳ１よりも短く（Ｓ２＜Ｓ１）設定されている。すなわち、緩衝保護部材１５のスライド長さＳ２は、緩衝保護部材１５の内端部に設けられた当接部１５ａが鍔状部１７の外周部１７ａに当接した第１の位置（図２に示す位置）と、緩衝保護部材１５の外周部の位置規制部１５ｂが本体ケース２の保持筒部２４の外端部に当接した第３の位置（図３に示す位置）との間の長さに設定されている。

[００４６]

この場合、第１の位置は、図２に示すように、緩衝保護部材１５の内端部に設けられた当接部１５ａが鍔状部１７の外周部１７ａに当接した状態で、操作部材１４が第１ばね部材２３によって押し出され、操作部材１４の軸部１８の内端部に設けられた抜止め部材２１が筒状部材１３の筒状部１６の内端面に当接したときに、緩衝保護部材１５の外端面と操作部材１４の頭部１９の外端面とがほぼ同一面上に配置される位置である。

[００４７]

また、第３の位置は、図３に示すように、緩衝保護部材１５が操作部材１４の頭部１９と共に本体ケース２に向けて押し込まれて、緩衝保護部材１５の外周部の位置規制部１５ｂが本体ケース２の保持筒部２４の外端部に当接した状態で、緩衝保護部材１５の外端面と操作部材１４の頭部１９の外端面とがほぼ同一面上に配置されたときに、操作部材１４の軸部１８の内端部が本体ケース２の内部に突出しても、スイッチ部２２がオン状態にならない位置である。

［００４８］
次に、このような腕時計のスイッチ装置１０の作用について説明する。
このスイッチ装置１０を組み立てる場合には、予め、本体ケース２の上部外周に防水パッキン３ａを介して外装ケース３を取り付ける。そして、この本体ケース２の保持筒部２４内に位置する保持溝２５内に第２ばね部材２６を配置し、この状態で緩衝保護部材１５を本体ケース２の保持筒部２４内に挿入させて、緩衝保護部材１５の内端部および当接部１５ａを本体ケース２の保持溝２５内に配置する。
［００４９］
この状態では、緩衝保護部材１５の内端部と本体ケース２の保持溝２５における軸方向の内端面（底面）との間に第２ばね部材２６が挟まれる。この状態で、本体ケース２の切欠き溝１１ｂ内に防水リング１２を配置して、本体ケース２の貫通孔１１内に筒状部材１３の筒状部１６を取り付ける。このときには、筒状部材１３の筒状部１６を本体ケース２の貫通孔１１内に挿入すると共に、筒状部材１３の鍔状部１７を緩衝保護部材１５の内部に配置する。
［００５０］
この状態で、鍔状部１７の締付溝１７ｂにドライバなどの工具を挿入させて、鍔状部１７を回転させることにより、筒状部１６の雄ねじ部１６ａを貫通孔１１の雌ねじ部１１ａに螺合させて締め付ける。これにより、筒状部１６が貫通孔１１に取り付けられると共に、鍔状部１７が防水リング１２を切欠き溝１１ｂ内に押し付ける。
［００５１］
また、このときには、鍔状部１７の外周部１７ａの内側面が緩衝保護部材１５の当接部１５ａの外側面に当接して、第２ばね部材２６を緩衝保護部材１５の内端部と本体ケース２の保持溝２５における軸方向の内端面（底面）との間に弾力的に挟み付ける。これにより、緩衝保護部材１５が本体ケース２の保持筒部２４内にスライド可能な状態で取り付けられる。
［００５２］
この場合には、緩衝保護部材１５が第２ばね部材２６のばね力によって本体ケース２の外部に向けて押し出されることにより、緩衝保護部材１５の内端部に設けられた当接部１５ａの外側面が鍔状部１７の外周部１７ａの内側面に当接し、緩衝保護部材１５の外周部の位置規制部１５ｂが本体ケース２の保持筒部２４の外端部から軸方向に所定間隔（Ｓ２）だけ離れた状態で配置される。
［００５３］
そして、操作部材１４を筒状部材１３に取り付ける。このときには、予め、操作部材１４の軸部１８の外周部に複数の防水リング２０を取り付けると共に、軸部１８の外周に第１ばね部材２３を配置する。この状態で、操作部材１４の軸部１８を本体ケース２の保持筒部２４側から筒状部材１３の筒状部１６内に挿入させて、軸部１８の内端部を本体ケース２内に突出させると共に、操作部材１４の頭部１９を緩衝保護部材１５内に挿入させる。
［００５４］
この状態で、本体ケース２内に突出した軸部１８の内端部に抜止め部材２１を取り付ける。これにより、軸部１８の複数の防水リング２０が筒状部材１３の筒状部１６の内周面に摺動可能な状態で圧接することにより、軸部１８の外周面と筒状部１６の内周面との間の防水が図られる。
［００５５］
また、このときには、第１ばね部材２３のばね力によって頭部１９が緩衝保護部材１５内から外部に向けて押し出されることにより、軸部１８の内端部の抜止め部材２１が本体ケース２の内周面に位置する筒状部材１３の筒状部１６の内端面に当接する。この状態では、頭部１９の外端面と緩衝保護部材１５の外端面とが同一面上に配置される。
［００５６］
この状態で、本体ケース２内に時計モジュール６を組み込む。このときには、時計モジ

ュール６に設けられたスイッチ部２２を操作部材１４の軸部１８の内端部に対応させる。この場合には、予め、時計モジュール６の外周部にスイッチ部２２の接点部２２ａを設け、この接点部２２ａの近傍に位置する時計モジュール６の外周部にスイッチ部２２の接点ばね２２ｂの一端部を設け、この接点ばね２２ｂｂの可変部の他端部を接点部２２ａに接離可能に対応させる。これにより、時計モジュール６にスイッチ部２２が取り付けられる。

［００５７］

この状態で、時計モジュール６を本体ケース２内に組み込む際には、スイッチ部２２の接点ばね２２ｂを、本体ケース２内に突出した操作部材１４の軸部１８の内端部に弾接させた状態で配置する。これにより、スイッチ装置１０が腕時計ケース１に組み付けられる。この後は、本体ケース２の下面に裏蓋５を取り付ければ良い。

［００５８］

次に、このスイッチ装置１０を使用する場合について説明する。

このスイッチ装置１０では、通常状態のときに、図２に示すように、緩衝保護部材１５が第２ばね部材２６のばね力によって本体ケース２の保持筒部２４内から外部に向けて押し出される。また、このときには、操作部材１４の頭部１９が第１ばね部材２３のばね力によって本体ケース２の外部に向けて押し出されて、第１の位置に配置される。

［００５９］

すなわち、緩衝保護部材１５が第２ばね部材２６のばね力によって押し出された際には、図２に示すように、緩衝保護部材１５の内端部における当接部１５ａの外側面が筒状部材１３の鍔状部１７における外周部１７ａの内側面に当接し、緩衝保護部材１５の外周部に設けられた位置規制部１５ｂが本体ケース２の保持筒部２４の外端部から所定間隔（Ｓ２）だけ離れた位置に配置される。

［００６０］

また、操作部材１４の頭部１９が第１ばね部材２３のばね力によって押し出された際には、図２に示すように、操作部材１４の軸部１８の内端部に設けられた抜止め部材２１が本体ケース２内に位置する筒状部１６の内端面に当接して、この軸部１８の内端部が時計モジュール６のスイッチ部２２の接点部２２ａから離れる。これにより、スイッチ部２２がオフ状態になる。この状態では、緩衝保護部材１５の外端部と操作部材１４の頭部１９の外端面とがほぼ同一面上に配置される。

［００６１］

そして、操作部材１４の頭部１９を押圧する際には、頭部１９よりも外径の大きい緩衝保護部材１５が頭部１９と共に押圧される。このときには、第２ばね部材２６のばね力が第１ばね部材２３のばね力よりも強く設定されていることにより、第２ばね部材２６のばね力に抗して緩衝保護部材１５を操作部材１４の頭部１９と共に押圧する。

［００６２］

これにより、図３に示すように、操作部材１４の頭部１９よりも外径の大きい緩衝保護部材１５と共に操作部材１４の頭部１９がスライドすることで、操作部材１４の押し込み感覚が向上する。このため、緩衝保護部材１５が保持筒部２４でガイドされながら本体ケース２側に向けてスライドし、緩衝保護部材１５の位置規制部１５ｂが保持筒部２４の外端部に当接して位置規制される。

［００６３］

これと同時に、操作部材１４の頭部１９が緩衝保護部材１５と共に本体ケース２内に向けてスライドする。このときには、図３に示すように、操作部材１４の軸部１８が筒状部材１３の筒状部１６内をスライドし、軸部１８の内端部が本体ケース２内に突出して、時計モジュール６のスイッチ部２２の接点ばね２２ｂを接点部２２ａに向けて押圧するが、緩衝保護部材１５のスライド長さＳ２が操作部材１４のスライド長さＳ１よりも短いため、軸部１８の内端部が本体ケース２内に突出しても、スイッチ部２２がオンすることはない。

［００６４］

この状態で、操作部材１４の頭部１９を第１ばね部材２３のばね力に抗して押圧する。このときには、図４に示すように、緩衝保護部材１５はスライドせず、操作部材１４のみがスライドし、頭部１９が第１ばね部材２３を圧縮させて筒状部材１３の鍔状部１７に接近すると共に、軸部１８の内端部が更に本体ケース２内に突出して、スイッチ部２２の接点ばね２２ｂを接点部２２ａに押し付けて接触させる。これにより、スイッチ部２２がオン状態になる。

［００６５］

一方、スイッチ装置１０が通常状態のときに、緩衝保護部材１５が外部から衝撃を受けた際には、その衝撃に応じて緩衝保護部材１５が操作部材１４の頭部１９と共にスライドして、第２ばね部材２６を圧縮すると共に、頭部１９が第１ばね部材２３を圧縮する。これにより、衝撃が緩衝されると共に、緩衝保護部材１５によって操作部材１４の頭部１９が保護される。

［００６６］

また、緩衝保護部材１５が外部から衝撃（緩衝保護部材１５の軸方向に対して垂直方向や斜め方向からの衝撃）を受けた際には、保持筒部２４が、ほぼ円筒状をなし、緩衝保護部材１５の軸方向の長さの半分ぐらいまで延出して設けられているので、緩衝保護部材１５が軸方向に対してねじれることなく、緩衝保護部材１５によって操作部材１４の頭部１９が保護される。

［００６７］

この場合、外部からの衝撃を緩衝しきれないときには、図３に示すように、緩衝保護部材１５が更にスライドして、緩衝保護部材１５の位置規制部１５ｂが保持筒部２４の外端部に当接して位置規制される。これにより、外部の衝撃を緩衝保護部材１５によって確実に受け止めて、スイッチ部２２が不用意にオンするのを確実に防ぐと共に、緩衝保護部材１５によって操作部材１４の頭部１９を確実にかつ良好に保護する。

［００６８］

また、このときには、操作部材１４の軸部１８が緩衝保護部材１５と共にスライドして、軸部１８の内端部が本体ケース２内に突出するが、図３に示すように、時計モジュール６のスイッチ部２２がオン状態になることはない。このため、外部からの衝撃を受けても、軸部１８の内端部によってスイッチ部２２が誤動作したり破損したりすることがなく、スイッチ部２２および時計モジュール６を良好に保護することができる。

［００６９］

このように、この腕時計のスイッチ装置１０によれば、貫通孔１１が設けられた腕時計ケース１の本体ケース２と、この本体ケース２の貫通孔１１に対してスライド可能に設けられた軸部１８、およびこの軸部１８の外端部に設けられて本体ケース２の外部に配置された頭部１９を備えた操作部材１４と、この操作部材１４の頭部１９の外周を覆った状態で、本体ケース２にスライド可能に設けられ、かつそのスライド長さＳ２が操作部材１４のスライド長Ｓ１さよりも短く設定された緩衝保護部材１５と、を備えていることにより、操作部材１４の操作性を向上させ、かつ耐衝撃性を確保することができる。

［００７０］

すなわち、この腕時計のスイッチ装置１０では、操作部材１４の頭部１９を押し込む際に、操作部材１４の頭部１９と共に緩衝保護部材１５をスライドさせた上、操作部材１４のみをスライドさせて押し込むことができるので、操作部材１４の頭部１９の外径よりも大きい外径の緩衝保護部材１５を操作部材１４の頭部１９と共にスライドさせることができ、これにより操作部材１４の押し込み感覚を向上させることができるので、操作部材１４の操作性を向上させることができる。

［００７１］

また、この腕時計のスイッチ装置１０では、緩衝保護部材１５が外部から衝撃を受けた際に、緩衝保護部材１５が操作部材１４の頭部１９を覆った状態で、緩衝保護部材１５を頭部１９と共にスライドさせることができるので、緩衝保護部材１５によって衝撃を緩衝することができると共に、操作部材１４の頭部１９を良好に保護することができ、これに

より耐衝撃性を確保することができる。

［００７２］

この場合、本体ケース２は、その貫通孔１１に設けられた筒状部材１３と、緩衝保護部材１５がスライド可能に配置される保持筒部２４と、を備えていることにより、貫通孔１１に設けられた筒状部材１３によって操作部材１４を本体ケース２の貫通孔１１に対して確実にかつ良好に取り付けることができると共に、保持筒部２４によって緩衝保護部材１５をスライド可能な状態で本体ケース２に対して確実にかつ良好に取り付けることができる。

［００７３］

すなわち、筒状部材１３は、本体ケース２の貫通孔１１内に固定された筒状部１６と、本体ケース２の外面に配置された鍔状部１７と、を備えているので、筒状部１６内に操作部材１４の軸部１８をスライド可能な状態で確実にかつ良好に取り付けることができる。また、保持筒部２４は、緩衝保護部材１５の外周に位置した状態で、本体ケース２にその外部に突出して設けられているので、保持筒部２４の内部に緩衝保護部材１５をスライド可能な状態で確実にかつ良好に取り付けることができる。

［００７４］

この場合、緩衝保護部材１５は、その内端部に筒状部材１３の鍔状部１７の外周部１７ａに接離可能に当接する当接部１５ａが設けられ、外周部に保持筒部２４の外端部に接離可能に当接する位置規制部１５ｂが設けられていることにより、緩衝保護部材１５のスライド長さＳ２を精度良く正確に設定することができる。

［００７５］

すなわち、緩衝保護部材１５は、本体ケース２の外部に向けて押し出された際に、当接部１５ａが鍔状部１７の外周部１７ａに当接して、位置規制部１５ｂが保持筒部２４の外端部から所定間隔（Ｓ２）だけ離れ、本体ケース２の内部に向けて押し込まれた際に、位置規制部１５ｂが保持筒部２４の外端部に当接し、当接部１５ａが鍔状部１７の外周部１７ａから所定間隔（Ｓ２）だけ離れることにより、緩衝保護部材１５のスライド長さＳ２を精度良く正確に設定することができる。

［００７６］

また、このスイッチ装置１０では、操作部材１４を本体ケース２の外部に向けて付勢する第１の付勢部材である第１ばね部材２３と、緩衝保護部材１５を本体ケース２の外部に向けて付勢する第２の付勢部材である第２ばね部材２６と、を備えていることにより、第１ばね部材２３のばね力によって操作部材１４を本体ケース２の外部に向けて押し出すことができ、また第２ばね部材２６のばね力によって緩衝保護部材１５を本体ケース２の外部に向けて押し出すことができる。

［００７７］

このため、このスイッチ装置１０では、緩衝保護部材１５が外部から衝撃を受けた際に、緩衝保護部材１５がスライドしながら第２ばね部材２６を圧縮させると共に、緩衝保護部材１５のスライドに伴って操作部材１４の頭部１９がスライドして第１ばね部材２３を圧縮させるので、衝撃を良好に緩衝することができると共に、操作部材１４の頭部１９を確実にかつ良好に保護することができる。

［００７８］

また、このスイッチ装置１０では、操作部材１４の頭部１９を押し込む際に、第２ばね部材２６のばね力に抗して緩衝保護部材１５を押し込むことにより、この緩衝保護部材１５と共に操作部材１４の頭部１９を押し込むことができ、これにより緩衝保護部材１５の位置規制部１５ｂが保持筒部２４の外端部に当接して、緩衝保護部材１５のスライドを停止させた状態で、頭部１９を第１ばね部材２３のばね力に抗して更に押し込むことができるので、操作部材１４の押し込み感覚を向上させることができ、これにより操作部材１４の操作性を向上させることができる。

［００７９］

この場合、第２ばね部材２６は、そのばね力が第１ばね部材２３のばね力よりも強く設

定されていることにより、第２ばね部材２６のばね力に抗して緩衝保護部材１５を操作部材１４の頭部１９と共に押圧すると、緩衝保護部材１５のスライドに伴って操作部材１４の頭部１９を確実にかつ良好にスライドさせることができ、緩衝保護部材１５のスライドが停止した状態で、第２ばね部材２６のばね力よりも軽い力で頭部１９を更に押し込むことができるので、操作部材１４の押し込み感覚を更に向上させることができ、これにより操作部材１４の操作性を、より一層、向上させることができる。

［００８０］

また、第２ばね部材２６は、リング形状の皿ばねであることにより、構造が簡単で、低価格を図ることができると共に、設置スペースのコンパクト化を図ることができ、これにより緩衝保護部材１５の内端部とこれに対応する本体ケース２の保持溝２５内における軸方向の内端面との間の僅かな隙間に効率良く良好に設置することができる。

［００８１］

また、このスイッチ装置１０では、緩衝保護部材１５が本体ケース２の外部に押し出された際に、その外端面と操作部材１４の頭部１９の外端面とがほぼ同一面上に位置することにより、外部からの衝撃を、操作部材１４の頭部１９が受けることがなく、緩衝保護部材１５で受け止めることができるので、この緩衝保護部材１５によって操作部材１４を確実にかつ良好に保護することができる。

［００８２］

さらに、このスイッチ装置１０では、本体ケース２内に設けられて、操作部材１４が緩衝保護部材１５のスライド長さＳ２よりも長いスライド長さＳ１で押し込まれた際に、オン動作するスイッチ部２２を備えていることにより、外部から衝撃を受けて緩衝保護部材１５が操作部材１４と共にスライドして押し込まれても、操作部材１４がスイッチ部２２をオン状態にさせないようにすることができ、これにより外部からの衝撃によるスイッチ部２２の誤動作およびスイッチ部２２の破損を確実に防ぐことができる。

［００８３］

また、このスイッチ装置１０における操作部材１４のスライド長さＳ１は、操作部材１４が押し出された第１の位置と操作部材１４が押し込まれてスイッチ部２２がオン状態になった第２の位置との間の長さに設定され、緩衝保護部材１５のスライド長さＳ２は、緩衝保護部材１５が押し出されてその外端部と操作部材１４の外端面とがほぼ同一面上に位置する第１の位置と緩衝保護部材１５が操作部材１４と共に押し込まれてスイッチ部２２がオン状態にならない第３の位置との間の長さに設定されていることにより、操作部材１４の操作性が良く、かつ外部からの衝撃によるスイッチ部２２の誤動作およびスイッチ部２２の破損を確実に防ぐことができる。

［００８４］

すなわち、このスイッチ装置１０では、緩衝保護部材１５のスライド長さＳ２が操作部材１４のスライド長さＳ１よりも短いため、外部から衝撃を受けて緩衝保護部材１５が操作部材１４と共にスライドして押し込まれても、操作部材１４がスイッチ部２２をオン状態にさせないようにすることができ、これにより外部からの衝撃によるスイッチ部２２の誤動作およびスイッチ部２２の破損を確実に防ぐことができる。

［００８５］

また、このスイッチ装置１０では、操作部材１４によってスイッチ部２２をオン動作させる際に、まず、緩衝保護部材１５を操作部材１４と共に押し込んで、操作部材１４の軸部１８の内端部をスイッチ部２２に接近させ、この状態で操作部材１４のみを更に押し込んで、スイッチ部２２をオン動作させることができるので、操作部材１４の押し込み感覚を向上させることができ、これにより操作部材１４の操作性が良く、確実にかつ良好にスイッチ部２２をオン動作させることができる。

［００８６］

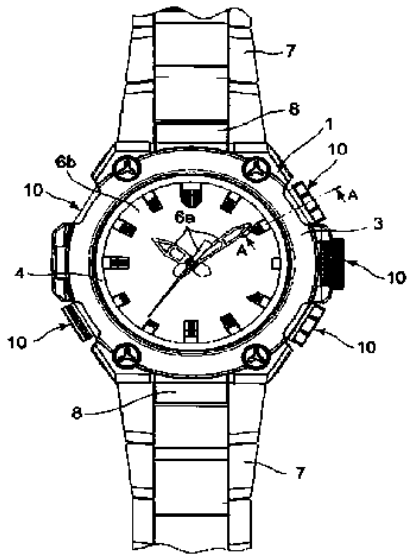
なお、上述した実施形態では、第２の付勢部材であるばね部材２６が皿ばねである場合について述べたが、この発明はこれに限らず、例えばスプリングワッシャなどの板状のばねであっても良い。

[００８７]
また、上述した実施形態では、第２の付勢部材として、ばね部材２６を用いた場合について述べたが、この発明はこれに限らず、例えば図５に示す変形例のように、第２の付勢部材として弾性部材３０を用いても良い。この場合、弾性部材３０は、ウレタンゴム、シリコーンゴム、エラストマなどの弾力性を有する合成樹脂、または衝撃吸収性を有するゲル状の樹脂などである。
[００８８]
また、上述した実施形態では、スイッチ部２２が接点部２２ａと接点ばね２２ｂとを備えた構成である場合について述べたが、この発明はこれに限らず、マイクロスイッチや近接スイッチなどのスイッチ部であっても良い。
[００８９]
さらに、上述した実施形態では、緩衝保護部材１５の内端部に当接部１５ａを緩衝保護部材１５の中心軸側に向けて突出させて設けた場合について述べたが、この発明はこれに限らず、例えば、緩衝保護部材１５の内端部に当接部を緩衝保護部材１５の径方向における外周側に向けて突出させて設けた構成であっても良い。
[００９０]
この場合には、本体ケース２に設けられた保持筒部２４の内周面に緩衝保護部材１５の当接部がスライド可能に挿入するガイド溝を設け、このガイド溝の軸方向における本体ケース２の外部側に位置する内端面に緩衝保護部材１５の当接部が接離可能に当接することにより、緩衝保護部材１５が外部に向けて押し出された際の位置を規制するように構成すれば良い。
[００９１]
なおまた、上述した実施形態では、腕時計に適用した場合について述べたが、必ずしも腕時計である必要はなく、例えばトラベルウオッチ、目覚まし時計、置き時計、掛け時計などの各種の時計に適用することができる。また、この発明は必ずしも時計である必要はなく、例えば、携帯電話機や携帯情報端末機などの電子機器にも適用することができる。
[００９２]
以上、この発明の一実施形態について説明したが、この発明は、これに限られるものではなく、特許請求の範囲に記載された発明とその均等の範囲を含むものである。
以下に、本願の特許請求の範囲に記載された発明を付記する。
[００９３]
(付記)
請求項１に記載の発明は、貫通孔が設けられたケースと、前記ケースの前記貫通孔に対してスライド可能に設けられた軸部、および前記軸部の外端部に設けられて前記ケースの外部に配置された頭部を備えた操作部材と、前記操作部材の前記頭部の外周を覆った状態で、前記ケースに、前記操作部材のスライド方向にスライド可能に設けられた緩衝保護部材と、を備えていることを特徴とするスイッチ装置である。
[００９４]
請求項２に記載の発明は、請求項１に記載のスイッチ装置において、前記緩衝保護部材のスライドの長さが前記操作部材のスライドの長さよりも短く設定されていることを特徴とするスイッチ装置である。
[００９５]
請求項３に記載の発明は、請求項１または請求項２に記載のスイッチ装置において、前記ケースには、前記緩衝保護部材の外周に位置した状態で、前記緩衝保護部材をスライド可能に保持する保持筒部が、前記ケースの外部に突出して設けられていることを特徴とするスイッチ装置である。
[００９６]
請求項４に記載の発明は、請求項３に記載のスイッチ装置において、前記保持筒部は、前記緩衝保護部材の軸方向の長さの半分ぐらいまで延出して設けられていることを特徴とするスイッチ装置である。

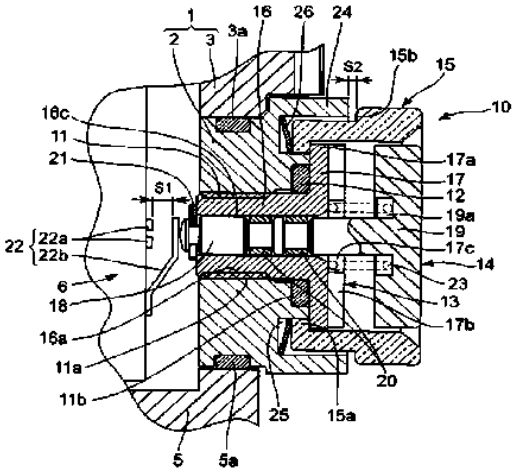
［００９７］
請求項５に記載の発明は、請求項１～請求項４のいずれかに記載のスイッチ装置において、前記操作部材を前記ケースの外部に向けて付勢する第１の付勢部材と、前記緩衝保護部材を前記ケースの外部に向けて付勢する第２の付勢部材と、を備えていることを特徴とするスイッチ装置である。
［００９８］
請求項６に記載の発明は、請求項５に記載のスイッチ装置において、前記第２の付勢部材は、ばね部材であることを特徴とするスイッチ装置である。
［００９９］
請求項７に記載の発明は、請求項５に記載のスイッチ装置において、前記第２の付勢部材は、弾力性を有する弾性部材であることを特徴とするスイッチ装置である。
［０１００］
請求項８に記載の発明は、請求項１～請求項７のいずれかに記載のスイッチ装置において、前記緩衝保護部材は、前記ケースの外部に前記操作部材と共に押し出された際に、前記緩衝保護部材の外端面と前記操作部材の外端面とがほぼ同一面上に位置することを特徴とするスイッチ装置である。
［０１０１］
請求項９に記載の発明は、請求項１～請求項８のいずれかに記載のスイッチ装置において、前記ケース内に設けられて、前記操作部材が前記緩衝保護部材のスライド長さよりも長いスライド長さで押し込まれた際に、オン状態になるスイッチ部を備えていることを特徴とするスイッチ装置である。
［０１０２］
請求項１０記載の発明は、請求項９に記載のスイッチ装置において、前記操作部材のスライド長さは、前記操作部材が押し出された第１の位置と前記操作部材が押し込まれて前記スイッチ部がオン状態になった第２の位置との間の長さに設定され、前記緩衝保護部材のスライド長さは、前記緩衝保護部材が押し出されてその外端部と前記操作部材の外端面とがほぼ同一面上に位置する前記第１の位置と前記緩衝保護部材が前記操作部材と共に押し込まれても前記スイッチ部がオン状態にならない第３の位置との間の長さに設定されていることを特徴とするスイッチ装置である。
［０１０３］
請求項１１に記載の発明は、請求項１～請求項１０のいずれかに記載されたスイッチ装置を備えていることを特徴とする時計である。
［符号の説明］
［０１０４］
１　腕時計ケース
２　本体ケース
３　外装ケース
６　時計モジュール
１０　スイッチ装置
１１　貫通孔
１１ａ　雌ねじ部
１３　筒状部材
１４　操作部材
１５　緩衝保護部材
１６　筒状部
１６ａ　雄ねじ部
１７　鍔状部
１８　軸部
１９　頭部
２０　防水リング

２１　抜止め部材
２２　スイッチ部
２３　第１ばね部材
２４　保持筒部
２５　保持溝
２６　第２ばね部材
３０　弾性部材
Ｓ１　操作部材のスライド長さ
Ｓ２　緩衝保護部材のスライド長さ

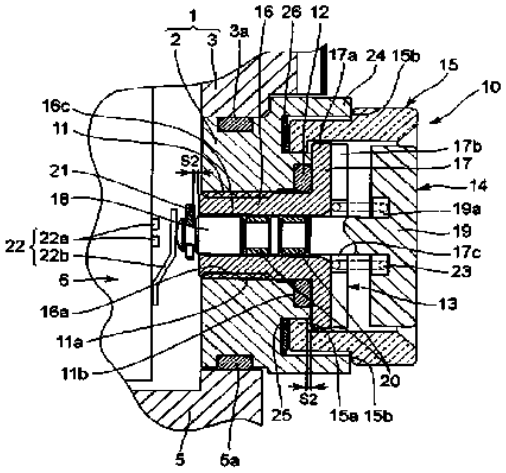
【図１】



【図２】



【図３】


1
2
3
3a
16
26
12
17a
24
15b
15
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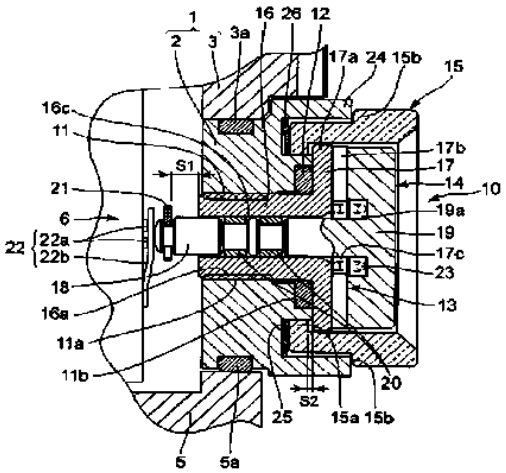
【図４】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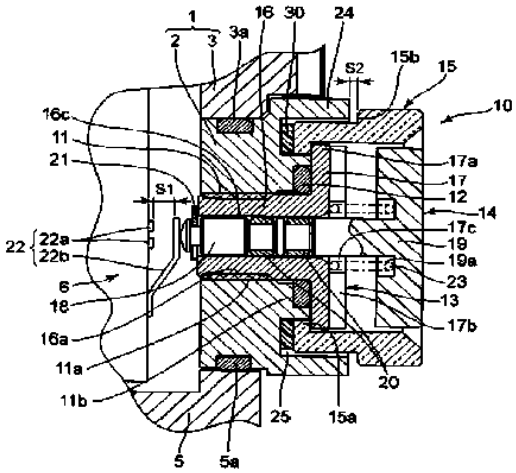
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Doc Code: PA..
Document Description: Power of Attorney

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Application Number	Not Yet Assigned
Filing Date	Herewith
First Named Inventor	Fletcher R. Rothkopf
Title	WEARABLE ELECTRONIC DEVICE
Art Unit	Not Yet Assigned
Examiner Name	Not Yet Assigned
Attorney Docket Number	P22914USC12

SIGNATURE of Applicant or Patent Practitioner

Signature	/Benno M. Guggenheimer/	Date (Optional)	
Name	Benno M. Guggenheimer	Registration Number	66,686
Title (if Applicant is a juristic entity)	Attorney for Applicant		
Applicant Name (if Applicant is a juristic entity)	Apple Inc.		

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 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.**

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Doc Code: PA..
Document Description: Power of Attorney

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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 62579

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Apple Inc.

☐ Inventor or Joint Inventor (title not required below)
☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	April 20, 2021
Name	Jeffrey L. Myers, Assistant Secretary and Chief IP Counsel of Apple Inc.		
Title	Assistant Secretary and Chief IP Counsel		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

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

Title of Invention	WEARABLE ELECTRONIC DEVICE P22914US1

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 14/842,617

filed on September 1, 2015.

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

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

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

WARNING:

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

LEGAL NAME OF INVENTOR

Inventor: Fletcher R. Rothkopf Date (Optional):

Signature:

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

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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LEGAL NAME OF INVENTOR

Inventor: Jonathan Ive Date (Optional): 01/05/2020

Signature: J. Ive

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

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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LEGAL NAME OF INVENTOR

Inventor: Julian Hoenig Date (Optional): _____

Signature: _____

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

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LEGAL NAME OF INVENTOR

Inventor: Rico Zorkendorfer Date (Optional): _____

Signature: _____

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

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WEARABLE ELECTRONIC DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation patent application of U.S. Patent Application No. 18/075,253, filed December 5, 2022, and titled "Wearable Electronic Device," which is a continuation patent application of U.S. Patent Application No. 17/951,973, filed September 23, 2022, and titled "Wearable Electronic Device," which is a continuation patent application of U.S. Patent Application No. 17/672,653, filed February 15, 2022, and titled "Wearable Electronic Device," now U.S. Patent No. 11,474,483, issued October 18, 2022, which is a continuation patent application of U.S. Patent Application No. 17/188,966, filed March 1, 2021, and titled "Wearable Electronic Device," which is a continuation patent application of U.S. Patent Application No. 16/826,130, filed March 20, 2020, and titled "Wearable Electronic Device," now U.S. Patent No. 10,942,491, issued March 9, 2021, which is a continuation patent application of U.S. Patent Application No. 14/842,617, filed September 1, 2015, and titled "Wearable Electronic Device," now U.S. Patent No. 10,599,101, issued March 24, 2020, which is a nonprovisional patent application of and claims the benefit of U.S. Provisional Patent Application No. 62/044,974, filed September 2, 2014, the disclosures of which are hereby incorporated herein by reference in their entireties. U.S. Patent Application No. 16/826,130, filed March 20, 2020, and titled "Wearable Electronic Device," now U.S. Patent No. 10,942,491, issued March 9, 2021 is also a continuation patent application of U.S. Patent Application No. 15/261,917, filed September 10, 2016, and titled "Wearable Electronic Device," now U.S. Patent No. 10,627,783, issued April 21, 2020, which is a continuation application of U.S. Patent Application No. 14/842,617, filed September 1, 2015, and titled "Wearable Electronic Device," now U.S. Patent No. 10,599,101, issued March 24, 2020, which is a nonprovisional patent application of and claims the benefit of U.S. Provisional Patent Application No. 62/044,974, filed September 2, 2014, the disclosures of which are hereby incorporated herein by reference in their entireties. U.S. Patent Application No. 16/826,130, filed March 20, 2020, and titled "Wearable Electronic Device," now U.S. Patent No. 10,942,491, issued March 9, 2021 is also a continuation patent application of U.S. Patent Application No. 15/261,914, filed September 10, 2016, and titled "Wearable Electronic Device," now U.S. Patent No. 10,613,485, issued April 7, 2020, which is a continuation patent application of U.S. Patent Application No. 14/842,617, filed

September 1, 2015, and titled "Wearable Electronic Device," now U.S. Patent No. 10,599,101, issued March 24, 2020, which is a nonprovisional patent application of and claims the benefit of U.S. Provisional Patent Application No. 62/044,974, filed September 2, 2014, the disclosures of which are hereby incorporated herein by reference in their entireties. U.S. Patent Application No. 16/826,130, filed March 20, 2020, and titled "Wearable Electronic Device," now U.S. Patent No. 10,942,491, issued March 9, 2021 is also a continuation patent application of U.S. Patent Application No. 15/261,912, filed September 10, 2016, and titled "Wearable Electronic Device," now U.S. Patent No. 10,620,591, issued April 14, 2020, which is a continuation patent application of U.S. Patent Application No. 14/842,617, filed September 1, 2015, and titled "Wearable Electronic Device," now U.S. Patent No. 10,599,101, issued March 24, 2020, which is a nonprovisional patent application of and claims the benefit of U.S. Provisional Patent Application No. 62/044,974, filed September 2, 2014, the disclosures of which are hereby incorporated herein by reference in their entireties.

