AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court District of Delaware on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
	10/20/2022	District of Delaware

PLAINTIFF	DEFENDANT
Apple Inc.	Masimo Corporation Sound United, LLC

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 see attachment		
2		
3		
4		
5		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director **Copy 3—Upon termination of action, mail this copy to Director**
Copy 2—Upon filing document adding patent(s), mail this copy to Director **Copy 4—Case file copy**

Patent or Trademark No.	Date of Patent or Trademark	Holder of Patent or Trademark
10,076,257	9/18/2018	Apple Inc.
10,627,783	4/21/2020	Apple Inc.
10,942,491	9/9/2021	Apple Inc.
10,987,054	4/27/2021	Apple Inc.
11,106,352	8/31/2021	Apple Inc.
11,474,483	10/18/2022	Apple Inc.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/841,543	04/27/2021	10987054	P35079USC2	6983

62579 7590 04/07/2021

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

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Sameer Pandya, Sunnyvale, CA;
Apple Inc., Cupertino, CA;
Adam T. Clavelle, San Francisco, CA;
Erik G. de Jong, San Francisco, CA;
Michael B. Wittenberg, San Francisco, CA;
Tobias J. Harrison-Noonan, San Francisco, CA;
Martin Melcher, Mountain View, CA;
Zhipeng Zhang, Santa Clara, CA;
Steven C. Roach, San Francisco, CA;
Steven P. Cardinali, Campbell, CA;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

IR103 (Rev. 10/09)

PTO/SB/08A and B (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.:** Not Yet Assigned	**FILING DATE:** Herewith
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P35079USC2

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.	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.	6,996,428	02/2006	Kislov et al.	
	A2.	7,486,386	02/2009	Holcombe	
	A3.	7,729,748	06/2010	Florian	
	A4.	7,822,469	10/2010	Lo	
	A5.	7,915,601	03/2011	Setlak et al.	
	A6.	7,957,762	06/2011	Herz et al.	
	A7.	8,954,135	02/2015	Yuen et al.	
	A8.	8,988,372	03/2015	Messerschmidt et al.	
	A9.	9,042,971	05/2015	Brumback et al.	
	A10.	9,100,579	06/2014	Schatvet et al.	
	A11.	9,348,322	05/2016	Fraser et al.	
	A12.	9,427,191	08/2016	LeBoeuf	
	A13.	9,485,345	11/2016	Dantu	
	A14.	9,557,716	01/2017	Inamdar	
	A15.	9,620,312	04/2017	Ely et al.	
	A16.	9,627,163	04/2017	Ely et al.	
	A17.	9,723,997	08/2017	Lamego	
	A18.	9,737,221	08/2017	Sato	
	A19.	9,848,823	12/2017	Raghuram et al.	
	A20.	10,092,197	10/2018	Han	
	A21.	10,123,710	11/2018	Gassoway et al.	
Change(s) applied to document, /C.G/ 1/21/2021	A22.	10,126,194	11/2018	Lee	
	A23.	10,172,562	01/2019	Lim et al.	
	A24.	10,254,804	04/2019	Dusan	
	A25.	10,524,671	01/~~2019~~ 2020	Lamego	
	A26.	10,534,900	01/2020	Cheong et al.	
	A27.	10,599,101	03/2020	Rothkopf et al.	
	A28.	10,610,157	04/2020	Pandya et al.	

20525905.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.K/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/841,543	04/06/2020	Sameer Pandya	P35079USC2	6983

62579 7590 03/31/2021

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

EXAMINER	
KIM, EUN HWA	

ART UNIT	PAPER NUMBER
3794	

NOTIFICATION DATE	DELIVERY MODE
03/31/2021	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

Supplemental ***Notice of Allowability***	**Application No.** 16/841,543	**Applicant(s)** Pandya et al.	
	Examiner EUNHWA KIM	**Art Unit** 3794	**AIA (FITF) Status** Yes

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to IDS filed on 3/22/21.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ 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.

3. ☑ The allowed claim(s) is/are 21-40 . As a result of the allowed claim(s), 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.**

4. ☐ 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)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/EUN HWA KIM/
Primary Examiner, Art Unit 3794

PTO/SB/08A and B (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.:** 16/841,543	**FILING DATE:** April 6, 2020
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** 3794
	EXAMINER NAME: Kim, Eun Hwa	**ATTY. DOCKET NO.:** P35079USC2

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.	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.	6,608,562	08/2003	Kimura et al.	
	A2.	8,670,819	03/2014	Iwamiya et al.	
	A3.	8,842,848	09/2014	Donaldson et al.	
	A4.	9,516,442	12/2016	Dusan	
	A5.	9,664,556	05/2017	Chu et al.	
	A6.	9,763,584	09/2017	Freschl et al.	
	A7.	9,852,844	12/2017	Golko et al.	
	A8.	9,891,590	02/2018	Shim et al.	
	A9.	10,271,800	04/2019	Lin 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 Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	B1.	2015/0002088	01/2015	D'Agostino	

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.	TW 201632136	09/2016	Rooti Labs Ltd.		✓

NONPATENT LITERATURE DOCUMENTS

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

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.K/

PTO/SB/08A and B (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.:** 16/841,543	**FILING DATE:** April 6, 2020
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** 3794
	EXAMINER NAME: Kim, Eun Hwa	**ATTY. DOCKET NO.:** P35079USC2

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 Signature	/EUN HWA KIM/	Date Considered	03/27/2021

[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.

22454614.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.K/

PTO/SB/47 (03-09)
Approved for use through 05/31/2015. OMB 0651-0016
U.S. Patent and Trademark Office; U. S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

"FEE ADDRESS" INDICATION FORM

Address to:
Mail Stop M Correspondence
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

- OR -

Fax to:
571-273-6500

INSTRUCTIONS: The issue fee must have been paid for application(s) listed on this form. In addition, only an address represented by a Customer Number can be established as the fee address for maintenance fee purposes (hereafter, fee address). A fee address should be established when correspondence related to maintenance fees should be mailed to a different address than the correspondence address for the application. **When to check the first box below**: If you have a Customer Number to represent the fee address. **When to check the second box below**: If you have no Customer Number representing the desired fee address, in which case a completed Request for Customer Number (PTO/SB/125) must be attached to this form. For more information on Customer Numbers, see the Manual of Patent Examining Procedure (MPEP) § 403.

For the following listed application(s), please recognize as the "Fee Address" under the provisions of 37 CFR 1.363 the address associated with:

☑ Customer Number: 000197

OR

☐ The attached Request for Customer Number (PTO/SB/125) form.

PATENT NUMBER (if known)	APPLICATION NUMBER
	16/841,543

Completed by (check one):

☐ Applicant/Inventor — /S. Craig Hemenway/ (Signature)

☑ Attorney or Agent of record 44,759 (Reg. No.) — S. Craig Hemenway (Typed or printed name)

☐ Assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96) — 303-223-1100 (Requester's telephone number)

☐ Assignee recorded at Reel _____ Frame_____ — March 22, 2021 (Date)

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more that one signature is required, see below*.

☐ * Total of _____forms are submitted.

This collection of information is required by 37 CFR 1.363. 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 5 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 COMPLETED FORMS TO THIS ADDRESS.
SEND TO: Mail Stop M Correspondence, 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.

Electronic Patent Application Fee Transmittal				
Application Number:	16841543			
Filing Date:	06-Apr-2020			
Title of Invention:	Wearable Electronic Device with Electrodes for Sensing Biological Parameters			
First Named Inventor/Applicant Name:	Sameer Pandya			
Filer:	Stephen C. Hemenway/Valerie Brown			
Attorney Docket Number:	P35079USC2			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	**Fee Code**	**Quantity**	**Amount**	**Sub-Total in USD($)**
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1200	1200

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
		Total in USD ($)		**1460**

Electronic Acknowledgement Receipt	
EFS ID:	42241168
Application Number:	16841543
International Application Number:	
Confirmation Number:	6983
Title of Invention:	Wearable Electronic Device with Electrodes for Sensing Biological Parameters
First Named Inventor/Applicant Name:	Sameer Pandya
Customer Number:	62579
Filer:	Stephen C. Hemenway/Valerie Brown
Filer Authorized By:	Stephen C. Hemenway
Attorney Docket Number:	P35079USC2
Receipt Date:	22-MAR-2021
Filing Date:	06-APR-2020
Time Stamp:	12:45:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1460
RAM confirmation Number	E20213LC46143518
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 Letter	P35079USC2-IDS.pdf	18469 66df5497da7612e9e3c0ce38f68185b945bf448b	no	2
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	P35079USC2-PTOSB08.pdf	33927 008d1095fea16fd53ae25c11101696dd0c399d1b	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	TW201632136A.pdf	2852458 48123077593eb4667d8d75ea16056e25521f3457	no	22
Warnings:					
Information:					
4	Issue Fee Payment (PTO-85B)	P35079USC2IssueFeeTransmittal.pdf	320489 fab0e53a4a6773ca02f9873b3d72435ea8f90982	no	1
Warnings:					
Information:					
5	Maintenance Fee Address Change	P35079USC2-FeeAddress.pdf	201351 5e656618c6dbf50594c1ef4d0a5736a369b56600	no	1
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	32614 ed44e01c49e4e73706231cee205dce3ddbf3a8e6	no	2
Warnings:					

Information:	
Total Files Size (in bytes):	3459308

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:			
Sameer Pandya, et al.		Examiner:	Kim, Eun Hwa
Application No. 16/841,543		Art Unit:	3794
Filed: April 6, 2020		Confirmation No.	6983
For:	WEARABLE ELECTRONIC DEVICE WITH ELECTRODES FOR SENSING BIOLOGICAL PARAMETERS		

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97(d), 1.97(e), 1.98 and 1.17(p)

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 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 make his or her own determination of materiality. 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. § 1.97(e), I state as follows:

☒ The reference identified as Cite No. C1 contained in this information disclosure statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(1).

☒ The references identified as Cite Nos. A1-A9 and B1 contained in this information disclosure statement were not cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing this certification after making reasonable inquiry, no item of information contain in this Information Disclosure Statement was known to any individual

designated in 37 C.F.R. § 1.56(c) more than three months prior to the filing of this Information Disclosure Statement. 37 C.F.R. § 1.97(e)(2).

This Information Disclosure Statement is being filed under 37 C.F.R. § 1.97(d) after the mailing date of a Notice of Allowance but before the payment of the issue fee. As such, this Information Disclosure Statement requires a statement under 37 C.F.R. § 1.97(e) and the fee of $260.00 pursuant to 37 C.F.R. § 1.17(p). Payment by credit card in the amount of $260.00 is being made with this filing. If any additional fees are deemed necessary, such fees may be charged to Deposit Account No. 504621.

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

Dated: March 22, 2021.