[0002] U.S. Patent Application No. 17/672,653, filed February 15, 2022, and titled "Wearable Electronic Device," now U.S. Patent No. 11,474,483, issued October 18, 2022, is also a continuation patent application of U.S. Patent Application No. 17/188,995, filed March 1, 2021, and titled "Wearable Electronic Device," which is a continuation patent application of U.S. Patent Application No. 16/826,130, filed March 20, 2020, and titled "Wearable Electronic Device," now U.S. Patent No. 10,942,491, issued March 9, 2021, which is a continuation patent application of U.S. Patent Application No. 14/842,617, filed September 1, 2015, and titled "Wearable Electronic Device," now U.S. Patent No. 10,599,101, issued March 24, 2020, which is a nonprovisional patent application of and claims the benefit of U.S. Provisional Patent Application No. 62/044,974, filed September 2, 2014, the disclosures of which are hereby incorporated herein by reference in their entireties. U.S. Patent Application No. 16/826,130, filed March 20, 2020, and titled "Wearable Electronic Device," now U.S. Patent No. 10,942,491, issued March 9, 2021 is also a continuation patent application of U.S. Patent Application No. 15/261,917, filed September 10, 2016, and titled "Wearable Electronic Device," now U.S. Patent No. 10,627,783, issued April 21, 2020, which is a continuation application of U.S. Patent Application No. 14/842,617, filed September 1, 2015, and titled "Wearable Electronic Device," now U.S. Patent No. 10,599,101, issued March 24, 2020, which is a nonprovisional patent application of and claims the benefit of U.S. Provisional Patent Application No. 62/044,974,

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[0003] This application is also a continuation patent application of U.S. Patent Application No. 17/188,966, filed March 1, 2021, and titled "Wearable Electronic Device."

[0004] This application is also a continuation patent application of U.S. Patent Application No. 17/188,995, filed March 1, 2021, and titled "Wearable Electronic Device."

[0005] This application is also a continuation patent application of U.S. Patent Application No. 17/951,973, filed September 23, 2022, and titled "Wearable Electronic Device,"

FIELD

[0006] The following disclosure generally relates to an electronic device, and more specifically to a wearable electronic device having a range of features, including touch input, force input, an interchangeable attachment system, health monitoring functionality, wireless power charging, wireless authentication and transaction functionality, and other features and functionality.

BACKGROUND

[0007] Portable electronic devices have become increasingly popular, and the features and functionality provided by portable electronic devices continue to expand to meet the needs and expectations of many consumers. However, some traditional portable electronic devices, particularly wearable electronic devices, may have relatively limited functionality or are only able to perform a specialized set of functions or tasks. For example, some traditional electronic wristwatches may be configured to perform a relatively limited set of functions, including displaying time, date, and performing basic timing functions. The embodiments described herein are directed to a wearable electronic device that provides a wide range of functionality, as compared to some traditional wearable electronic devices.

SUMMARY

[0008] The embodiments included herein are directed to a consumer product, which may include a portable or wearable electronic device that is configured to provide an expansive feature set integrated or incorporated into a compact form factor. In some aspects of the present disclosure, a consumer product may integrate or combine multiple subsystems into a single device to provide a wide range of functionality, including biometric sensing, touch-based user input, near-field communications, and other desirable features. In some aspects, multiple subsystems are integrated into the relatively compact space of a wrist-worn device.

[0009] Some example embodiments are directed to wearable electronic device having a housing that includes a flat bottom portion, a top portion defining a cavity, and a curved side portion that extends from the bottom portion to the top portion. A band may be attached to the housing and configured to secure the wearable electronic device to a user. A display may be at least partially disposed within the cavity and may have a viewable area. The device may also include a cover disposed above the display and including a flat middle portion larger than the viewable area of the display, a curved edge portion surrounding the flat middle portion and coinciding with the curved side portion along a perimeter of the cavity to form a continuous contoured surface.

[0010] In some embodiments, the continuous contoured surface is tangent with the flat bottom portion of the housing at a first end of the contour. The continuous contoured surface may also be tangent with the flat middle portion of the cover at a second end of the contour. In some embodiments, the continuous contoured surface has a constant radius.

[0011] In some embodiments, the cavity has a rectangular shape. The curved edge portion of the housing may have four sides that surround the cavity, each side is orthogonal to two adjacent sides. Each side may be connected to an adjacent side by a rounded corner. In some embodiments, the rounded corners have a curvature that corresponds to a curvature of the continuous contoured surface formed by the curved edge portion of the cover and the curved side portion of the housing.

[0012] Some embodiments include a crown module that is positioned at least partially within an aperture formed within the curved side portion of the housing. The crown module may include an outer surface configured to receive a rotary user input. The crown module may be offset with respect to a centerline of the housing between the top portion and the flat bottom portion. The offset may be toward the top portion of the housing. The crown module may include a dial having a portion that is higher than an interface between the cover and the housing.

[0013] In some example embodiments, a port is formed in the curved side portion of the housing. An acoustic module may be disposed within the housing and configured to produce an audio output through the port. The acoustic module may include an acoustic element and an acoustic cavity that acoustically couples the acoustic element to the port. The port may include an orifice that is offset with respect to the acoustic cavity to prevent the direct ingress of liquid into the acoustic module.

[0014] In some embodiments, the device includes a gasket positioned between the housing and the cover. The housing may also include a ledge formed along a perimeter of the cavity. The gasket may be positioned along the ledge that is formed along the perimeter of the cavity. The gasket, the cover, and the housing may be configured to cooperate to form a substantially water-proof seal.

[0015] In some example embodiments, the device includes a biosensor module that is disposed in an opening formed in the flat bottom portion of the housing. The biosensor module may include a chassis positioned in the opening of the housing and defining an array of windows. An array of light sources may be attached to the chassis and configured to emit light into the user through the array of windows. The biosensor module may also include an optically transparent rear cover disposed over the chassis and over the array of windows and operative to pass light emitted from the array of light sources into the user. In some embodiments, the rear cover has a convex outer contour.

[0016] Some example embodiments are directed to an electronic device having a housing comprising a bottom portion defining an opening and a band attached to the housing and configured to secure the electronic device to a user. A biosensor module may be disposed within the opening of the housing. A rear cover may be disposed over the biosensor module and may

include an edge protruding outwardly from the bottom portion of the housing and an outer surface having a convex curved contour. In some embodiments, the outer surface of the rear cover defines one or more windows that provide operational access to one or more optical components of the biosensor module. The one or more windows may have a curvature that matches the convex curved contour of the outer surface.

[0017] In some embodiments, the biosensor module includes an array of light sources that are configured to emit light into a body of the user. The biosensor module may also include a photodetector configured to receive light produced by a light source of the array of light sources that is reflected from the body and produce a sensor signal. In some cases, the biosensor module is removably coupled to the housing.

[0018] In some embodiments, the device also includes a processing unit configured to compute a health metric associated with the user based on the sensor signal. The device may also include a display disposed within the housing and configured to display the health metric.

[0019] Some example embodiments are directed to a wearable electronic device, having a housing including a top portion, a cavity formed within the top portion, and a curved side portion that surrounds the cavity. The device may also include a transparent cover disposed over the cavity of the housing and may include a flat middle portion at a center of the transparent cover, a curved outer portion that emanates from and surrounds the flat middle portion and extends outwardly to an edge of the transparent cover, and a mask positioned relative to an internal surface of the transparent cover. The mask may have an outer boundary located proximate to the edge of the transparent cover and an inner boundary located within the curved outer portion of the transparent cover.

[0020] In some embodiments, the device includes a display disposed below the transparent cover. A perimeter portion of a viewable area of the display may be disposed below the mask. The device may also include an antenna having a shape that corresponds to a shape of the cavity formed within the housing. The antenna may be disposed in a groove formed in the internal surface of the transparent cover. The groove may be formed between the outer boundary and the inner boundary of the mask. In some embodiments, the cover is formed from a sapphire

material. The antenna may be configured to facilitate wireless communication between the wearable electronic device and an external device.

[0021] Some example embodiments are directed to an electronic device having a housing including a first end, a second end opposite the first end, a first side extending between the first and second ends, and a second side opposite to the first side and extending between the first and second ends. The first end may define a first groove extending between the first and second sides and may be configured to receive a first lug portion of a first band. The second end may define a second groove extending between the first and second sides and may be configured to receive a second lug portion of a second band. The first and second grooves may have an inwardly curved concave shape with an undercut feature that retains the first and second lug portions. In some embodiments, the first groove extends through a solid portion of the housing to form a continuous interior shape.

[0022] In some embodiments, the device includes a display at least partially disposed within a cavity of the housing. A cover may be disposed above the display and at least a portion of the first groove is disposed below the cover. The first and second grooves may be formed at an angle with respect to a centerline of the housing. The first and second grooves may be angled upward toward a top of the housing and inward toward the center of the housing. The first and second grooves may cross the centerline of the housing.

[0023] Some example embodiments are directed to a wearable electronic device including a housing and a band attached to the housing and configured to secure the wearable electronic device to a user. A crown may be disposed relative to the housing and configured to receive a rotational input. An encoder may be operatively coupled to the crown and configured to produce an encoder output that corresponds to the rotational input. A speaker module may be disposed within the housing and configured to produce an audio output that corresponds to the encoder output. A haptic device may be disposed within the housing and configured to produce a haptic output that corresponds to the encoder output. In some embodiments, the haptic output is synchronized with the audio output. The crown may be further configured to translate along an axis and actuate a tactile switch.

[0024] In some embodiments, the device also includes a display element within the housing. The device may be configured to display a list of items on the display element and scroll the list of items in response to the encoder output. The device may also be configured to synchronize the audio and haptic outputs with the scrolling of the list of items. In some embodiments, the crown is further configured to translate along an axis and actuate a tactile switch. The crown may be operative to select an item of the list of items when the tactile switch is actuated.

[0025] Some example embodiments are directed to a wearable electronic device having a housing that includes a bottom portion and an aperture formed in the bottom portion. A band may be attached to the housing and configured to secure the wearable electronic device to a user. A biosensor module may be disposed in the aperture of the housing. The biosensor module may include an array of light sources configured to emit light into a body of the user, and a photodetector configured to receive light produced by a light source of the array of light sources that is reflected from the body and produce a sensor signal. The device may also include a processing unit that is configured to compute a health metric associated with the user based on the sensor signal. A display may be disposed within the housing and configured to display the health metric.

[0026] In some embodiments, the array of light sources and the photodetector are configured to function as multiple photoplethysmography (PPG) sensors. Each PPG sensor may be configured to be used to compute a separate health metric. In some embodiments, a first light source of the array of light sources includes a green LED adapted to detect blood perfusion in the body. A second light source of the array of light sources may include an infrared LED adapted to detect water content of the body. The health metric may include one or more of: a heart rate, a respiration rate, a blood oxygenation level, and a blood volume estimate.

[0027] In some embodiments, the device also includes at least one pair of electrodes disposed on an exterior surface of the housing. The at least one pair of electrodes may be configured to produce a signal when the at least one pair of electrodes is in contact with the body. In some case, the signal is used to compute an additional health metric that includes one or more of: a heart function, a body fat estimate, and a body fat estimate.

[0028] Some example embodiments are directed to a wearable electronic device including a housing and a band attached to the housing and configured to secure the wearable electronic device to a user. The device may also include an array of light emitting diodes (LEDs) disposed within the housing, the array of LEDs being configured to emit light. A photodetector may be disposed within the housing and configured to receive light produced by an LED of the array of LEDs that is reflected from a body of the user and produce a first sensor signal in response to the received light. The device may also include at least one pair of electrodes disposed on an exterior surface of the wearable electronic device. The electrodes may be configured to produce a second sensor signal when the electrodes are in contact with a respective portion of the body. The device may also include a processing unit that is configured to compute one or more health metrics based on the first and second sensor signals. The device may also include a display disposed at least partially within the housing and configured to display the one or more health metrics.

[0029] Some example embodiments are directed to a wearable electronic device including a housing and a band attached to the housing and configured to secure the wearable electronic device to a user. A cover may be disposed relative to the housing and a display may be attached to a lower surface of the cover. A force sensor may be positioned between the cover and the housing and attaching the cover to the housing. The force sensor may be configured to detect the force of a touch on the cover. The force sensor may also form a barrier to prevent ingress of liquid into the wearable electronic device. In some embodiments, an antenna may be disposed relative to the cover and external from the housing. The antenna may be configured to facilitate wireless communication with an external device.

[0030] In some example embodiments, a wearable electronic device may include a housing and a band attached to the housing and configured to secure the wearable electronic device to a user. A display element may be positioned within the housing and a rechargeable battery may be disposed within the housing and operatively coupled to the display element. The device may also include a receive coil within the housing configured to inductively couple with an external transmit coil. A power conditioning circuit may be configured to recharge the rechargeable battery using power received by the receive coil. The power conditioning circuit may be configured to provide power to the display element. The device may also include a first

alignment magnet positioned within the receive coil and configured to align the device with respect to a second alignment magnet positioned within the external transmit coil.

[0031] Some example embodiments are directed to a wearable electronic device that includes a housing and a band attached to the housing and configured to secure the wearable electronic device to a user. A cover may be positioned relative to the housing and a display may be disposed within the housing and below the cover. A force sensor may be disposed within the housing and configured to detect a force of a touch on the cover. A touch sensor may be disposed between the display and the cover. The touch sensor may be configured to detect a location of the touch on the cover. In some embodiments, the force sensor is disposed along a perimeter of the display. The device may also include a processing unit and memory disposed within the housing. The processing unit may be configured to interpret a touch gesture on a surface of the cover using a force output from the force sensor and a touch output from the touch sensor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] The disclosure will be readily understood by the following detailed description in conjunction with the accompanying drawings, wherein like reference numerals designate like structural elements.

[0033] FIG. 1 depicts an example wearable electronic device having a device body and band.

[0034] FIG. 2 depicts an example schematic diagram of a wearable electronic device.

[0035] FIG. 3 depicts an example functional diagram for a wearable electronic device.

[0036] FIG. 4 depicts an example wearable electronic device as part of a system of devices.

[0037] FIG. 5 depicts a system of interchangeable components for a wearable device.

[0038] FIG. 6 depicts an example wearable electronic device having a device body and band.

[0039] FIG. 7 depicts an exploded view of components of an example wearable electronic device.

[0040] FIG. 8 depicts an example housing for a wearable electronic device.

[0041] FIG. 9 depicts an example force sensor configured to use a capacitive measurement.

[0042] FIGs. 10A-B depict plan views of example force sensors.

[0043] FIG. 11 depicts an example force sensor configured to use a resistive measurement.

[0044] FIG. 12 depicts an example pixelated force sensor configured to use a resistive measurement.

[0045] FIGs. 13A-B depict example force sensor structures.

[0046] FIGs. 14A-C depict an example touch sensor based on mutual capacitance.

[0047] FIGs. 15A-B depict an example touch sensor based on self capacitance.

[0048] FIG. 16 depicts an example device having biosensors.

[0049] FIG. 17 depicts an example device having wireless communications with an external device.

[0050] FIG. 18 depicts an example electronic device and example dock of an inductive charging system.

[0051] FIG. 19 depicts a block diagram of an example inductive charging system.

[0052] FIG. 20 depicts an example acoustic module.

[0053] FIGs. 21A-B depict an example cover and antenna.

[0054] FIGs. 22A-B depict an example haptic module.

[0055] FIG. 23 depicts an example device having a crown module with an encoder.

[0056] FIGs. 24A-B depict an example device having a crown module with a tactile switch.

[0057] FIGs. 25A-C depict an example receiving feature for a band.

[0058] FIG. 26 depicts example elements of a display.

DETAILED DESCRIPTION

[0059] Provided herein are descriptions and examples of a consumer product, which may include a portable electronic device, a wearable electronic device, or other type of device. By way of example and not by way of limitation, the consumer product may be an electronic device, a mechanical device, or an electromechanical device. Specific example devices include mobile phones, personal digital assistants, music players, timekeeping devices, health monitoring devices, tablet computers, laptop computers, glasses (electronic or otherwise), portable storage devices, and the like.

[0060] In one particular embodiment, the consumer product is a portable and, more specifically, a wearable consumer product. A wearable consumer product is one that can be worn by or otherwise secured to a user. For example, the consumer product may be a wearable electronic device including, but not limited to, a wearable computer, a wearable watch, a wearable communication device, a wearable media player, a wearable health monitoring device, and the like. A wearable consumer product may be worn by a user in a variety of ways. In some examples, the consumer product is a wrist-worn product and may include a band that can be wrapped around a user's wrist to secure the consumer product to the user's body. The device may include one or more other types of attachments including, for example, an armband, lanyard, waistband, chest strap, and the like.

[0061] Some aspects of the disclosure are directed to a wearable electronic device having improved functionality and/or versatility as compared to some traditional wearable devices. For example, some aspects of the disclosure are directed to a consumer product, such as a portable electronic device, having an expansive feature set integrated or incorporated into a compact form factor. In some aspects of the present disclosure, a consumer product may integrate or combine multiple subsystems into a single device to provide a wide range of functionality, including biometric sensing, touch-based user input, near-field communications, and other desirable features. In some aspects, multiple subsystems are integrated into the relatively compact space of a wrist-worn device. Some aspects of the following disclosure are directed to the integration of a variety of subsystems or modules to provide functionality that may not be possible using some traditional device platforms. In some cases, the configuration and/or functionality

provided by the various subsystems may be configurable by the end user, the manufacturer, and/or a vendor of the device. Example subsystems or modules of a consumer product and their respective functions are described below with respect to FIGs. 2 and 3.

[0062] Some aspects of the disclosure are directed to a consumer product that is configured to communicate wirelessly with any of a number of other devices, such as a mobile phone, computer, tablet computing devices, personal media players, televisions, networked home appliances, networked home controls, electronic systems in vehicles, and so on. Through wireless communication with other devices, the consumer product may transmit and/or receive various notifications, messages, or other information between devices. The wireless communication may also facilitate the relay of alerts or other device outputs to notify the user of an event or action. In some aspects, the consumer product may communicate wirelessly with any of a number of electronic accessories, including headset devices, portable speaker devices, portable microphone devices, display screens, and so on. An example communication system is described below with respect to FIG. 4 and with respect to other examples provided herein.

[0063] In some aspects, the consumer product may include a system of interchangeable components used to attach or secure the consumer product to the user. The system of interchangeable components may include a set of interchangeable bands or attachment devices that are configured to connect or attach to a receiving feature on the body of the product. The receiving feature may be standardized within the system of interchangeable components and allow multiple types of bands or attachment devices to be used with the same housing or body. The system of interchangeable components may also allow for an interchange between different bodies, which may include different types of electronic devices or other consumer products. Each body of the different devices or products may have a similar receiving feature that is standardized within the system of interchangeable components. An example system of interchangeable components is described below with respect to FIG. 5 and with respect to other examples provided herein.

[0064] Some aspects of the present disclosure are directed to a consumer product that includes a body that includes a case or housing used to protect as well as support the internal components of the product in their assembled position. The housing may enclose and support

various components, including, for example, integrated circuits, subsystems, modules, and other internal components of the device. In some aspects, the housing forms a water-resistant or water-proof barrier and also provides structural rigidity necessary to protect internal components. The housing may be formed as a single piece, which may enhance the structural rigidity, water impermeability, and manufacturability of the housing. An example housing and example internal components for a consumer product are provided below with respect to FIGs. 6-8 and with respect to other examples provided herein.

[0065] In some aspects, the consumer product includes a force sensor that is configured to detect and measure the magnitude of a force or pressure on a surface of the product. In some implementations, the force sensor includes a capacitive-based sensor that is configured to estimate the force based on a deflection or movement between capacitive plates that is caused by and correlates to the amount of force caused by a touch. In some implementations, the force sensor is a resistance- or charge-based sensor that is configured to estimate the force based on the deflection of a sheet or film that is positioned relative to the touch-sensitive surface of the product. In some implementations, the output from the force sensor is combined with the output from a touch sensor, which may be self-capacitive or mutually capacitive, or a combination of the two. Example force and touch sensors are described below with respect to FIGs. 9-15B and with respect to other examples provided herein.

[0066] In some aspects, the consumer product includes one or more biosensors. The biosensors may include optical and/or electronic biometric sensors that may be used to compute one or more health metrics. Example health metrics include, without limitation, a heart rate, a respiration rate, blood oxygenation level, a blood volume estimate, blood pressure, or a combination thereof. In some embodiments, the biosensors include an electrical sensor that may be used to measure electrocardiographic (ECG) characteristics, galvanic skin resistance, and other electrical properties of the user's body. An example consumer product having multiple biosensors is described below with respect to FIG. 16 and with respect to other examples herein.

[0067] In some aspects, the consumer product is configured to perform wireless communication with an external device. In some implementations, the wireless communication may include a Near Field Communication (NFC) interface. The NFC interface may be used to

identify the device and initiate a secure data connection, which may be used to authorize transactions, purchases, or conduct other forms of e-commerce. An example consumer product having wireless communications with an external device is described in more detail below with respect to FIG. 17 and with respect to other examples herein.

[0068] In some aspects, the consumer product is configured to recharge an internal battery using a wireless charging system. In some implementations, the consumer product includes one or more receiving inductive coils that are configured to cooperate with one or more transmitting inductive coils that are located in a charging dock or other external device. The wireless charging system may allow the transfer of power and/or wireless communications with the consumer product without the use of an external port or terminal connection. An example consumer product having wireless charging capabilities is described in more detail below with respect to FIGs. 18-19 and with respect to other examples herein.

[0069] In some aspects, the consumer product includes one or more acoustic modules that are configured to function as a speaker and/or a microphone for the product. The speaker and/or microphone may include features that enhance the water/liquid resistance or impermeability of the consumer product. The consumer product may also include a haptic module or actuator that is configured to produce a haptic output that may be perceived by the user. In some implementations, the output of an acoustic module, such as a speaker, and the haptic module may be used to provide feedback or an alert to the user. In some cases, an acoustic module and the haptic module provide feedback to the user and may be coordinated with a user input, such as user-interface selecting, user-interface scrolling, or other user input command. An example acoustic module is described below with respect to FIG. 20 and an example haptic module is described below with respect to FIGs. 22A-B.

[0070] In some aspects, the consumer product includes a dial or crown that is coupled to an encoder or other rotary sensor for detecting a rotary input. In some implementations, the output from the optical encoder is used to drive an aspect of a user interface or control other functionality of the product. Additionally, the dial or crown may include a tactile switch that can be actuated by pressing inward on the dial or crown. An example consumer product having a

crown is described below with respect to FIGs. 23-24B and with respect to other examples herein.

[0071] The description that follows includes sample devices, components, modules, systems, methods, and apparatuses that embody various elements of the present disclosure. However, it should be understood that various elements of the described disclosure may be combined and/or practiced in a variety of forms in addition to those described herein. In particular, the modules and components are described in a particular combination with respect to some examples provided below. However other combinations are possible, which may be achieved by adding, removing, and/or re-arranging modules to obtain a device or system having the desired characteristics.

[0072] FIG. 1 depicts a wearable consumer product 10. For example, the consumer product 10 may be a wearable electronic device. In one example, the consumer product 10 may be a wearable multifunctional electronic device including multiple functionalities such as time keeping, health monitoring, sports monitoring, medical monitoring, communications, navigation, computing operations, and/or the like. The functionalities may include but are not limited to: keeping time; monitoring a user's physiological signals and providing health-related information based on those signals; communicating (in a wired or wireless fashion) with other electronic devices or services, which may be different types of devices having different functionalities; providing alerts to a user, which may include audio, haptic, visual and/or other sensory output, any or all of which may be synchronized with one another; visually depicting data on a display; gathering data form one or more sensors that may be used to initiate, control, or modify operations of the device; determining a location of a touch on a surface of the device and/or an amount of force exerted on the device, and using either or both as input; accepting voice input to control one or more functions; accepting tactile input to control one or more functions; capturing and transmitting images; and so on. These and other functions and features will be described in more detail herein.

[0073] The wearable consumer product 10 can take a variety of forms. In one example, the consumer product 10 may be a wrist-worn electronic device. The device may include a variety of types of form factors including, wristbands, armbands, bracelets, jewelry, and/or the like.

[0074] In the illustrated embodiment, the consumer product 10 includes a device body 11. The device body 11 may include a housing that carries, encloses and supports both externally and internally various components (including, for example. integrated circuit chips and other circuitry) to provide computing and functional operations for the consumer product 10. The components may be disposed on the outside of the housing, partially within the housing, through the housing, completely inside the housing, and the like. The housing may, for example, include a cavity for retaining components internally, holes or windows for providing access to internal components, and various features for attaching other components. The housing may also be configured to form a water-resistant or water-proof enclosure for the body 11. For example, the housing may be formed from as a single unitary body and the openings in the unitary body may be configured to cooperate with other components to form a water-resistant or water-proof barrier.

[0075] Examples of components that may be contained in the device body 11 include processing units, memory, display, sensors, biosensors, speakers, microphones, haptic actuators, batteries, and so on. In some cases, the device body 11 may take on a small form factor. In cases such as these, the components may be packaged and/or in order to provide the most functionality in the smallest space. The components may also be configured to take up a minimal amount of space, which may facilitate the device body 11 having a small form factor. Additionally, the integration and assembly of the various components may be configured to enhance the reliability of the consumer product 10.

[0076] The construction of the housing of the device body 11 may be widely varied. For example, housing may be formed from a variety of materials including plastic, rubber, wood, silicone, glass, ceramics, fiber composites, metal or metal alloys, (e.g., stainless steel, aluminum), precious metals (e.g., gold, silver), or other suitable materials, or a combination of these materials.

[0077] Also in the illustrated embodiment, the wearable electronic device includes a band 12 or strap or other means for attaching to a user. The band 12 may, for example, be configured to attach to the body and provide a loop for securing to the wrist of the user. The band 12 may be integral with the housing or it may be a separate part. If integral, the band 12 may be a

continuation of the housing. In some cases, the integral band may be formed from the same material as the housing. If the band 12 is separate, the band may be fixed or releasably coupled to the housing. In both cases, the band 12 may be formed from similar or different materials as the housing. In most cases, the band 12 is formed from a flexible material such that it can conform to a user's body. Furthermore, the band 12 itself may be a single integral part or it may include attachment ends that provide an open and closed configuration. The attachment ends may, for example, be manifested as a clasp or other similar attachment mechanism or device. This particular configuration allows a user to open the band 12 for placement on the arm and close the band 12 in order to secure the band and body to the arm. The band 12 may be widely varied. By way of example, they may be formed from rubber, silicone, leather, metal, mesh, links and/or the like.

[0078] FIG. 2 depicts an example schematic diagram of a wearable electronic device. By way of example, device 100 of FIG. 2 may correspond to the consumer product 10 shown in FIG. 1. To the extent that multiple functionalities, operations, and structures are disclosed as being part of, incorporated into, or performed by device 100, it should be understood that various embodiments may omit any or all such described functionalities, operations, and structures. Thus, different embodiments of the device 100 may have some, none, or all of the various capabilities, apparatuses, physical features, modes, and operating parameters discussed herein.

[0079] As shown in FIG. 2, the device 100 includes one or more processing units 102 that are configured to access a memory 104 having instructions stored thereon. The instructions or computer programs may be configured to perform one or more of the operations or functions described with respect to the device 100. For example, the instructions may be configured to control or coordinate the operation of a display 120, one or more input/output components 106, one or more communication channels 108, one or more sensors 110, a speaker 122, a microphone 124 and/or one or more haptic feedback devices 112.

[0080] The processing units 102 of FIG. 2 may be implemented as any electronic device capable of processing, receiving, or transmitting data or instructions. For example, the processing units 102 may include one or more of: a microprocessor, a central processing unit (CPU), an application-specific integrated circuit (ASIC), a digital signal processor (DSP), or

combinations of such devices. As described herein, the term "processor" is meant to encompass a single processor or processing unit, multiple processors, multiple processing units, or other suitably configured computing element or elements.

[0081] The memory 104 can store electronic data that can be used by the device 100. For example, a memory can store electrical data or content such as, for example, audio and video files, documents and applications, device settings and user preferences, timing and control signals or data for the various modules, data structures or databases, and so on. The memory 104 can be configured as any type of memory. By way of example only, the memory can be implemented as random access memory, read-only memory, Flash memory, removable memory, or other types of storage elements, or combinations of such devices.

[0082] In the schematic diagram of FIG. 2, the one or more input components 106 are represented as a single item within the schematic diagram. However, input components 106 may represent a number of different input components, including buttons, switches, and dials for accepting user input, and so on. More specifically, the input components 106 may correspond to the buttons, dials, crowns or other devices for receiving input. Generally, the input components 106 are configured to translate a user-provided input into a signal or instructions that may be accessed using instructions executed on the processing units 102. In the present example, the input components 106 may include the hardware configured to receive the user input (e.g., button, switch, crown, and encoder) which is operatively coupled to circuitry and firmware used to generate signals or data that are able to be accessed using processor instructions. Each input component 106 may include specialized circuitry for generating signals or data and, additionally or alternatively, circuitry and firmware for generating signals or data may be shared between multiple input components 106. In some cases, the input components 106 produce user-provided feedback for application-specific input that corresponds to a prompt or user interface object presented on display 120. For example, the crown (item 642 of FIG. 6) may be used to receive rotational input from the user, which may be translated into an instruction to scroll a list or object presented on the display 120. The input components 106 may also produce user input for system-level operations. For example the input components 106 may be configured to interact directly with hardware or firmware being executed on the device 100 for system-level

operations, including, without limitation, power on, power off, sleep, awake, and do-not-disturb operations.

[0083] As shown in FIG. 2, the device 100 may also include one or more acoustic elements, including a speaker 122 and a microphone 124. The speaker 122 may include drive electronics or circuitry and may be configured to produce an audible sound or acoustic signal in response to a command or input. Similarly, the microphone 124 may also include drive electronics or circuitry and is configured to receive an audible sound or acoustic signal in response to a command or input. The speaker 122 and the microphone 124 may be acoustically coupled to respective ports or openings in the housing that allow acoustic energy to pass, but may prevent the ingress of liquid and other debris. As shown in FIG. 2, the speaker 122 and microphone 124 are also operatively coupled to the processing units 102, which may control the operation of the speaker 122 and microphone 124. In some cases, the processing units 102 are configured to operate the speaker 122 to produce an acoustic output that corresponds to an application or system-level operation being performed on the device 100. In some cases, the speaker 122 is operatively coupled to other modules, including, for example, input components 106, such as a crown or button. In some implementations, the device 100 is configured to produce an audible output that corresponds to the operation of the crown or buttons using the speaker 122. The microphone 124 may be configured to produce an output or signal in response to an acoustic stimulus. For example, the microphone 124 may be operatively coupled to the memory 104 and may be configured to record audio input, including human speech, music, or other sounds. In some cases, the microphone 124 may be configured to receive voice signals, which may be interpreted as voice commands by the processing units 102.

[0084] The one or more communication channels 108 may include one or more wireless interface(s) that are adapted to provide communication between the processing unit(s) 102 and an external device. In general, the one or more communication channels 108 may be configured to transmit and receive data and/or signals that may be interpreted by instructions executed on the processing units 102. In some cases, the external device is part of an external communication network that is configured to exchange data with wireless devices. Generally, the wireless interface may include, without limitation, radio frequency, optical, acoustic, and/or magnetic signals and may be configured to operate over a wireless interface or protocol. Example wireless

interfaces include radio frequency cellular interfaces, fiber optic interfaces, acoustic interfaces, Bluetooth interfaces, infrared interfaces, USB interfaces, Wi-Fi interfaces, TCP/IP interfaces, network communications interfaces, or any conventional communication interfaces.

[0085] In some implementations, the one or more communications channels 108 may include a dedicated wireless communication channel between the device 100 and another user device, such as a mobile phone, tablet, computer, or the like. In some cases, output, including audio sounds or visual display elements, are transmitted directly to the other user device for output to the user. For example, an audible alert or visual warning may be transmitted to a user's mobile phone for output on that device. Similarly, the one or more communications channels 108 may be configured to receive user input provided on another user device. In one example, the user may control one or more operations on the device 100 using a user interface on an external mobile phone, table, computer, or the like.

[0086] Additionally, as described in more detail below with respect to FIG. 17, the communications channels 108 may include a Near Field Communication (NFC) interface. The NFC interface may be used to identify the device and initiate a secure data connection, which may be used to authorize transactions, purchases, or conduct other forms of e-commerce.

[0087] As shown in FIG. 2, the device 100 also includes one or more sensors 110 represented as a single item within the schematic diagram. However, the sensors 110 may represent a number of different sensors, including devices and components that are configured to detect environmental conditions and/or other aspects of the operating environment. Example sensors 110 include an ambient light sensor (ALS), proximity sensor, temperature sensor, barometric pressure sensor, moisture sensor, and the like. Thus, the sensors 110 may also be used to compute an ambient temperature, air pressure, and/or water ingress into the device. In some embodiments, the sensors 110 may include one or more motion sensors for detecting movement and acceleration of the device 100. The one or more motion sensors may include one or more of the following: an accelerometer, a gyroscope, a tilt sensor, or other type of inertial measurement device.

[0088] The device 100 also includes one or more biosensors 118 and may include optical and/or electronic biometric sensors that may be used to compute one or more health metrics. As

described in more detail below with respect to FIG. 16, one or more of the biosensors 118 may include a light source and a photodetector to form a photoplethysmography (PPG) sensor. The optical (e.g., PPG) sensor or sensors may be used to compute various health metrics including, without limitation, a heart rate, a respiration rate, blood oxygenation level, a blood volume estimate, blood pressure, or a combination thereof. One or more of the biosensors 118 may also be configured to perform an electrical measurement using one or more electrodes. The electrical sensor(s) may be used to measure electrocardiographic (ECG) characteristics, galvanic skin resistance, and other electrical properties of the user's body. Additionally or alternatively, one or more of the biosensors 118 may be configured to measure body temperature, exposure to UV radiation, and other health-related information.

[0089] The device 100 may also include one or more haptic devices 112. The haptic device 112 may include one or more of a variety of haptic technologies such as, but not necessarily limited to, rotational haptic devices, linear actuators, piezoelectric devices, vibration elements, and so on. In general, the haptic device 112 may be configured to provide punctuated and distinct feedback to a user of the device. More particularly, the haptic device 112 may be adapted to produce a knock or tap sensation and/or a vibration sensation. As shown in FIG. 2, the haptic device 112 may be operatively coupled to the processing unit 102 and memory 104. In some embodiments, the haptic device 112 may be directly controlled by the processing unit 102. In some embodiments, the haptic device 112 may be controlled, at least in part, by the operation of an input component 106, including, for example, a button, dial, crown, or the like. The operation of the haptic device 112 may also be paired or linked to the operation of one or more other output devices, including, for example, the display 120 or the speaker 122.

[0090] As shown in FIG. 2, the device 100 may include a battery 114 that is used to store and provide power to the other components of the device 100. The battery 114 may be a rechargeable power supply that is configured to provide power to the device 100 while it is being worn by the user. The device 100 may also be configured to recharge the battery 114 using a wireless charging system. Accordingly, in some cases, the device may include a wireless power module 116 that may be configured to receive power from an external device or dock. The wireless power module 116 may be configured to deliver power to components of the device, including the battery 114. The wireless power module 116 and an external charging station or

dock may also be configured to transmit data between the device and a base or host device. In some cases, the wireless power module 116 may interface with the wireless charging station or dock to provide an authentication routine that is able to identify specific hardware, firmware, or software on the device in order to facilitate device maintenance or product updates. A more detailed description of an example wireless charging station is provided below with respect to FIGs. 18-19.

[0091] The device 100 may include a variety of other components, including for example, a camera or camera modules. The camera may be configured to capture an image of a scene or subject located within a field of view of the camera. The image may be stored in a digital file in accordance with any one of a number of digital formats. In some embodiments, the device 100 includes a camera, which includes an image sensor formed from a charge-coupled device (CCD) and/or a complementary metal–oxide–semiconductor (CMOS) device. The camera may also include one or more optical components disposed relative to the image sensor, including, for example, a lens, an filter, a shutter, and so on.

[0092] FIG. 3 depicts functional elements of the device 100, in accordance with some embodiments. In particular, FIG. 3 depicts the inputs that may be received and outputs that may be produced on an example device 100. By way of example, the device 100 may correspond to the devices shown in FIGs. 1 and 2. As shown in FIG. 3, the device 100 may include a force input 302 that may be produced using a force sensor that is configured to detect and measure the magnitude of a force of a touch on a surface of the device. The force input 302 may include a non-binary output that is generated in response to a touch. For example, the force input 302 may include a range of values or analog value that corresponds to the amount of force exerted on a surface of the device. Additionally or alternatively, the force input 302 may include binary (e.g., on, off) output in response to the force of a touch. The force input 302 may be used to control various aspects of the device. For example, the force input 302 may be used to control an aspect, such as a cursor or item selection on a user interface presented on the display of the device. The force input 302 may also be used to control the audio output 308, haptic output 312, and other functionality of the device. The force input 302 may also be used to distinguish between different types of input from the user. For example, a light touch from the user may be interpreted as a scroll command and used to index or scroll through a list of items on the display.

A harder touch from the user may be interpreted as a selection or confirmation of an item on the display. In some embodiments, the force input 302 is used to distinguish an intentional touch from the user from an incidental or accidental touch that may be ignored.

[0093] As shown in FIG. 3, the device 100 may also include a touch input 306 that may be produced using a touch sensor that is configured to detect and measure the location of a touch on a surface of the device. In some implementations, the touch sensor is a capacitive-based touch sensor that is disposed relative to the display or display stack of the device. The touch sensor may be a separate non-integrated sensor relative to the force sensor. In alternative embodiments, the touch sensor may also be physically and/or logically integrated with the force sensor to produce a combined output. The touch input 306 may be used to control various aspects of the device. For example, the touch input 306 may be used to control an aspect of the user interface presented on the display of the device. The touch input 306 may also be used to control the audio output 308, haptic output 312, and other functionality of the device.

[0094] In some cases, the logical integration of the force input 302 and the touch input 306 enhances the versatility or adaptability of device 100 by enabling a more sophisticated user interface than is currently available on some traditional wearable devices. In particular, the force input 302 and the touch input 306 may be combined to interpret a wider range of gestures and input commands than may be possible using, for example, only a touch input. For example, the force input 302 may provide a magnitude of a force of a touch, which may be used to distinguish between two touch input commands that have a similar location or gesture path. An improved touch interface using both force input 302 and touch input 306 may be particularly advantageous when interpreting touch commands on a relatively small area surface, such as a display screen or cover glass of a wearable electronic device.

[0095] As shown in FIG. 3, the device 100 may also include a button/dial input 310 that may be produced using an input device that is configured to receive input from the user. As described previously, the device 100 may include one or more buttons disposed on or near an external surface of the housing and are configured to receive input from a user. The device may also include a dial or crown that is configured to accept rotational input from the user. As described

in more detail below with respect to FIGs. 24A-B, the dial or crown may also include a push feature that is adapted to accept input from the user.

[0096] The device 100 may also accept audio input 314 using a microphone or other acoustic sensing device. The audio input 314 may be adapted to accept input from the user, including voice commands and other audio signal input. The audio input 314 may also be adapted to detect and measure ambient audio conditions that may be used to adjust the volume of the audio output 308 or operation of the haptic output 312. The audio input 314 may also be used to record an audio stream or voice message in accordance with an audio recording application or software program.

[0097] As shown in FIG. 3, the device 100 may include a display output 304 in accordance with some embodiments. The display output 304 includes visual or graphical output that may be produced using the display element of the device. In some embodiments, the display output 304 includes a graphical user interface produced using an operating system or software application executed on one or more processing units of the device. In one example, the display output 304 includes a graphical depiction that resembles a watch face or other timekeeping device. In other examples, the display output 304 includes a graphical interface for an e-mail, text messaging, or other communication-oriented program. The display output 304 may also present visual information that corresponds to one of the other functional aspects of the device 100. For example, the display output 304 may include information that corresponds to the biosensor input 320, sensor input 318, force input 302, touch input 306, and others.

[0098] As shown in FIG. 3 the device 100 may include an audio output 308 that may be produced with a speaker or acoustic module. The audio output 308 may include sounds or audio signals that are associated with the operation of the device. For example, the audio output 308 may correspond to the operation of an input device to provide audio feedback to the user. For example the audio output 308 may correspond to an input received in the form of a force input 302, touch input 306, and/or button/dial input 310. In some cases, the audio output 308 may also include a portion of an auditory alert that may be produced alone or combined with a haptic output 312 and/or display output 304 of the device 100.

[0099] The device 100 may also include a sensor input 318 produced using one or more sensors that may be configured to monitor and detect various environmental conditions. For example, the sensor input 318 may include signals or data produced using an ambient light sensor, proximity sensor, temperature sensor, barometric pressure sensor, or other sensor for monitoring environmental conditions surrounding or near the device. In general, the sensor input 318 may be used to adapt the functionality of the device 100 to conform to the one or more environmental conditions. For example, the brightness of the display output 304, the volume of the audio output 308, and/or the operation of the input to the device 100 may be based on the sensor input 318.

[0100] In some embodiments, the sensor input 318 includes input produced by one or more motion sensors. The motion sensors may include one or more of the following: an accelerometer, a gyroscope, a tilt sensor, or other type of inertial measurement device. A sensor input 318 produced using one or more motion sensors may be used to monitor and detect changes in motion of the device 100. Changes in linear and angular motion may be used to determine or estimate an orientation of the device relative to a known location or fixed datum. The sensor input 318 produced from the one or more motion sensors may also be used to track the movement of the user. The movement of the user may be used to facilitate navigation or map-guided functionality of the device. Additionally, input related to the gross movement of the user can be used as a pedometer or activity meter, which may be stored and tracked over time to determine health metrics or other health-related information. Additionally, in some embodiments, sensor input 318 from the one or more motion sensors may be used to identify motion gestures. For example, the motion sensors can be used to detect an arm raise or the position of a user's body (within a predetermined confidence level of certainty).

[0101] The device 100 may also include a biosensor input 320 produced using one or more biosensors or biosensor modules that are configured to monitor physiological and/or health conditions of a user. As discussed above with respect to FIG. 2, the device may include one or more optical sensors for measuring heart rate, blood pressure, oxygen saturation, or a combination thereof. The device may also include one or more sensors having electrical contacts that are disposed to contact the user's body. The sensors may be configured to measure electrocardiographic (ECG) characteristics, galvanic skin resistance, and other electrical

properties of the user's body. Additionally or alternatively, sensors may be configured to measure body temperature, exposure to UV radiation, and other health related information. The biosensor input 320 may be combined with other aspects of the device to provide heath-monitoring functionality. For example, the biosensor input 320 may be used to compute data that is presented using the display output 304. The operation of the biosensor input 320 may also be controlled using the force input 302, touch input 306, or other user input 310 to provide an interactive health monitoring function or application.

[0102] As shown in FIG. 3, the device may include a haptic output 312 that may be produced using one or more haptic devices that are configured to provide haptic feedback to the user. In particular, the haptic output 312 may be produced using one or more electromechanical subassemblies that are configured to induce motion or vibration in the device, which may be perceived or sensed by the user. In some cases, the haptic actuator or device is tuned to operate based on a resonance or near resonance with respect to the device, which may enhance haptic output. In some cases, the haptic actuator or device is configured to operate based on a resonance or near resonance with respect to some components of the device, such as the band or clasp of the device.

[0103] In some embodiments, the haptic output 312 may correspond to the operation of one or more other modules or subsystems. For example, the haptic output 312 may include a vibration or haptic feedback that corresponds to an audio alert or visual alert or signal produced by the acoustic module or display, respectively. Additionally or alternatively, the haptic output 312 may be operated in conjunction with an input from the user. The haptic output 312 may include haptic or force feedback that confirms that the user input was or is being received. By way of example, a haptic output 312 may include a click or vibration when the crown of the device is turned or a button is depressed. The haptic output 312 may also be coordinated with other functionality of the device including, for example, message transmission operations, power management operations, force sensor operations, biosensor operations, to provide a notification, to provide an alert, and others.

[0104] As shown in FIG. 3, the device 100 may also include communications input/output (I/O) 316, which may facilitate communication with an external device or system. The

communications I/O 316 may be produced using one or more wireless interfaces, including radio frequency cellular interfaces, fiber optic interfaces, acoustic interfaces, Bluetooth interfaces, Near Field Communication interfaces, infrared interfaces, USB interfaces, Wi-Fi interfaces, TCP/IP interfaces, network communications interfaces, or any conventional communication interfaces. In some cases, the communications I/O 316 may include signals and data received from an external device that has been paired or is otherwise in electronic communication with the device 100. The external data included in the communications I/O 316 may include, for example, message data associated with an electronic communication, notification data associated with an event, and/or data related to audio or visual content. The communications I/O 316 may also include an authorization or identification of external devices in communication with the device 100 or users associated with one or more external devices. Similarly, the communications I/O 316 may be used to output various forms of data or signals to one or more devices or systems that are external to the device 100. For example, the communications I/O 316 may include data or computations that are produced using the biosensor input 320 and/or the sensor input 318.

[0105] FIG. 4 depicts an example wearable electronic device 100 as part of a system of devices. By way of example, the wearable electronic device 100 of FIG. 4 may correspond to the devices shown in any of the previous figures. Generally, the wearable electronic device 100 may communicate wirelessly with any of a number of other devices, such as mobile phone 420, computer 430, tablet computing devices, personal media players, televisions, networked home appliances, networked home controls, electronic systems in vehicles, and so on. Additionally, the wearable electronic device 100 may communicate wirelessly with any of a number of electronic accessories, including headset devices, portable speaker devices, portable microphone devices, display screens, and so on. Communication may be through a wired or wireless connection, including any technology mentioned herein.

[0106] In some embodiments the wearable electronic device 100 may accept a variety of bands, straps, or other retention mechanisms (collectively, "bands"). These bands may be removably connected to the electronic device by a feature formed into the band or band assembly that is accepted in a recess or other aperture within the device and locks thereto. An example band interface is described in more detail below with respect to FIGs. 25A-C.

[0107] In general, a user may change combinations of bands and electronic devices, thereby permitting mixing and matching of the two categories. It should be appreciated that devices having other forms and/or functions may include similar recesses and may releasably mate with a lug and/or band incorporating a lug. In this fashion, a system of bands and devices may be envisioned, each of which is compatible with another. A single band may be used to connect to devices, as one further example; in such embodiments the band may include electrical interconnections that permit the two devices to transmit signals to one another and thereby interact with one another.

[0108] Insofar as the electronic device 100 may connect either physically or through a data communication link with other computing devices, the combination of devices and bands may be thought of as an ecosystem having multiple parts that interact with one another, may intelligently communicate with one another, may share functionality and/or may substitute for one another in terms of operations, output, input and the like. Examples of devices existing in such an ecosystem follow, but are illustrative rather that limiting.

[0109] As one example, a number of electronic devices 100, 420, 430 may each have identical or similar attachment structures that permit them to share a band or connector. A user may thus change the interconnected band and device(s) with respect to one another, permitting a number of different physical connections between different ecosystem components. In some embodiments, a band that serves to retain an electronic device only may be swapped for bands having additional functionalities, such as transmitting data between devices connected to the band, adding functionality to a connected device that the device lacks, providing additional power to a connected device, and so on. Further, different bands may look different, so that the appearance of the electronic device(s) in combination with a band(s) may change by changing the band(s) and/or device(s) with respect to one another.

[0110] As another example, electronic devices 100, 420, 430 may communicate with one another as part of the overall ecosystem. Data may be passed from one device 420 to another 100. This may be useful if the user 410 is wearing one electronic device 100 but is not near another device 430 that wishes to notify the user or interact with the user in some fashion. Continuing the example, the computer 430 may transmit a reminder or message to the wearable

device 100 to gain the user's attention. As another example, the computer 430 (or any other electronic device in the ecosystem) may transmit a state of an application or even the device itself to the wearable device 100. Thus, for example, if an application operating on the computer needs the user's attention, it may be gained through an alert issued by the wearable device.

[0111] Data communication between devices in an ecosystem may also permit the devices to share functionality. As one non-limiting example, electronic devices may share sensor data with one another to permit one device access to data it normally would not have, from a sensor it does not physically incorporate. Thus, any given device 100, 420, 430 may draw on the abilities of other devices in the ecosystem to provide an enhanced and relatively seamless experience for a user 410.

[0112] FIG. 5 depicts a system 500 of interchangeable components for a wearable device. By way of example, one or more of the devices of FIG. 5 may correspond to the devices shown in any of the previous figures. FIG. 5 depicts a system 500 including a variety of interchangeable components, including multiple device bodies 515, 525, 535 that are configured to connect via a standard interface to any one of a number of different bands 551a-b, 552a-b, 553a-b, 554a-b, and 555a-b. In addition, each of the three devices may be configured to connect via a standard interface to another type of non-band component, such as a lug 556a-b, non-band component, or other device.

[0113] As shown in FIG. 5, the system 500 may include a body or device that is adapted to attach to one or more bands, straps, or other similar component that may be used to attach the device to the body of a user. In some embodiments, the device may be interchangeable or interchanged to provide a different set of functions or features. In some embodiments, the bands or attachment components may be interchangeable or interchanged to provide desired functionality or features.

[0114] In the example depicted in FIG. 5, each of the devices includes at least one receiving feature 504 that is configured to interconnect with a corresponding feature 502 that is attached to or integrally formed with the end of each of the bands or other mating parts. In some embodiments, receiving feature 504 includes a channel or groove that is formed in one end of the device body. The mating feature 502 of a respective band or component may be configured to

slidably engage with the receiving feature 504 of a respective device body to attach the band or component. An example receiving feature is described in more detail below with respect to FIGs. 25A-C. In some embodiments, the receiving feature 504 and the mating feature 502 are standardized in the system 500 and, thus, any of the bands (551a-b, 552a-b, 553a-b, 554a-b, and 555a-b) can be interchangeably used with any of the device bodies 515, 525, 535.

[0115] With respect to FIG. 5, each of the bands may be formed from a different material or using a different construction. In the present example, bands 551a-b may be formed from a textile material that may be constructed from a pattern of thread or fiber material. The textile material may include a variety of materials, including natural fibers, synthetic fibers, metallic fibers, and so on. The bands 552a-b may be formed from a woven material and may be constructed from an array of warp fibers or threads interwoven with one or more weft fibers or threads. Similarly, the warp and weft fibers may include a variety of materials, including natural fibers, synthetic fibers, metallic fibers, and so on. The bands 553a-b may be formed from leather material 553a-b. In one example, the bands 553a-b are formed from a sheet or strip of cowhide; however, the bands 553a-b may also be formed from one of any number of types of animal hide. The leather material 553a-b may also include a synthetic leather material, such as vinyl or plastic. The bands 554a-b may be formed from a metallic mesh or link construction. For example the bands 554a-b may be formed from a Milanese mesh or other similar type of construction. The bands 555a-b may be formed from a silicone or other elastomer material.

[0116] In some cases, the band is a composite construction including various materials, which may be selected based on the end use or application. In some embodiments, a first band strap, or a first portion of the first band strap, may be made up of a first material and a second band strap, or a second portion of the second band strap, may be made from a second, different material. The band may also be made up of a plurality of links and, as such, the band may be resizable by, for example, adding or removing links. Example bands and band constructions are provided below in Section 12.

[0117] In the system 500, an interchangeable band may allow for individual customization of the device or to better adapt the device for a range of uses or applications. In some instances, the type of band that is selected and installed can facilitate a particular user activity. For example,

band 551a-b may be formed from a textile material and include a durable clasp that may be particularly well suited for exercise or outdoor activities. Alternatively, as discussed above the band 554a-b may be formed from a metallic material and include a thin or low-profile clasp that may be well suited for more formal or fashion-focused activities.

[0118] In some embodiments, the band may be coupled to a separate component having the mating feature 502. The band may be coupled using pins, holes, adhesives, screws, and so on. In yet other embodiments, the band may be co-molded or overmolded with at least a portion of the component having the mating feature 502. In some embodiments, the band is coupled to the component via a pin that allows the straps to rotate with respect to the component. The pin may be formed integrally with or disposed in a loop formed in the end of the band.

[0119] In the example system 500, each of the bands is shown as having a generic band clasp. However, the type of band clasp that is used may vary between embodiments. On example band clasp may include a first band strap having a buckle or tang assembly which is configured to interface with a second band strap having a series of apertures or holes formed with the strap. Additionally or alternatively, the bands may include a magnetic clasp having one or more magnetic elements on a first band strap that is configured to mate to one or more magnetic or ferromagnetic elements on a second band strap.

[0120] As shown in FIG. 5, the system may include multiple device bodies 515, 525, 535 that may vary in size, shape, and composition. The device body 515, 525, 535 may include one or more of the embodiments described herein and may include, but is not limited to a wearable computer, a wearable watch, a wearable communication device, a wearable media player, a wearable health monitoring device, and/or the like. In particular, the device body may correspond to the device body described with respect to device body 610 of device 100 (shown in FIG. 6).

1. Example Wearable Electronic Device

[0121] FIG. 6 depicts an example wearable electronic device, which may include various aspects of the device(s) described above. In some embodiments, multiple modules or subsystems are physically and operationally integrated together to provide particular

functionality or device features. In particular, the interaction between the subsystems, or the subsystems themselves, may be configurable by the user, manufacturer, or vendor to adapt the device to produce certain functionality. Some example combinations and interactions between the various modules and subsystems are expressly provided in the present description. However, the combinations and interactions provided herein are merely illustrative in nature and are not intended to be limiting on the scope of the disclosure.

[0122] FIG. 6 depicts an example configuration of a wearable electronic device 100. In particular, FIG. 6 depicts an electronic wearable device 100 including a device body 610 that may be configured to be attached to the wrist of a user using a band assembly 620. This configuration may also be referred to herein as a wearable device, a device, an electronic wristwatch, or an electronic watch. While these terms may be used with respect to certain embodiments, the functionality provided by the example electronic wearable device 100 may be substantially greater than or vary with respect to many traditional electronic watches or timekeeping devices.

[0123] In the present example, the exterior surface of the device body 610 is defined, in part, by the exterior surface of the housing 601 and the exterior surface of the cover 609. In the example depicted in FIG. 6, the device body 610 is substantially rectangular with round or curved side portions. The outer surfaces of the cover 609 and the housing 601 coincide at a joint interface and cooperate to form a continuous contoured surface. The continuous contoured surface may have a constant radius and may be tangent to a flat middle portion of the cover 609 and/or a flat bottom portion of the housing 601. In some embodiments, the cover 609 has substantially the same shape as a flat bottom portion and at least a portion of the curved side portions of the housing 601. A more complete description of the geometry of the cover 609 and the housing 601 is provided below with respect to FIGs. 7 and 8.

[0124] In the example of FIG. 6, the device 100 includes a display (item 120 of FIG. 2) that is disposed at least partially within an opening or cavity defined within a top portion of the housing 601 of the device body 610. The display may be formed from a liquid crystal display (LCD), organic light emitting diode (OLED) display, organic electroluminescence (OEL) display, or other type of display device. The display may be used to present visual information

to the user and may be operated in accordance with one or more display modes or the software applications being executed on the device 100. By way of example, the display may be configured to present the current time and date similar to a traditional watch or timepiece. The display may also present a variety of other visual information that may correspond to or be produced using one of the other modules in the device 100. For example, the display may be configured to display one of a variety of notification messages, which may be generated based on data received from the one or more sensors, the wireless communication system, or other subsystem of the device 100. The display may also be configured to present visual information or data that is based on the output of one or more sensor outputs. The display may also provide status or information related to a wireless charging process or battery power. The display may also present visual output or information related to media being produced using a speaker or acoustic module of the device 100. Accordingly, a variety of other types of visual output or information may be presented using the display.

[0125] In the current example, the display includes or is integrated with a cover 609 that helps to protect the display from physical impact or scratches. In the field of wearable devices, the cover 609 may also be referred to generically as a crystal or cover glass, regardless of the material that is used to form the cover 609. In some cases, the cover 609 is formed from a sheet or block of sapphire material. Sapphire may provide superior optical and surface hardness properties as compared to other materials. In some cases, the sapphire material has a hardness of approximately 9 on the Mohs scale. In alternative embodiments, the cover 609 is formed from a glass, polycarbonate, or other optically transparent material. The cover 609 may also be coated with one or more optical or mechanical enhancing materials or surface treatments. For example, interior and/or exterior surfaces of the cover 609 may be coated with an anti-reflective (AR), oleophobic or other coating to enhance the visible or functional properties of the display. Additionally, in some cases, the cover 609 may be configured to cooperate with an antenna used to facilitate wireless communication with an external device. FIGs. 21A-B, described in more detail below, provide one example embodiment of a cover configured to cooperate with an antenna.

[0126] In the example depicted in FIG. 6, the cover 609 is formed from a transparent material and, when assembled has an external surface and an internal surface. The cover 609 is

disposed above the display and encloses a cavity or opening formed in the top portion of the housing 601. In some embodiments, the external surface of the cover 609 cooperates with the external surface of the housing to form a substantially continuous external peripheral surface of the electronic device. As shown in FIG. 6, the external surface of the cover 609 has a flat middle portion at the center of the cover, which extends outwardly. The cover 609 also includes a curved edge portion that emanates from and surrounds the flat middle portion and extends outwardly to an edge at the side of the cover 609. In some embodiments, the cover 609 also includes an opaque mask disposed relative to the internal surface of the transparent cover. The opaque mask may correspond to or otherwise define the viewable area of the display 120. The mask may have an outer boundary that is located proximate the edge of the side of the cover 609 and has an inner boundary located within the curved edge portion of the cover 609.

[0127] As shown in FIG. 6, the cover 609 is disposed relative to a top portion of the housing 601. The housing 601 includes a top portion defining an opening, which is surrounded by a curved side portion. In the present example, the curved edge portion of the cover 609 coincides with the curved side portion of the housing 601 to form a continuous external surface of the electronic device 100. In some instances, the cover 609 may have a contour that follows or otherwise corresponds to a similar contour of the housing 601 to form a substantially continuous surface at the interface between the two components. As shown in FIG. 6, the cover 609 protrudes above the housing 601.

[0128] In some instances, the cover 609 is disposed relative to a touch sensor (item 702 of FIG. 7). In some embodiments, the touch sensor may be integrated with the display or other element of the device 100. The touch sensor may be formed from one or more capacitive sensor electrodes or nodes that are configured to detect the presence and/or location of an object or the user's finger that is touching or nearly touching the surface of the display. In some cases, the touch sensor includes an array of sensing nodes formed in accordance with a mutual capacitance sensing scheme.

[0129] In one example, the touch sensor may include an array of mutual capacitance touch nodes that can be formed by a two-layer electrode structure separated by a dielectric material. One layer of electrodes may comprise a plurality of drive lines and another layer of electrodes

may comprise a plurality of sense lines, and where the drive lines and the sense lines cross, mutual capacitive sense nodes are formed (also referred to as coupling capacitance). In some implementations, the drive lines and sense lines may cross over each other in different planes separated from one another by a dielectric. Alternatively, in other embodiments the drive lines and sense lines can be formed substantially on a single layer. An example touch sensor and touch-sensing node are described in more detail below with respect to FIGs. 14A-C and 15A-B.

[0130] Alternatively or additionally, the touch sensor may include one or more self-capacitive nodes or electrodes that are configured to detect a discharge of electrical current or charge when an object, such as a user's finger, contacts or nearly contacts a surface of the housing 601 or other surface of the device 100. Other types of electronically sensing nodes, including resistive, inductive, or the like, may also be integrated into a surface of the device 100.

[0131] In some embodiments, the device 100 may also include a force sensor (item 705 of FIG. 7). The force sensor may be disposed relative to the display 120 or integrated with other elements of the device 100. In some cases, the force sensor includes one or more force sensing structures or force-sensing nodes for detecting and measuring the magnitude of a force or pressure due to a touch on a surface of the device 100. The force sensor may be formed from or implement one or more types of sensor configurations. For example, capacitive and/or strain based sensor configurations may be used alone or in combination to detect and measure the magnitude of a force or pressure due to a touch. As described in more detail below, a capacitive force sensor may be configured to detect the magnitude of a touch based on the displacement of a surface or element on the device. Additionally or alternatively, a strain-based force sensor may be configured to detect the magnitude of a touch based on the deflection. Example force sensor and force-sensing modules are described in more detail below with respect to FIGs. 9-12.

[0132] As shown in FIG. 6, the device 100 also includes device body 610 including a housing 601 that upon which may be mounted or integrated with various components of the device 100. The housing 601 serves to surround at a peripheral region as well as support the internal components of the product in their assembled position. In some embodiments, the housing 601 may enclose and support internally various components (including for example integrated circuit chips and other circuitry) to provide computing and functional operations for

the device 100. The housing 601 may also help define the shape or form of the device. That is, the contour of the housing 601 may embody the outward physical appearance of the device. As such, it may include various ornamental and mechanical features that improve the aesthetical appearance and tactile feel of the device. For example, the housing 601 may include a contoured surface that includes rectilinear contours, curvilinear contours, or combinations thereof. The housing 601 may also include various surface features, including textures, patterns, decorative elements, and so on.

[0133] In the present example, the housing 601 is formed from a single piece, which may also be referred to as single-body, unitary, or uni-body design or construction. By utilizing a single-body construction, the structural integrity of the device may be improved as compared to a multi-piece construction. For example, a single body may be more easily sealed from contaminants as compared to a multi-piece enclosure. Additionally, a single-body enclosure may be more rigid due, in part, to the absence of joints or seams. The rigidity of the housing 601 may be further enhanced by increasing the material thickness in areas where mechanical stress may be greatest, while also maintaining or thinning other areas where mechanical stress may be lower or reduced. Variations in the thickness of the housing 601 may be possible by machining or casting the housing 601 as a single piece. Additionally, a single-body housing 601 may include one or more features for mounting or integrating the internal components of the device 100, which may facilitate manufacturing and/or assembly of the device 100.

[0134] An example housing 601 is described in more detail below with respect to FIG. 8. The housing 601 may be formed from a variety of materials, including, without limitation plastic, glass, ceramics, fiber composites, metal (e.g., stainless steel, aluminum, magnesium), other suitable materials, or a combination of these materials. Further, the housing 601 may include a surface treatment or coating, which may be formed from a variety of materials, including, without limitation aluminum, steel, gold, silver and other metals, metal alloys, ceramics, wood, plastics, glasses, and the like.

[0135] As discussed above, the display, the touch sensor, and force sensor may be disposed within the housing 601. In this example, one or more buttons 644 and a crown 642 used to receive user input may also be disposed within or relative to the housing 601. Other types of

user input, including for example, one or more dials, slides, or similar user input devices or mechanisms may also be disposed within or relative to the housing 601. As described in more detail with respect to FIGs. 7 and 8, the housing 601 may include various features for attaching and mounting the subassemblies and modules of the device 100. In particular, the housing 601 may have one or more openings for receiving the cover 609, the display, the force sensor, or other components. The housing 601 may also include one or more holes or openings for receiving the button 644 and crown 642 that are located around the perimeter of the device 100. In some embodiments, the housing 601 also includes internal features, such as bosses and threaded portions, that can be used to attach modules or components within the housing 601.

[0136] The device 100 may also include an ambient light sensor (ALS) that is configured to detect and measure changes in ambient lighting conditions. The ALS may include a photodiode and one or more optical elements or lenses for collecting light. An ALS may be located on an external facing surface that is less likely to be blocked when the device is worn or in use. The ALS may be used to adjust settings, including screen brightness and other visual output depending on the overall lighting conditions.

[0137] The housing 601 may also include one or more motion-sensing elements or devices for detecting motion of the device 100. For example, the device 100 may include one or more accelerometers that are configured to sense acceleration or changes in motion. Additionally or alternatively, the device 100 may include one or more gyroscopic sensors that are configured to detect changes in direction. In some cases, the one or more gyroscopic sensors may include a spinning mass that can be used to detect changes in angular velocity. Multiple motion-sensing elements may be used to detect motion along multiple directions or axes. The motion sensors may also be used to identify motion gestures. For example, the motion sensors can be used to detect an arm raise or the position of a user's body (within a predetermined confidence level of certainty). The one or more motion-sensing elements may be used to determine an orientation of the device relative to a known or fixed datum. For example, the device may include a compass and/or global positioning system (GPS) that can be used to identify an absolute position. The one or more motion sensing elements may then measure deviation or movement with respect to the absolute position to track movement of the device or the user wearing the device. In some implementations, the one or more motion-sensing elements are used to detect gross movement of

the device or user. The gross movement may be used as a pedometer or activity meter, which may be tracked over time and used to calculate a health metric or other health-related information.

[0138] Described in more detail with respect to FIG. 8, the housing 601 may also include one or more openings or orifices coupled to an acoustic module or speaker 122, which may include a speaker and/or a microphone subassembly. Although the housing 601 may include one or more openings or orifices, the housing 601 may still be substantially waterproof/water resistant and may be substantially impermeable to liquids. For example, the opening or orifice in the housing or enclosure may include a membrane or mesh that is substantially impermeable to liquid ingress. Additionally or alternatively, the geometry of the opening or orifice and other internal features of the housing 601 may be configured to reduce or impede the ingress of liquid or moisture into the device 100. In one example, the opening is formed from one or more orifices that are offset with respect to an internal acoustic chamber or cavity, which may prevent a direct path from the outside of the housing 601 into the acoustic module.

[0139] As shown in FIG. 6, the device 100 includes a device body 610 that may be attached to a user's wrist using a band 620. In the present example, the band 620 include a first band strap 621 attached to a first receiving feature 623 and a second band strap 622 attached to a second receiving feature 624. In some embodiments, the first and second band straps 621, 622 include a lug feature that is configured to attach to the first and second receiving features 623, 624, respectively. As shown in FIG. 6, the free ends of the band straps 621, 622 are connected with a clasp 625.

[0140] The band straps 621, 622 are formed from a flexible or compliant material that may be specially configured for a particular application. The band straps 621, 622 may be formed from a variety of materials, including, for example, leather, woven textiles, or metallic mesh materials. The material and construction of the band straps 621, 622 may depend on the application. For example, the band straps 621, 622 may be formed from a woven textile material configured for exposure to impact and moisture typically associated with outdoor activities. In another example, the band straps 621, 622 may be formed from a metallic mesh material that

may be configured to have a fine finish and construction that may be more appropriate for professional or social activities.

[0141] Similarly, the clasp 625 of the band 620 may be configured for a particular application or to work with a particular style of band. For example, if the band straps 621, 622 are formed from a metallic mesh material, the clasp 625 may include a magnetic clasp mechanism. In the present example, the device 100 is configured to be attached to the wrist of a user. However, in alternative embodiments, the device may be configured to be attached to the arm, leg or other body part of the user.

[0142] The housing 601 includes one or more features for attaching the band straps 621, 622. In the present example, the housing 601 includes a first receiving feature 623 and a second receiving feature 624 for attaching the first band strap 621 and the second band strap 622, respectively. In this example, the band straps 621, 622 include a lug portion that is adapted to mechanically engage with the receiving features 623, 624. A more detailed description of the receiving features and lugs is provided below with respect to FIGs. 25A-C. As shown in FIG. 6, the first 623 and second receiving features 624 may be integrally formed into the housing 601. In alternative embodiments, the receiving features may be formed from separate parts and may be attached to the housing 601 during manufacturing. In some embodiments, the receiving features 623, 624 may be configured to release the band straps 621, 622 from the device body 610 (e.g., the housing 601). For example, one or both of the receiving features 623, 624 may include a button or slide, which may be actuated by the user to release a corresponding band strap 621 and 622. One advantage of a releasable lug is that the user can swap between a variety of bands that may be specially configured for a particular use scenario. For example, some bands may be specially configured for sport or athletic activities and other bands may be configured for more formal or professional activities.

[0143] The device 100 may also include a rear cover 608 located on the rear-facing surface of the housing 601 of the device body 610. The rear cover 608 may improve the strength and/or scratch resistance of the surface of the device 100. For example, in some embodiments, the rear cover 608 may be formed from a sapphire sheet, zirconia, or alumina material having superior scratch resistance and surface finish qualities. In some cases, the sapphire material has a

hardness greater than 6 on the Mohs scale. In some cases, the sapphire material has a hardness of approximately 9 on the Mohs scale. Due to the superior strength of the sapphire material, a cover glass formed from a sapphire sheet may be very thin. For example, the thickness of a sapphire cover sheet may be less 300 microns thick. In some cases, the thickness of a sapphire cover sheet may be less than 100 microns thick. In some cases, the thickness of a sapphire cover sheet may be less than 50 microns thick. In some embodiments, the rear cover 608 is contoured in shape. For example, the rear cover 608 may have a convex curved surface.