Respectfully submitted,

/S. Craig Hemenway/

S. Craig Hemenway, Registration No. 44,759
Attorney for Assignee
USPTO Customer No. 62579

Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, Colorado 80202
Phone: (303) 223-1100
Fax: (303) 223-1111

PTO/SB/08A and B (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.:** 16/841,543	**FILING DATE:** April 6, 2020
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** 3794
	EXAMINER NAME: Kim, Eun Hwa	**ATTY. DOCKET NO.:** P35079USC2

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.	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.	6,608,562	08/2003	Kimura et al.	
	A2.	8,670,819	03/2014	Iwamiya et al.	
	A3.	8,842,848	09/2014	Donaldson et al.	
	A4.	9,516,442	12/2016	Dusan	
	A5.	9,664,556	05/2017	Chu et al.	
	A6.	9,763,584	09/2017	Freschl et al.	
	A7.	9,852,844	12/2017	Golko et al.	
	A8.	9,891,590	02/2018	Shim et al.	
	A9.	10,271,800	04/2019	Lin 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 Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	B1.	2015/0002088	01/2015	D'Agostino	

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.	TW 201632136	09/2016	Rooti Labs Ltd.		✓

NONPATENT LITERATURE DOCUMENTS

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

22454614.1

PTO/SB/08A and B (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.:** 16/841,543	**FILING DATE:** April 6, 2020
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** 3794
	EXAMINER NAME: Kim, Eun Hwa	**ATTY. DOCKET NO.:** P35079USC2

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 Signature		Date Considered	

[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.

Espacenet

Bibliographic data: TW201632136 (A) — 2016-09-16

Wearable electronic device

Inventor(s): CHANG MING-SHIUNG [TW]; LI KO-MAI [TW]; CHUANG SHU-CHEN [TW] ± (CHANG, MING-SHIUNG, ; LI, KO-MAI, ; CHUANG, SHU-CHEN)

Applicant(s): ROOTI LABS LTD [TW] ± (ROOTI LABS LIMITED)

Classification: **- international:*A61B5/00; A61B5/04***
- cooperative: **A61B5/0015 (US); A61B5/6838 (EP, US);** A61B2560/0443 (EP, US); A61B5/002 (EP, US); A61B5/02438 (EP, US); A61B5/0245 (EP, US)

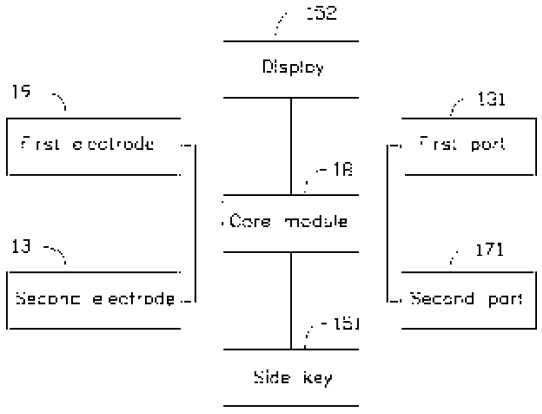
Application number: TW20150104176 20150206

Priority number (s): CN201410463521 20140912

Also published as: CN105411563 (A) US2016073881 (A1) US9579021 (B2)

Abstract of TW201632136 (A)

A wearable electronic device which includes a signal acquisition component and an adapter component, the adapter component includes a housing element, a first electrode, and a second electrode. The housing element provides a groove, the signal acquisition component is contained in the groove. The first electrode and the second electrode are protruding from a bottom of the housing element, and are electrically connected to the signal acquisition component. The signal acquisition component collects biological signals via the first electrode and the second electrode.



Masimo Ex. 1002
IPR Petition - USP 10,987,054

Masimo Ex. 1002
IPR Petition - USP 10,987,054

201632136

(19)中華民國智慧財產局

(12)發明說明書公開本 (11)公開編號：TW 201632136 A

(43)公開日： 中華民國 105 (2016) 年 09 月 16 日

(21)申請案號：104104176 (22)申請日： 中華民國 104 (2015) 年 02 月 06 日

(51)Int. Cl.： *A61B5/00 (2006.01)* *A61B5/04 (2006.01)*

(30)優先權：2014/09/12 中國大陸 201410463521.0

(71)申請人：路提科技股份有限公司 (中華民國) ROOTI LABS LIMITED (TW)
臺北市內湖區瑞光路 583 巷 26 號

(72)發明人：張銘雄 CHANG, MING-SHIUNG (TW) ；黎克邁 LI, KO-MAI (TW) ；莊舒蓁 CHUANG, SHU-CHEN (TW)

(74)代理人：陳俊銘

申請實體審查：無 申請專利範圍項數：10 項 圖式數：5 共 18 頁

(54)名稱

可穿戴電子裝置

WEARABLE ELECTRONIC DEVICE

(57)摘要

一種可穿戴電子裝置，包括訊號擷取元件和轉接元件，該轉接元件包括容置件、第一電極和第二電極，該容置件具有一容置槽，該訊號擷取元件容置於該容置槽內，所述第一電極和第二電極突出於該容置件底部設置，並與該訊號擷取元件電性連接，該訊號擷取元件通過所述第一電極和第二電極擷取人體生物訊號。

A wearable electronic device which includes a signal acquisition component and an adapter component, the adapter component includes a housing element, a first electrode, and a second electrode. The housing element provides a groove, the signal acquisition component is contained in the groove. The first electrode and the second electrode are protruding from a bottom of the housing element, and are electrically connected to the signal acquisition component. The signal acquisition component collects biological signals via the first electrode and the second electrode.

指定代表圖：

Masimo Ex. 1002
IPR Petition - USP 10,987,054

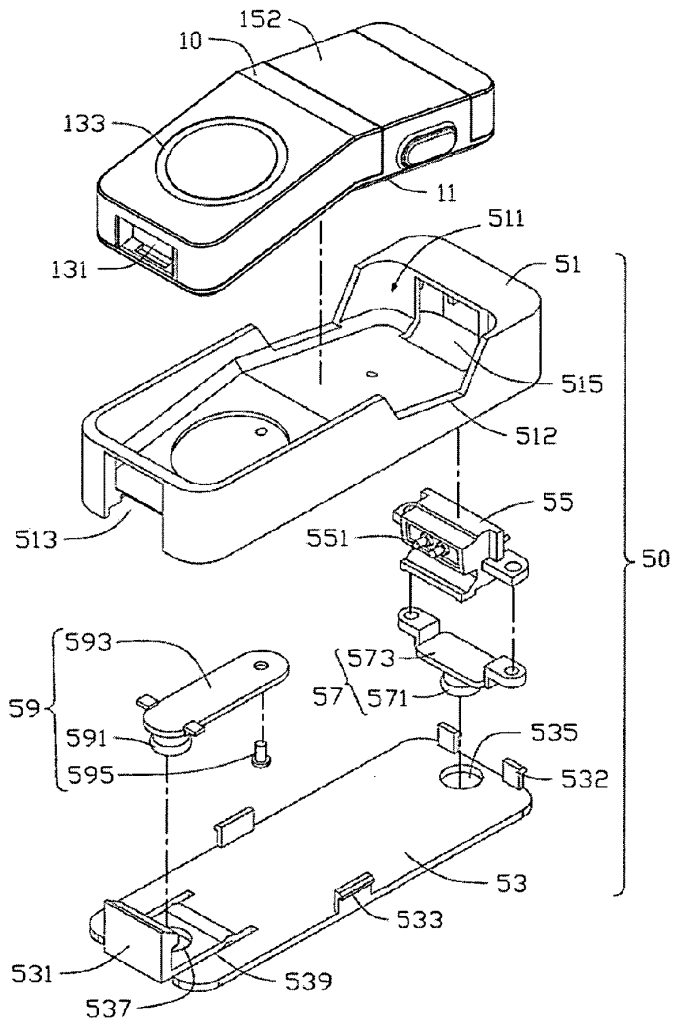


圖 3

符號簡單說明：

10・・・訊號擷取元件

11・・・底座

131・・・第一介面

133・・・標示件

151・・・側鍵

152・・・顯示幕

50・・・轉接元件

51・・・容置件

511・・・容置槽

512・・・缺口

513・・・通孔

515・・・卡槽

53・・・卡合件

531・・・卡扣部

532、533・・・卡扣件

535・・・第一過孔

537・・・第二過孔

55・・・訊號轉接件

551・・・轉接電極

57・・・第一電極

571・・・第一凸出部

573・・・固定件

59・・・第二電極

591・・・第二凸出部

593・・・定位件

595・・・螺杆

Masimo Ex. 1002
IPR Petition - USP 10,987,054

【發明說明書】

【中文發明名稱】 可穿戴電子裝置

【英文發明名稱】 WEARABLE ELECTRONIC DEVICE

【技術領域】

【0001】 本發明涉及一種可攜式電子裝置，尤其涉及一種可穿戴電子裝置。

【先前技術】

【0002】 可穿戴電子裝置是一種可以讓使用者直接穿戴到身上，或通過配件整合到使用者衣服上的可攜式電子裝置，其可通過軟體支援或雲端交互的方式來實現與手持無線終端或雲伺服器進行通信。近年來，隨著無線通訊技術的飛速發展，在消費性電子領域掀起了一股可穿戴電子裝置的研發和生產熱潮。目前市面上的可穿戴電子裝置基本以腕帶（如智慧手錶、手環等）或頭戴（如智慧眼鏡、頭帶等）的穿戴方式爲主，還有少部分被集成到使用者衣服上形成智慧服裝。然，對於一款優秀的可穿戴產品來說，其穿戴方式不應該被限定，而是可以由用戶自行選擇，以保證良好的用戶體驗。

【發明內容】

【0003】 鑒於以上情況，本發明提供一種多功能的可穿戴電子裝置。

【0004】 一種可穿戴電子裝置，包括訊號擷取元件和轉接元件，該轉接元件包括容置件、第一電極和第二電極，該容置件具有一容置槽，該訊號擷取元件容置於該容置槽內，所述第一電極和第二電極突出於該容置件底部設置，並與該訊號擷取元件電性連接，該訊號

Masimo Ex. 1002
IPR Petition - USP 10,987,054

擷取元件通過所述第一電極和第二電極擷取人體生物訊號。

【0005】 該可穿戴電子裝置通過將該訊號擷取元件可選擇地與該轉接元件或該通信元件連接，有效控制了該訊號擷取元件的尺寸，使該可穿戴電子裝置具有小巧、時尚的外觀。

【圖式簡單說明】

【0006】 圖1爲本發明可穿戴電子裝置的立體圖。

【0007】 圖2爲圖1所示的可穿戴電子裝置的訊號擷取元件和轉接元件的立體圖。

【0008】 圖3爲圖1所示可穿戴電子裝置的分解圖。

【0009】 圖4爲圖1所示可穿戴電子裝置另一角度的分解圖。

【0010】 圖5爲圖1所示的可穿戴電子裝置的通信元件的立體圖。

【實施方式】

【0011】 請一併參閱圖1和圖5，本發明提供一種可穿戴電子裝置100，包括訊號擷取元件10、轉接元件50和通信元件70。該訊號擷取元件10用於擷取和處理人體生物訊號，並具有液晶顯示、震動提示及無線通訊功能。該轉接元件50與該訊號擷取元件10連接，以使該可穿戴電子裝置100被使用者穿戴。該通信元件70可拆卸地與該訊號擷取元件10電性連接，用於給該訊號擷取元件10充電並傳送該訊號擷取元件10獲取的人體生物訊號。