[0144] FIG. 7 depicts an example exploded view of various modules and subassemblies of the device 100. As shown in FIG. 7, multiple components are configured to be disposed within and/or attached to the housing 601. The exploded view provided in FIG. 7 depicts one example arrangement of the components of the device 100. However, in other embodiments, arrangement, placement, and/or grouping of the subassemblies and the components of the subassemblies may vary.

[0145] In the present example, a main cavity of the housing 601 houses an electronics subassembly 720 and the battery 114 of the device. The electronics subassembly 720 includes one or more electrical circuit assemblies for coupling the various electrical components of the device 100 to each other and to power supplied by the battery 114. The electronics subassembly 720 may also include structural elements or components that provide structural rigidity for the electronics subassembly 720 and/or structural mounting or support for other components disposed within the housing 601. As shown in FIG. 7, within the cavity of the housing 601, the speaker 122, the crown module 642, and the battery 114 are all disposed above the electronics subassembly 720. In the present embodiment the top surface of the speaker 122, the crown module 642, and the battery 114 have a substantially similar height. In some embodiments, the speaker 122, the crown module 642, and the battery 114, when assembled in the housing 601, define an area for the display 120 within the cavity. Thus, as shown in FIG. 7, the display 120 may overlay the speaker 122, the crown module 642, and the battery 114, which overlay the electronics subassembly 720.

[0146] As shown in FIG. 7, the cover 609 is configured to fit within a corresponding recess formed within the housing 601. In particular, the cover 609 includes a vertical portion having a

height that corresponds to the depth of the recess formed within the housing 601. In this example, the device 100 includes a force sensor 705 disposed between the housing 601 and a cover subassembly 704. As described in more detail below with respect to FIGs. 9 and 10A-B, the force sensor 705 may be configured to detect a force placed on a surface of the cover 609 by detecting a relative deflection between the cover 609 (or cover subassembly 704) and the housing 601. In the present example, the force sensor 705 also forms a gasket or seal between the cover subassembly 704 and the housing 601. In some implementations, the seal is a water-proof or water-resistant seal that helps to prevent water or liquid ingress into the internal cavity of the housing 601. The force sensor 705 may also be used to join the cover subassembly 704 to the housing 601 using an adhesive or film.

[0147] In some embodiments, the cover subassembly 704 includes the cover 609 which is disposed above the touch sensor 702 and display 120. In the present example, the touch sensor 702 and the display 120 are attached to each other by an optically clear adhesive layer (OCA). Similarly, an OCA layer is used to attach the touch sensor 702 to the cover 609. Other adhesives or bonding techniques may be used to attach the display 120 and the touch sensor 702 to the cover 609. In some embodiments, the touch sensor 702 is integrated into the display 120 and the display 120 (and integrated touch sensor 702) are attached to the cover 609.

[0148] As shown in FIG. 7, the speaker 122 is also disposed within the cavity of the housing 601. The speaker 122 is adapted to mechanically and acoustically interface with a port formed in the side of the housing 601. In some embodiments, the port is configured to prevent a direct path for water or liquid into an acoustic chamber or cavity of the speaker 122. In some embodiments, the device 100 also includes a microphone that is similarly coupled to another port formed in the side of the housing 601. A more detailed description of the speaker 122 and microphone is provided below with respect to the acoustic module of FIG. 20.

[0149] In the present example, the haptic device 112 is also disposed within the cavity of the housing 601 proximate to the speaker 122. In some embodiments, the haptic device 112 is rigidly mounted to a portion of the housing 601. A rigid mounting between the housing 601 and the haptic device 112 may facilitate the transmission of vibrations or other energy produced by the haptic device 112 to the user. In the present example, the haptic device 112 includes a

moving mass that is configured to oscillate or translate in a direction that is substantially parallel with a rear face of the housing 601. In some implementations, this orientation facilitates the perception of a haptic output produced by the haptic device 112 by a user wearing the device 100. While this configuration is provided as one example, in other implementations, the haptic device 112 may be placed in a different orientation or may be configured to produce a haptic response using a rotating mass or other type of moving mass.

[0150] As shown in FIG. 7, the device also includes an antenna subassembly 722. In this example, a portion of the antenna subassembly 722 is disposed within the housing 601 and a portion of the antenna subassembly 722 is disposed within the cover assembly. In some implementations, a portion of the antenna subassembly 722 is disposed relative to a feature formed within the cover 609. An example embodiment is described in more detail below with respect to FIGs. 21A-B.

[0151] In the example depicted in FIG. 7, the device 100 also includes a crown module 642 which is disposed in an aperture or hole in the housing 601. When installed, a portion of the crown module 642 is located outside of the housing 601 and a portion of the crown module 642 is disposed within the housing 601. The crown module 642 may be configured to mechanically and/or electrically cooperate with the electronics subassembly 720. A more detailed description of an example crown module is provided below with respect to FIGs. 23 and 24A-B. The housing 601 also includes a button 644, which is disposed in an opening of the housing 601 and may be configured to mechanically and/or electrically cooperate with the electronics subassembly 720.

[0152] In the example depicted in FIG. 7, a biosensor module 710 is disposed in an opening formed in the rear surface of the housing 601. In some embodiments, the biosensor module 710 includes the rear cover 608 and may also include a chassis or plate that facilitates attachment of the biosensor module 710 to the housing 601. The chassis or plate or the cover sheet 608 may also include features or elements that facilitate a watertight seal between the biosensor module 710 and the housing 601. For example, the rear cover 608 may include a shelf or flange that may be used to form a seal between the biosensor module 710 and the housing 601. As described in more detail below with respect to FIG. 16, the biosensor module 710 may include one or more

light sources, one or more photodetectors, and one or more electrodes or conductive elements that are configured to detect and measure a physiological condition or property of the user.

[0153] In some embodiments, the rear cover 608 has an edge that protrudes outwardly from the back surface of the housing 601. The rear cover 608 may also have a convex curved area located between the edges of the rear cover 608. The convex curved area of the rear cover 608 may include one or more windows or apertures that provide operational access to one or more internal components located within the housing 601. In some embodiments, the windows have a curvature that matches the curvature of the convex curved area of the rear cover.

2. Example Housing

[0154] As described above, a wearable electronic device may include a device body that includes a housing or enclosure shell. As previously described, the housing may function as a chassis that physically integrates the various components of the device. The housing may also form a protective shell or housing for the components and function as a barrier against moisture or debris. In the present examples, the housing is formed as a uni-body, unitary, or single body or component. A single-body construction may be advantageous by providing mounting features directly into the housing, which may reduce space, reduce part count, and increase structural rigidity as compared to some alternative configurations. Additionally, a single-body construction may improve the housing's ability to prevent the ingress of moisture or debris by reducing or eliminating seams or joints between external components.

[0155] FIG. 8 depicts an example housing 601 in accordance with some embodiments. In the present example, the housing 601 is formed as a single body or component. As shown in FIG. 8, the housing 601 is formed as a single part or body. The housing 601 may be formed, for example, by machining or shaping a solid or cast blank having the approximate shape of the housing 601. In some implementations, the housing 601 may be configured to provide structural integrity for potentially delicate internal components and also withstand a reasonable impact.

[0156] In the present embodiment, the housing 601 is formed as a uni-body, unitary, or single-body construction having a flat bottom portion 801 and a top portion including flange 812. The top portion defines an internal cavity 805, which is surrounded by four sides 802a-d that are

integrally formed with the bottom portion 801. The internal cavity 805 can also be described as being defined by the top portion, the four sides 802a-d and the bottom portion 801. In this example, the internal cavity 805 has a rectangular (square) shape, although the specific shape may vary with different implementations. In the present example, the four sides 802a-d define a curved side portion of the housing 601 that extends from the bottom portion 801 to the top portion of the housing 601. Each side 802a-d is orthogonal to an adjacent side and each side 802a-d is connected to an adjacent side by a rounded corner. For example, side 802a is orthogonal to two adjacent sides 802b and 802d and is connected to those sides by respective rounded corners. The shape or contour of the rounded corners may correspond to the curvature of the curved portion of the housing 601. Specifically, the curvature of the rounded corners may match or correspond to the curvature of the continuous external surface formed by the housing 601 and the cover 609, as described above with respect to FIG. 6.

[0157] The sides 802a-d may vary in thickness in order to provide the structural rigidity for the device. In general, areas of high stress may have an increased material thickness as compared to areas of low stress, which may have a reduced material thickness. In particular, portions of the sides 802a-d near the bottom portion 801 may have an increased thickness as compared to portions of the sides 802a-d located further away from the bottom portion 801. This configuration may improve the structural rigidity and overall stiffness of the housing 601.

[0158] As shown in FIG. 8, one or more mounting features may be formed directly into the housing 601, which may reduce the number of parts and also enhance the structural integrity of the device. As shown in FIG. 8, receiving features 623, 624 may be formed as channels or openings that are configured to receive an end of a band (e.g., a lug) having a mating feature. As described above with respect to FIG. 5, the receiving features 623, 624 may be standardized and configured to work with a system of interchangeable components. Forming the receiving features 623, 624 directly into the housing 601 may reduce parts and also facilitate structural rigidity of the device.

[0159] In the example depicted in FIG. 8, the housing 601 can be described as having two ends (a first end and a second end opposite the first end), and a first side and a second side opposite the first side, the sides being continuous with the ends. In this example, the first and

second ends and the first and second sides having an outwardly curved three-dimensional shape. In this example, the receiving feature 623 is formed from a first groove situated in the first end. Similarly, the receiving feature 624 is formed from a second groove situated in the second end. In the present example the grooves have openings at the interface of the first and second sides and first and second ends. As shown in FIG. 8 the groove also has an inwardly curved concave three-dimensional shape with an undercut feature. For example, the middle portion of the groove of receiving features 623, 624 may have a width that is greater than the opening of the receiving features 623, 624. In some embodiments, the upper portion of the housing overhangs the lower portion of the housing at the groove opening. In the example depicted in FIG. 8, the groove is cut into a solid portion of the housing such that the groove forms a continuous interior shape.

[0160] The geometry of the receiving features may be located with respect to other features or components of the device. In the example depicted in FIG. 8, at least a portion of the groove of the receiving features 623, 624 may be disposed underneath the cover (item 609 of FIGs. 6-7). With respect to FIG. 6, the groove of the receiving features 623, 624 is located underneath the opening for the cover, which is defined by the sealing ledge 810 and flange 812 formed in the upper portion of the housing 601. In some embodiments, the length of the groove extends further than the width of the opening configured to receive the cover (and thus the cover, when assembled). In some embodiments, the grooves are formed at an angle relative to the centerline of the housing. In some cases, the angle is approximately 5 degrees. In some embodiments, the groove is located underneath the centerline of the housing 601. In some embodiments, the groove is angled upward toward the top of the housing 601 and inward toward the center of the housing 601. The groove 601 may angle upward and cross the centerline of the housing. In some cases, the groove crosses the vertical centerline of the housing 601.

[0161] In the present embodiment, the housing 601 also includes an aperture 821 formed into the side 802c of the housing 601 for attaching a crown or crown module (item 642 of FIGs. 6-7). In some embodiments, the aperture 821 for the crown is offset upwardly from the centerline of the housing 601. In some embodiments, the aperture 821 for the crown is positioned such that an upper portion of a crown (when installed) is higher than the interface of cover 609 and housing 601. With respect to FIG. 6, the interface may correspond to the upper edge of the flange 812.

[0162] The housing 601 also includes an opening 822 formed into the side 802c of the housing 601 for attaching the button (item 644 of FIGs. 6-7). In some embodiments, the aperture 821 for the crown and the opening 822 for the button are disposed with the length defined by a flat part of the cover. In some embodiments, the aperture 821 for the crown is disposed above the centerline of the housing 601 and the opening 822 for the button is disposed below the centerline of the housing 601. In some embodiments, the aperture 821 for the crown and the opening 822 for the button are disposed on a curved surface of the housing 601. The housing 601 may also include various other internal features, including threaded features and bosses, for attaching other internal components of the device.

[0163] In some cases, the housing 601 may be formed as a single-piece or integral enclosure shell to enhance the structural rigidity and/or liquid-sealing properties of the device. As described above with respect to FIGs. 6 and 7, the housing 601 may be integrated with a cover (e.g., crystal) and other external components to provide a substantially sealed housing. In the present embodiment, the housing 601, includes a sealing ledge 810 formed around the perimeter of the main cavity 805 formed within the housing 601. In some embodiments, the sealing ledge 810 (and thus the cover when installed) is located in the center of the housing 601. The sealing ledge 810 may be defined by a substantially flat portion 811 that is adapted to form a seal between the housing 601 and another component (e.g., the force sensor 705 or cover 609 of FIGs. 6-7). The sealing ledge 810 may be formed at a depth that is substantially similar or corresponds to the thickness of the mating cover.

[0164] As shown in FIG. 8, the sealing ledge 810 may also include flange 812 that protrudes from the flat portion and forms a continuous surface with the side walls 802a-d. In some cases, the flange 812 is configured to cooperate with the cover (item 609 of FIGs. 6-7) to form a substantially continuous surface. In some implementations, the sides 802a-d and the cover or crystal are configured to cooperate or mechanically interface to improve the strength and the water sealing properties of the device.

[0165] As also shown in FIG. 8, an opening or aperture 815 may be formed in the bottom portion 801 of the housing 601. In some embodiments, the opening or aperture 815 is located at the center of the housing 601. As described above with respect to FIG. 7, the aperture 815 may

be used to integrate a sensor array or other module used to collect measurements that may be used to compute a health metric or other health-related information. The present embodiment may be advantageous by integrating multiple components in a single opening 815, which may facilitate a water-proof or water-resistant property of the device. Additionally, by integrating a sensor array into a module that attaches via the opening 815, same housing 601 may be used with a variety of sensing configurations or arrays. For example, the number or sensors or components may be increased or decreased without modifying the housing 601. This may allow for flexibility in the product development and may facilitate upgrades as new sensing configurations are available.

[0166] As previously discussed above with respect to FIGs. 6-7, the housing 601 may also be configured to serve as a protective housing for one or more acoustic elements, such as a microphone or speaker. Additionally, in some embodiments, the housing 601 may also be configured to inhibit the ingress of foreign particulate or moisture. In particular, the housing 601 may include a speaker port having orifices 831, 832 that are configured to transmit acoustic signals but also prevent the ingress of liquid or other foreign particulate. In the present example, the speaker port includes orifices 831, 832 that are offset with respect to an acoustic chamber or cavity to prevent the direct ingress of liquid into the speaker subassembly or acoustic module. In the present example, a shielding or umbrella portion of the housing, which is substantially free of openings, is formed between the orifices 831, 832, which helps to prevent the direct ingress of liquid. Similarly, the housing 601 includes a microphone port having orifices 833, 834 that are offset from a corresponding acoustic chamber or cavity to prevent the direct ingress of liquid into the microphone subassembly or acoustic module.

[0167] In the example depicted in FIG. 8, the orifices 831, 832 of the speaker port are located on one side of the aperture 821 for the crown and the orifices 833, 834 for the microphone are located on the other side of the aperture 821. Both the orifices 831, 832 of the speaker port and the orifices 833, 834 for the microphone are located on a curved portion of the housing 601.

3. Example Force Sensor and Touch Sensor

[0168] As discussed previously, a wearable electronic device may include one or more sensors for detecting the location and force of a touch. For the purposes of the following description of the force sensor and touch sensor, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100 including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0169] In some embodiments, a force sensor and a touch sensor may be disposed relative to the display of a wearable electronic device for to form a touch-sensitive surface. The following description is provided with respect to individual force and touch sensors that may be used to determine the force and location of a touch, respectively. However, in some embodiments, a single integrated sensor may be used to detect both the force and location of a touch on the device.

[0170] In one embodiment, an output from a force sensor may be combined with a touch sensor to provide both location and force of a single touch or of multiple touches on the surface of a device. In an alternative embodiment, a hybrid or integrated force and touch sensor may be used to sense both touch force and location of a single touch or of multiple touches. In either embodiment, by sensing both the force and location of a touch, multiple types of user input may be generated and interpreted. In one example, a first touch may be correlated with a first force and a first touch location or gesture. Based on the magnitude of the force, the first touch may be interpreted as a first type of input or command. A second touch may be sensed as having a second, different force and a similar location or gesture as the first touch. Based in part on the magnitude of the second force, the second touch may be interpreted as a second type of input or command. Thus, a force sensor (alone or in combination with another touch sensor) may be used to produce different responses or outputs depending on the force of the touch.

[0171] The one or more force sensors may be formed from or may be implemented as one or more types of sensor configurations. For example, capacitive and/or strain based sensor configurations may be used alone or in combination to detect and measure the magnitude of a touch. As described in more detail below, a capacitive force sensor may be configured to detect

the magnitude of a touch based on the displacement of a surface or element on the device. Additionally or alternatively, a strain-based force sensor may be configured to detect the magnitude of a touch based on a deflection of the surface, such as the cover glass.

[0172] By way of example, the force sensor may include a capacitive force sensor, which may be formed from one or more capacitive plates or conductive electrodes that are separated by a compressible element or other compliant member. As a force is applied to a surface of the device, the compressible element may deflect resulting in a predictable change in the capacitance between the plates or electrodes. In some implementations, a capacitive force sensor may be formed from transparent materials and disposed over the display. In other implementations, a capacitive force sensor may be formed from non-transparent materials and disposed beneath or around the perimeter of a display.

[0173] FIG. 9 depicts a detail cross-sectional view of a portion of a force sensor 900 that may be arranged around the perimeter of a display 120. As shown in FIG. 9, a force-sensing structure 901 of the force sensor 900 may be disposed beneath the cover 609 and along the side of an edge or the perimeter of the display 120. In this example, the force sensor 900 is configured to detect and measure the force of a touch on the surface 911 of the cover 609. In the present embodiment, a first capacitive plate 902 is fixed with respect to the cover 609. A second, lower capacitive plate 904 is fixed with respect to the housing 601 and may be disposed on a shelf or mounting surface located along the perimeter of the device. The first capacitive plate 902 and the second capacitive plate 904 are separated by a compressible element 906.

[0174] In the configuration depicted in FIG. 9, a touch on the surface 911 of the device may cause a force to be transmitted through the cover 609 of the device and to the force sensor 900. In some cases, the force causes the compressible element 906 to compress, thereby bringing the first capacitive plate 902 and the second capacitive plate 904 closer together. The change in distance between the first and second capacitive plates 902, 904 may result in a change of capacitance, which may be detected and measured. For example, in some cases, a force-sensing circuit may measure this change in capacitance and output a signal that corresponds to the measurement. A processor, integrated circuit or other electronic element may correlate the circuit output to an estimate of the force of the touch. Although the term "plate" may be used to

describe certain elements, such as the capacitive plates or conductive electrodes, it should be appreciated that the elements need not be rigid but may instead be flexible (as in the case of a trace or flex).

[0175] FIG. 10A depicts an example configuration of the force sensor 1000 having four individual force-sensing structures 1001a-d arranged around the perimeter of a display in a device. For the sake of clarity, the crystal, display, and other elements of the device are omitted from the depiction of FIG. 10A. Each of the force-sensing structures 1001a-d may be formed from a pair of capacitive plates separated by a compressible element. Additionally, each force-sensing structure 1001a-d may be separated by a small gap at or near the corners of the opening in the housing 601. In the example depicted in FIG. 10A, the four individual force-sensing structures 1001a-d may each be operatively coupled to force-sensing circuitry that is configured to detect a change in the capacitance of each force-sensing structure 1001a-d. Using the example arrangement depicted in FIG. 10A, the approximate location of the touch may be determined by comparing the relative change in capacitance of each force-sensing structure 1001a-d. For example, a change in capacitance of structure 1001b that is larger as compared to a change in capacitance of structure 1001d may indicate that the touch is closer to structure 1001b. In some embodiments, the degree of the difference in the change in capacitance may be used to provide a more accurate location estimate.

[0176] While the configuration shown in FIG. 10A depicts the force-sensing structures as individual elements separated by a small gap, in some embodiments, the force-sensing structure may be formed as a single continuous piece. FIG. 10B depicts a force sensor 1050 formed as a single force-sensing structure 1051 formed as a continuous part along the perimeter of the display. Similar to the example described above, the force-sensing structure 1051 may be operatively coupled to force sensing circuitry that is configured to detect a change in the capacitance of one or more capacitive elements of the force-sensing structure 1051. While the force-sensing structure 1051 is formed as a continuous structure, there may be multiple sensing elements (e.g., capacitive plates) that are disposed within the structure at different locations, and which may be configured to detect deflection or compression of the structure over a portion of entire area of the force-sensing structure 1051. In some embodiments, the force-sensing structure 1051 may also function as a seal or gasket to prevent ingress of moisture or other

foreign contaminants into the main cavity of the housing. Additionally, the force-sensing structure 1051 may be integrated with one or more sealing or adhesive layers that also function as a barrier for foreign contaminants.

[0177] As mentioned previously, the force sensor may additionally or alternatively include a strain-based sensing configuration. The strain-based sensing configuration may include, for example, a charge-based or resistive sensor configuration. FIG. 11 depicts a cross-sectional view of a device having an example force sensor 1100 that uses one or more force-sensitive films to detect and measure the force of a touch on a surface 1111 of the cover 609. In this example, the force sensitive film 1102 and 1104 are formed from a transparent material and are disposed relative to a viewable portion of the display 120. As shown in FIG. 11, the force sensor 1100 includes a first force-sensitive film 1102 and a second force-sensitive film 1104 that are separated by one or more intermediate layers 1106. The force-sensitive films 1102, 1104 may be configured to produce different electrical outputs in response to a strain or deflection of the cover 609. In some cases, the intermediate layer 1106 is compressible to allow the first force-sensitive film 1102 to deflect with respect to the second force-sensitive film 1104. In other cases, the intermediate layer 1106 may not be compressible and the first force-sensitive film 1102 deflects in a predictable manner with respect to the second force-sensitive film 1104. While FIG. 11 depicts an example force sensor 1100 having two force-sensitive films, alternative embodiments may include only a single force-sensitive film or, alternatively, include more than two force-sensitive films.

[0178] In general, a transparent force-sensitive film may include a compliant material that exhibits an electrical property that is variable in response to deformation or deflection of the film. The transparent force-sensitive film may be formed from a piezoelectric, piezo-resistive, resistive, or other strain-sensitive materials. Transparent resistive films can be formed by coating a substrate with a transparent conductive material. Potential transparent conductive materials include, for example, polyethyleneioxythiophene (PEDOT), indium tin oxide (ITO), carbon nanotubes, graphene, silver nanowire, other metallic nanowires, and the like. Potential substrate materials include, for example, glass or transparent polymers like polyethylene terephthalate (PET) or cyclo-olefin polymer (COP). Typically, when a piezo-resistive or resistive film is strained, the resistance of the film changes as a function of the strain. The

resistance can be measured with an electrical circuit. In this way, a transparent piezo-resistive or resistive film can be used in a similar fashion as a strain gauge.

[0179] If transparency is not required, then other film materials may be used, including, for example, Constantan and Karma alloys for the conductive film and a polyimide may be used as a substrate. Nontransparent applications include force sensing on track pads or the back of display elements. In general, transparent and non-transparent force-sensitive films may be referred to herein as "force-sensitive films" or simply "films."

[0180] In some embodiments, the force-sensitive film is patterned into an array of lines, pixels, or other geometric elements herein referred to as film elements. The regions of the force-sensitive film or the film elements may also be connected to sense circuitry using electrically conductive traces or electrodes. FIG. 12 depicts a cross-sectional view a device having a strain-based force sensor 1200 formed from one or more strain pixel elements 1202 and 1204 separated by intermediate layer 1206. Each of the pixel elements 1202, 1204 may be separated by a gap 1210. In the present example, each pixel element 1202, 1204 may exhibit a measurable change in an electrical property in response to a force being applied to the device. By way of example, as a force is applied to a surface 1211 on the cover 609, one or more of the pixel elements 1202, 1204 is deflected or deformed. Sense circuitry, which is in electrical communication with the one or more pixel elements 1202, 1204, may be configured to detect and measure the change in the electrical property of the film due to the deflection. Based on the measured electrical property of the pixel elements 1202, 1204, an estimated amount of force can be computed. In some cases, the estimated force may represent the magnitude of a touch on the surface 1211 of the device, and be used as an input to a graphical user interface or other element of the device. Additionally, in some embodiments, the relative strain of the individual pixel elements may be compared to estimate a location of the touch. While FIG. 12 depicts an example force sensor 1200 having two layers of pixel elements, alternative embodiments may include only a single layer of pixel elements or, alternatively, include more than two layers of pixel elements.

[0181] The pixel elements 1202, 1204 may be specifically configured to detect strain along one or more directions. In some cases, each pixel element 1202, 1204 includes an array of traces generally oriented along one direction. This configuration may be referred to as a piezo-resistive

or resistive strain gauge configuration. In general, in this configuration the force-sensitive-film is a material whose resistance changes in response to strain. The change in resistance may be due to a change in the geometry resulting from the applied strain. For example, an increase in length combined with decrease in cross-sectional area may occur in accordance with Poisson's effect. The change in resistance may also be due to a change in the inherent resistivity of the material due to the applied strain. For example, the applied strain may make it easier or harder for electrons to transition through the material. The overall effect is for the total resistance to change with strain due to the applied force.

[0182] Further, in a piezo-resistive or resistive strain gauge configuration, each pixel may be formed from a pattern of the force-sensitive-film, aligned to respond to strain along a particular axis. For example, if strain along an x-axis is to be measured, the pixel should have a majority of its trace length aligned with the x-axis. By way of example, FIG. 13A depicts a pixel element 1302 having traces that are generally oriented along the x-axis and may be configured to produce a strain response that is substantially isolated to strain in the x-direction. Similarly, FIG. 13B depicts a pixel element 1304 having traces that are generally oriented along the y-axis and may be configured to produce a strain response that is substantially isolated to strain in the y-direction.

[0183] In some embodiments, the force-sensitive film may be formed from a solid sheet of material and is in electrical communication with a pattern of electrodes disposed on one or more surfaces of the force-sensitive film. The electrodes may be used, for example, to electrically connect a region of the solid sheet of material to sense circuitry. This configuration may be referred to as a piezo-strain configuration. In this configuration, the force-sensitive film may generate a charge when strained. The force-sensitive film may also generate different amounts of charge depending on the degree of the strain. In some cases, the overall total charge is a superposition of the charge generated due to strain along various axes.

[0184] As mentioned previously, a force sensor may be combined with a touch sensor that is configured to detect and measure the location of a touch on the surface of the device. FIG. 14A depicts a simplified schematic representation of an example mutual capacitance touch sensor. As shown in FIG. 14A, a touch sensor 1430 may be formed by an array of nodes 1402 formed at the

intersection of an array of drive lines 1404 and sense lines 1406. In this example, stray capacitance C_{stray} may be present at each node 1402 (although FIG. 14A depicts only one C_{stray} for one column for purposes of simplifying the figure). In the example of FIG. 14A, AC stimuli V_{stim} 1414, V_{stim} 1415 and V_{stim} 1417 can be at different frequencies and phases. Each stimulation signal on a row can cause a charge $Q_{sig}=C_{sig}\times V_{stim}$ to be injected into the columns through the mutual capacitance present at the affected nodes 1402. A change in the injected charge (Q_{sig_sense}) can be detected when a finger, palm or other object is present at one or more of the affected nodes 1402. V_{stim} signals 1414, 1415 and 1417 can include one or more bursts of sine waves. Note that although FIG. 14A illustrates rows 1404 and columns 1406 as being substantially perpendicular, they need not be aligned, as described above. Each column 1406 may be operatively coupled to a receive channel of a charge-monitoring circuit.

[0185] FIG. 14B depicts a side view of an exemplary node in a steady-state (no touch) condition according to examples of the disclosure. In FIG. 14B, electric field lines 1408 between a column 1406 and a row 1404 separated by dielectric 1410 is shown at node 1402.

[0186] FIG. 14C depicts a side view of an exemplary pixel in a dynamic (touch) condition. An object such as finger 1412 can be placed near node 1402. Finger 1412 can be a low-impedance object at signal frequencies, and can have an AC capacitance C_{finger} from the column trace 1406 to the body. The body can have a self-capacitance to ground C_{body} of about 200 pF, where C_{body} can be much larger than C_{finger}. If finger 1412 blocks some electric field lines 1408 between row and column electrodes (those fringing fields that exit the dielectric 1410 and pass through the air above the row electrode), those electric field lines can be shunted to ground through the capacitance path inherent in the finger and the body, and as a result, the steady state signal capacitance C_{sig} can be reduced by DC_{sig}. In other words, the combined body and finger capacitance can act to reduce C_{sig} by an amount DC_{sig} (which can also be referred to herein as C_{sig_sense}), and can act as a shunt or dynamic return path to ground, blocking some of the electric field lines as resulting in a reduced net signal capacitance. The signal capacitance at the pixel becomes C_{sig}-DC_{sig}, where DC_{sig} represents the dynamic (touch) component. Note that C_{sig}-DC_{sig} may always be nonzero due to the inability of a finger, palm or other object to block all electric fields, especially those electric fields that remain entirely within the dielectric material. In addition, it should be understood that as finger 1412 is pushed harder or more completely onto

the touch sensor, finger 1412 can tend to flatten, blocking more and more of the electric fields lines 1408, and thus DC_{sig} may be variable and representative of how completely finger 1412 is pushing down on the panel (i.e., a range from "no-touch" to "full-touch").

[0187] Additionally or alternatively, the touch sensor may be formed from an array of self-capacitive pixels or electrodes. FIG. 15A depicts an example touch sensor circuit corresponding to a self-capacitance touch pixel electrode and sensing circuit. Touch sensor circuit 1509 can have a touch pixel electrode 1502 with an inherent self-capacitance to ground associated with it, and also an additional self-capacitance to ground that can be formed when an object, such as finger 1512, is in proximity to or touching the touch pixel electrode 1502. The total self-capacitance to ground of touch pixel electrode 1502 can be illustrated as capacitance 1504. Touch pixel electrode 1502 can be coupled to sensing circuit 1514. Sensing circuit 1514 can include an operational amplifier 1508, feedback resistor 1516, feedback capacitor 1510 and an input voltage source 1506, although other configurations can be employed. For example, feedback resistor 1516 can be replaced by a switch capacitor resistor. Touch pixel electrode 1502 can be coupled to the inverting input of operational amplifier 1508. An AC input voltage source 1506 can be coupled to the non-inverting input of operational amplifier 1508. Touch sensor circuit 1509 can be configured to sense changes in the total self-capacitance 1504 of touch pixel electrode 1502 induced by finger 1512 either touching or in proximity to the touch sensor panel. Output 1520 can be used by a processor to determine a presence of a proximity or touch event, or the output can be inputted into a discreet logic network to determine the presence of a touch or proximity event.

[0188] FIG. 15B depicts an example self-capacitance touch sensor 1530. Touch sensor 1530 can include a plurality of touch pixel electrodes 1502 disposed on a surface and coupled to sense channels in a touch controller, can be driven by stimulation signals from the sense channels through drive/sense interface 1525, and can be sensed by the sense channels through the drive/sense interface 1525 as well. After touch controller has determined an amount of touch detected at each touch pixel electrode 1502, the pattern of touch pixels in the touch screen panel at which touch occurred can be thought of as an "image" of touch (e.g., a pattern of fingers touching the touch screen). The arrangement of the touch pixel electrodes 1502 in FIG. 15B is

provided as one example; however, the arrangement and/or the geometry of the touch pixel electrodes may vary depending on the embodiment.

[0189] As previously mentioned, a force sensor may be implemented alone or in combination with another type of touch sensor to sense both touch force and touch location, which may enable more sophisticated user touch input than using touch location alone. For example, a user may manipulate a computer-generated object on a display using a first type of interaction using a relatively light touch force at a given touch location. The user may also interact with the object using a second type of interaction by using a relatively heavy or sharper touch force at the given location. As one specific example, a user may manipulate or move a computer-generated object, such as a window, using a relatively light touch force. Additionally or alternatively, the user may also select or invoke a command associated with the window using a relatively heavy or sharper touch force. In some cases, multiple types of interactions may be associated with multiple amounts of touch force.

[0190] Additionally, it may be advantageous for the user to be able to provide an analog input using a varying amount of force. A variable, non-binary input may be useful for selecting within a range of input values. The amount of force may, in some cases, be used to accelerate a scrolling operation, a zooming operation, or other graphical user interface operation. It may also be advantageous to use the touch force in a multi-touch sensing environment. In one example, the force of a touch may be used to interpret a complex user input performed using multiple touches, each touch having a different magnitude or degree of force. As a specific but non-limiting example, touch and force may be used in a multi-touch application that allows the user to play a varying tone or simple musical instrument using the surface of the device. In such a housing, the force of each touch may be used to interpret a user's interaction with the buttons or keys of a virtual instrument. Similarly, the force of multiple touches can be used to interpret a user's multiple touches in a game application that may accept multiple non-binary inputs at different locations.

4. Sensor or Biosensor Module

[0191] As described above with respect to FIG. 2, a wearable electronic device may include one or more sensors that can be used to calculate a health metric or other health-related

information. For the purposes of the following description of the biosensor module, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100 including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0192] In some embodiments, a wearable electronic device may function as a wearable health assistant that provides health-related information (whether real-time or not) to the user, authorized third parties, and/or an associated monitoring device. The wearable health assistant may be configured to provide health-related information or data such as, but not limited to, heart rate data, blood pressure data, temperature data, blood oxygen saturation level data, diet/nutrition information, medical reminders, health-related tips or information, or other health-related data. The associated monitoring device may be, for example, a tablet computing device, phone, personal digital assistant, computer, and the like.

[0193] In accordance with some embodiments, the electronic device can be configured in the form of a wearable electronic device that is configured or configurable to provide a wide range of functionality. As described above with respect to FIG. 2, the wearable electronic device 100 may include a processing units 102 coupled with or in communication with a memory 104, one or more communications channels 108, output devices such as a display 120 and speaker 122, one or more input components 106, and other modules or components. An example wearable electronic device 100 may be configured to provide or calculate information regarding time, health information, biostatistics, and/or status to externally connected or communicating devices and/or software executing on such devices. The device 100 may also be configured to send and receive messages, video, operating commands, and other communications.

[0194] With reference to FIG. 16, an example device 100 may include various sensors for measuring and collecting data that may be used to calculate a health metric or other health-related information. As one example, the wearable communication device can include an array of light sources 1611-1613 and a detector 1614 that are configured to function as an optical sensor or sensors. In one example, an optical sensor or sensors may implemented as a pairing of one or more light sources 1611-1613 and the detector 1614. In one example implementation, the detector 1614 is configured to collect light and convert the collected light into an electrical

sensor signal that corresponds to the amount of light incident on a surface of the detector 1614. In one embodiment, the detector may be a photodetector, such as a photodiode. In other embodiments, the detector 1614 may include a phototube, photosensor, or other light-sensitive device.

[0195] In some cases, the one or more optical sensors may operate as a photoplethysmography (PPG) sensor or sensors. In some instances, a PPG sensor is configured to measure light and produce a sensor signal that can be used to estimate changes in the volume of a part of a user's body. In general, as light from the one or more light sources passes through the user's skin and into the underlying tissue, some light is reflected, some is scattered, and some light is absorbed, depending on what the light encounters. The light that is received by the detector 1614 may be used to generate a sensor signal, which may be used to estimate or compute a health metric or other physiological phenomena.

[0196] The light sources may operate at the same light wavelength range, or the light sources can operate at different light wavelength ranges. As one example, with two light sources, one light source may transmit light in the visible wavelength range while the other light source can emit light in the infrared wavelength range. In some cases, a modulation pattern or sequence may be used to turn the light sources on and off and sample or sense the reflected light. With reference to FIG. 16, the first light source 1611 may include, for example, a green LED, which may be adapted for detecting blood perfusion in the body of the wearer. The second light source 1612 may include, for example, an infrared LED, which may be adapted to detect changes in water content or other properties of the body. The third 1613 light source may be a similar type or different types of LED element, depending on the sensing configuration.

[0197] The optical (e.g., PPG) sensor or sensors may be used to compute various health metrics, including, without limitation, a heart rate, a respiration rate, blood oxygenation level, a blood volume estimate, blood pressure, or a combination thereof. In some instances, blood may absorb light more than surrounding tissue, so less reflected light will be sensed by the detector of the PPG sensor when more blood is present. The user's blood volume increases and decreases with each heartbeat. Thus, in some cases, a PPG sensor may be configured to detect changes in blood volume based on the reflected light, and one or more physiological parameters of the user

may be determined by analyzing the reflected light. Example physiological parameters include, but are not limited to, heart rate, respiration rate, blood hydration, oxygen saturation, blood pressure, perfusion, and others.

[0198] While FIG. 16 depicts one example embodiment, the number of light sources and/or detectors may vary in different embodiments. For example, another embodiment may use more than one detector. Another embodiment may also use fewer or more light sources than are depicted in the example of FIG. 16. In particular, in the example depicted in FIG. 16, the detector 1614 is shared between multiple light sources 1611-1613. In one alternative embodiment, two detectors may be paired with two corresponding light sources to form two optical sensors. The two sensors (light source/detector pairs) may be operated in tandem and used to improve the reliability of the sensing operation. For example, output of the two detectors may be used to detect a pulse wave of fluid (e.g., blood) as it passes beneath the respective detectors. Having two sensor readings taken at different locations along the pulse wave may allow the device to compensate for noise created by, for example, movement of the user, stray light, and other effects.

[0199] In some implementation, one or more of the light sources 1611-1613 and the detector 1614 may also be used for optical data transfer with a base or other device. For example, the detector 1614 may be configured to detect light produced by an external mating device, which may be interpreted or translated into a digital signal. Similarly, one or more of the light sources 1611-1613 may be configured to transmit light that may be interpreted or translated into a digital signal by an external device.

[0200] Returning to FIG. 16, the device 100 may also include one or more electrodes to measure electrical properties of the user's body. In this example, a first electrode 1601 and second electrode 1602 are disposed on the rear face of the device 100. The first 1601 and second 1602 electrodes may be configured to make contact with the skin of the user's wrist when the device is being worn. As shown in FIG. 16, a third electrode 1603 and fourth electrode 1604 may be disposed along a periphery of the device body 610. In the configuration of FIG. 16, the third 1603 and fourth 1604 electrodes are configured to come into contact with the skin of the user's other hand (that is not wearing the device 100). For example, the third 1603 and fourth

1604 electrodes may be contacted when the user pinches the device 100 between two digits (e.g., a forefinger and thumb).

[0201] FIG. 16 depicts one example arrangement of electrodes. However, in other embodiments, one or more of the electrodes may be placed in locations that are different than the configuration of FIG. 16. For example, one or more electrodes may be placed on a top surface or other surface of the device 100. Additionally, fewer electrodes or more electrodes may be used to contact the user's skin, depending on the configuration.

[0202] Using the electrodes of the device, various electrical measurements may be taken, which may be used to compute a health metric or other health-related information. By way of example, the electrodes may be used to detect electrical activity of the user's body. In some cases, the electrodes may be configured to detect electrical activity produced by the heart of the user to measure heart function or produce an electrocardiograph (ECG). As another example, the electrodes of the device may be used to detect and measure conductance of the body. In some cases, the measured conductance may be used to compute a galvanic skin response (GSR), which may be indicative of the user's emotional state or other physiological condition. By way of further example, the electrodes may also be configured to measure other health characteristics, including, for example, a body fat estimate, body or blood hydration, and blood pressure.

[0203] In some embodiments, the optical sensors and electrodes discussed above with respect to FIG. 16 may be operatively coupled to sensing circuitry and the processing units 102 to define a health monitoring system. In this capacity, the processing units 102 may be any suitable type of processing device. In one embodiment, the processing units 102 include a digital signal processor. The processing units 102 may receive signals from the optical sensor(s) and/or electrodes and process the signals to correlate the signal values with a physiological parameter of the user. As one example, the processing units 102 can apply one or more demodulation operations to the signals received from the optical sensor. Additionally, the processing units 102 may control the modulation (i.e., turning on and off) of the light sources according to a given modulation pattern or sequence. The processing units 102 may also be used to calculate one or more biometrics or other heath related information.

[0204] In some implementations, the wearable electronic device may also receive sensor data or output from an external device. For example, an external mobile device having a global positioning system (GPS) may relay location information to the wearable device, which may be used to calibrate an activity metric, such as a pedometer or distance calculator. Similarly, sensor output of the wearable electronic device may be transmitted to an external device to compute health-related information. For example, output from an accelerometer in the wearable electronic device may be used determine a body position or gesture, which may be relayed to an external device and used to compute health-related information, such as activity level.

[0205] In some embodiments, some or all of the biosensors may be integrated into a module that is separate from and attached to the housing 601 of the device 100. As described above with respect to FIG. 6, in some embodiments, the biosensors are disposed relative to or attached to a rear cover 608 that is formed from an optically transparent material and is configured to be positioned with the opening of the housing 601. In some embodiments, the rear cover 608 is disposed completely within the area of the cover so that the two components completely overlap when viewed from above. In some embodiments, the rear cover 608 has an edge that protrudes outwardly from the back surface of the housing 601. In some embodiments, an edge of the rear cover 608 extends past a flat portion of the back surface of the housing 601. The rear cover 608 may also have a convex, curved outer contour. The rear cover 608 may have a convex shape that is located within the center and surrounded by the edges of the rear cover 608. The convex curved area of the rear cover 608 may include one or more windows or apertures that provide operational access to one or more internal components located within the housing. For example, the rear cover 608 may include an array of windows, each window including an aperture or opening for a respective light source 1611-1613 and/or the detector 1614. In some embodiments, the windows have a curvature that matches the curvature of the convex curved area of the rear cover 608. In some embodiments, rear cover 608 includes a chamfered edge and a curved bottom surface, the windows being disposed within the curved surface. In some embodiments, two openings of the rear cover 608 are located along a first axis (e.g., an x-axis) and two openings are located along a second axis (e.g., a y-axis) that is transverse to the first axis.

5. Example Wireless Communications with External Devices

[0206] A wearable electronic device may include a functionality for performing wireless communications with an external device. For the purposes of the following description, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0207] In some embodiments, the wireless communications are performed in accordance with a Near Field Communications (NFC) protocol. The communication may include an identification protocol and a secured data connection that can be used to identify the user, authorize activity, perform transactions, or conduct other aspects of electronic commerce.

[0208] FIG. 17 depicts an example system 1700 including a device 100 that is located proximate to a station 1710. The station 1710 may include a variety of devices, including, without limitation, a payment kiosk, a vending machine, a security access point, a terminal device, or other similar device. In some cases, the station 1710 is incorporated into a larger system or device. For example, the station 1710 may be incorporated into a security gate of a building or a payment center for a vending system.

[0209] As shown in FIG. 17, the device 100 is a wearable electronic device that may be placed proximate to the station 1710. In this example, a second device 1720 is carried by a user, and may also be placed proximate to the station 1710. In some embodiments, the device 100 and/or the second device 1720 includes a radio-frequency identification (RFID) system that is configured to enable one-way or two-way radio-frequency (RF) communications with the station 1710. The one- or two-way communication may include an identification of the device 100 and the station 1710 to initiate a secured data connection between the two devices. The secured data connection may be used to authorize a transaction between the user and an entity that is associated with the station 1710.

[0210] In some embodiments, the user may initiate a communication with the station 1710 by placing the device 100 near an active region on the station 1710. In some implementations, the station 1710 is configured to automatically detect the presence of the device 100 and initiate

an identification process or routine. The RFID system of the device may include a unique identifier or signature that may be used to authenticate the identity of the user. As previously mentioned, the identification process or routine may be used to establish a secure data connection between the device 100 and the station 1710. The secure data connection may be used to authorize a purchase or download of data to or from the device 100. In some cases, the secure data connection may be used to authorize the transfer of funds from a credit card or financial institution in exchange for a product that is associated with the station 1710. Other transactions or forms of electronic commerce may also be performed using the wireless communication between the device 100 and the station 1710.

6. Example Wireless Power System

[0211] As discussed above, a wearable electronic device may include an internal battery that is rechargeable using an external power source. For the purposes of the following description, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0212] One challenge associated with small devices is that it may be difficult to incorporate an electrical port for coupling the device to an external power source. Because wearable electronic devices have limited space for an external connector, it may be advantageous to electrically couple to a device without a cable or external connector. In at least some embodiments, the wearable electronic device described herein may be configured to operate as a receiver in a wireless power transfer system.

[0213] A wireless power transfer system, one example of which is an inductive power transfer system, typically includes a power-transmitting structure to transmit power and a power-receiving structure to receive power. In some examples, a power-receiving electronic device includes or otherwise incorporates an inductive power-receiving element configured to receive wireless power and/or charge one or more internal batteries. Similarly, a charging device may include or otherwise incorporate an indicative power-transmitting element configured to wirelessly transmit power to the power-receiving electronic device. The charging device may be configured as a base or dock on which the power-receiving electronic device rests or to which it

physically connects in some embodiments. In other embodiments, the charging device may be proximate the electronic device but not necessarily touching or physically coupled.

[0214] In many examples, the battery-powered electronic device may be positioned on an external surface of the power-transmitting device, otherwise referred to as a dock. In these systems, an electromagnetic coil within the dock (e.g., transmit coil) may produce a time-varying electromagnetic flux to induce a current within an electromagnetic coil within the electronic device (e.g., receive coil). In many examples, the transmit coil may transmit power at a selected frequency or band of frequencies. In one example the transmit frequency is substantially fixed, although this is not required. For example, the transmit frequency may be adjusted to improve inductive power transfer efficiency for particular operational conditions. More particularly, a high transmit frequency may be selected if more power is required by the electronic device and a low transmit frequency may be selected if less power is required by the electronic device. In other examples, a transmit coil may produce a static electromagnetic field and may physically move, shift, or otherwise change its position to produce a spatially-varying electromagnetic flux to induce a current within the receive coil.

[0215] The electronic device may use the received current to replenish the charge of a rechargeable battery or to provide power to operating components associated with the electronic device. Thus, when the electronic device is positioned on the dock, the dock may wirelessly transmit power at a particular frequency via the transmit coil to the receive coil of the electronic device.

[0216] A transmit coil and receive coil may be disposed respectively within housings of the dock and electronic device so as to align along a mutual axis when the electronic device is placed on the dock. If misaligned, the power transfer efficiency between the transmit coil and the receive coil may decrease as misalignment increases. Accordingly, in many examples, the wireless power transfer system may include one or more alignment assistance features to effect alignment of the transmit and receive coils along the mutual axis.

[0217] FIG. 18 depicts a front perspective view of an example wireless power transfer system 1800 in an unmated configuration. The illustrated embodiment shows an inductive power transmitter dock 1802 that is configured to couple to and wirelessly transmit power to an

inductive power receiver accessory, in this case device 100. The wireless power transfer system 1800 may include one or more alignment assistance features to effect alignment of the device 100 with the dock 1802 along a mutual axis. For example, the housings of the dock 1802 and the device 100 may assist with alignment. In one implementation, a portion of the housing of the device 100 may engage and/or interlock with a portion of the housing of the dock 1802 in order to effect the desired alignment. In some embodiments, a bottom portion of the device 100 may be substantially convex and a top surface of the dock 1802 may be substantially concave. In other examples, the interfacing surfaces of the dock 1802 and the device 100 may be substantially flat, or may include one or more additional housing features to assist with effecting mutual alignment.

[0218] In some embodiments, one or more actuators in the dock 1802 and/or device 100 can be used to align the transmitter and receiver devices. In yet another example, alignment assistance features, such as protrusions and corresponding indentations in the housings of the transmitter and receiver devices, may be used to align the transmitter and receiver devices. The design or configuration of the interface surfaces, one or more alignment assistance mechanisms, and one or more alignment features can be used individually or in various combinations thereof.

[0219] Alignment assistance can also be provided with one or more magnetic field sources. For example, a permanent magnet within the dock 1802 may attract a permanent magnet within the device 100. In another example, a permanent magnet within the device 100 may be attracted by a magnetic field produced by the dock 1802. In further examples, multiple alignment assistance features may cooperate to effect alignment of the transmit and receive coils. Power transfer efficiency may also decrease if the power consumption of the electronic device changes (e.g., the electronic device transitions from a trickle charge mode to constant current charge mode) during wireless power transfer.

[0220] As discussed previously with respect to FIG. 2, the device 100 may include a processor coupled with or in communication with a memory, one or more communication interfaces, output devices such as displays and speakers, and one or more input devices such as buttons, dials, microphones, or touch-based interfaces. The communication interface(s) can provide electronic communications between the communications device and any external

communication network, device or platform, such as, but not limited to, wireless interfaces, Bluetooth interfaces, Near Field Communication interfaces, infrared interfaces, USB interfaces, Wi-Fi interfaces, TCP/IP interfaces, network communications interfaces, or any conventional communication interfaces. The device 100 may provide information regarding time, health, statuses or externally connected or communicating devices and/or software executing on such devices, messages, video, operating commands, and so forth (and may receive any of the foregoing from an external device), in addition to communications.

[0221] In the example depicted in FIG. 18, the dock 1802 may be connected to an external power source, such as an alternating current power outlet, by power cord 1808. In other embodiments, the dock 1802 may be battery operated. In still further examples, the dock 1802 may include a power cord 1808 in addition to an internal or external battery. Similarly, although the embodiment is shown with the power cord 1808 coupled to the housing of the dock 1802, the power cord 1808 may be connected by any suitable means. For example, the power cord 1808 may be removable and may include a connector that is sized to fit within an aperture or receptacle opened within the housing of the dock 1802.

[0222] Although the device 100 is shown in FIG. 18 as larger than the dock 1802, the depicted scale may not be representative of all embodiments. For example, in some embodiments the dock 1802 may be larger than the device 100. In still further embodiments the two may be substantially the same size and shape. In other embodiments, the dock 1802 and device 100 may take separate shapes.

[0223] FIG. 19 depicts a simplified block diagram of relevant aspects of the device 100 and dock 1802. It may be appreciated that certain components of both the dock 1802 and device 100 are omitted from the figure for clarity. Likewise, the positions of the elements that are shown are meant to be illustrative rather than necessarily portraying a particular size, shape, scale, position, orientation, or relation to one another, although some embodiments may have elements with one or more of such factors as illustrated.

[0224] As described previously with respect to FIG. 2, the device 100 may include one or more electronic components located within the housing 601. For clarity, some of the components and modules described or depicted in various embodiments are omitted from the

depiction of FIG. 19. As shown in FIG. 19, the device 100 may include an internal battery 114 that may be used to provide power to the various internal components of the device 100. As described previously, the internal battery 114 may be rechargeable by an external power supply. In the present example, the internal battery 114 is operably connected to a receive coil 1869 via power conditioning circuit 1810.

[0225] In the present example, the device 100 includes a receive coil 1869 having one or more windings for inductively coupling with a transmit coil 1832 of the dock 1802. The receive coil 1869 may receive power wirelessly from the dock 1802 and may pass the received power to a battery 114 within the device 100 via power conditioning circuit 1810. The power conditioning circuit 1810 may be configured to convert the alternating current received by the receive coil 1869 into direct current power for use by other components of the device. In one example, the processing units 102 may direct the power, via one or more routing circuits, to perform or coordinate one or more functions of the device 100 typically powered by the battery 114.

[0226] As shown in FIG. 19, the dock 1802 includes a transmit coil 1832 having one or more windings. The transmit coil 1832 may transmit power to the device 100 via electromagnetic induction or magnetic resonance. In many embodiments, the transmit coil 1832 may be shielded with a shield element that may be disposed or formed around portions of the transmit coil 1832. Similarly, the receive coil 1869 may also include a shield element that may be disposed or formed around a portion of the receive coil 1869.

[0227] As shown in FIG. 19, the dock 1802 also includes a processor 1834 that may be used to control the operation of or coordinate one or more functions of the dock 1802. In some embodiments, the dock 1802 may also include one or more sensors 1836 to determine whether the device 100 is present and ready to receive transmitted power from the dock 1802. For example, the dock 1802 may include an optical sensor, such as an infrared proximity sensor. When the device 100 is placed on the dock 1802, the infrared proximity sensor may produce a signal that the processor 1834 uses to determine the presence of the device 100. The processor 1834 may, optionally, use another method or structure to verify the presence of the electronic device via sensor 1836. Examples of different sensors that may be suitable to detect or verify the

presence of device 100 may include a mass sensor, a mechanical interlock, switch, button or the like, a Hall effect sensor, or other electronic sensor. Continuing the example, after the optical sensor reports that the device 100 may be present, the processor 1834 may activate a communication channel to attempt to communicate with the device 100.

[0228] As illustrated in FIG. 19, a bottom surface of the housing of the device 100 may partially contact a top surface of the dock housing. In some implementations, the interfacing surfaces of the device 100 and the dock 1802 may be formed with complementary geometries. For example, as depicted in FIG. 19, the bottom surface of the device 100 is convex and the top surface of the dock 1802 is concave, following the same curvature as the bottom surface of the device 100. In this manner, the complementary geometries may facilitate alignment of the electronic device and dock for efficient wireless power transfer.

[0229] In some embodiments, the dock 1802 and device 100 may include other alignment assistance features. For example the device 100 may include an alignment magnet 1838 which is positioned and oriented to attract a corresponding alignment magnet 1840 within the dock 1802. In some cases, when the device 100 is positioned proximate the dock 1802, the alignment magnets 1838, 1840 may be mutually attracted, thereby affecting alignment of the portable electronic device 100 and the dock 1802 along a mutual axis. In other examples, the dock 1802 may include a ferromagnetic material in place of the alignment magnet 1840. In these examples, the alignment magnet 1838 may be attracted to the ferromagnetic material. In still further cases, the receive coil 1869 or transmit coil 1832 may produce a static magnetic field that either attracts or repels either or both of the alignment magnets 1838, 1840.

[0230] As shown in FIG. 19, the alignment magnets 1838, 1840 may be positioned within a respective coil 1869, 1832. When the alignment magnets 1838, 1840 are drawn together, the coils 1869, 1832 may be placed into alignment. Additionally, the complementary geometries of the device 100 and the dock 1802 may further facilitate alignment when the alignment magnets 1838, 1840 are drawn together.

7. Example Acoustic Module

[0231] As described above, the device may include one or more devices for transmitting and receiving acoustic energy. For the purposes of the following description of the acoustic module, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above. As previously discussed, in some embodiments, the device may include a speaker for transmitting acoustic energy and/or a microphone for receiving acoustic energy. For the purposes of the following description, a speaker device and a microphone are referred to generically as an acoustic module, which may be configured to transmit and/or receive acoustic energy depending on the particular implementation.

[0232] FIG. 20 depicts a simplified schematic cross-sectional view of a first embodiment of a device having an acoustic module 2006. The representation depicted in FIG. 20 is not drawn to scale and may omit some elements for clarity. The acoustic module 2006 may represent either a portion of a speaker and/or microphone device described above with respect to the electronic device 100 of FIG. 2.

[0233] As shown in FIG. 20, an acoustic port 2020 may be formed in the housing 601 of the electronic device. In the present example, the acoustic port 2020 includes first and second orifices 2031, 2032 that are formed in the housing 601 and acoustically couple the acoustic cavity 2011 of the acoustic module 2006 to the external environment (external to the electronic device). In the present embodiment, the first and second orifices 2031, 2032 are offset with respect to the opening of the acoustic cavity 2011. This configuration may help reduce the direct ingress of liquid 2001 into acoustic cavity 2011 of the acoustic module 2006 Also, as shown in FIG. 20 a shield 2021 or umbrella structure that is formed between the orifices 2031, 2032 blocks the direct ingress of liquid 2001 into the acoustic cavity 2011. As shown in FIG. 20, the acoustic module 2006 also includes a screen element 2015 disposed at one end of the acoustic cavity 2011, which may also prevent the ingress of liquid or other foreign debris into the acoustic cavity 2011. The acoustic module 2006 also includes a seal 2016 disposed between the housing

601 and the connector element 2012 of the module, which may also be configured to prevent the ingress of water into the device and/or module.

[0234] In the present example depicted in FIG. 20, the acoustic module 2006 may correspond to the speaker 122 described with respect to some embodiments. As shown in FIG. 20, the acoustic module 2006 includes various components for producing and transmitting sound, including a diaphragm 2010, a voice coil 2009, a center magnet 2008, and side magnets/coils 2007. These components may cooperate to form a speaker acoustic element. In one implementation, the diaphragm 2010 is configured to produce sound waves or an acoustic signal in response to a stimulus signal in the center magnet 2008. For example, a modulated stimulus signal in the center magnet 2008 causes movement of the voice coil 2009, which is coupled to the diaphragm 2010. Movement of the diaphragm 2010 creates the sound waves, which propagate through the acoustic cavity 2011 of acoustic module 2006 and eventually out the acoustic port 2020 to a region external to the device. In some cases, the acoustic cavity 2011 functions as an acoustical resonator having a shape and size that is configured to amplify and/or dampen sound waves produced by movement of the diaphragm 2010.

[0235] As shown in FIG. 20, the acoustic module 2006 also includes a yoke 2014, support 2013, connector element 2012, and a cavity wall 2017. These elements provide the physical support of the speaker elements. Additionally, the connector element 2012 and the cavity wall 2017 together form at least part of the acoustic cavity 2011. The specific structural configuration of FIG. 20 is not intended to be limiting. For example, in alternative embodiments, the acoustic cavity may be formed from additional components or may be formed from a single component.

[0236] The acoustic module 2006 depicted in FIG. 20 is provided as one example of a type of speaker acoustic module. In other alternative implementations, the acoustic module may include different acoustic elements for producing and transmitting sound, including, for example, a vibrating membrane, piezoelectric transducer, vibrating ribbon, or the like. Additionally, in other alternative implementations, the acoustic module may be a microphone acoustic module having one or more elements for converting acoustic energy into an electrical impulse. For example, the acoustic module may alternatively include a piezoelectric microphone acoustic element for producing a charge in response to acoustic energy or sound.

[0237] As previously mentioned, because the acoustic port 2020 connects the acoustic module 2006 to the external environment, there is a possibility that liquid may accumulate or infiltrate the interior of the module. In some cases, the screen element 2015 or other protective features may not prevent all liquid from entering the acoustic cavity 2011 of the module. For example, if the device is subjected to a liquid under pressure or a directed stream of liquid, some liquid ingress may occur. Additionally, naturally occurring moisture in the air may condense and accumulate over time resulting in the presence of liquid within the module. Thus, in some implementations, the acoustic module 2006 may include one or more elements configured to expel water or liquid that accumulates in, for example, the acoustic cavity 2011 of the module. The liquid expulsion process may include modifying the charge on a portion of the wall of the acoustic cavity 2011 to change the surface energy of the wall and/or producing an acoustic pulse using the diaphragm 2010 to help expel liquid from the acoustic cavity 2011. In some embodiments, the screen 2015 may also have hydrophilic or hydrophobic properties that may facilitate removal of liquid held within the acoustic cavity 2011.

8. Example Antenna and Cover

[0238] As previously described, a wearable electronic device may be configured to communicate wirelessly with various external devices and communication networks. For the purposes of the following description, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0239] In some embodiments, as previously discussed with respect to FIG. 2, the device may include one or more communication channels that are configured to transmit and receive data and/or signals over a wireless communications network or interface. Example wireless interfaces include radio frequency cellular interfaces, Bluetooth interfaces, Wi-Fi interfaces, or any other known communication interface.

[0240] In some implementations an antenna may be disposed with respect to the cover (e.g., crystal) of a device to facilitate wireless communications with an external device or communication network. In some cases, it may be advantageous to integrate an antenna into the

cover to improve the transmission and reception of wireless signals from the device. In particular, the cover of the device may have dielectric properties that facilitate the transmission of radio frequency signals while also protecting the antenna from physical damage or interference. Additionally, if the antenna is integrated into a perimeter portion of the cover, the visual appearance or clarity of the cover may be minimized. Furthermore, the embodiments described below with respect to FIGs. 21A-B may be used to integrate an antenna external to the housing, without increasing the thickness of the device body.

[0241] FIG. 21A depicts a perspective exploded view of a cover 2100 and an antenna assembly 2130. The cover 2100 depicted in FIG. 21A is viewed from an inner surface 2124 that is configured to attach to or interface with the opening of the housing (described above with respect to FIG. 1). As shown in FIG. 21A, a groove 2128 may be formed within the inner surface 2124. In this example, the groove 2128 is formed around the periphery of the cover 2100. As mentioned previously, this may be advantageous in minimizing the visual impact of having the antenna assembly 2130 located within the cover 2100.

[0242] As shown in FIG. 21A the antenna assembly 2130 includes an antenna ring 2134 and a terminal 2140 which may interface with an electrical connector 2150. In the present embodiment, the groove 2128 formed in the surface of the cover 2100 may be configured to accept the antenna ring 2134. In particular, the groove 2128 may receive the entire antenna ring 2134 without a portion of the antenna ring 2134 protruding past the inner surface 2124, when the antenna ring 2134 is installed. In some cases, the groove 2128 is formed to be a clearance or near clearance fit with the diameter of the antenna ring 2134. Thus, in some cases, the antenna ring 2134 may substantially fill the groove 2128 when the ring is installed. In some cases, the groove 2128 may be configured to retain the antenna ring 2134 due to a slight interference fit or due to a feature formed within either the cover 2100 and/or the antenna assembly 2130. In the present embodiment, the antenna assembly 2130 may be installed in the cover 2100 and then connected to other electronics via the terminal 2140 and the connector 2150, which may protrude into an opening in the case or housing.

[0243] FIG. 21B depicts a cross-sectional view of the cover and antenna at the connection point. In particular, FIG. 21B depicts a detail cross-sectional view of the cover 2100 installed

within the housing 601 at a region near the terminal 2140. In this example, the cover 2100 is attached to a shelf of the housing 601 via a compressible element 2122. The compressible element 2122 may provide a seal against water or other contaminates and also provide compliance between the cover 2100 and the housing 601. The compressible element 2122 may be formed from a nitrile or silicone rubber and may also include an adhesive or other bonding agent.

[0244] As shown in FIG. 21B, the antenna ring 2134 is disposed entirely within the groove 2128. In this case, the antenna ring 2134 does not protrude past the inner surface 2124. The antenna ring 2134 is electrically connected to the terminal 2140, which protrudes into an opening in the housing 601. As shown in FIG. 21B, the terminal 2140 includes conductive pads 2142 for electrically connecting to the antenna ring 2134. In this example, spring clips 2152 are configured to mechanically and electrically connect to the conductive pads 2142 on the terminal 2140. One advantage to the configuration depicted in FIG. 21B is that the antenna assembly 2130 may be installed in the cover 2100 before the cover 2100 is installed in the housing 601. The terminal 2140 and connector 2150 facilitate a blind connection that may assist electrical connection as the cover 2100 is installed. Additionally, the configuration depicted in FIG. 21B may allow for some movement between the cover 2100 and the housing 601 without disturbing the electrical connection with the antenna ring 2134.

9. Example Haptic Module

[0245] As described above, the device may include one or more haptic modules for providing haptic feedback to the user. The embodiments described herein may relate to or take the form of durable and thin haptic feedback elements suitable to provide a perceivable single pulse haptic feedback. In general, a haptic device may be configured to produce a mechanical movement or vibration that may be transmitted through the housing and/or other component of the device. In some cases, the movement or vibration may be transmitted to the skin of the user and perceived as a stimulus or haptic feedback by the user. In some implementations, the haptic feedback may be coupled to one or more device outputs to alert the user of an event or activity. For example, a haptic output may be produced in combination with an audio output produced by the speaker, and/or a visual output produced using the display.

[0246] The space constraints associated with a small wrist-worn device may present unique challenges to integrating a haptic mechanism into wearable electronics. In particular, a haptic mechanism may use a moving mass used to create the movement or vibration of the haptic output. The larger the mass that is moved, the easier it may be to create a perceivable stimulus using the haptic mechanism. However, a large moving mass and the supporting mechanism may be difficult to integrate into the compact space of, for example, the housing of a wearable electronic wristwatch.

[0247] Thus, the haptic module implemented in some embodiments may be configured to maximize the mechanical energy that is produced in a very compact form factor. FIGs. 22A-B depict one example haptic mechanism that may be particularly well suited for use in a wearable electronic device. While the embodiment described with respect to FIGs. 22A-B is provided as one example, the haptic module is not limited to this particular configuration.

[0248] FIG. 22A depicts a three-quarters perspective view of a haptic device 112, with a top, front and left sidewall of the housing 2220 removed to expose internal components. FIG. 22B depicts a cross-sectional perspective view of the haptic device 112 cut in half to expose the internal components. In this example, a coil 2200 is used to induce movement of a frame 2260, which houses a central magnet array 2210. As shown in FIGs. 22A-B, the movement of the frame 2260 is guided by a shaft 2250 that is fixed with respect to a housing 2220.

[0249] In the present example, the coil 2200 may be energized by transmitting a current (e.g., from the battery) along a length of a wire that forms the coil 2200. A direction of the current along the wire of the coil 2200 determines a direction of a magnetic field that emanates from the coil 2200. In turn, the direction of the magnetic field determines a direction of movement of the frame 2260 housing the central magnet array 2210. One or more springs may bias the frame 2260 towards the middle region of the travel. In this example, the frame 2260 and central magnet array 2210, through operation of the coil 2200, function as a moving mass, which generates a tap or vibration. The output of the haptic device 112, created by the moving mass of the frame 2260 and central magnet array 2210, may be perceived as a haptic feedback or stimulus to the user wearing the device.

[0250] For example, when the coil 2200 is energized, the coil 2200 may generate a magnetic field. The opposing polarities of the magnets in the magnet array 2210 generates a radial magnetic field that interacts with the magnetic field of the coil 2200. The Lorentz force resulting from the interaction of the magnetic fields causes the frame 2260 to move along the shaft 2250 in a first direction. Reversing current flow through the coil 2200 reverses the Lorentz force. As a result, the magnetic field or force on the central magnet array 2210 is also reversed and the frame 2260 may move in a second direction. Thus, frame 2260 may move in both directions along the shaft 2250, depending on the direction of current flow through the coil 2200.

[0251] As shown in FIG. 22A, the coil 2200 encircles the central magnet array 2210, which is disposed near the center of the frame 2260. As previously described, the coil 2200 may be energized by transmitting a current along the length of the wire forming the coil 2200, and the direction of the current flow determines the direction of the magnetic flux emanating from the coil 2200 in response to the current. Passing an alternating current through the coil 2200 may cause the central magnet array 2210 (and frame 2260) to move back and forth along a shaft 2250. In order to prevent the central magnet array 2210 from being attracted to the shaft 2250, which could increase friction between the two and thereby increase the force necessary to move the central magnet array 2210 and frame 2260, the shaft 2250 may be formed from a non-ferrous material such as tungsten, titanium, stainless steel, or the like.

[0252] As depicted in FIGs. 22A-B, the coil 2200 is positioned within a frame 2260 that holds the central magnet array 2210, but is not affixed to the coil 2200. Rather, an air gap separates the coil 2200 from the central magnet array 2210 and the frame 2260 is free to move with respect to the coil 2200, which is generally stationary. Further, the frame 2260 generally moves with the central magnet array 2210. As illustrated in FIGs. 22A-B, the frame 2260 may have an aperture formed therein of sufficient size to contain the coil 2200. Even when the frame and central magnet array are maximally displaced within the housing 2220 (e.g., to one end or the other of the shaft 2250), the coil 2200 does not contact any portion of the frame 2260. It should be appreciated that the coil 2200 remains stationary in the housing 2220 while the frame 2260 and central magnet array 2210 move, although in other embodiments the coil 2200 may move instead of, or in addition to, the frame and/or central magnet array. However, by keeping

the coil 2200 stationary, it may be easier to provide interconnections for the coil, such as between the coil and the flex, and therefore reduce the complexity of manufacture.

[0253] As shown in FIGs. 22A-B, the central magnet array 2210 may be formed from at least two magnets 2211, 2212 of opposing polarities. A center interface 2270 may be formed from a ferrous or non-ferrous material, depending on the embodiment. A ferrous material for the center interface 2270 may enhance the overall magnetic field generated by the central magnet array 2210, while a non-ferrous material may provide at least a portion of a return path for magnetic flux and thus assist in localizing the flux within the housing 2220. In some embodiments, the magnets 2211, 2212 are formed from neodymium while the frame is tungsten. This combination may provide a strong magnetic field and a dense mass, thereby yielding a high weight per volume structure that may be used as the moving part of the haptic device 112.