【0012】 請一併參閱圖1和圖2，該訊號擷取元件10包括底座11、第一殼體13、第二殼體15、第三殼體17、訊號擷取電極19及機芯（圖未示）。該底座11在其大致中間的位置彎折形成一鈍角的彎折部。該底座11外表面還設置有一密封層111，該密封層111由橡膠材料製

成。該第一殼體13在對應該底座11彎折部的位置設置一對應的彎折，該第一殼體13、第二殼體15及第三殼體17依次包覆於該底座11上，並共同形成一容置空間，以容置該機芯。其中，該第一殼體13及該第三殼體17爲金屬材質，該第二殼體15爲塑膠材質，且該第一殼體13作爲該訊號擷取元件10的一電極，並與該機芯電性連接。該第一殼體13表面還設置有一環狀標示件133，用於標示該第一殼體13的電極接觸位置。用戶只需將手指按壓在該環狀標示件133所標示的圓餅狀區域內，即可在由該第一殼體13形成的電極和該訊號擷取電極19之間形成回路，以擷取人體生物訊號。該機芯具有處理人體生物訊號的功能，同時該機芯還具有震動提示功能。該訊號擷取電極19貫穿該底座11設置，並在該容置空間中與該機芯電性連接，以將擷取到的人體生物訊號傳送給該機芯處理。該第一殼體13遠離該第二殼體15的一側設置有一第一介面131，該第一介面131具有一卡合結構，用於與所述轉接元件50連接。該第二殼體15一側設置有一側鍵151，該側鍵151與該機芯電性連接，用於電源控制及參數設置。該第二殼體15上還設置一顯示幕152，該顯示幕152與該機芯電性連接，用於顯示人體生理狀態、機芯工作參數及時間等資訊。該第三殼體17遠離該第二殼體15的一側設置有一第二介面171，該第二介面171具有與該第一介面131相似的卡合結構，用於可拆卸的機械連接所述轉接元件50或通信元件70；同時，該第二介面171還與該機芯電性連接，以將該轉接元件50擷取的人體生物訊號從該第二介面171傳送至該機芯，或通過該通信元件70給該機芯充電以及將該機芯中的資料通過該通信元件70匯出到其他電子設備。

【0013】 請一併參閱圖3和圖4，該轉接元件50包括容置件51、卡合件53、

訊號轉接件55、第一電極57和第二電極59。

【0014】 該容置件51具有一容置槽511，用於容置所述訊號擷取元件10。該容置槽511兩側與該側鍵151對應的位置對稱設置二缺口512，該側鍵151從其中一缺口512處露出，以方便操作該側鍵11以及將該訊號擷取元件10從該容置槽511中取出。該容置件51一端設置一通孔513，通孔513與容置槽511連通。該卡合件53固定於該容置件51底部。

【0015】 該卡合件53一端開設二相對的狹縫539，並於所述二狹縫539之間的部分彎折延伸出一“L”形的卡扣531，該卡扣531從該通孔513露出於容置槽511內，用於和設置於該訊號擷取元件10一側的該第一介面131卡合。該卡合件53與所述第一電極57和第二電極59對應的位置分別開設一第一過孔535和第二過孔537。該容置件51相對於該通孔513一端的端壁上設置一與容置槽511連通的卡槽515。

【0016】 該訊號轉接件55設置於該卡槽515內，用於和該第二介面171機械及電性連接。該轉接件55具有一凸出塊（圖未標），該凸出塊上間隔設置二個轉接電極551。當該轉接件55被裝配到該卡槽515內時，該凸出塊朝向該容置槽511內延伸。當該訊號擷取元件10被放置於該容置槽511內時，該凸出塊與所述第二介面171配合，形成可拆卸的機械連接，同時所述二個轉接電極551通過該第二介面171與所述機芯電性連接。

【0017】 該第一電極57和該第二電極59由該容置件51底部伸出。具體地，該第一電極57包括一第一凸出部571和一固定件573，該第一凸出部571設置在該固定件573的一側且通過所述第一過孔535從該容

Masimo Ex. 1002
IPR Petition - USP 10,987,054

置件51底部伸出。固定件573固定於該容置件51上，比如，通過螺釘（圖未示）依次穿過轉接件55與固定件573從而與容置件51鎖固。

【0018】 該第二電極59包括一第二凸出部591、一定位件593和一螺杆595。該第二凸出部591設置在該定位件593的一端且通過所述第二過孔537從該容置件51底部伸出。該螺杆595穿過該定位件593的另一端，並將其鎖固在該容置件51上。所述第一凸出部571、第二凸出部591用於與一智慧服裝結合，以使該可穿戴電子裝置100以智慧服裝的形式被用戶穿戴。該第一電極57和該第二電極59分別與所述二轉接電極551電性連接，以將擷取到的人體生物訊號傳送至所述機芯。

【0019】 請參閱圖5，該通信元件70包括轉接頭71、傳輸線73及通用序列匯流排（Universal Serial Bus，USB）介面75。該轉接頭71一端設置一卡持件711，另一端通過該傳輸線73與該USB介面75連接。該卡持件711用於與所述第二介面171卡合，並使該轉接頭71通過該第二介面171與該機芯電性連接，從而使該通信元件70與該訊號擷取元件10建立通信。可以理解，所述訊號轉接件55與該通信元件70共用該第二介面171，當需要充電或資料傳輸時，只需將該訊號擷取元件10從該轉接元件50中取出，再將該通信元件70與該第二介面171連接，即利用該USB介面給該訊號擷取元件10充電以及將該機芯中的資料通過該通信元件70匯出到其他電子設備。

【0020】 該可穿戴電子裝置100通過將該訊號擷取元件10可選擇地與該轉接元件40或該通信元件70連接，並讓所述轉接元件40及通信元件

Masimo Ex. 1002
IPR Petition - USP 10,987,054

70共用該第二介面171，以及利用外接通信元件70給該訊號擷取元件充電或將該機芯中的資料通過該通信元件70匯出到其他電子設備，有效控制了該訊號擷取元件10的尺寸，使該可穿戴電子裝置100實現與智慧服裝結合的穿戴形式的同時具有小巧、時尚的外觀。

【0021】 以上所述，僅爲本發明的較佳實施例，並非是對本發明作任何形式上的限定。另外，本領域技術人員還可在本發明精神內做其它變化，當然，這些依據本發明精神所做的變化，都應包含在本發明所要求保護的範圍之內。

【符號說明】

【0022】 可穿戴電子裝置：100

【0023】 訊號擷取元件：10

【0024】 底座：11

【0025】 第一殼體：13

【0026】 第一介面：131

【0027】 標示件：133

【0028】 第二殼體：15

【0029】 側鍵：151

【0030】 顯示幕：152

【0031】 第三殼體：17

【0032】 第二介面：171

Masimo Ex. 1002
IPR Petition - USP 10,987,054

【0033】 訊號擷取電極：19

【0034】 轉接元件：50

【0035】 容置件：51

【0036】 容置槽：511

【0037】 缺口：512

【0038】 通孔：513

【0039】 卡槽：515

【0040】 卡合件：53

【0041】 卡扣部：531

【0042】 卡扣件：532、533

【0043】 第一過孔：535

【0044】 第二過孔：537

【0045】 訊號轉接件：55

【0046】 轉接電極：551

【0047】 第一電極：57

【0048】 第一凸出部：571

【0049】 固定件：573

【0050】 第二電極：59

【0051】 第二凸出部：591

Masimo Ex. 1002
IPR Petition - USP 10,987,054

【0052】　定位件：593

【0053】　螺杆：595

【0054】　通信元件：70

【0055】　轉接頭：71

【0056】　卡持件：711

【0057】　傳輸線：73

【0058】　USB介面：75

【主張利用生物材料】

【0059】　無

Masimo Ex. 1002
IPR Petition - USP 10,987,054

201632136 專利案號：104104176

申請日：104. 2. 06

201632136

IPC分類：
A61B5/00 (2006.01)
A61B5/04 (2006.01)

【發明摘要】

【中文發明名稱】可穿戴電子裝置

【英文發明名稱】WEARABLE ELECTRONIC DEVICE

【中文】

一種可穿戴電子裝置，包括訊號擷取元件和轉接元件，該轉接元件包括容置件、第一電極和第二電極，該容置件具有一容置槽，該訊號擷取元件容置於該容置槽內，所述第一電極和第二電極突出於該容置件底部設置，並與該訊號擷取元件電性連接，該訊號擷取元件通過所述第一電極和第二電極擷取人體生物訊號。

【英文】

A wearable electronic device which includes a signal acquisition component and an adapter component, the adapter component includes a housing element, a first electrode, and a second electrode. The housing element provides a groove, the signal acquisition component is contained in the groove. The first electrode and the second electrode are protruding from a bottom of the housing element, and are electrically connected to the signal acquisition component. The signal acquisition component collects biological signals via the first electrode and the second electrode.

Masimo Ex. 1002
IPR Petition - USP 10,987,054

【指定代表圖】 第（ 3 ）圖

【代表圖之符號簡單說明】

訊號擷取元件：10

底座：11

第一介面：131

標示件：133

側鍵：151

顯示幕：152

轉接元件：50

容置件：51

容置槽：511

缺口：512

通孔：513

卡槽：515

卡合件：53

卡扣部：531

卡扣件：532、533

第一過孔：535

第二過孔：537

訊號轉接件：55

轉接電極：551

第一電極：57

第一凸出部：571

固定件：573

Masimo Ex. 1002
IPR Petition - USP 10,987,054

第二電極：59

第二凸出部：591

定位件：593

螺杆：595

【特徵化學式】

無

Masimo Ex. 1002
IPR Petition - USP 10,987,054

【發明申請專利範圍】

【第1項】 一種可穿戴電子裝置，其包括訊號擷取元件和轉接元件，該轉接元件包括容置件、第一電極和第二電極，該容置件具有一容置槽，該訊號擷取元件容置於該容置槽內，所述第一電極和第二電極突出於該容置件底部設置，並與該訊號擷取元件電性連接，該訊號擷取元件通過所述第一電極和第二電極擷取訊號。

【第2項】 如申請專利範圍第1項所述之可穿戴電子裝置，其中所述訊號擷取元件包括底座、第一殼體、第二殼體、第三殼體、訊號擷取電極和機芯，該第一殼體作爲該訊號擷取元件的一電極，並與該機芯電性連接，該第一殼體表面設置一標示件，該第一殼體、第二殼體及第三殼體依次包覆於該底座上，並共同形成一容置空間，以容置該機芯，該訊號擷取電極貫穿該底座設置，並在該容置空間中與該機芯電性連接，以將擷取到的訊號傳送給該機芯。