10. Example Crown Module

[0254] As described above, the device may include a crown that may be used to accept user input to the device. For the purposes of the following description, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0255] In some embodiments, a crown may be used to accept rotary input from the user, which may be used to control aspects of the device. The crown may be knurled or otherwise textured to improve grip with the user's finger and/or thumb. In some embodiments, a crown may be turned by the user to scroll a display or select from a range of values. In other embodiments, the crown may be rotated to move a cursor or other type of selection mechanism from a first displayed location to a second displayed location in order to select an icon or move the selection mechanism between various icons that are output on the display. In a time keeping application, the crown may also be used to adjust the position of watch hands or index digits displayed on the display of the device. The crown may also be used to control the volume of a speaker, the brightness of the display screen, or control other hardware settings.

[0256] In some embodiments, the crown may also be configured to accept linear, as well as rotary, input. For example, the crown may be configured to translate along an axis when pressed or pulled by the user. In some cases, the linear actuation may be used as additional user input. The actuation may provide a binary output (actuated/not actuated) or may also provide a non-binary output that corresponds to the amount of translation along the axis of motion. In some instances, the linear input to the crown may be combined with the rotary input to control an aspect of the device.

[0257] The embodiments described herein may be used for at least a portion of the crown module integrated into a wearable electronic device. The embodiments are provided as examples and may not include all of the components or elements used in a particular implementation. Additionally, the crown module is not intended to be limited to the specific examples described below and may vary in some aspects depending on the implementation.

[0258] In some embodiments, an optical encoder may be used to detect the rotational motion of the crown. More specifically, the example provided below with respect to FIG. 23 may use an optical encoder to detect rotational movement, rotational direction and/or rotational speed of a component of the electronic device. Once the rotational movement, rotational direction and/or rotational speed have been determined, this information may be used to output or change information and images that are presented on a display or user interface of the electronic device.

[0259] Integrating an optical encoder into the space constraints of a typical wearable electronic device may be particularly challenging. Specifically, some traditional encoder configurations may be too large or delicate for use in a portable electronic device. The optical encoder described below may provide certain advantages over some traditional encoder configurations and may be particularly well suited for use with a crown module of a wearable electronic device.

[0260] As shown in the example embodiment of FIG. 23, the optical encoder of the present disclosure includes a light source 2370, a photodiode array 2380, and a shaft 2360. However, unlike typical optical encoders, the optical encoder of the present disclosure utilizes an encoding pattern disposed directly on the shaft 2360. For example, the encoding pattern includes a number of light and dark markings or stripes that are axially disposed along the shaft 2360. Each

stripe or combination of stripes on the shaft 2360 may be used to identify a position of the shaft 2360. For example, as light is emitted from the light source 2370 and reflected off of the shaft 2360 into the photodiode array 2380, a position, rotation, rotation direction and rotation speed of the shaft 2360 may be determined. Once the rotation direction and speed are determined, this information may be used to output or change information or images that are presented on the display or user interface of the electronic device.

[0261] In other embodiments, the shape or form of the shaft of the encoder may be used to determine a position, rotation, rotation direction and rotation speed of the shaft. For example, the shaft may be fluted or have a number of channels that cause the light to be reflected in a number of different directions. Accordingly, a diffractive pattern may be used to determine the rotation, rotation direction and rotation speed of the shaft.

[0262] FIG. 23 illustrates a simplified depiction of the device 100 and crown module 642 in accordance with some embodiments. As shown in FIG. 23, the crown module 642 may be integrated with the housing 601 of the device 100 and may be formed from a dial 2340 disposed at the end of a shaft 2360. In the present embodiment, the crown module 642 also forms part of the optical encoder. As discussed above, the crown module 642 includes an optical encoder that includes a shaft 2360, a light source 2370, and a photodiode array 2380. Although a photodiode array is specifically mentioned, embodiments disclosed herein may use various types of sensors that are arranged in various configurations for detecting the movement described herein. For example, the movement of the shaft 2360 may be detected by an image sensor, a light sensor such as a CMOS light sensor or imager, a photovoltaic cell or system, photo resistive component, a laser scanner and the like.

[0263] The optical encoder may produce an encoder output that is used to determine positional data of the crown module 642. In particular, the optical encoder may produce an output that is used to detect that movement of the dial 2340 including the direction of the movement, speed of the movement and so on. The movement may be rotational movement, translational movement, angular movement, and so on. The optical encoder may also be used to detect the degree of the change of rotation of the dial 2340 and/or the angle of rotation of the dial 2340 as well as the speed and the direction of the rotation of the dial 2340.

[0264] The signals or output of the optical encoder may be used to control various aspects of other components or modules of the device. For example, continuing with the time keeping application example discussed above, the dial 2340 may be rotated in a clockwise manner in order to advance the displayed time forward. In one implementation, the optical encoder may be used to detect the rotational movement of the dial 2340, the direction of the movement, and the speed at which the dial 2340 is being rotated. Using the output from the optical encoder, the displayed hands of a time keeping application may rotate or otherwise move in accordance with the user-provided rotational input.

[0265] Referring back to FIG. 23, the crown module 642 may be formed from dial 2340 that is coupled to the shaft 2360. In some cases, the shaft 2360 and dial 2340 may be formed as a single piece. As the shaft 2360 is coupled to, or is otherwise a part of the dial 2340, as the dial 2340 rotates or moves in a particular direction and at a particular speed, the shaft 2360 also rotates or moves in the same direction and with the same speed.

[0266] As shown in FIG. 23, the shaft 2360 of the optical encoder includes an encoding pattern 2365. As discussed above, the encoding pattern 2365 may be used to determine positional information about the shaft 2360 including rotational movement, angular displacement and movement speed. As shown in FIG. 23, the encoding pattern 2365 may include a plurality of light and dark stripes.

[0267] Although light stripes and dark stripes are specifically mentioned and shown, the encoding pattern 2365 may consist of various types of stripes having various shades or colors that provide surface contrasts. For example, the encoding pattern 2365 may include a stripe or marking that has a high reflective surface and another stripe that has a low reflective surface regardless of the color or shading of the stripes or markings. In another embodiment, a first stripe of the encoding pattern 2365 may cause specular reflection while a second stripe of the encoding pattern 2365 may cause diffuse reflection. When the reflected light is received by the photodiode array 2380, a determination may be made as to the position and movement of the shaft such as described below. In embodiments where a holographic or diffractive pattern is used, the light from the light source 2370 may diffract from the shaft 2360. Based on the

diffracted light, the photodiode array 2380 may determine the position, movement and direction of movement of the shaft 2360.

[0268] In some embodiments, the stripes of the encoding pattern 2365 extend axially along the shaft 2360. The stripes may extend along the entire length of the shaft 2360 or partially along a length of the shaft 2360. In addition, the encoding pattern 2365 may also be disposed around the entire circumference of the shaft 2360. In other embodiments, the encoding pattern 2365 may include a radial component. In yet other embodiments, the encoding pattern 2365 may have both a radial component and an axial component.

[0269] In some embodiments, the crown module may also include a tactile switch for accepting translational input from the user. FIGs. 24A-B depict another example of a crown module 642a having a tactile switch assembly 2410. As shown in FIG. 24A, the tactile switch assembly 2410 may include a dial 2448 (or button), a coupling 2418, a shear plate 2456, and a tactile switch 2414.

[0270] In the embodiment depicted in FIGs. 24A-B, the dial 2448 is translatable and/or rotatable relative to the housing. The ability of the dial 2448 to translate and rotate relative to the housing allows a user to provide a rotational force and/or translating force to the tactile switch assembly. In particular, the dial 2448 of the present example may be operably coupled to or form part of an optical encoder, in accordance with the example described above with respect to FIG. 23.

[0271] In the present example, the dial 2448 includes an outer surface 2432 that is configured to receive a rotary or rotational user input and a stem 2450 that extends from an interior surface 2434 of the dial 2448. The stem 2450 may define a coupling aperture that extends longitudinally along a length or a portion of a length of the stem 2450. In the depicted example, the stem 2450 may be hollow or partially hollow.

[0272] In the example depicted in FIGs. 24A-B, the coupling 2418 may be a linkage, such as a shaft, that couples the dial 2448 to the tactile switch 2414. The coupling 2418 may be integrally formed with the dial 2448 or may be a separate component operably connected thereto. For example, the stem 2450 of the dial 2448 may form the coupling member that is integrally

formed with the dial 2448. The coupling 2418 may be made of a conductive material, such as one or more metals or metal alloys. Due to the conductive characteristics, the coupling 2418 may further act to electrically couple the dial 2448 to the tactile switch 2414 and shear plate 2456. In the example depicted in FIGs. 24A-B, the shear plate 2456 is positioned between the coupling 2418 and the tactile switch 2414. In some embodiments, the shear plate 2456 may prevent or reduce shearing forces from the coupling from being transmitted to the tactile switch. The shear plate 2456 also allows transfer of linear force input from the dial 2448 to the switch 2414.

[0273] The configuration depicted in FIGs. 24A-B may be used to accept both rotational and translational input from the user. For example, if a user provides a rotational force to the dial 2448, the coupling 2418 and dial 2448 may rotate in the direction of the force. The coupling 2418 may be attached to or integrated with one or more sensors that are configured to detect rotational movement. For example the coupling 2418 may be integrated with an optical encoder, similar to the example described above with respect to FIG. 23. Additionally, if a user provides a translational force to the dial 2448, the force may be transmitted through the dial 2448 and coupling 2418 to actuate the switch 2414. In some cases, the switch 2414 includes a metal dome switch that is configured to provide a tactile feedback when actuated. In some cases, the actuation of a dome switch may be perceived by the user as a click or release as the switch 2414 is actuated. Once the force has been removed from the dial 2448, the dome switch resiliently returns to its original position, providing a biasing force against the coupling 2418 to return both the dial 2448 and the coupling 2418 to their original positions. In some embodiments, the tactile switch 2414 may include a separate biasing element, such as a spring, that exerts a force (either directly or indirectly via the shear plate) against the coupling. FIG. 24A depicts the tactile switch assembly 2410 when there is no force applied (un-actuated). FIG. 24B depicts the tactile switch assembly 2410 when there is a translational force applied to the dial 2448 (actuated).

11. Example Band Attachment Mechanism

[0274] For the purposes of the following description, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features

of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above.

[0275] As described above, a wearable electronic device may include a band that is attached to a device body having one or more receiving features. In particular, the housing may include or form a receiving feature that facilitates an interchange or replacement of different bands that are used to secure the device to the wrist of the user. By replacing or interchanging bands the device may be adapted for multiple uses ranging from sporting activities to professional or social activities.

[0276] In some embodiments, the receiving features are configured to be operated without the use of special tools or fixtures. For example, the bands may be interchanged by hand or with the help of a simple tool, such as a pointed object. Additionally or alternatively, a tool or other component, such as a component of the device to which the attachment system is coupled, may be configured to actuate a button or other component of the attachment system to secure and/or release the band from the device. In one embodiment, the lug portion of a band may be configured to be inserted into an opening or channel portion of the receiving feature. Once the lug of the band has been inserted into the opening, the lug may slide within the opening of the device until the band is secured or otherwise coupled to the device. The coupling between the band and the receiving feature may provide a secure attachment of the band to the housing or device body. Just as the band is configured to slide into the channel of the receiving feature, the lug may also slide out of the channel of the receiving feature allowing the band to be detached from the device body.

[0277] In one embodiment, the receiving feature includes a locking mechanism, which may be integrated with portions of either the band or the receiving feature. In one example, as the band is inserted into a receiving feature of the device, the locking mechanism interfaces with a portion of the receiving feature to lock or otherwise secure the band within the receiving feature. The locking mechanism may also be configured to interface with a releasing mechanism associated with the receiving feature. For example, a releasing mechanism may be configured to disengage or release the locking mechanism. In some implementations. actuation of the

releasing mechanism causes the locking mechanism to be released and allows the band to be removed by sliding within the receiving feature.

[0278] FIG. 25A depicts a receiving feature and band assembly as viewed from the bottom of the device body. As shown in FIG. 25A, a receiving feature 623a includes an opening or channel 2501 that is formed into the body or housing of the device. The channel 2501 is configured to receive the lug 2510 attached to an end of the band strap 621a. The receiving feature 623a may also include a locking mechanism 2530 that is configured to maintain the band strap 621a within the channel 2501 once it has been installed. As discussed above, the locking mechanism 2530 may be releasable by the user, which may facilitate band replacement. In this example, the locking mechanism 2530 includes a spring-loaded retaining mechanism that engages the lug 2510 to retain the lug 2510 in the channel 2501 and maintain the attachment of the band strap 621a to the device. As shown in FIG. 25A, the locking mechanism 2530 also includes a button located on the bottom of the housing that may be depressed by the user to release the locking mechanism and allow the lug 2510 and the band strap 621a to be removed from the channel 2501. In the present example, the button of the locking mechanism 2530 is located on a curved portion of the case or housing. In some embodiments, the button of the locking mechanism 2530 is located along the centerline of the case or housing.

[0279] In some embodiments, the opening or channel 2501 of the receiving feature 623a includes a port or connector for receiving a mating electrical component. In some embodiments, the connector or port is covered by a label or sticker so that the inside surface of the opening or channel 2501 appears continuous. The connector or port may be located along the vertical centerline of the case or housing.

[0280] FIG. 25B depicts an example exploded view of the receiving feature 623a and the lug 2510 of the band strap 621a. As shown in FIG. 25B, the band strap 621a may be formed from a separate part and attached to lug 2510 via a pivot or other type of joint. In other embodiments, the band strap 621a may have an end feature that is integrally formed as part of the band strap 621a. As also shown in FIG. 25B, the lug 2510 may be attached to the receiving feature 623a by aligning the axis of the lug 2510 with the axis of the channel 2501 and then sliding the lug 2510 into the channel 2501.

[0281] FIG. 25C depicts an example assembly sequence of the lug 2510 being inserted into the channel 2501 of the receiving feature 623a. As shown in FIG. 25C, the lug 2510 may be positioned along the side of the receiving feature 623a having the lug 2510 approximately aligned with the channel 2501 of the receiving feature 623a. The lug 2510 (and band strap 621a) may then be inserted into the channel 2501 of the receiving feature 623a by sliding the lug 2510 along the length of the channel 2501. Once the lug 2510 is approximately centered in the channel 2501 of the receiving feature 623a, the locking mechanism 2530 or other securing feature may engage, thereby retaining the lug 2510 (and band strap 621a) within the channel 2501. As previously discussed, the lug 2510 (and band strap 621a) may be removed from the receiving feature 623a by depressing the button of the locking mechanism 2530, which may disengage the lock and allow movement of the lug 2510 within the channel 2501.

[0282] The example described above is provided with respect to one example embodiment. The geometry of the end of the band strap and/or the geometry of the channel may vary depending on the implementation. Additionally, the engagement mechanism may vary depending on the design of the band strap and the device body. The geometry or layout of the features may vary and remain within the scope of the present disclosure. Additionally, while the examples provided above are described with respect to attaching a band strap to a device body, the receiving feature (623a) may be used to attach a variety of other parts to the device body. For example a lanyard, cable, or other accessory may be attached to the device body using the receiving feature and other similar features.

12. Example Bands

[0283] As described above, a wearable electronic device may include a band that is used to secure the device to the wrist of a user. In some embodiments, the band may be formed from two band straps that are attached to the housing of the device body. The band straps may be secured around the wrist of a user by a clasp or latching mechanism. As also described above, the device may be configured to facilitate replacement of the band. This feature may allow the use of a variety of types of bands, which may adapt the device for multiple uses ranging from sporting activities to professional or social activities.

[0284] In some cases, the band may be formed from a woven textile material. In one example, the band is formed from a woven material that includes one or more strands or threads formed from a natural or synthetic material. The woven material may be formed, for example, from a plurality of warp threads that are woven around one or more weft threads. More specifically, the woven material may include a plurality of warp threads disposed along the length of the band, and at least one weft thread positioned perpendicular to, and coupled to, woven or interlaced between the plurality of warp threads. In some cases, the plurality of warp threads may run the entire length of the woven portion of the band strap. Additionally, in some cases, the at least one weft thread may include a single thread that may be continuously woven between the plurality of warp threads or, alternatively, may include a plurality of threads that may be woven between the plurality of warp threads. A weft thread that is woven between a plurality of warp threads may form consecutive cross-layers with respect to the plurality warp threads in order to form the band.

[0285] In some cases, one or more of the strands or threads may be a metallic or conductive material. This may improve the strength of the band and may also facilitate coupling with magnetic elements, such as a metallic clasp. In some cases, other elements may be woven into the band, including, for example, product identifying elements, decorative elements, or functional components.

[0286] In other embodiments, the band may be formed from a metallic mesh material. In one example, the metallic mesh is formed from an array of links that are interlocked to form a sheet of fabric. Some or all of the links in the mesh may be formed from a ferromagnetic material, which may facilitate magnetic engagement with a magnetic clasp. In some cases, each link of the mesh is formed from a section of metallic filament that is bent or formed into a closed shape. Each closed shape may be interlocked with one or more adjacent links to form a portion of the sheet or fabric. In some cases, a metallic filament is formed around a series of rods or pins that are disposed at a regular spacing within the mesh. In some cases, one or more strands or filaments that may be formed from a ferromagnetic material are woven or integrated with the links of the mesh.

[0287] In other examples, the band may be formed from a sheet of material. For example, the band may be formed from a synthetic leather, leather, or other animal hide. Additionally or alternatively, the band may be formed from a polymer material, an elastomer material, or other type of plastic or synthetic. In some cases, the band is formed from a silicone sheet material.

[0288] The clasp that is used to attach the free ends of the band straps may vary depending on the material that is used and the construction of the band. For example, as mentioned above, a metallic mesh material may use a metallic clasp to join the ends of the band. Additionally, a leather band may be integrated with magnetic and/or ferromagnetic components and may include a magnetic clasp. In some embodiments, the free ends of the band straps are secured using a buckle or tang on a first band strap that is configured to interface with a hole or aperture in a second band strap. A variety of other clasp configurations may also be used.

13. Example Display

[0289] For the purposes of the following description, the described device 100 is one example of that shown and discussed above with respect to FIGs. 2-7. However, certain features of the device 100, including the external surface geometry, may be simplified or vary with respect to aspects of the device 100 discussed above. As described above, the device includes a display disposed within the housing or enclosure. The device may be formed from a liquid crystal display (LCD), organic light emitting diode (OLED) display, organic electroluminescence (OEL) display, or other type of display device. The display may be used to present visual information to the user, including, for example, a graphical user interface, notifications, health statistics, and the like. In some cases, the display may be configured to present the current time and date similar to a traditional watch or timepiece.

[0290] In some embodiments, the display is formed from an organic light emitting diode (OLED) display element. An active region of the display may include an array of light-emitting display pixels 2604 such as array 2602, shown in FIG. 26. Pixels 2604 may be arranged in rows and columns in array 2602 and may be controlled using a pattern of control lines. Each pixel may include a light-emitting element such as organic light-emitting diode 2612 and associated control circuitry 2610. Control circuitry 2610 may be coupled to the data lines 2606 and gate lines 2608 so that control signals may be received from driver circuitry, which may be

implemented as an integrated circuit. Although described as an OLED display, certain embodiments may implement other display technology, such as LCD displays and the like.

[0291] To the extent that multiple functionalities, operations, and structures are disclosed as being part of, incorporated into, or performed by device 100, it should be understood that various embodiments may omit any or all such described functionalities, operations, and structures. Thus, different embodiments of the device 100 may have some, none, or all of the various capabilities, apparatuses, physical features, modes, and operating parameters discussed herein

[0292] Although the disclosure above is described in terms of various exemplary embodiments and implementations, it should be understood that the various features, aspects and functionality described in one or more of the individual embodiments are not limited in their applicability to the particular embodiment with which they are described, but instead can be applied, alone or in various combinations, to one or more of the other embodiments of the invention, whether or not such embodiments are described and whether or not such features are presented as being a part of a described embodiment. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments but instead defined by the claims herein presented.

CLAIMS

We claim:

1. A wearable electronic device, comprising:

a housing comprising:

a flat bottom portion;

a top portion defining a cavity; and

a curved side portion that extends from the bottom portion to the top portion;

a band attached to the housing and configured to secure the wearable electronic device to a user;

a display at least partially disposed within the cavity and having a viewable area; and

a cover disposed above the display and comprising:

a flat middle portion larger than the viewable area of the display; and

a curved edge portion surrounding the flat middle portion and coinciding with the curved side portion along a perimeter of the cavity to form a continuous contoured surface.

2. The wearable electronic device of claim 1, wherein:

the continuous contoured surface is tangent with the flat bottom portion of the housing at a first end of the contour; and

the continuous contoured surface is tangent with the flat middle portion of the cover at a second end of the contour.

3. The wearable electronic device of claim 2, wherein the continuous contoured surface has a constant radius.

4. The wearable electronic device of claim 1, wherein

the cavity has a rectangular shape;

the curved edge portion of the housing has four sides that surround the cavity;

each side is orthogonal to two adjacent sides; and

each side is connected to an adjacent side by a rounded corner.

5. The wearable electronic device of claim 4, wherein:

the rounded corners have a curvature that corresponds to a curvature of the continuous contoured surface formed by the curved edge portion of the cover and the curved side portion of the housing.

6. The wearable electronic device of claim 1, further comprising:

a crown module positioned at least partially within an aperture formed within the curved side portion of the housing; wherein:

the crown module comprises an outer surface configured to receive a rotary user input.

7. The wearable electronic device of claim 6, wherein:

the crown module is offset with respect to a centerline of the housing between the top portion and the flat bottom portion; and

the offset is toward the top portion of the housing; and

the crown module includes a dial having a portion that is higher than an interface between the cover and the housing.

8. The wearable electronic device of claim 1, further comprising:

a port formed in the curved side portion of the housing;

an acoustic module disposed within the housing and configured to produce an audio output through the port, the acoustic module comprising:

an acoustic element; and

an acoustic cavity that acoustically couples the acoustic element to the port; wherein:

the port includes an orifice that is offset with respect to the acoustic cavity to prevent the direct ingress of liquid into the acoustic module.

9. The wearable electronic device of claim 1, further comprising:

a gasket positioned between the housing and the cover; and

a ledge formed along a perimeter of the cavity, wherein:

the gasket is positioned along the ledge that is formed along the perimeter of the cavity; and

the gasket, the cover, and the housing are configured to cooperate to form a substantially water-proof seal.

10. The wearable electronic device of claim 1, further comprising:

a biosensor module disposed in an opening formed in the flat bottom portion of the housing, the biosensor module comprising:

a chassis positioned in the opening of the housing and defining an array of windows;

an array of light sources attached to the chassis and configured to emit light into the user through the array of windows; and

an optically transparent rear cover disposed over the chassis and over the array of windows and operative to pass light emitted from the array of light sources into the user.

11. The wearable electronic device of claim 10, wherein the rear cover has a convex outer contour.

12. An electronic device, comprising:

a housing comprising a bottom portion defining an opening;

a band attached to the housing and configured to secure the electronic device to a user;

a biosensor module disposed within the opening;

a rear cover disposed over the biosensor module and comprising

an edge protruding outwardly from the bottom portion of the housing; and

an outer surface having a convex curved contour.

13. The electronic device of claim 12, wherein:

the outer surface of the rear cover defines one or more windows that provide operational access to one or more optical components of the biosensor module; and

the one or more windows have a curvature that matches the convex curved contour of the outer surface.

14. The electronic device of claim 12, wherein the biosensor module comprises:

an array of light sources configured to emit light into a body of the user; and

a photodetector configured to receive light produced by a light source of the array of light sources that is reflected from the body and produce a sensor signal.

15. The electronic device of claim 14, further comprising:

a processing unit configured to compute a health metric associated with the user based on the sensor signal; and

a display disposed within the housing and configured to display the health metric

16. The electronic device of claim 12, wherein the biosensor module is removably coupled to the housing.

17. A wearable electronic device, comprising:

a housing comprising:

a top portion;

a cavity formed within the top portion; and

a curved side portion that surrounds the cavity; and

a transparent cover disposed over the cavity of the housing and comprising:

a flat middle portion at a center of the transparent cover;

a curved outer portion that emanates from and surrounds the flat middle portion and extends outwardly to an edge of the transparent cover; and

a mask positioned relative to an internal surface of the transparent cover, wherein the mask has an outer boundary located proximate to the edge of the transparent cover and an inner boundary located within the curved outer portion of the transparent cover.

18. The wearable electronic device of claim 17, further comprising:

a display disposed below the transparent cover, wherein a perimeter portion of a viewable area of the display is disposed below the mask.

19. The wearable electronic device of claim 17, wherein the device further comprises:

an antenna having a shape that corresponds to a shape of the cavity formed within the housing, wherein:

the antenna is disposed in a groove formed in the internal surface of the transparent cover; and

the groove is formed between the outer boundary and the inner boundary of the mask.

20. The wearable electronic device of claim 19, wherein:

the cover is formed from a sapphire material; and

the antenna is configured to facilitate wireless communication between the wearable electronic device and an external device.

ABSTRACT

A consumer product that is a portable and, in some cases, a wearable electronic device. The wearable electronic device may have functionalities including: keeping time; monitoring a user's physiological signals and providing health-related information based on those signals; communicating with other electronic devices or services; visually depicting data on a display; gather data form one or more sensors that may be used to initiate, control, or modify operations of the device; determine a location of a touch on a surface of the device and/or an amount of force exerted on the device, and use either or both as input.

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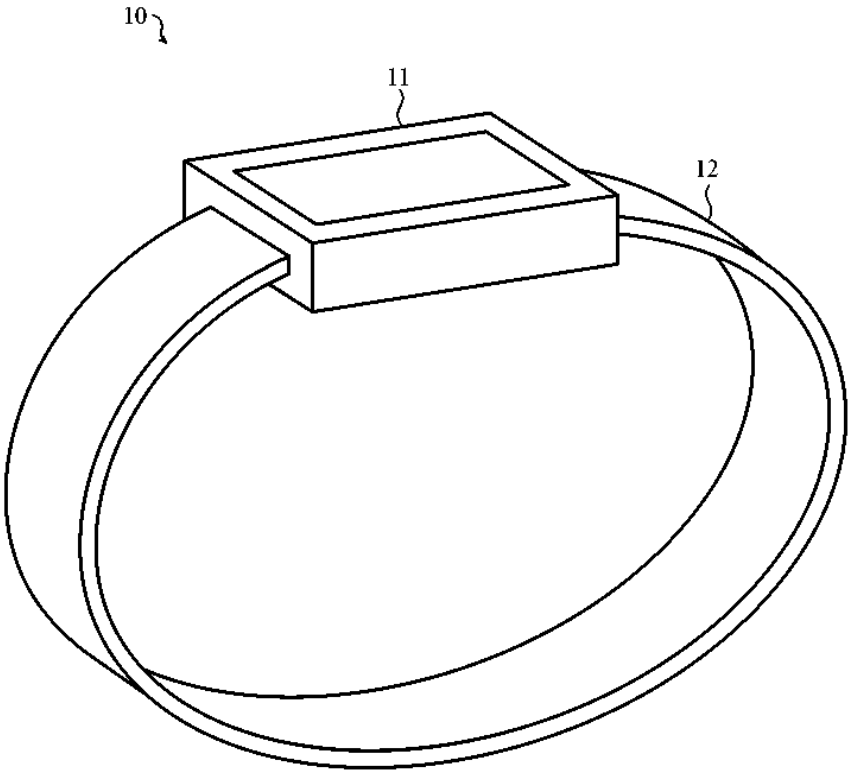
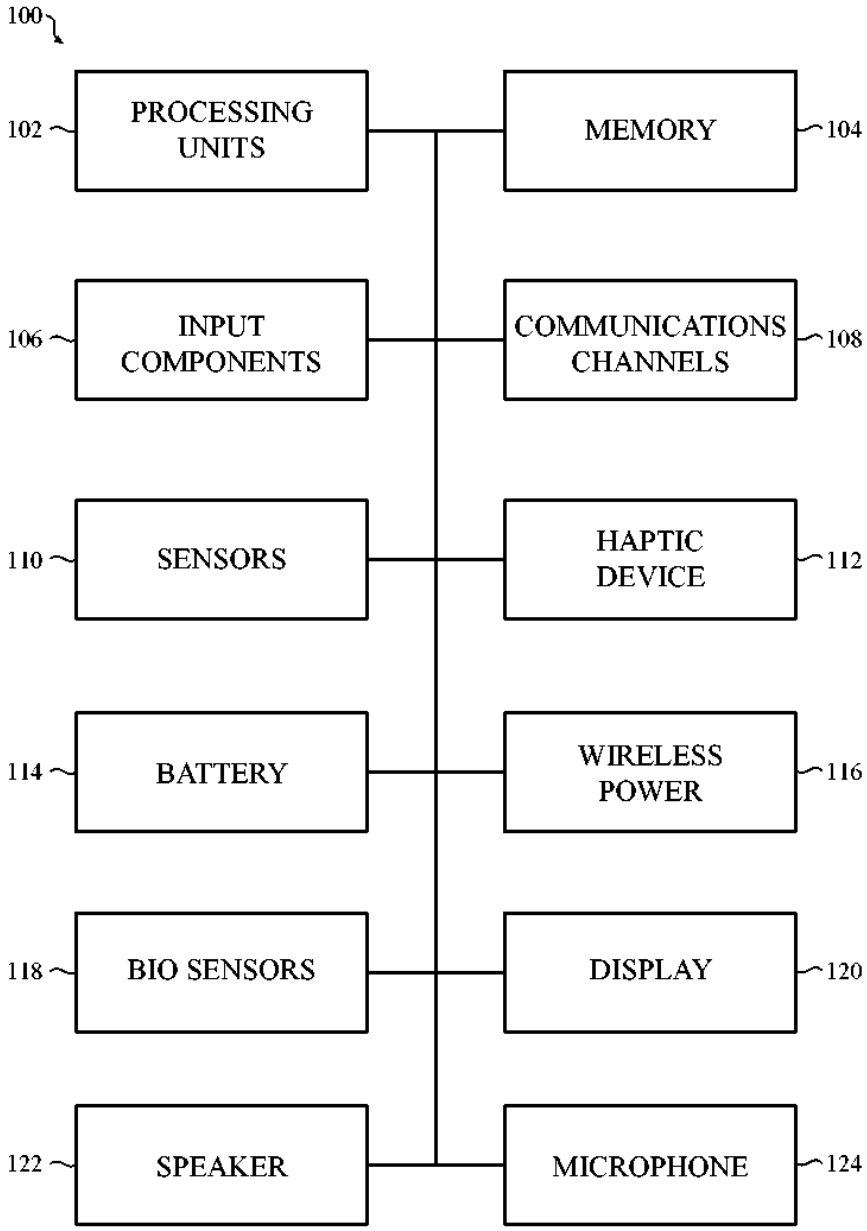


FIG. 1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MEMORY
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INPUT COMPONENTS
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COMMUNICATIONS CHANNELS
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SENSORS
110
HAPTIC DEVICE
112
BATTERY
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WIRELESS POWER
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BIO SENSORS
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DISPLAY
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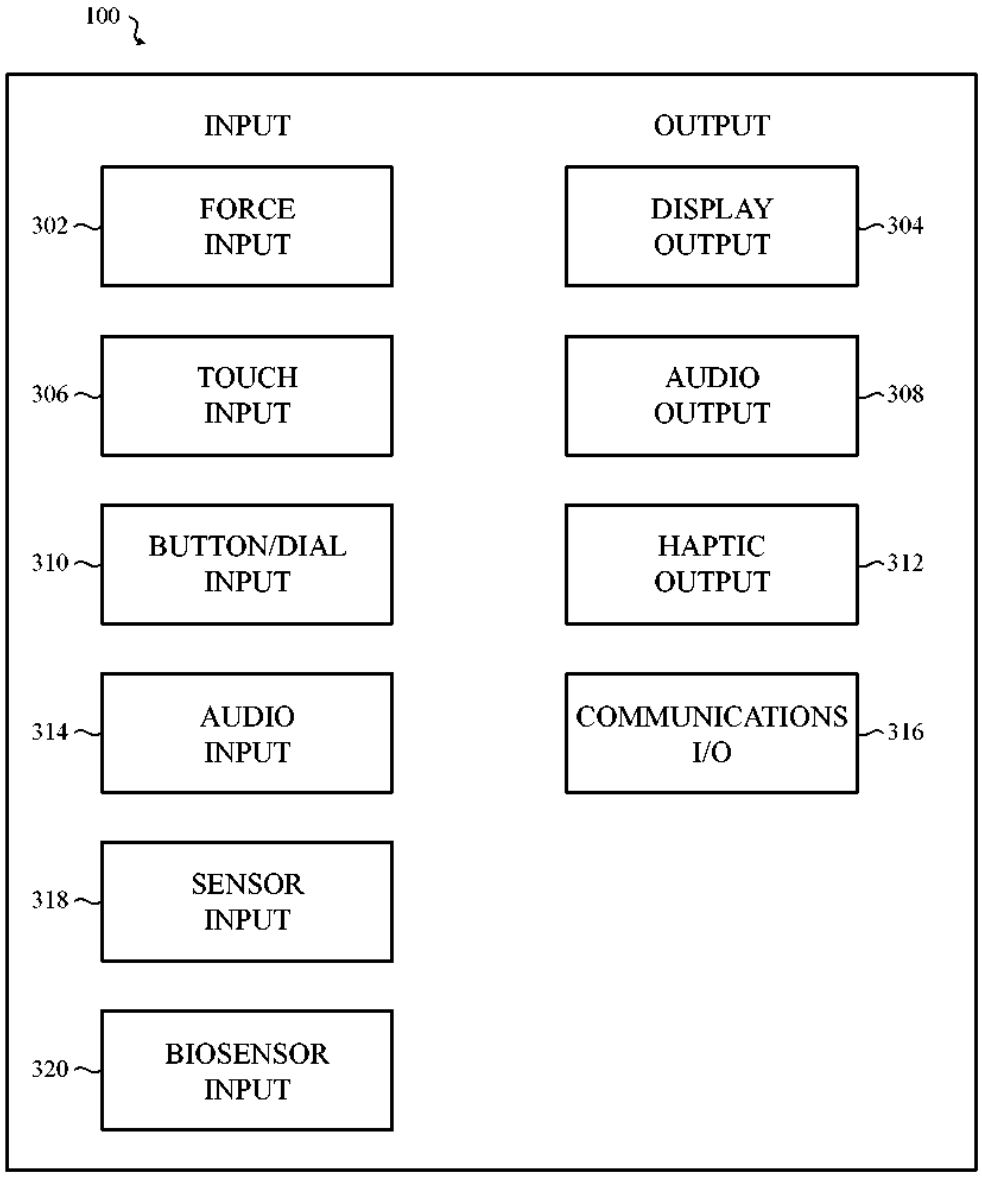
SPEAKER
122
MICROPHONE
124