【第3項】 如申請專利範圍第2項所述之可穿戴電子裝置，其中所述可穿戴電子裝置還包括通信元件，該通信元件可選擇地與該訊號擷取元件連接，用於與該訊號擷取元件建立通信。

【第4項】 如申請專利範圍第3項所述之可穿戴電子裝置，其中所述第一殼體一側設置有一第一介面，該第一介面與所述轉接元件連接，該第三殼體一側設置有一第二介面，該第二介面與該機芯電性連接，該第二介面可選擇地與該轉接元件或該通信元件連接。

【第5項】 如申請專利範圍第4項所述之可穿戴電子裝置，其中所述轉接元件還包括卡合件，該容置件一端設置一通孔，該卡合件固定於該容置件底部，該卡合件一端設置一卡扣，該卡扣從該通孔露出，用於和該第一介面卡合

。

【第6項】 如申請專利範圍第5項所述之可穿戴電子裝置，其中所述轉接元件還包括訊號轉接件，該容置件相對於該通孔一端的端壁上設置一卡槽，該訊號轉接件設置於該卡槽內，該訊號轉接件和該第二介面連接，該訊號轉接件上設置二轉接電極，所述二轉接電極與所述機芯電性連接。

【第7項】 如申請專利範圍第6項所述之可穿戴電子裝置，其中所述第一電極包括一第一凸出部和一固定件，該第一凸出部通過該固定件固定於該容置件上，該第二電極包括一第二凸出部、一定位件和一螺杆，該第二凸出部設置在該定位件的一端，該螺杆穿過該定位件的另一端，並將其鎖固在該容置件上。

【第8項】 如申請專利範圍第7項所述之可穿戴電子裝置，其中所述卡合件與所述第一電極和第二電極對應的位置分別開設一第一過孔和一第二過孔，該第一電極貫穿該第一過孔設置，該第二電極貫穿該第二過孔設置。

【第9項】 如申請專利範圍第6項所述之可穿戴電子裝置，其中所述第一電極和該第二電極分別與所述二轉接電極電性連接，以將擷取到的訊號傳送至所述機芯。

【第10項】 如申請專利範圍第4項所述之可穿戴電子裝置，其中所述通信元件包括轉接頭、傳輸線及USB介面，該轉接頭一端設置一卡持件，另一端通過該傳輸線與該USB介面連接，該卡持件用於與所述第二介面卡合，並使該轉接頭通過該第二介面與該機芯電性連接。

Masimo Ex. 1002
IPR Petition - USP 10,987,054

【發明圖式】

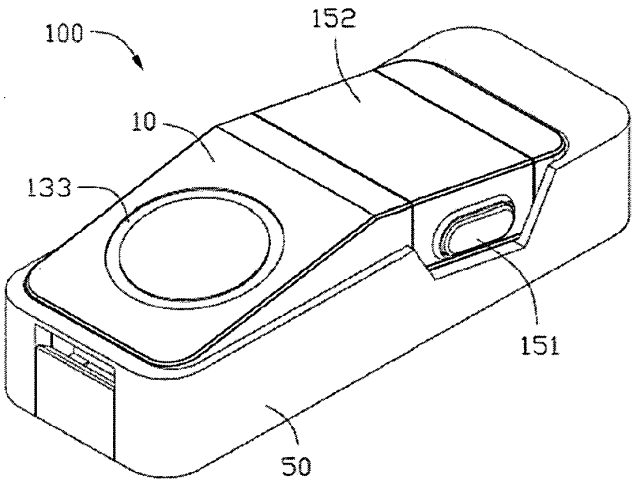


圖 1

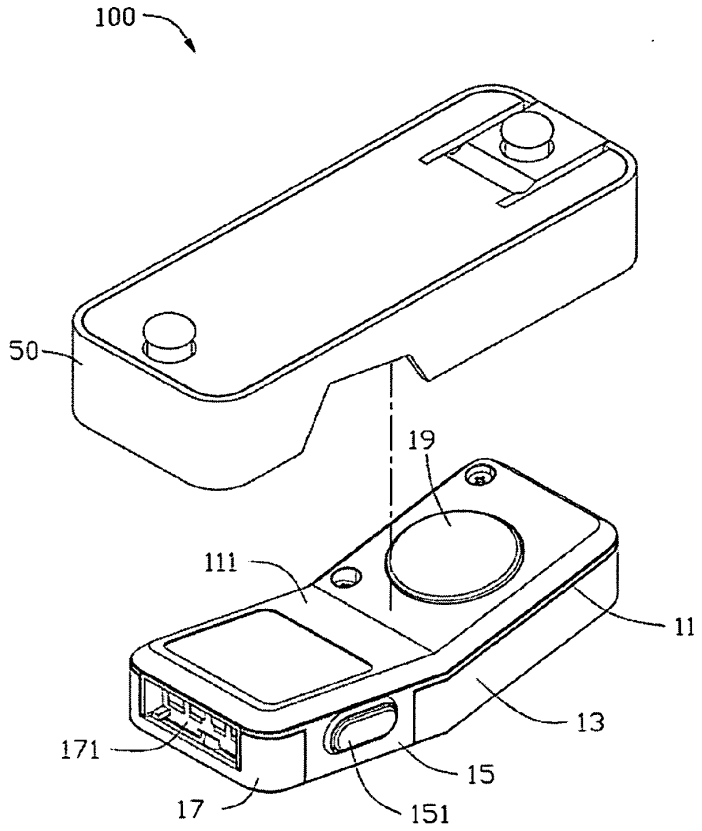


圖 2

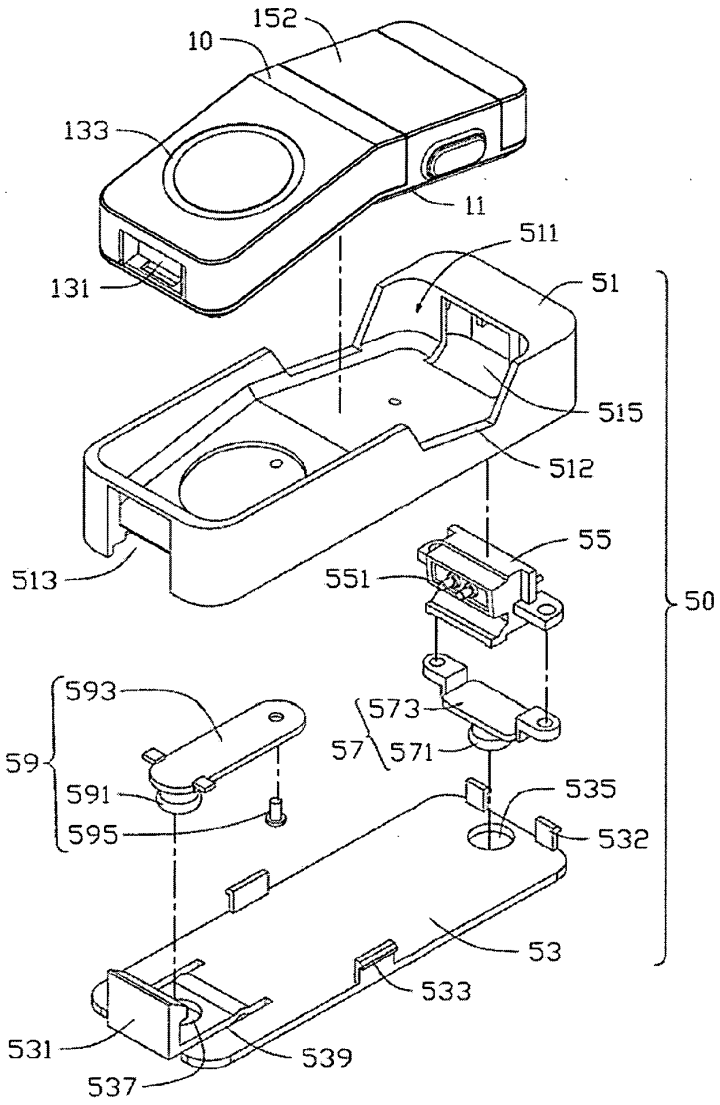

152
10
133
11
511
131
51
515
512
55
513
551
50
593
573
59
57
571
591
535
595
532
53
533
531
539
537

圖 3

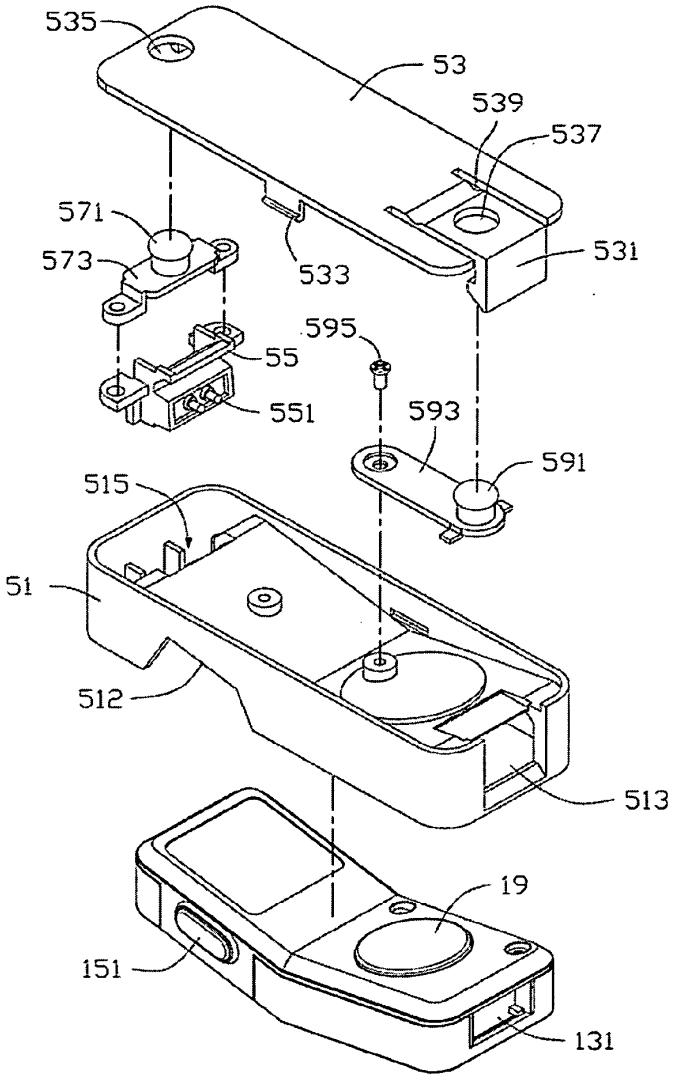

535
53
539
537
571
573
533
531
595
55
551
593
591
515
51
512
513
19
151
131

圖 4

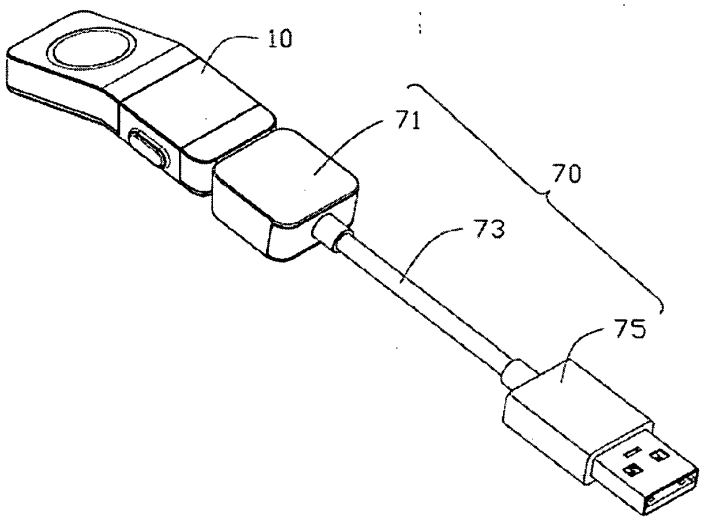


圖 5

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

62579 7590 12/23/2020
APPLE INC./BROWNSTEIN
c/o Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, CO 80202

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/841,543	04/06/2020	Sameer Pandya	P35079USC2	6983

TITLE OF INVENTION: Wearable Electronic Device with Electrodes for Sensing Biological Parameters

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	03/23/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
KIM, EUN HWA	3794	600-301000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Brownstein Hyatt Farber Schreck, LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Apple Inc.

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Cupertino, California

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☑ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☑ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies .....

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

☑ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 50-4621

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /S. Craig Hemenway/ Date March 22, 2021

Typed or printed name S. Craig Hemenway Registration No. 44,759

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

62579 7590 12/23/2020

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

EXAMINER	
KIM, EUN HWA	
ART UNIT	PAPER NUMBER
3794	

DATE MAILED: 12/23/2020

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/841,543	04/06/2020	Sameer Pandya	P35079USC2	6983

TITLE OF INVENTION: Wearable Electronic Device with Electrodes for Sensing Biological Parameters

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	03/23/2021

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

62579 7590 12/23/2020
APPLE INC./BROWNSTEIN
c/o Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, CO 80202

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/841,543	04/06/2020	Sameer Pandya	P35079USC2	6983

TITLE OF INVENTION: Wearable Electronic Device with Electrodes for Sensing Biological Parameters

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	03/23/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
KIM, EUN HWA	3794	600-301000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1_____
2_____
3_____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required) ❑Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/841,543	04/06/2020	Sameer Pandya	P35079USC2	6983

62579 7590 12/23/2020

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

EXAMINER	
KIM, EUN HWA	
ART UNIT	**PAPER NUMBER**
3794	

DATE MAILED: 12/23/2020

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 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, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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.

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Notice of Allowability	**Application No.** 16/841,543	**Applicant(s)** Pandya et al.	
	Examiner EUNHWA KIM	**Art Unit** 3794	**AIA (FITF) Status** Yes

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

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to claims filed on 11/23/2020.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ 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.

3. ☑ The allowed claim(s) is/are 21-40 . As a result of the allowed claim(s), 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.**

4. ☐ 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)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/EUN HWA KIM/
Primary Examiner, Art Unit 3794

Terminal Disclaimer

1. The terminal disclaimer filed on December 15, 2020 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of **U.S. Pat. No. 10, 610, 157** has been reviewed and is accepted. The terminal disclaimer has been recorded.

Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance: During the search of the prior art, Kegasawa (U.S. PGPub. No. 2016/0338598) was found to be the closest to the claimed invention. However, in view of the claim amendments and Remarks filed on November 23, 2020, Kegasawa fails to disclose, teach, and/or suggest all the limitations as claimed in amended independent claims 21, 29 and 35. Specifically, Kegasawa fails to disclose, teach, or suggest the carrier assembly comprising a carrier member and (first/second or rear) electrode(s) as claimed. As explained by the Applicant, Kegasawa's electrodes (542 in Fig. 16) is a separate component from the carrier assembly (53 in Fig. 16). There would be no motivation to modify the carrier assembly (53 in Fig. 16) of Kegasawa and provide electrodes directly onto the carrier assembly. Accordingly, claims 22-28, 30-32, and 36-40 are allowable as being dependent on independent claim 21, 29 and 35, respectively.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EUNHWA KIM whose telephone number is (571)270-1265. The examiner can normally be reached on 9AM-5:30PM.

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, JOSEPH STOKLOSA can be reached on (571) 272-1213. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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

/EUN HWA KIM/
Primary Examiner, Art Unit 3794
12/15/2020

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/841,543	Pandya et al.
	Examiner	**Art Unit**
	EUNHWA KIM	3794

CPC							
Symbol						**Type**	**Version**
A61B	/	5	/	681		F	2013-01-01
G06F	/	1	/	163		I	2013-01-01
A61B	/	5	/	0404		I	2013-01-01
A61B	/	5	/	02427		I	2013-01-01
A61B	/	5	/	02438		I	2013-01-01
A61B	/	5	/	04085		I	2013-01-01
A61B	/	5	/	044		I	2013-01-01
G04G	/	9	/	0005		I	2013-01-01
G04G	/	21	/	025		I	2013-01-01
G04G	/	21	/	08		I	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/EUN HWA KIM/ Primary Examiner, Art Unit 3794	16 December 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	21	4A

U.S. Patent and Trademark Office — Part of Paper No.: 20201211

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/841,543	Pandya et al.
	Examiner	**Art Unit**
	EUNHWA KIM	3794

INTERNATIONAL CLASSIFICATION				
CLAIMED				
A61B	/	5	/	00
A61B	/	5	/	0404
A61B	/	5	/	0408
A61B	/	5	/	024
A61B	/	5	/	044

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/EUN HWA KIM/ Primary Examiner, Art Unit 3794	16 December 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	21	4A

U.S. Patent and Trademark Office — Part of Paper No.: 20201211

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/841,543	Pandya et al.
	Examiner	**Art Unit**
	EUNHWA KIM	3794

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☑ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/EUN HWA KIM/ Primary Examiner, Art Unit 3794	16 December 2020	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	21	4A

U.S. Patent and Trademark Office — Part of Paper No.: 20201211

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/841,543	Pandya et al.
	Examiner	Art Unit
	EUNHWA KIM	3794

CPC - Searched*		
Symbol	Date	Examiner
A61B5/0404,04085,02427,02438,681,6824,6898	07/22/2020	EK

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
Inventor and Assignee Search	07/22/2020	EK
CPC based text search (see EAST search history printout)	07/22/2020	EK
see EAST updated Search History printout	12/16/2020	EK

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
see EAST search	see EAST search history	12/16/2020	EK

/EUN HWA KIM/ Primary Examiner, Art Unit 3794	

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	"16841543"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/12/16 10:09
L2	624	((("PANDYA") near3 ("Sameer")) OR (("CLAVELLE") near3 ("Adam")) OR (("DE") near3 ("JONG") near3 ("Erik")) OR (("WITTENBERG") near3 ("Michael")) OR (("HARRISON-NOONAN") near3 ("Tobias")) OR (("MELCHER") near3 ("Martin")) OR (("ZHANG") near3 ("Zhipeng")) OR (("ROACH") near3 ("Steven")) OR (("CARDINALI") near3 ("Steven"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/12/16 10:13
L3	216	L2 and watch	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/12/16 10:13
L4	2	"20020096736"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/12/16 10:22
L9	3	"9833159".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/12/16 11:57
L10	11	("20100112964" | "20140266920" | "20150048979" | "20150091764" | "4230127" | "7171259" | "8482467" | "8508418" | "9008761" | "9281553").PN. OR ("9833159").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/12/16 11:58
S1	2	"16193836"	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/07/29 13:28

			FPRS; EPO; JPO			
S2	6	(US-0072912-$ | US-0090806-$ | US-19387086-$ | US-20190072912-$ | US-20190090806-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:28
S3	0	(TW-201610621-$ | TW-201621491-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:28
S4	12	(US-0058375-$ | US-0090599-$ | US-0181644-$ | US-10123710-$ | US-18783990-$ | US-20160058375-$ | US-20170090599-$ | US-20170181644-$ | US-9348322-$ | US-9627163-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:29
S5	0	(WO-16204443-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:29
S6	45	(US-0011210-$ | US-0015496-$ | US-0058309-$ | US-0198966-$ | US-0230754-$ | US-0242659-$ | US-0275832-$ | US-0310656-$ | US-0349803-$ | US-0354332-$ | US-0378071-$ | US-17848348-$ | US-20110015496-$ | US-20130310656-$ | US-20140275832-$ | US-20160058309-$ | US-20160198966-$ | US-20160242659-$ | US-20160349803-$ | US-20160378071-$ | US-20170011210-$ | US-20170230754-$ | US-20170354332-$ | US-7486386-$ | US-7729748-$ | US-7822469-$ | US-7915601-$ | US-7957762-$ | US-8988372-$ | US-9100579-$ | US-9485345-$ | US-9620312-$ | US-9723997-$ | US-9737221-$ | US-9848823-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:30
S7	1	(JP-2001145607-$ | WO-15030712-$ | WO-16040392-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:30
S8	63	S2 S4 S6	US-PGPUB;	OR	OFF	2019/07/29 13:31

			USPAT; USOCR; FPRS; EPO; JPO			
S9	7	("20030142291" | "5002387" | "6597438" | "7911617").PN. OR ("9348322").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/07/29 13:56
S10	11,028	a61b5/681.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:58
S11	40,542	(first and second and third) adj (electrode)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:59
S12	59	S10 and S11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 14:00
S13	100	a61b5/681.cpc. and crown	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 14:58
S14	117	a61b5/681.cpc. and (button pin crown) with (electrode)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 14:59
S15	93	S13 not S14	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 15:38
S16	21	"14455375"	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/07/29 16:01

			FPRS; EPO; JPO			
S17	7	a61b5/681.cpc. and arc with electrode	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:09
S18	18	"20040111087"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:13
S19	1	"20150250049"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:14
S20	6,642	a61b5/6824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:36
S21	6,180	a61b5/6898.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:36
S22	3,206	a61b5/0404.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:37
S23	16,604	a61b5/0404,0408,04085,04284,044.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:38
S24	487	S23 and wrist and watch	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/07/29 16:38

			FPRS; EPO; JPO			
S25	602	S23 and (wrist and watch or wristwatch or wrist adj watch)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:39
S26	28,134	S20 S21 S23	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:39
S27	783	S26 and wrist near5 watch	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:39
S28	26	S26 and wrist near5 watch and S11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:40
S29	148	wrist near5 watch and S11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:50
S30	18,747	(G04G21/025 or G04G21/08 or G04G9/0005 or G06F1/163).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 17:12
S31	5,554	S30 and (watch wristwatch)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 17:12
S32	64	S30 and (watch wristwatch) and (first and second and third) near5 electrode	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/07/29 17:13