FIG. 2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TOUCH INPUT
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AUDIO OUTPUT
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BUTTON/DIAL INPUT
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COMMUNICATIONS I/O
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SENSOR INPUT
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BIOSENSOR INPUT

FIG. 3

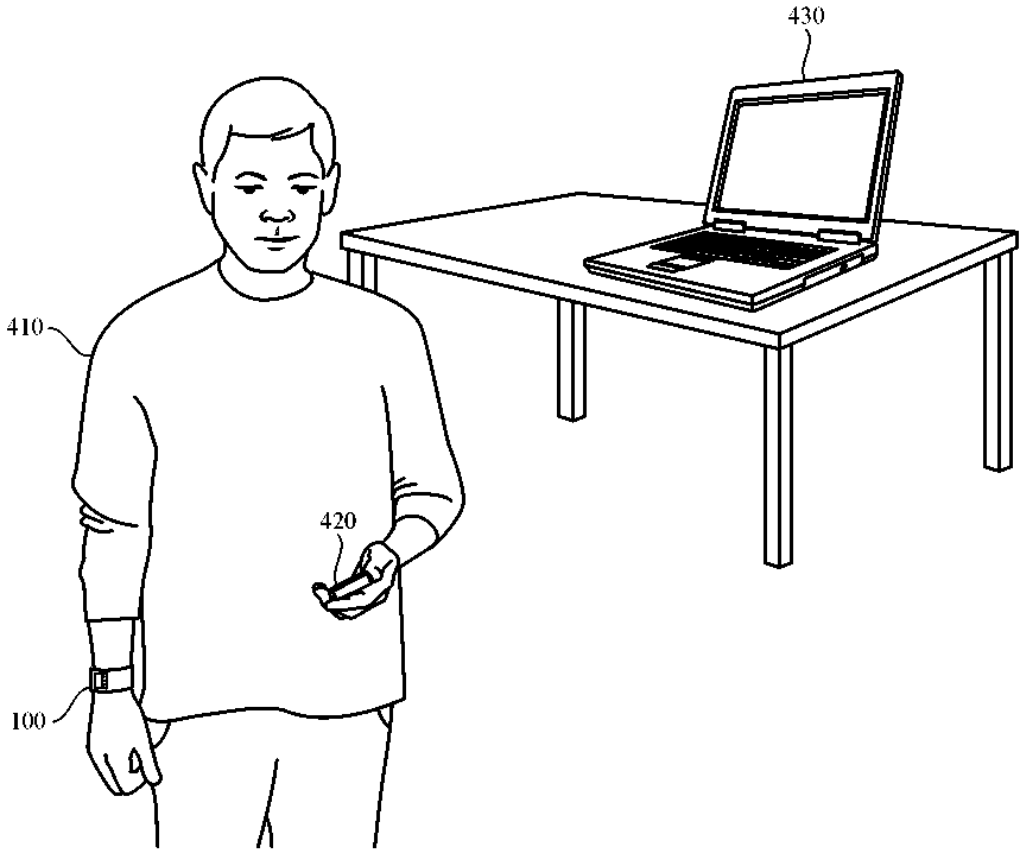

FIG. 4

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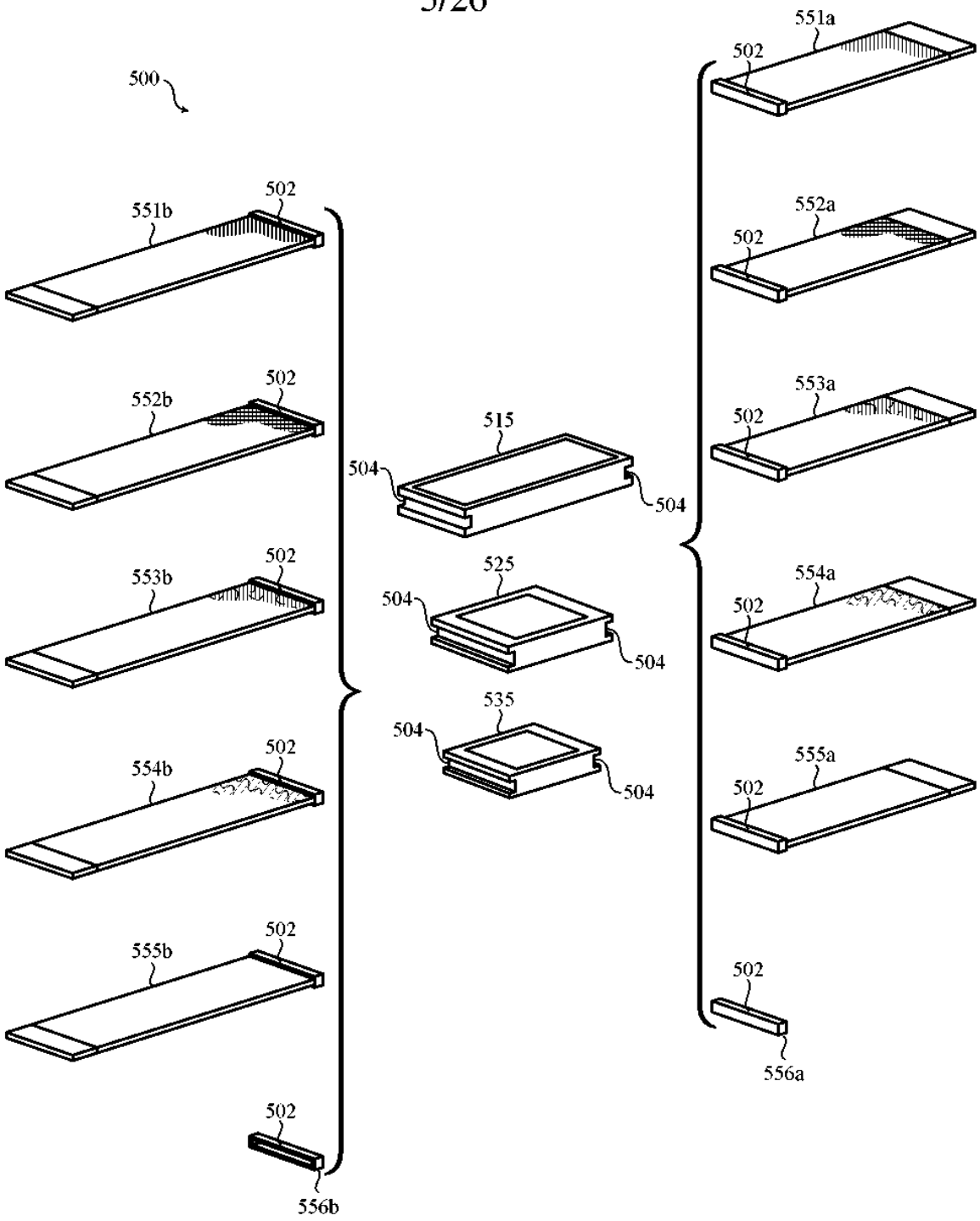
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FIG. 5

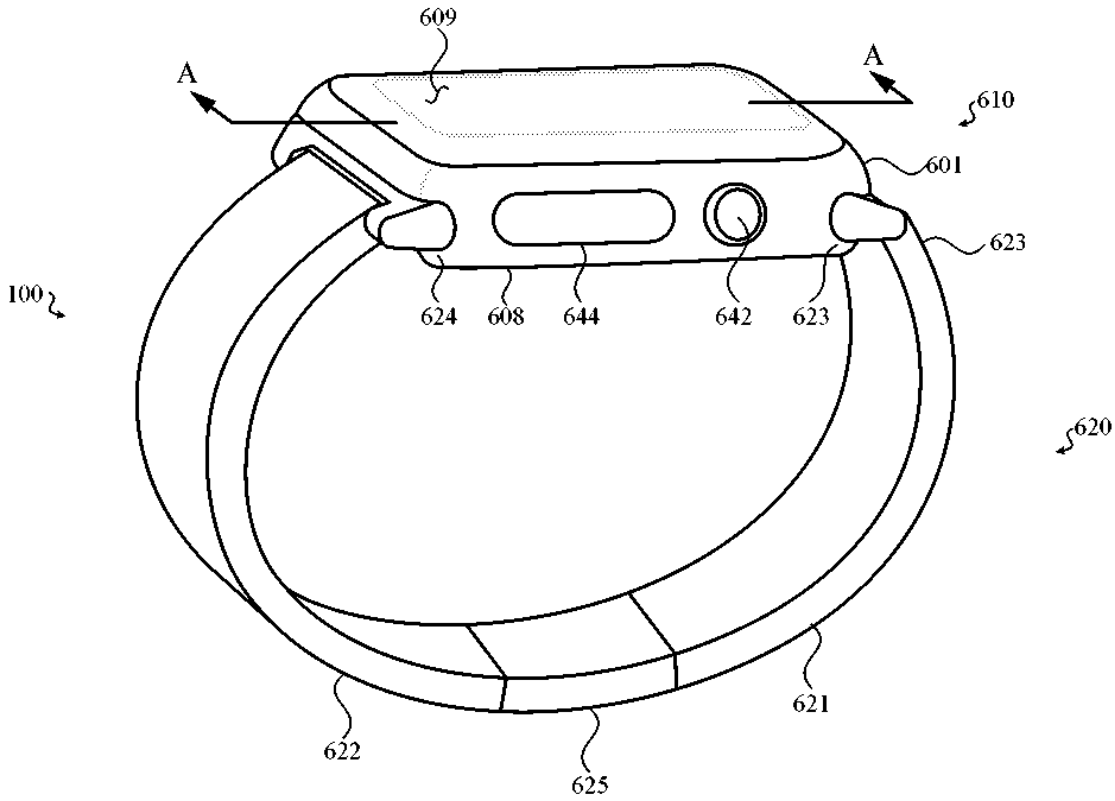

FIG. 6

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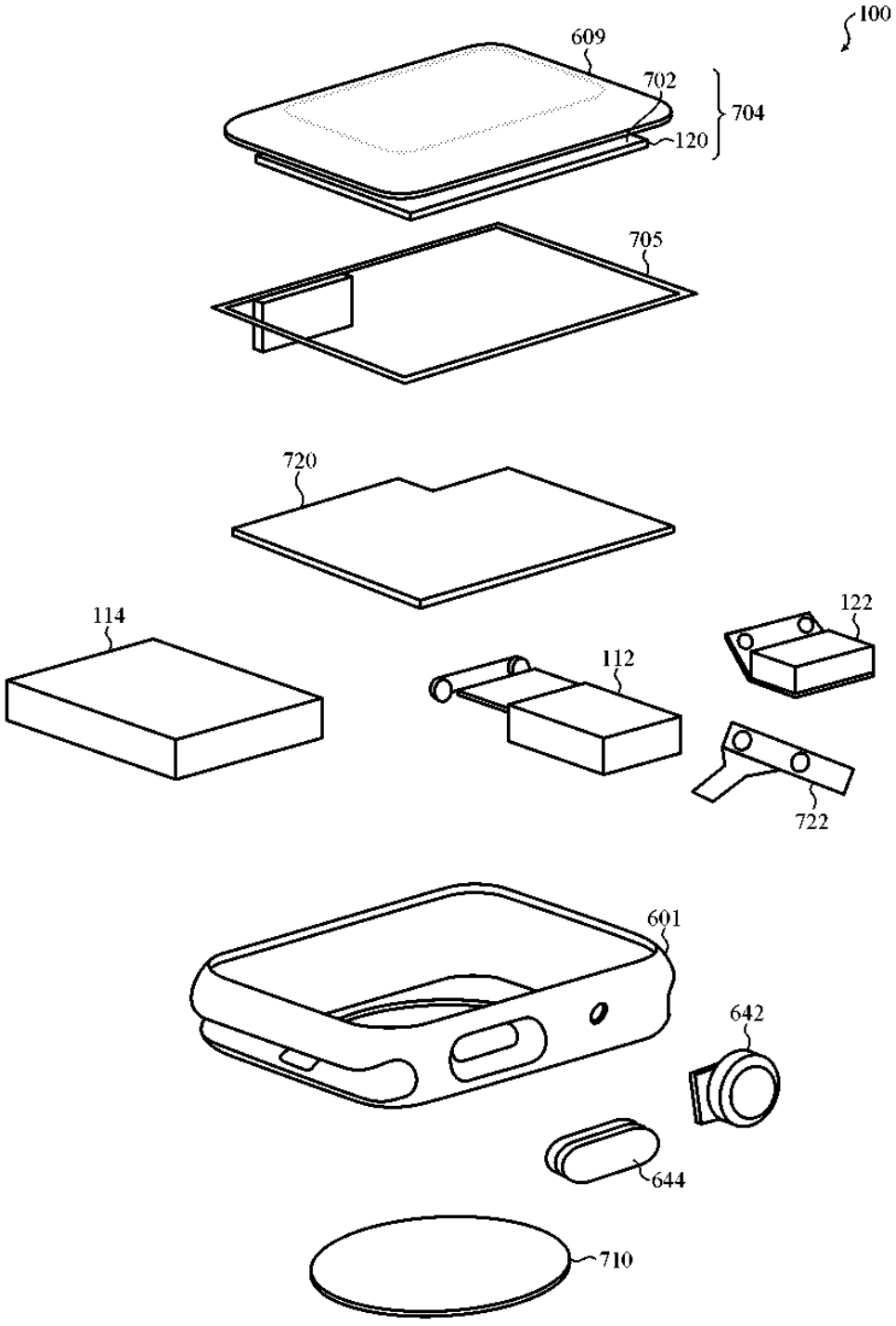
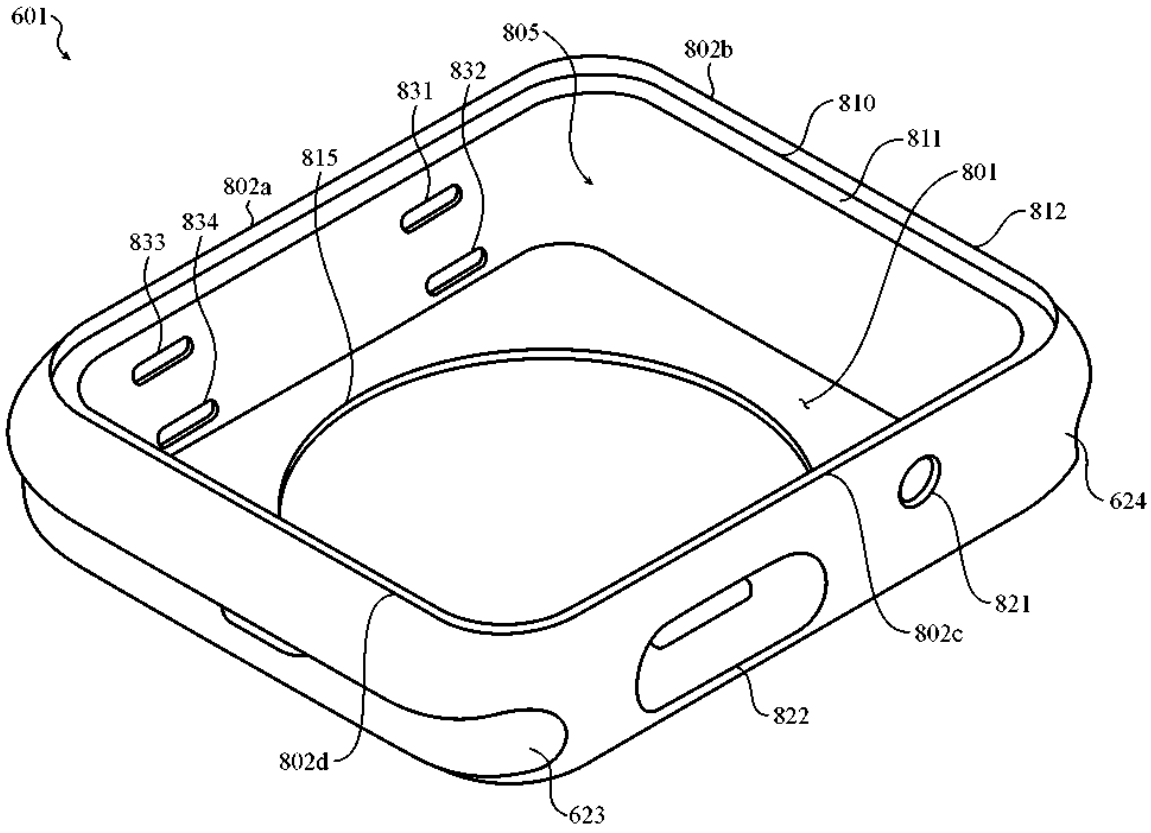


FIG. 7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802b
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802c
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802d
623

FIG. 8

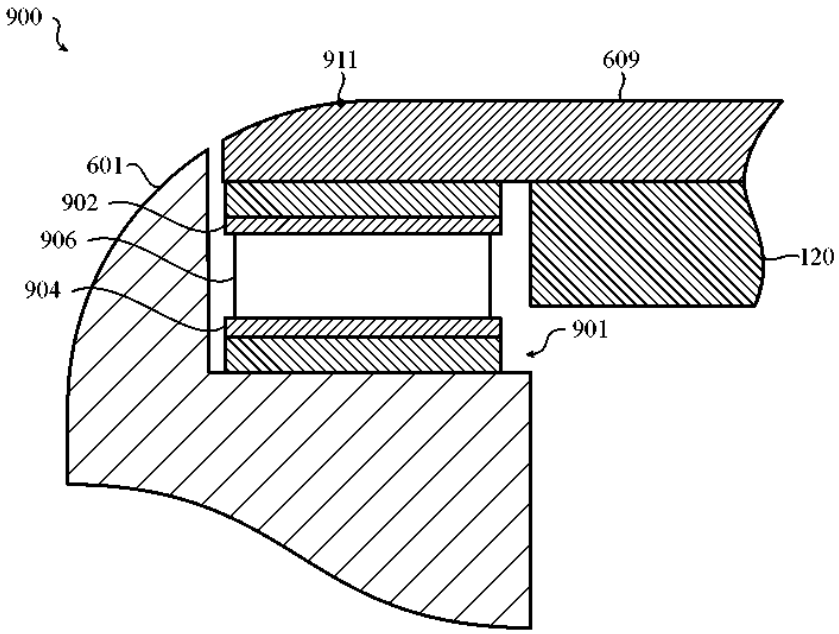

FIG. 9

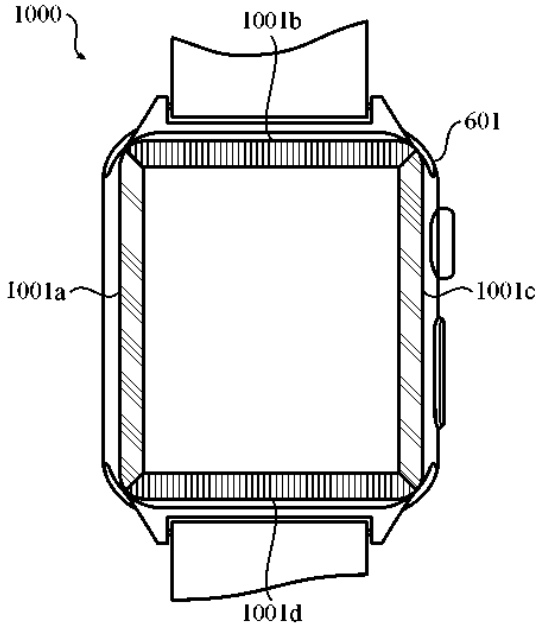

FIG. 10A

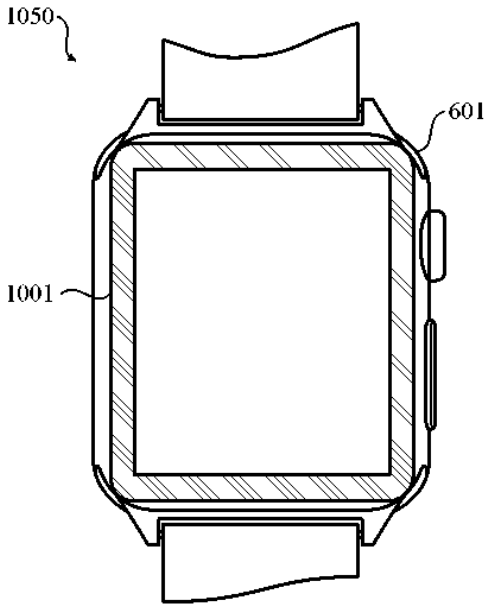

FIG. 10B

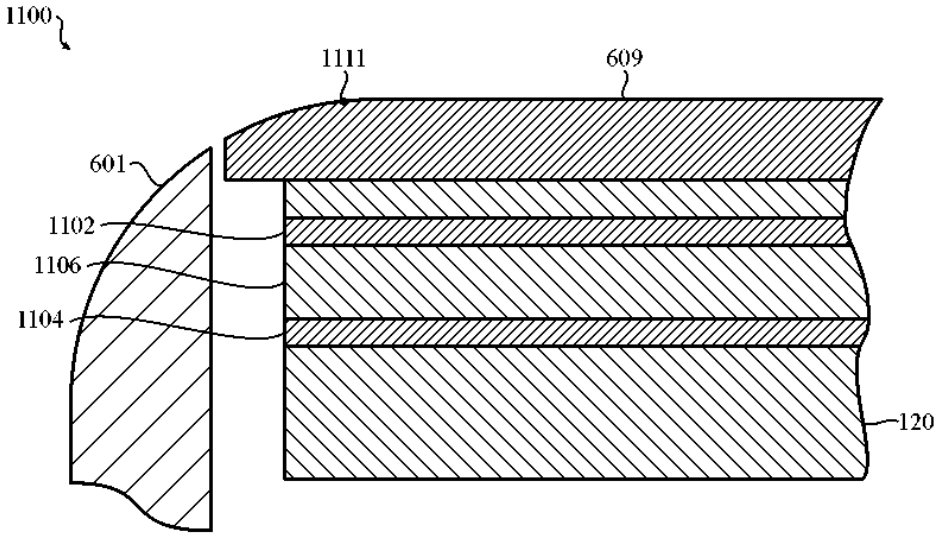

FIG. 11

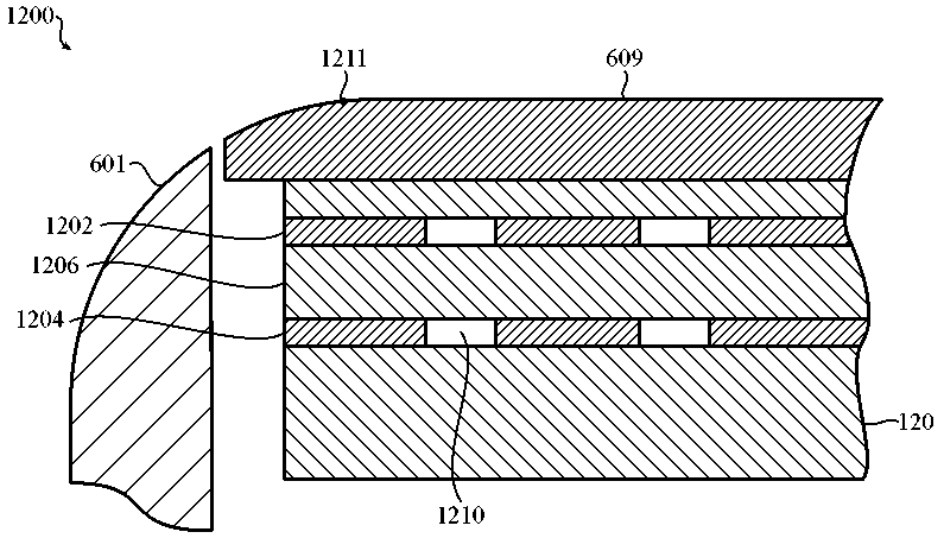

FIG. 12

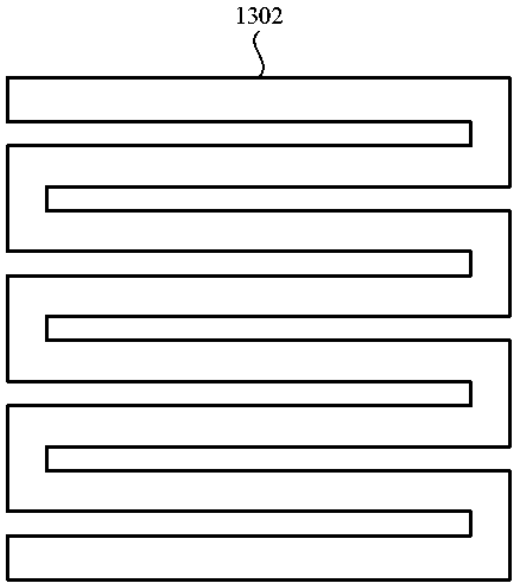

FIG. 13A

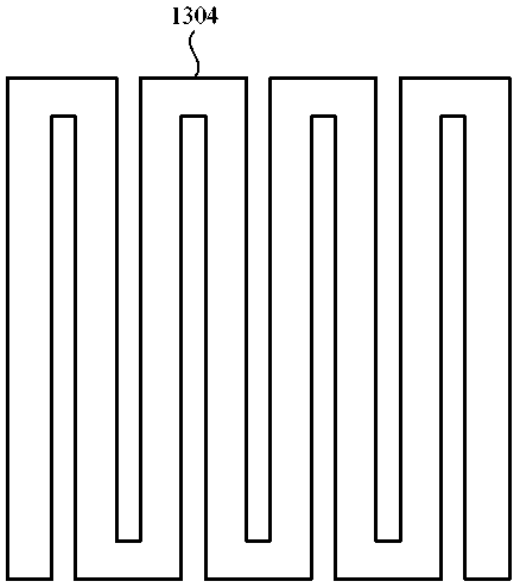

FIG. 13B

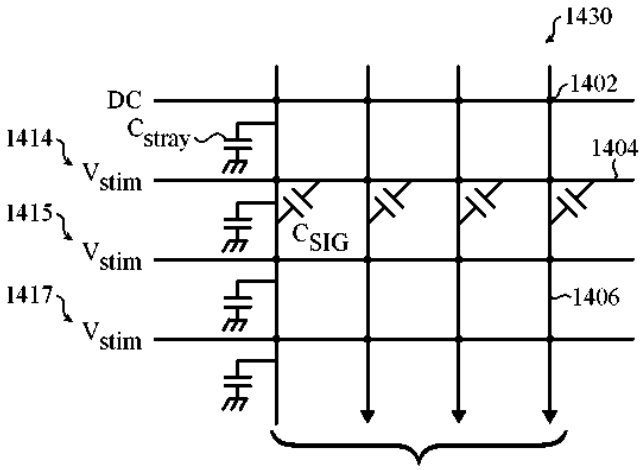

FIG. 14A

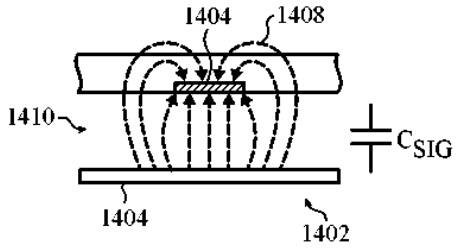

FIG. 14B

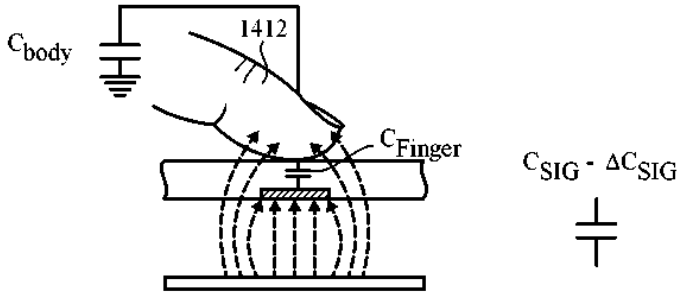

FIG. 14C

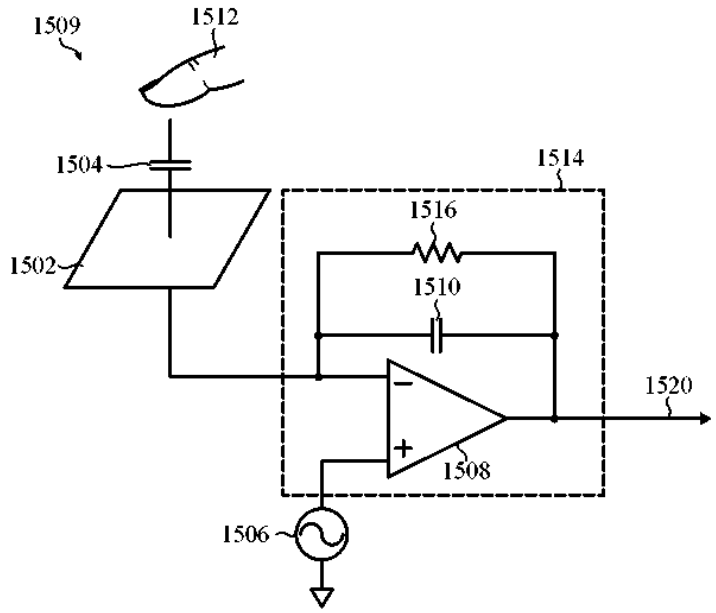

FIG. 15A

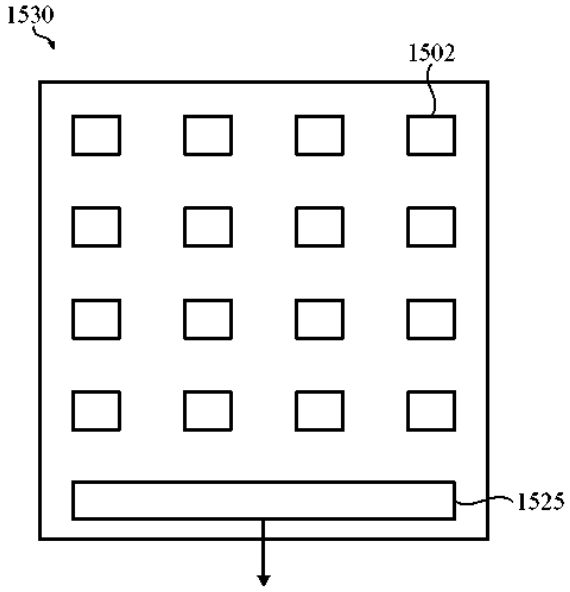

FIG. 15B

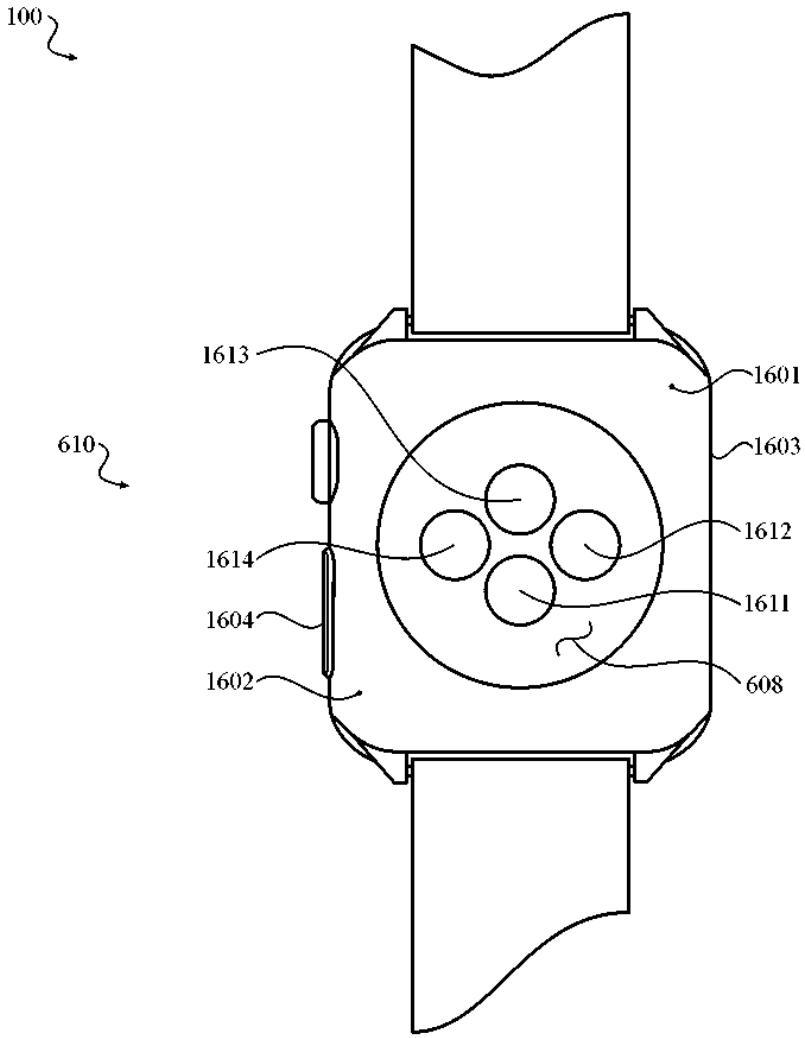

FIG. 16

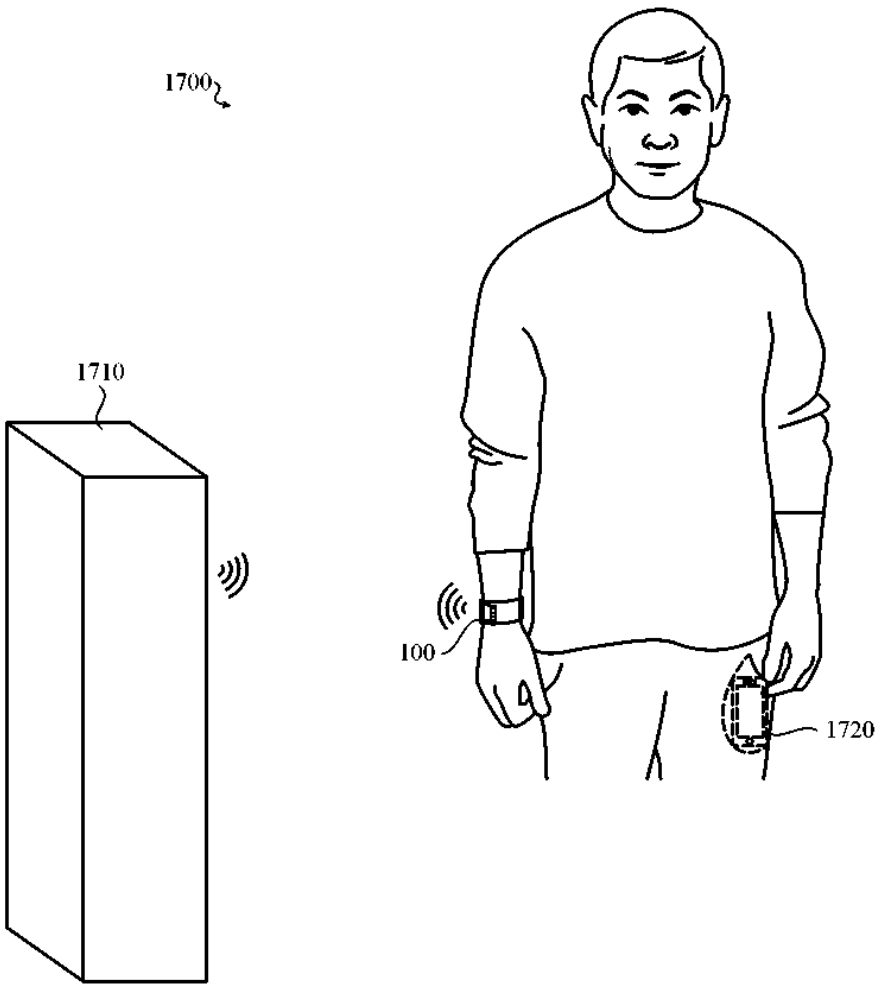

FIG. 17

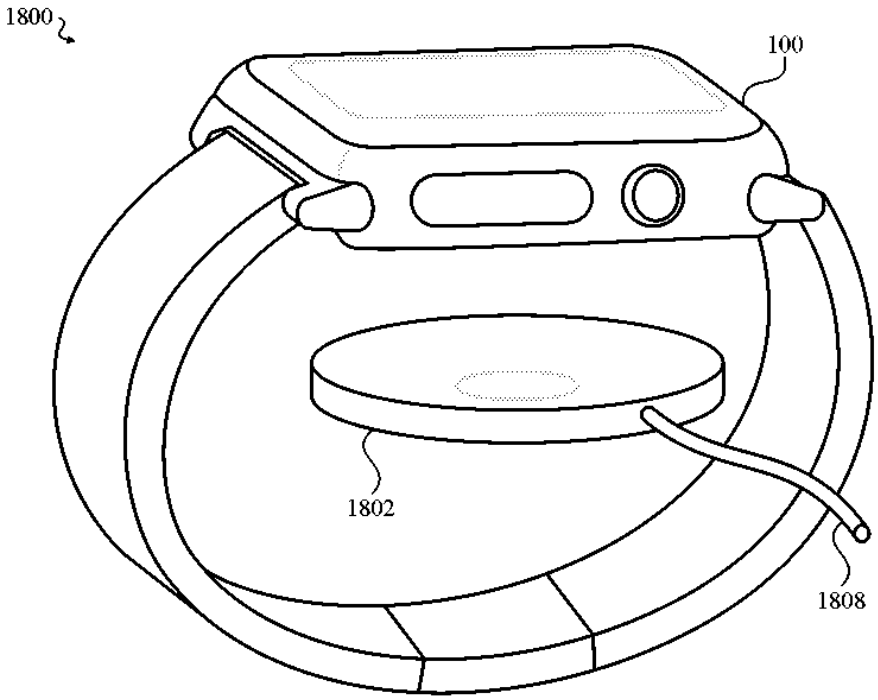

FIG. 18

19/26

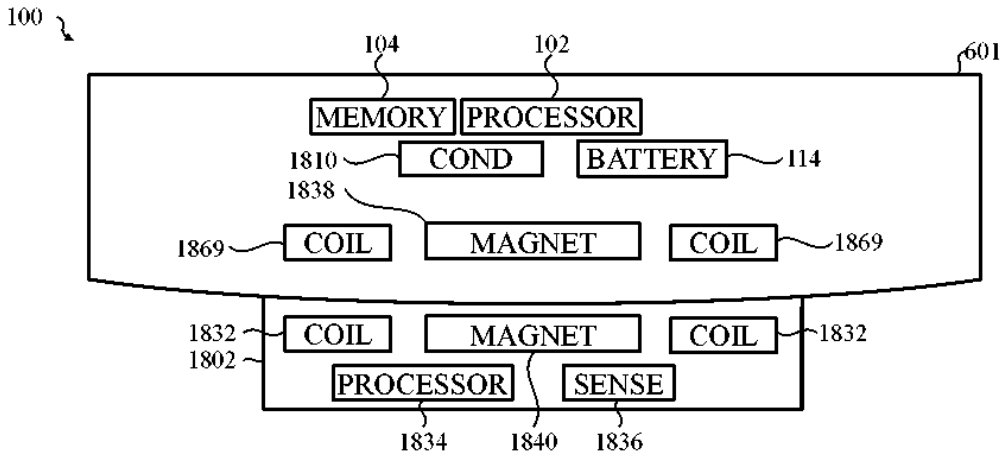
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FIG. 19