			FPRS; EPO; JPO			
S33	6,259	a61b2562/0209,0214.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 17:32
S34	14	S33 and wrist adj watch	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 17:33
S35	63	S33 and (wrist adj watch wristwatch wrist near3 watch)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 17:33
S36	2	"16193836"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/06 11:04
S37	1	"20160287172"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/06 15:34
S38	5	"16165391"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/06 15:44
S39	1	"20160338598"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/08 10:12
S40	3	"20150041289"	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/08/08 10:16

			FPRS; EPO; JPO			
S41	2	"16193836"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 17:28
S42	18	watch and crown same2 (split trim) same2 insulat$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 17:32
S43	15	watch and insulat$4 near5 (crown)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 17:35
S44	1,958	watch and (pulse adj wave or heart adj rate) and opaque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 17:49
S45	374	smart adj watch and (pulse adj wave or heart adj rate) and opaque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 17:49
S46	18	"20150041289" "20160338598" "2014007493" "9557716".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 18:31
S47	12	"20150041289" "20160338598" "20140107493" "9557716".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 18:32
S48	9	"9042971".pn. "9427191".pn. "10126194".pn.	US-PGPUB; USPAT; USOCR;	OR	OFF	2019/11/21 13:28

			FPRS; EPO; JPO			
S49	11	"9042971".pn. "9427191".pn. "10126194".pn. "20160338642" "20190220069"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 13:29
S50	2	"16193836"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 14:38
S51	10	"20040181141" "20140107493" "20180235542"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 15:05
S52	510	((("PANDYA") near3 ("Sameer")) OR (("CLAVELLE") near3 ("Adam")) OR (("DE") near3 ("JONG") near3 ("Erik")) OR (("WITTENBERG") near3 ("Michael")) OR (("HARRISON-NOONAN") near3 ("Tobias")) OR (("MELCHER") near3 ("Martin")) OR (("ZHANG") near3 ("Zhipeng")) OR (("ROACH") near3 ("Steven")) OR (("CARDINALI") near3 ("Steven"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/11/21 15:12
S53	162	S52 and watch	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 15:13
S54	180	S52 and (hand near2 held watch)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 15:13
S55	3	S52 and (hand near2 held watch) and (ecg) and (pulse adj wave heart near2 (rate monitor$4 wave))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 15:14

S56	396	S52 and (optic$4 transpar$4 light)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 15:15
S57	26	S52 and (optic$4 transpar$4 light) same2 (skin)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 15:15
S62	578	((("PANDYA") near3 ("Sameer")) OR (("CLAVELLE") near3 ("Adam")) OR (("DE") near3 ("JONG") near3 ("Erik")) OR (("WITTENBERG") near3 ("Michael")) OR (("HARRISON-NOONAN") near3 ("Tobias")) OR (("MELCHER") near3 ("Martin")) OR (("ZHANG") near3 ("Zhipeng")) OR (("ROACH") near3 ("Steven")) OR (("CARDINALI") near3 ("Steven"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/07/22 10:26
S63	197	S62 and watch	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/07/22 10:44
S64	4	"10285645".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/07/22 10:47
S65	4	"20170086743"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/07/22 10:48
S66	12	("20080049560" | "20110007468" | "20130261405" | "20130272103" | "20160058375" | "20160069371" | "20160313700" | "4903253" | "7126483" | "9721452").PN. OR ("10285643").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 10:52
S67	14	("20080049560" | "20110007468" | "20130235546" | "20130261405" | "20130272103" | "20160058375" | "20160069371" | "20160128209" | "20160313700" | "4903253" | "4958279" |	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 10:53

		"6971789" | "7126483" | "9721452").PN. OR ("10548529").URPN.				
S68	40	("10381881" | "20020055763" | "20030011527" | "20040051617" | "20040220485" | "20070228833" | "20080074112" | "20080079420" | "20080303479" | "20100289341" | "20110115735" | "20110127951" | "20110164471" | "20120032632" | "20120112552" | "20120200169" | "20130049484" | "20130113422" | "20140143933" | "20140232330" | "20150015180" | "20150123604" | "20150164422" | "20150195009" | "20150223709" | "20150326028" | "20150364938" | "20150371768" | "20160064137" | "20160111887" | "20170047635" | "20170049352" | "20170133880" | "20170224218" | "20180062430" | "3646562" | "4230127" | "5814900" | "6300920" | "6950695").PN. OR ("10491041").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 10:53
S69	56	S66 S67 S68	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 11:04
S70	3,579	a61b5/0404.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:41
S71	7,169	a61b5/04085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:41
S72	13,534	a61b5/02438.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:42
S73	16,055	a61b5/02427,02438.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:42

S74	18,842	a61b5/681,6824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:43
S75	7,435	a61b5/6898.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:43
S76	42,503	S70 S71 S72 S73 S74 S75	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:44
S77	6,443	S76 and watch	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:44
S78	33,691	S70 S71 S74 S75	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:44
S79	7,243	S78 and S73	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:44
S80	1,770	S79 and watch	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:45
S81	956	S79 and watch and (sapphire zirconia plastic crystal crystalline glass)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:47

S82	47	S79 and watch and (sapphire zirconia plastic crystal crystalline glass) same2 (coat$4 depost$4) with (electrode conduct$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:48
S83	0	samsung.as. and (eunhwa near2 kim).xp.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 12:21
S84	22	(eunhwa near2 kim).xp.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 12:21
S85	269,740	samsung.as.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 12:23
S86	3,292	samsung.as. and (gsr and impedance ecg)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 12:23
S87	11	samsung.as. and (gsr and impedance and bia and ecg)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 12:23
S88	37	(US-20110015496-$ or US-20160058309-$ or US-20160058375-$ or US-20160242659-$ or US-20170090599-$ or US-20170181644-$ or US-20040181141-$ or US-20160338598-$ or US-20140215246-$ or US-20090312655-$ or US-20190076089-$ or US-20150041289-$ or US-20160287095-$ or US-20180235542-$ or US-20170090614-$ or US-20170357419-$ or US-20150342525-$ or US-20140107493-$ or US-20190090806-$ or US-20170224218-$ or US-20170049352-$ or US-20080049560-$ or US-20190001131-$ or US-	US-PGPUB; USPAT; FPRS; JPO	OR	OFF	2020/07/22 14:48

		20180212449-$).did. or (US-10123710-$ or US-7729748-$ or US-9348322-$ or US-9620312-$ or US-9848823-$ or US-9737221-$ or US-5001687-$ or US-9557716-$ or US-10585467-$).did. or (EP-3451117-$ or EP-3327520-$).did. or (JP-2016214641-$).did.				
S89	21	S88 and light near5 (detect$4 receiv$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 14:48
S90	20	S88 and (coat$4 plat$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:36
S91	9	S88 and (coat$4 plat$4 deposit$4) near5 (electrode conduct$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:36
S92	3,579	a61b5/0404.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S93	7,169	a61b5/04085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S94	16,055	a61b5/02427,02438.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S95	18,842	a61b5/681,6824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43

S96	7,435	a61b5/6898.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S97	33,691	S92 S93 S95 S96	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S98	7,243	S97 and S94	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S99	1,770	S98 and watch	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S100	156	S99 and (coat$4 plat$4 deposit$4) near5 (electrode conduct$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S101	14	S99 and (coat$4 deposit$4) near5 (electrode conduct$4) same (aluminum titanium nitride chronium silicon carbon diamond)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:45
S102	21	("20020013534" | "20070265140" | "20070287923" | "20080033275" | "20080194917" | "20110247321" | "20140018648" | "20140276134" | "20140277739" | "20140288390" | "20140296658" | "20140364749" | "20150207914" | "20170319136" | "4987900" | "5261412" | "6491647" | "6876135" | "7339572" | "7641614" | "8471438").PN. OR ("10575780").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 16:19
S103	5	S102 and coat$4	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 16:20

S104	37	("10061350" | "20050075542" | "20060100530" | "20080171915" | "20100024573" | "20110125037" | "20130053661" | "20140031705" | "20140174958" | "20140180137" | "20140200412" | "20140257050" | "20140296749" | "20150091711" | "20150135410" | "20150173633" | "20150297132" | "20150305675" | "20160058388" | "20160066844" | "20160071408" | "20160074649" | "20160143584" | "20160256116" | "20170086742" | "20170086743" | "8033916" | "8541745" | "8684900" | "8764651" | "8781791" | "8920332" | "9274507" | "9609921" | "9781984" | "9875008" | "9898120").PN. OR ("10285645").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 16:23
S105	86	S99 and (coat$4 deposit$4) near5 (electrode conduct$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 16:27
S106	125	S99 and (electrode conduct$4) same (aluminum titanium nitride chronium silicon carbon diamond)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 16:32
S107	3	S99 and (electrode conduct$4) same (diamond dlc)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 16:39
S108	1,255	a61b5/$5.cpc. and (electrode conduct$4) same (diamond dlc)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 16:40
S109	199	a61b5/$5.cpc. and (coat$4) same (electrode conduct$4) same (diamond dlc)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 16:43
S110	2	"20180235532"	US-PGPUB;	OR	OFF	2020/07/22 17:34

			USPAT; USOCR; FPRS; EPO; JPO			
S111	8	"20160058375"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 18:19
S112	40	(US-20110015496-$ or US-20160058309-$ or US-20160058375-$ or US-20160242659-$ or US-20170090599-$ or US-20170181644-$ or US-20040181141-$ or US-20160338598-$ or US-20140215246-$ or US-20090312655-$ or US-20190076089-$ or US-20150041289-$ or US-20160287095-$ or US-20180235542-$ or US-20170090614-$ or US-20170357419-$ or US-20150342525-$ or US-20140107493-$ or US-20190090806-$ or US-20170224218-$ or US-20170049352-$ or US-20080049560-$ or US-20190001131-$ or US-20180212449-$ or US-20150335283-$ or US-20180369587-$).did. or (US-10123710-$ or US-7729748-$ or US-9348322-$ or US-9620312-$ or US-9848823-$ or US-9737221-$ or US-5001687-$ or US-9557716-$ or US-10585467-$ or US-9999392-$).did. or (EP-3451117-$ or EP-3327520-$).did. or (JP-2016214641-$).did.	US-PGPUB; USPAT; FPRS; JPO	OR	OFF	2020/07/22 18:20
S113	8	S112 and opaque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 18:20
S116	2	"10610157"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:22
S117	79	(US-20110012784-$ | US-0015496-$ | US-0072912-$ | US-0090599-$ | US-0090806-$ | US-0100684-$ | US-0101870-$ | US-0181644-$ | US-0198966-$ | US-0220069-$ | US-0230754-$ | US-0235542-$ | US-0242659-$ | US-0275832-$ | US-0338598-	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:37

		$ | US-0338642-$ | US-0378071-$ | US-10092197-$ | US-10123710-$ | US-10126194-$ | US-10172562-$ | US-10254804-$ | US-10524671-$ | US-10534900-$ | US-10599101-$ | US-10610157-$ | US-1572252-$ | US-20110015496-$ | US-20140275832-$ | US-20160198966-$ | US-20160242659-$ | US-20160338598-$ | US-20160338642-$ | US-20160378071-$ | US-20170090599-$ | US-20170181644-$ | US-20170230754-$ | US-20180235542-$ | US-20190072912-$ | US-20190090806-$ | US-20190101870-$ | US-20190220069-$ | US-20200100684-$ | US-20525905-$ | US-6996428-$ | US-7486386-$ | US-7729748-$ | US-7822469-$ | US-7915601-$ | US-7957762-$ | US-8954135-$ | US-8988372-$ | US-9042971-$ | US-9100579-$ | US-9348322-$ | US-9427191-$ | US-9485345-$ | US-9557716-$ | US-9620312-$ | US-9627163-$ | US-9723997-$ | US-9737221-$ | US-9848823-$).DID.				
S118	18	(CN-102483608-$ | CN-104050444-$ | CN-105339871-$ | CN-105556433-$ | CN-105955519-$ | CN-106236051-$ | CN-106462665-$ | CN-1572252-$ | CN-203732900-$ | CN-205121417-$ | CN-206209589-$ | JP-2001145607-$ | JP-2009519737-$ | KR-20110012784-$ | TW-201610621-$ | TW-201621491-$ | WO-15030712-$ | WO-16204443-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:37
S119	3	(15/030712 | 16/204443).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:38
S120	100	S117 S118 S119	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:38
S121	22	"20150041289" "20160338598" "20160058375" "20170235532" "20160120472" "20140107493"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:40

S122	22	"20150041289" "20160338598" "20160058375" "20180235532" "20160120472" "20140107493"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:41
S123	42	(US-20110015496-$ or US-20160058309-$ or US-20160058375-$ or US-20160242659-$ or US-20170090599-$ or US-20170181644-$ or US-20040181141-$ or US-20160338598-$ or US-20140215246-$ or US-20090312655-$ or US-20190076089-$ or US-20150041289-$ or US-20160287095-$ or US-20180235542-$ or US-20170090614-$ or US-20170357419-$ or US-20150342525-$ or US-20140107493-$ or US-20190090806-$ or US-20170224218-$ or US-20170049352-$ or US-20080049560-$ or US-20190001131-$ or US-20180212449-$ or US-20150335283-$ or US-20180369587-$).did. or (US-20160120472-$ or US-20180235532-$).did. or (US-10123710-$ or US-7729748-$ or US-9348322-$ or US-9620312-$ or US-9848823-$ or US-9737221-$ or US-5001687-$ or US-9557716-$ or US-10585467-$ or US-9999392-$).did. or (EP-3451117-$ or EP-3327520-$).did. or (JP-2016214641-$).did.	US-PGPUB; USPAT; FPRS; JPO	OR	OFF	2020/09/10 08:59
S124	7	S123 and coat$4 with conduct$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/09/10 09:00
S126	4	"16193836"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/12/11 17:34

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp

L5	2	(watch and light and electrode and (transparent) and (carrier)).clm.	US-PGPUB; USPAT	OR	OFF	2020/12/16 11:44
L6	1	(watch and light and electrode and (transparent) and (carrier) and sensor).clm.	US-PGPUB; USPAT	OR	OFF	2020/12/16 11:45
L7	2	(watch and light and electrode and (transparent) and heart and sensor).clm.	US-PGPUB; USPAT	OR	OFF	2020/12/16 11:45
L8	9	(watch and light and electrode and heart adj rate and sensor).clm.	US-PGPUB; USPAT	OR	OFF	2020/12/16 11:46
S58	17,391	(watch).clm.	US-PGPUB; USPAT	OR	OFF	2019/11/21 15:18
S59	467	(watch and (electrode)).clm.	US-PGPUB; USPAT	OR	OFF	2019/11/21 15:18
S60	21	(watch and (electrode) and (optic$4 near3 sens$4)).clm.	US-PGPUB; USPAT	OR	OFF	2019/11/21 15:19
S61	33	(watch and (electrode) and ((optic$4 near3 sens$4) or (puls$4) near5 (monitor$4 detect$4 indent$5))).clm.	US-PGPUB; USPAT	OR	OFF	2019/11/21 15:19
S114	2	"Term Removed"	USPAT	OR	OFF	2020/07/22 14:48
S115	2	"Term Removed"	USPAT	OR	OFF	2020/07/22 18:20
S125	2	"Term Removed"	USPAT	OR	OFF	2020/09/10 08:59

12/16/2020 11:59:26 AM
C:\Users\ekim4\Documents\EAST\Workspaces\16841543.wsp

Bibliographic Data

Application No: 16/841,543

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /EUN HWA KIM/ (Examiner's Signature) | (Initials)

Title: Wearable Electronic Device with Electrodes for Sensing Biological Parameters

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
04/06/2020	600	3794	P35079USC2
RULE			

APPLICANTS

Apple Inc., Cupertino, CA, UNITED STATES

INVENTORS

Sameer Pandya, Sunnyvale, CA, UNITED STATES

Adam T. Clavelle, San Francisco, CA, UNITED STATES

Erik G. de Jong, San Francisco, CA, UNITED STATES

Michael B. Wittenberg, San Francisco, CA, UNITED STATES

Tobias J. Harrison-Noonan, San Francisco, CA, UNITED STATES

Martin Melcher, Mountain View, CA, UNITED STATES

Zhipeng Zhang, Santa Clara, CA, UNITED STATES

Steven C. Roach, San Francisco, CA, UNITED STATES

Steven P. Cardinali, Campbell, CA, UNITED STATES

CONTINUING DATA

This application is a CON of 16193836 11/16/2018 PAT 10610157

16193836 is a CON of 16118282 08/30/2018

16118282 has PRO of 62644886 03/19/2018

16118282 has PRO of 62554196 09/05/2017

FOREIGN APPLICATIONS

IF REQUIRED, FOREIGN LICENSE GRANTED**

04/14/2020

STATE OR COUNTRY

UNITED STATES

ADDRESS

Masimo Ex. 1002
IPR Petition - USP 10,987,054

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

FILING FEE RECEIVED

$5,860

PTO/SB/08A and B (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.:** 16/841,543	**FILING DATE:** April 6, 2020
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** 3794
	EXAMINER NAME: Kim, Eun Hwa	**ATTY. DOCKET NO.:** P35079USC2

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.	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.	9,833,159	12/2017	Chu 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 Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

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]

NONPATENT LITERATURE DOCUMENTS

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

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 Signature	/EUN HWA KIM/	Date Considered	12/16/2020

[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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.K/

PTO/SB/08A and B (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.:** 16/841,543	**FILING DATE:** April 6, 2020
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** 3794
	EXAMINER NAME: Kim, Eun Hwa	**ATTY. DOCKET NO.:** P35079USC2

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.	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.	9,833,159	12/2017	Chu 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 Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

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]

NONPATENT LITERATURE DOCUMENTS

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

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 Signature		Date Considered	

[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.

Electronic Acknowledgement Receipt	
EFS ID:	41394630
Application Number:	16841543
International Application Number:	
Confirmation Number:	6983
Title of Invention:	Wearable Electronic Device with Electrodes for Sensing Biological Parameters
First Named Inventor/Applicant Name:	Sameer Pandya
Customer Number:	62579
Filer:	Benno Maxim Guggenheimer/Valerie Brown
Filer Authorized By:	Benno Maxim Guggenheimer
Attorney Docket Number:	P35079USC2
Receipt Date:	15-DEC-2020
Filing Date:	06-APR-2020
Time Stamp:	17:19:23
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	P35079USC2-IDS.pdf	17817 4a1dd349687058ea82e0ae85e76c7bdcd1e9e601	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	P35079USC2-PTOSB08.pdf	26799 b927e62df69a550f8a4c671d50e231083ab92e44	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
			Total Files Size (in bytes):	44616	

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:			
Sameer Pandya, et al.		Examiner:	Kim, Eun Hwa
Application No. 16/841,543		Art Unit:	3794
Filed: April 6, 2020		Confirmation No.	6983
For:	WEARABLE ELECTRONIC DEVICE WITH ELECTRODES FOR SENSING BIOLOGICAL PARAMETERS		

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97(c)(1), 1.97(e), and 1.98

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 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 make his or her own determination of materiality. 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.

This Information Disclosure Statement is filed after the period specified in 37 C.F.R. § 1.97(b), but before the mailing date of either (1) a final Office action or (2) a Notice of Allowance. Accordingly, this Information Disclosure Statement requires a statement according to 37 C.F.R. § 1.97(e).

Statement Under 37 C.F.R. § 1.97(e)(1)

The undersigned hereby certifies that the reference cited in this Information Disclosure Statement was first cited in a communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this Information Disclosure Statement.

The Assignee believes no 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 has any questions, please contact the undersigned attorney.

Dated: December 15, 2020.

Respectfully submitted,

/Benno M. Guggenheimer/
Benno M. Guggenheimer, Registration No. 66,686
Attorney for Assignee
USPTO Customer No. 62579

Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, Colorado 80202
Phone: (303) 223-1100
Fax: (303) 223-1111

Doc Code: DIST.E.FILE **Document Description: Electronic Terminal Disclaimer - Filed**	PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT**
Application Number	16841543
Filing Date	06-Apr-2020
First Named Inventor	Sameer Pandya
Attorney Docket Number	P35079USC2
Title of Invention	Wearable Electronic Device with Electrodes for Sensing Biological Parameters

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
Apple Inc.	100%

The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

10610157

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

◉ Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.

Masimo Ex. 1002
IPR Petition - USP 10,987,054

○ I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.	
Applicant claims the following fee status: ○ Small Entity ○ Micro Entity ◉ Regular Undiscounted I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.	
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: ◉ An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application Registration Number 66686 ○ A sole inventor ○ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ○ A joint inventor; all of whom are signing this request	
Signature	/Benno M. Guggenheimer/
Name	Benno M. Guggenheimer

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal	
Application Number:	16841543
Filing Date:	06-Apr-2020
Title of Invention:	Wearable Electronic Device with Electrodes for Sensing Biological Parameters
First Named Inventor/Applicant Name:	Sameer Pandya
Filer:	Benno Maxim Guggenheimer/Valerie Brown
Attorney Docket Number:	P35079USC2
Filed as Large Entity	
Filing Fees for Utility under 35 USC 111(a)	

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	1814	1	170	170
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**170**

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 16841543

Filing Date: 06-Apr-2020

Applicant/Patent under Reexamination: Pandya

Electronic Terminal Disclaimer filed on December 15, 2020

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt	
EFS ID:	41389820
Application Number:	16841543
International Application Number:	
Confirmation Number:	6983
Title of Invention:	Wearable Electronic Device with Electrodes for Sensing Biological Parameters
First Named Inventor/Applicant Name:	Sameer Pandya
Customer Number:	62579
Filer:	Benno Maxim Guggenheimer/Valerie Brown
Filer Authorized By:	Benno Maxim Guggenheimer
Attorney Docket Number:	P35079USC2
Receipt Date:	15-DEC-2020
Filing Date:	06-APR-2020
Time Stamp:	14:02:19
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$170
RAM confirmation Number	E2020BEE02159451
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	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	33471 689bc2e225dc546daf494be612333c9f8e0082e0	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	31056 8d4d50d4b3d2941c89056d1a8d45a6a55582f80f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	64527		

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.