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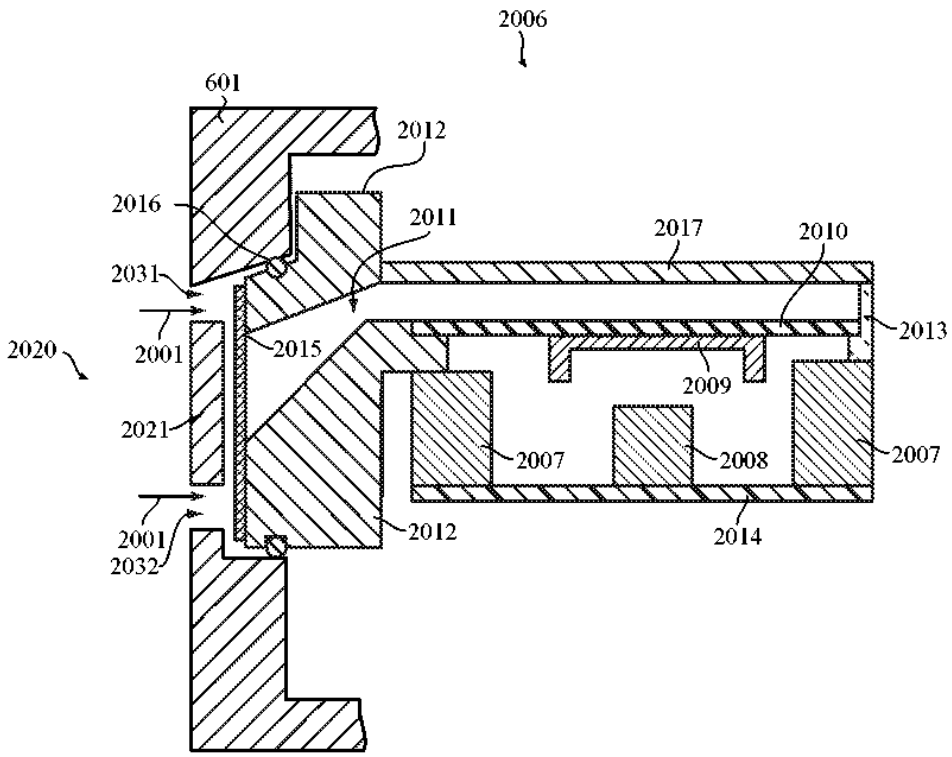
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FIG. 20

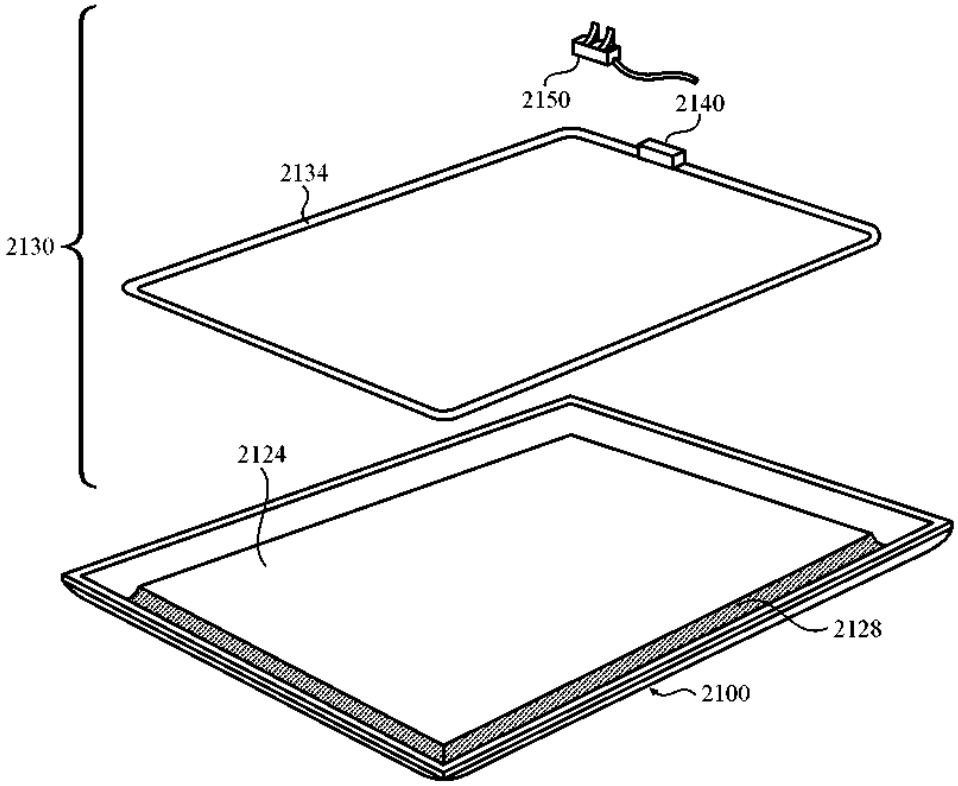

FIG. 21A

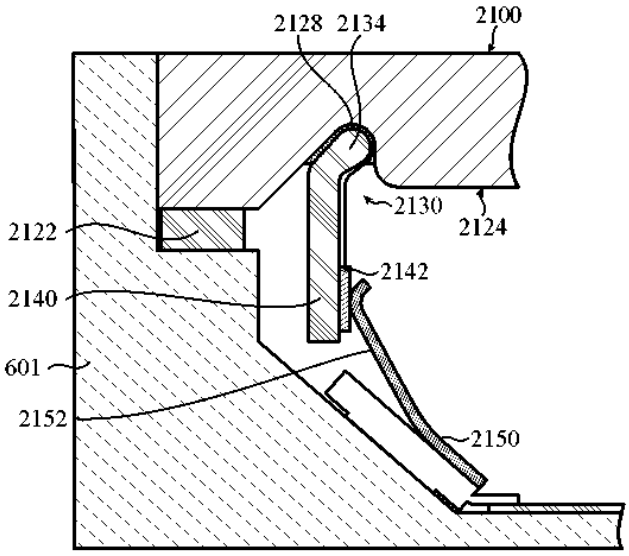

FIG. 21B

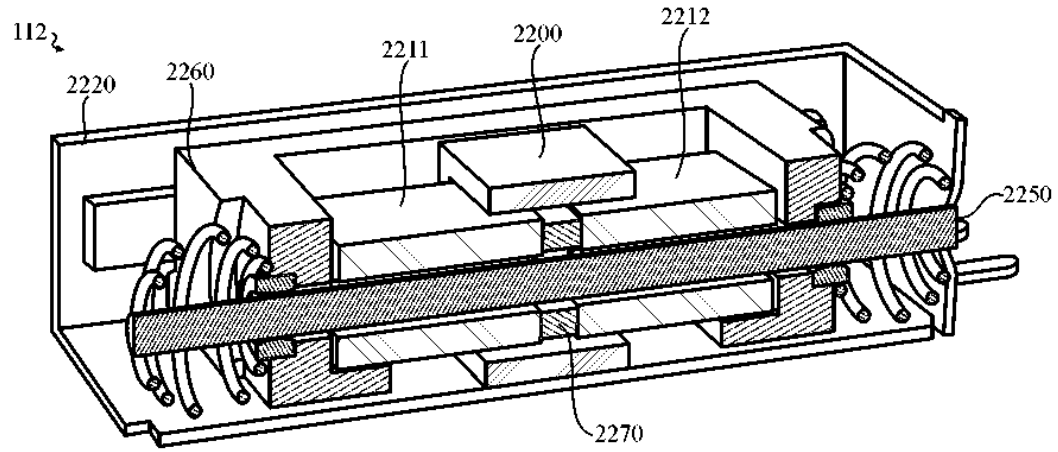

FIG. 22A

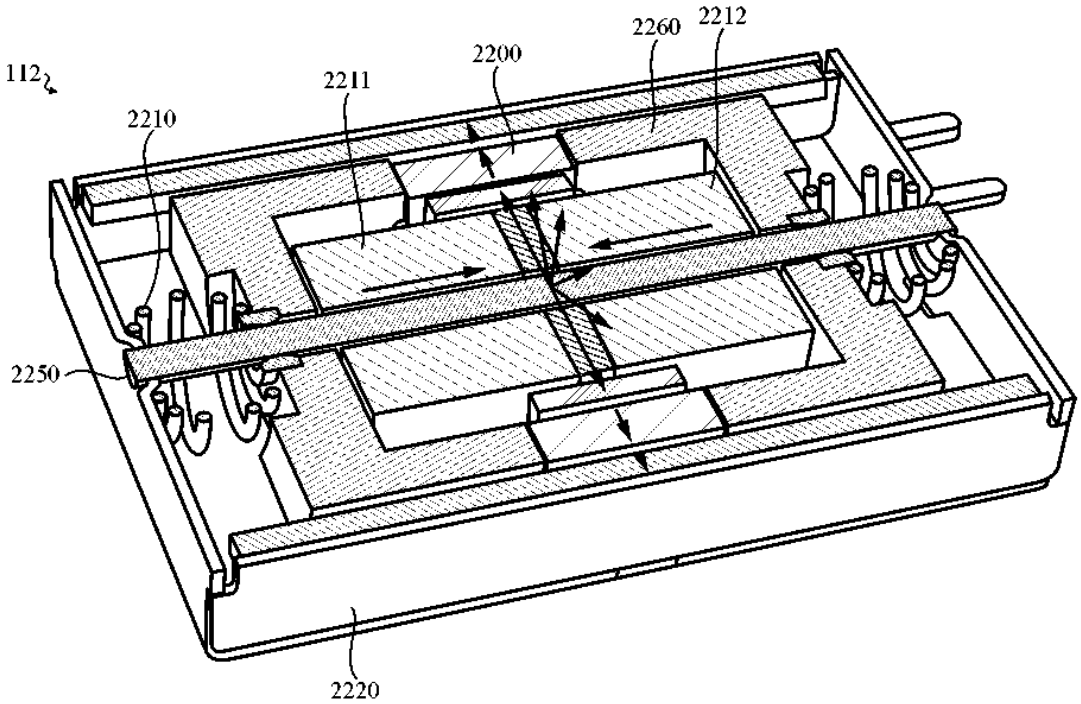

FIG. 22B

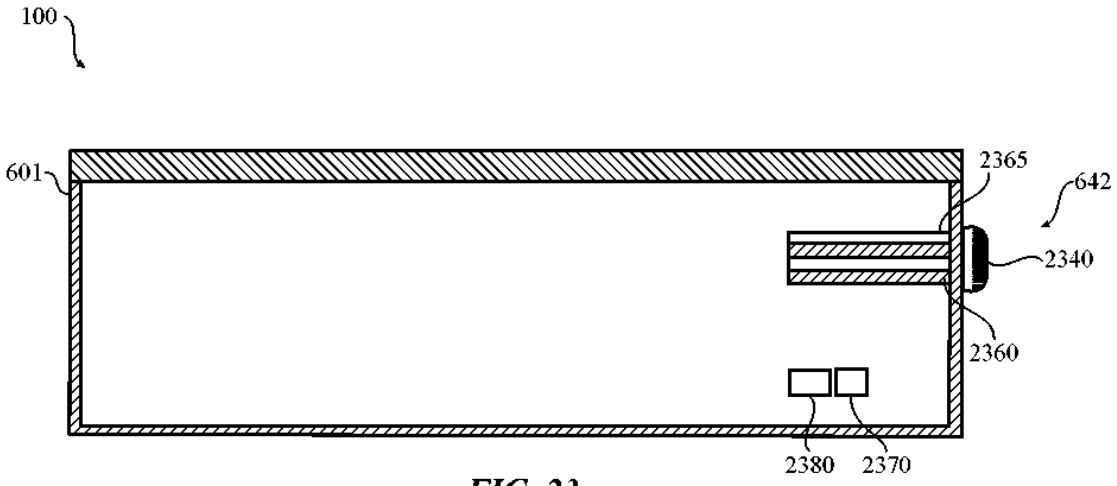

FIG. 23

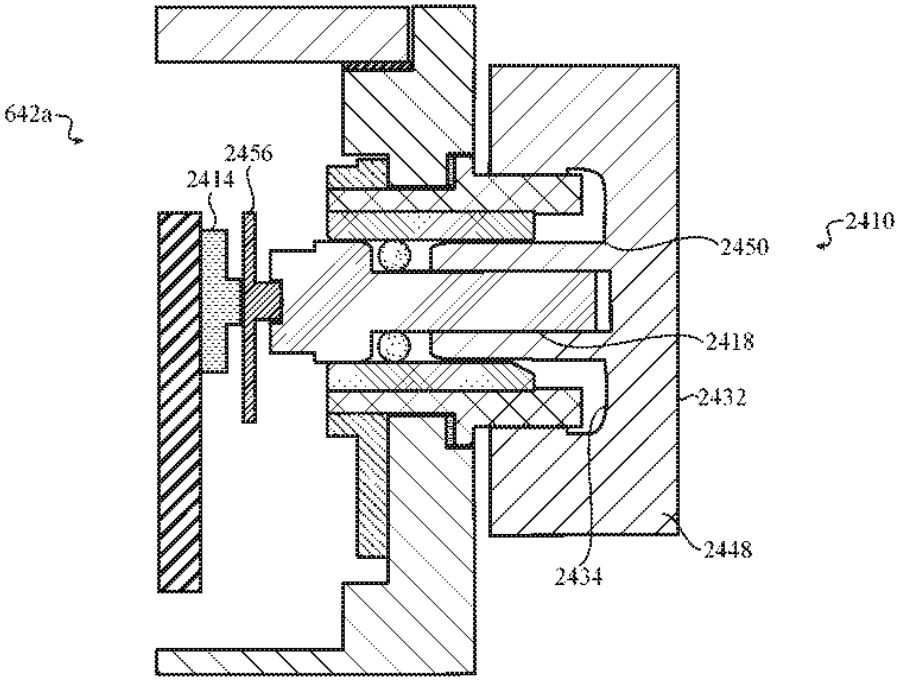

FIG. 24A

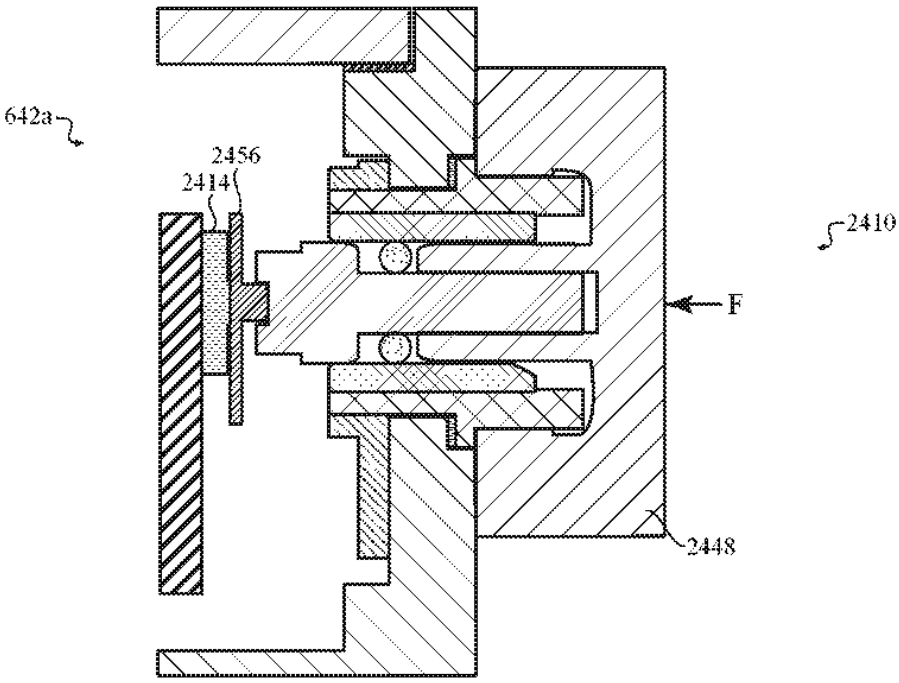

FIG. 24B

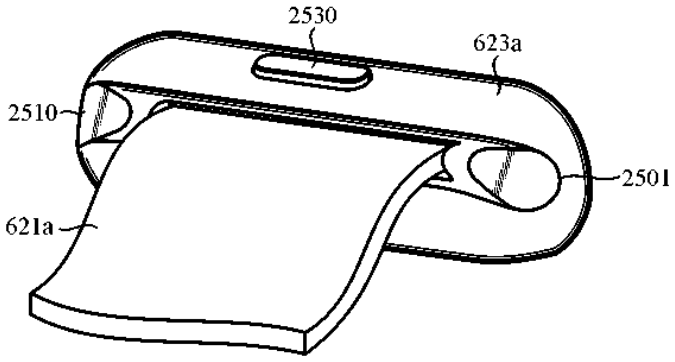

FIG. 25A

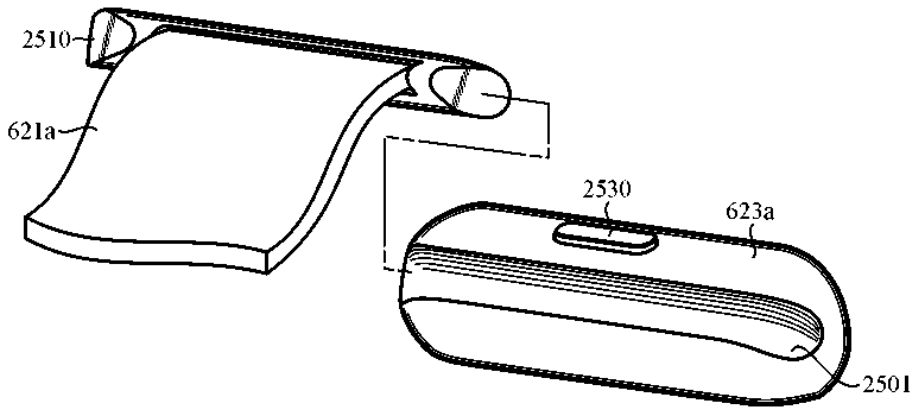

FIG. 25B

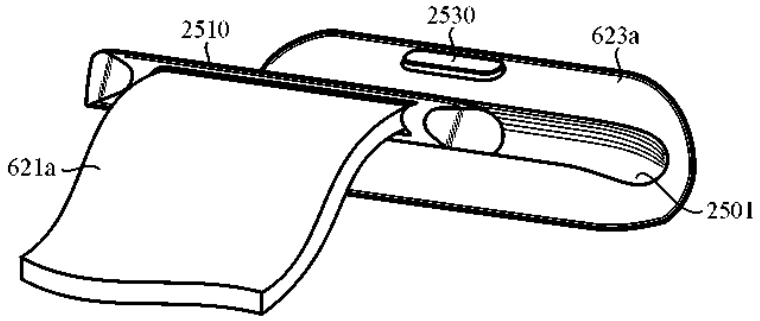

FIG. 25C

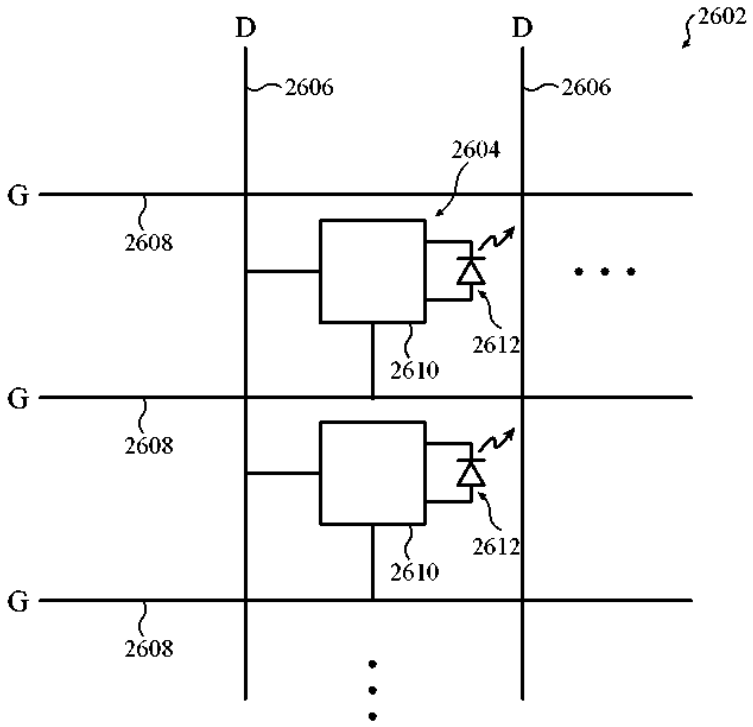

FIG. 26

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	WEARABLE ELECTRONIC DEVICE
First Named Inventor/Applicant Name:	Fletcher R. Rothkopf
Filer:	Benno Maxim Guggenheimer/Sonya Domingo
Attorney Docket Number:	P22914USC12

Filed as Large Entity

Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800
REQUEST FOR PRIORITIZED EXAMINATION	1817	1	4200	4200
Pages:				
Claims:				
Miscellaneous-Filing:				
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**6020**

Electronic Acknowledgement Receipt	
EFS ID:	47652790
Application Number:	18119175
International Application Number:	
Confirmation Number:	4975
Title of Invention:	WEARABLE ELECTRONIC DEVICE
First Named Inventor/Applicant Name:	Fletcher R. Rothkopf
Customer Number:	62579
Filer:	Benno Maxim Guggenheimer/Sonya Domingo
Filer Authorized By:	Benno Maxim Guggenheimer
Attorney Docket Number:	P22914USC12
Receipt Date:	08-MAR-2023
Filing Date:	
Time Stamp:	17:59:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$6020
RAM confirmation Number	E202338I00457771
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	P22914USC12_Application_Transmittal.pdf	280612 fb2bead879c171239738f43342481d0ced411ef5	no	2
Warnings:					
Information:					
2	Track One Request	P22914USC12_Request_for_Prioritized_Examination.pdf	114815 52604d02f199d14f48d0c41d9c74b162e0ec30ad	no	2
Warnings:					
Information:					
3	Application Data Sheet	P22914USC12_ADS.pdf	1261698 5d534406f73f51733d24c6b3fb73f3b2bd4502cd	no	12
Warnings:					
Information:					
4	Power of Attorney	P22914USC12_POA.pdf	270109 850ca7419197e40965c9341acb3759651a83d796	no	2
Warnings:					
Information:					
5	Oath or Declaration filed	P22914USC12_Declarations.pdf	521510 ce81974c9cdfd8ae41b3306e295a7505d3fa8a2b	no	4
Warnings:					
Information:					
6		P22914USC12_Specification.pdf	419837 a155a428d9705b6f73c258e4c66e5397f7d77420	yes	98
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	

	Specification		1	92	
	Claims		93	97	
	Abstract		98	98	
Warnings:					
Information:					
7	Drawings-only black and white line drawings	P22914USC12_Figures.pdf	1412501 775d6bcf1c35e4a057802027f69998f38ccbe30c	no	26
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Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	48834 6da809f075df52e3062e6e2e8cc17cd203fc4505	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	4329916		

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.

PTO/AIA/15 (03-13)
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UTILITY PATENT APPLICATION TRANSMITTAL

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

Attorney Docket No.	P22914USC12
First Named Inventor	Fletcher R. Rothkopf
Title	WEARABLE ELECTRONIC DEVICE
Express Mail Label No.	Electronically filed

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☐ **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. ☐ **Applicant asserts small entity status.** See 37 CFR 1.27
3. ☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. ☑ **Specification** [*Total Pages* 98] Both the claims and abstract must start on a new page. *(See MPEP § 608.01(a) for information on the preferred arrangement)*
5. ☑ **Drawing(s)** (35 U.S.C. 113) [*Total Sheets* 26]
6. **Inventor's Oath or Declaration** [*Total Pages* 4] *(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))*
   a. ☐ Newly executed (original or copy)
   b. ☑ A copy from a prior application (37 CFR 1.63(d))
7. ☑ **Application Data Sheet** * *See note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R** in duplicate, large table, or Computer Program (*Appendix*)
   ☐ Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission** (*if applicable, items a. – c. are required*)
   a. ☐ Computer Readable Form (CRF)
   b. ☐ Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ Paper
   c. ☐ Statements verifying identity of above copies

ADDRESS TO:

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

ACCOMPANYING APPLICATION PAPERS

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

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

19. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: 62579 **OR** ☐ Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature	/Benno M. Guggenheimer/	Date	March 8, 2023
Name (Print/Type)	Benno M. Guggenheimer	Registration No. (Attorney/Agent)	66,686

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

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

Privacy Act Statement

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

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

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

Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/AIA/424 (04-14)

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	Fletcher R. Rothkopf	Nonprovisional Application Number (if known):	
Title of Invention:	WEARABLE ELECTRONIC DEVICE		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently $0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.

2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.

3. The applicable box is checked below:

I. ☑ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.

---OR---

(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, **or** the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature /Benno M. Guggenheimer/	Date March 8, 2023
Name (Print/Typed) Benno M. Guggenheimer	Practitioner Registration Number 66,686

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.**

☐ *Total of _____ forms are submitted.

Privacy Act Statement

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

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

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P22914USC12
	Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE	

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

Secrecy Order 37 CFR 5.2:

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

Inventor Information:

Inventor 1 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Fletcher	R.	Rothkopf	

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

City	State/Province	Country of Residence
Los Altos	CA	US

Mailing Address of Inventor:

Address 1	One Apple Park Way
Address 2	

City	State/Province	Postal Code	Country
Cupertino	CA	95014	US

Inventor 2 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Jonathan		Ive	

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

City	State/Province	Country of Residence
San Francisco	CA	US

Mailing Address of Inventor:

Address 1	2808 Broadway Street
Address 2	

City	State/Province	Postal Code	Country
San Francisco	CA	94115	US

Inventor 3 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Julian		Hoenig	

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P22914USC12
	Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE	

City	San Francisco	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	610 Elizabeth Street		
Address 2			
City	San Francisco	State/Province	CA
Postal Code	94114	Country	US

Inventor 4 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Rico		Zorkendorfer	

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

City	San Francisco	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	3928 17th Street		
Address 2			
City	San Francisco	State/Province	CA
Postal Code	94114	Country	US

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

Correspondence Information:

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

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

Customer Number	62579		
Email Address	PatentDocket@bhfs.com	Add Email	Remove Email

Application Information:

Title of the Invention	WEARABLE ELECTRONIC DEVICE		
Attorney Docket Number	P22914USC12	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	26	Suggested Figure for Publication (if any)	6

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P22914USC12
	Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE	

Filing By Reference:

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

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

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

Publication Information:

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

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

Representative Information:

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

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	62579		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	18075253	2022-12-05

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P22914USC12
	Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE	

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
18075253	Continuation of	17951973	2022-09-23

Prior Application Status	Patented		Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
17951973	Continuation of	17672653	2022-02-15	11474483	2022-10-18

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
17672653	Continuation of	17188966	2021-03-01

Prior Application Status	Patented		Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
17188966	Continuation of	16826130	2020-03-20	10942491	2021-03-09

Prior Application Status	Patented		Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16826130	Continuation of	14842617	2015-09-01	10599101	2020-03-24

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
14842617	Claims benefit of provisional	62044974	2014-09-02

Prior Application Status	Patented		Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16826130	Continuation of	15261917	2016-09-10	10627783	2020-04-21

Prior Application Status	Patented		Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15261917	Continuation of	14842617	2015-09-01	10599101	2020-03-24

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
14842617	Claims benefit of provisional	62044974	2014-09-02

Prior Application Status	Patented		Remove		
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16826130	Continuation of	15261914	2016-09-10	10613485	2020-04-07

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P22914USC12
	Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE	

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15261914	Continuation of	14842617	2015-09-01	10599101	2020-03-24
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
14842617	Claims benefit of provisional	62044974	2014-09-02		
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16826130	Continuation of	15261912	2016-09-10	10620591	2020-04-14
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15261912	Continuation of	14842617	2015-09-01	10599101	2020-03-24
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
14842617	Claims benefit of provisional	62044974	2014-09-02		
Prior Application Status	Pending				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
17672653	Continuation of	17188995	2021-03-01		
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
17188995	Continuation of	16826130	2020-03-20	10942491	2021-03-09
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16826130	Continuation of	14842617	2015-09-01	10599101	2020-03-24
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
14842617	Claims benefit of provisional	62044974	2014-09-02		
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16826130	Continuation of	15261917	2016-09-10	10627783	2020-04-21

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P22914USC12
	Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE	

Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15261917	Continuation of	14842617	2015-09-01	10599101	2020-03-24
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
14842617	Claims benefit of provisional	62044974	2014-09-02		
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16826130	Continuation of	15261914	2016-09-10	10613485	2020-04-07
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15261914	Continuation of	14842617	2015-09-01	10599101	2020-03-24
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
14842617	Claims benefit of provisional	62044974	2014-09-02		
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16826130	Continuation of	15261912	2016-09-10	10620591	2020-04-14
Prior Application Status	Patented				Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15261912	Continuation of	14842617	2015-09-01	10599101	2020-03-24
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
14842617	Claims benefit of provisional	62044974	2014-09-02		
Prior Application Status	Pending				Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)		
	Continuation of	17188966	2021-03-01		

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P22914USC12
	Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE	

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	17188995	2021-03-01
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	17951973	2022-09-23

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

Foreign Priority Information:

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

Remove

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

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

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

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P22914USC12
	Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P22914USC12
	Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE	

Applicant Information:

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

Applicant 1 — Remove

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

Clear

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

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

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Apple Inc.		
Mailing Address Information For Applicant:			
Address 1	One Apple Park Way		
Address 2			
City	Cupertino	**State/Province**	CA
Country	US	Postal Code	95014
Phone Number		Fax Number	
Email Address			

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

Assignee Information including Non-Applicant Assignee Information:

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P22914USC12
	Application Number	
Title of Invention	WEARABLE ELECTRONIC DEVICE	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

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If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

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Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

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NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Benno M. Guggenheimer/			Date (YYYY-MM-DD)	2023-03-08
First Name	Benno M.	Last Name	Guggenheimer	Registration Number	70361

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