Electronic Acknowledgement Receipt	
EFS ID:	41199163
Application Number:	16841543
International Application Number:	
Confirmation Number:	6983
Title of Invention:	Wearable Electronic Device with Electrodes for Sensing Biological Parameters
First Named Inventor/Applicant Name:	Sameer Pandya
Customer Number:	62579
Filer:	Peter James Nagle/Valerie Brown
Filer Authorized By:	Peter James Nagle
Attorney Docket Number:	P35079USC2
Receipt Date:	23-NOV-2020
Filing Date:	06-APR-2020
Time Stamp:	14:28:22
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	Amendment/Req. Reconsideration-After Non-Final Reject	P35079USC2-FAI-Amendment.pdf	93641 b15729804 1cd789d255da130299fb6d04fa0e92a	no	12

Warnings:

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Information:	
Total Files Size (in bytes):	93641

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor(s):	Sameer Pandya, et al.		
App. No.:	16/841,543	Con. No.:	6983
Filed:	April 6, 2020	Art Unit:	3794
Title:	Wearable Electronic Device with Electrodes for Sensing Biological Parameters	Examiner:	Kim, Eun Hwa

AMENDMENT AND RESPONSE TO OFFICE ACTION

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

Sir:

In response to the First Action Interview Office action dated September 23, 2020, please consider the following remarks and amend the above-identified application as follows:

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

Remarks begin on page 7 of this paper.

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Amendments to the Claims:

1-20. (Cancelled)

21. (Currently Amended) An electronic watch comprising:

a housing member;

a display at least partially enclosed by the housing member;

a carrier assembly coupled to the housing member and comprising:

a carrier member ~~coupled to the housing and~~ formed from a transparent material;

a first electrode positioned on the carrier member, operably coupled to a processor and configured to detect a first voltage; and

a second electrode positioned on the carrier member, operably coupled to the processor and configured to detect a second voltage, the first and second electrodes at least partially surrounding a first region of the carrier member and a second region of the carrier member;

a light emitter positioned below [[a]] the first region of the carrier member;

a light receiver positioned below [[a]] the second region of the carrier member and configured to receive light reflected from a wrist;

~~a first electrode positioned on the carrier, operably coupled to a processor and configured to detect a first voltage;~~

~~a second electrode positioned on the carrier, operably coupled to the processor and configured to detect a second voltage, the first and second electrodes at least partially surrounding the first and second regions of the carrier;~~

a third electrode coupled to the housing member, operably coupled to the processor, and configured to detect a third voltage; and

the processor positioned within the ~~housing~~ electronic watch and configured to determine an electrocardiogram using the first voltage, the second voltage, and the third voltage.

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

the light receiver is a first light receiver;

the electronic watch further comprises a second light receiver; and

the first and second light receivers are configured to measure a heart rate using the light reflected from the wrist.

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

the housing member defines a rectangular outer housing profile;

the display is a rectangular display; and

the carrier member defines a circular outer carrier profile.

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

the first electrode includes a first conductive coating deposited on the carrier member; and

the second electrode includes a second conductive coating deposited on the carrier member.

25. (Previously Presented) The electronic watch of claim 24, wherein the first and second conductive coatings include one or more of an aluminum titanium nitride material, a chromium silicon carbon nitride material, or a diamond like carbon material.

26. (Currently Amended) The electronic watch of claim 24, wherein:

the first conductive coating is deposited along an exterior surface of the carrier member, an edge of the carrier member, and an interior surface of the carrier member; and

the processor is operably coupled to the first electrode along a portion of the first conductive coating positioned along the interior surface of the carrier member.

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

the electronic watch further comprises a button having a conductive button cap; and

the conductive button cap defines the third electrode.

28. (Currently Amended) The electronic watch of claim 21, wherein:

the carrier member includes an opaque ink mask deposited along an inner surface of the carrier member surrounding the first and second regions;

the first and second electrodes are positioned along an exterior surface of the carrier member that is over the opaque ink mask; and

the exterior surface of the carrier member protrudes outward from an external surface of the housing member.

29. (Currently Amended) A wearable electronic device comprising:

a rectangular housing member defining a rectangular front opening and a circular rear opening;

a cover having a rectangular cover profile and positioned over the rectangular front opening;

a display positioned below the cover;

a carrier assembly coupled to the rectangular housing member and comprising:

a carrier member having a circular carrier profile and positioned over the circular rear opening;

a rear electrode positioned on the carrier member and configured to receive a first voltage signal from a wrist of a user;

an optical sensor system comprising:

an optical emitter positioned below a first region of the carrier member; and

an optical receiver positioned below a second region of the carrier member;

~~a rear electrode positioned on the carrier and configured to receive a first voltage signal from a wrist of a user;~~

a side electrode positioned along an exterior of the rectangular housing member and configured to receive a second voltage signal from a finger of the user; and

a processor positioned within the ~~rectangular housing~~ wearable electronic device and configured to determine a biological parameter using the first and second voltage signals.

30. (Currently Amended) The wearable electronic device of claim 29, wherein:

the rear electrode is a first rear electrode; and

the wearable electronic device further comprises a second rear electrode positioned on the carrier member and configured to ground the wearable electronic device to the user.

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

the first rear electrode defines a first arc that partially surrounds the optical sensor system; and

the second rear electrode defines a second arc that partially surrounds the optical sensor system.

32. (Currently Amended) The wearable electronic device of claim 29, wherein:

the rear electrode is formed from a conductive coating deposited along an exterior surface of the carrier member; and

the conductive coating extends around an edge of the carrier member and along an inner portion of the carrier member that is internal to the wearable electronic device.

33. (Previously Presented) The wearable electronic device of claim 29, wherein the optical sensor system is an optical heart rate sensor that is configured to measure a heart rate of the user.

34. (Previously Presented) The wearable electronic device of claim 29, wherein:

the optical sensor system is configured to measure a heart rate of the user; and

the biological parameter is an electrocardiogram (ECG) of the user.

35. (Currently Amended) A watch comprising:

a housing member;

a display configured to display a graphical output;

a carrier assembly coupled to the housing member and comprising:

a carrier member protruding outward from an external surface of the housing member; and

a rear electrode positioned on the carrier member, the rear electrode operably coupled to a processor and configured to detect a first voltage;

an optical sensor positioned below the carrier member and configured to transmit optical signals through the carrier member;

~~a rear electrode positioned on the carrier, the rear electrode operably coupled to a processor and configured to detect a first voltage;~~

a side electrode positioned along an exterior of the watch, the side electrode operably coupled to the processor and configured to detect a second voltage; and

the processor positioned within the watch ~~housing~~ and configured to:

determine a biological parameter; and

cause a change to the graphical output in response to determining the biological parameter.

36. (Currently Amended) The watch of claim 35, wherein:

the carrier member defines a circular outer profile;

the optical sensor comprises a light emitter configured to emit light through a first region of the carrier member;

the optical sensor comprises an optical receiver configured to receive reflected light through a second region of the carrier member; and

the rear electrode is positioned along a peripheral region of the carrier member and at least partially surrounds the first and second regions of the carrier member.

37. (Currently Amended) The watch of claim 35, wherein:

the rear electrode is a first rear electrode;

the watch further comprises a second rear electrode positioned on the carrier member; and

the first rear electrode and the second rear electrode are defined by a conductive coating deposited on a surface of the carrier member.

38. (Previously Presented) The watch of claim 37, wherein the second rear electrode is configured to ground the watch to a portion of a skin of a user wearing the watch.

39. (Currently Amended) The watch of claim 35, wherein:

the rear electrode includes a conductive coating that includes one or more of an aluminum titanium nitride or a chromium silicon carbon nitride material; and

the conductive coating extends along an edge of the carrier member and along an interior surface of the carrier member.

40. (Previously Presented) The watch of claim 35, wherein:

the watch further comprises a button; and

the side electrode is positioned along a surface of the button.

REMARKS

This paper is submitted in response to the Office action mailed on September 23, 2020. This paper amends claims 21, 23-24, 26, 28-30, 32, 35-37, and 39. Support for these amendments and new claims can be found, for example, in at least paragraphs 83-108 and 110-144, and FIGS. 4A-7 and 9A-10D of the application as filed. No new matter is added. The amendments and arguments presented herein, as well as any claim cancellations, are made solely for the purpose of advancing prosecution, and do not indicate acquiescence to the rejections or to any characterizations of the cited references or the instant claims. Moreover, all amendments and remarks herein are made without prejudice to, disclaimer of, or dedication of any subject matter, and a right is specifically reserved to file continuation and/or divisional applications claiming any subject matter disclosed in the application.

After entry of this Amendment and Response, claims 21-40 will be pending.

I. Interview Summary

The Assignee thanks Examiner Kim for the courtesy of a telephonic interview on September 18, 2020. In attendance were Examiner Kim and the Assignee's representative Peter Nagle. During the call, the rejections were discussed, as well as proposed amendments directed to the concept that electrodes are positioned on a carrier member (e.g., a carrier member that is formed from a transparent material and coupled to a housing member). The Examiner indicated that the proposed amendments would likely overcome the rejections of record, but that further consideration or search would be required.

II. Claim Rejections Under 35 U.S.C. § 102

The Examiner rejected claims 21, 23, and 35-38 under 35 U.S.C. § 102 as being anticipated by Kegasawa (U.S. Patent Pub. No. 2016/0338598; hereinafter "Kegasawa"). These claims are believed to be patentable over Kegasawa at least because Kegasawa does not disclose each and every limitation of the rejected independent claims.

Amended claim 21 recites (emphasis added):

> An electronic watch comprising:
>
> **a housing member**;
>
> a display at least partially enclosed by the housing member;
>
> **a carrier assembly coupled to the housing member and comprising**:

a carrier member formed from a transparent material;

a first electrode positioned on the carrier member, operably coupled to a processor and configured to detect a first voltage; and

a second electrode positioned on the carrier member, operably coupled to the processor and configured to detect a second voltage, the first and second electrodes at least partially surrounding a first region of the carrier member and a second region of the carrier member;

a light emitter positioned below the first region of the carrier member;

a light receiver positioned below the second region of the carrier member and configured to receive light reflected from a wrist;

a third electrode coupled to the housing member, operably coupled to the processor, and configured to detect a third voltage; and

the processor positioned within the electronic watch and configured to determine an electrocardiogram using the first voltage, the second voltage, and the third voltage.

Thus, amended claim 21 recites an electronic watch that includes a housing member and a carrier assembly coupled to the housing member. The carrier assembly includes "a carrier member formed from a transparent material," "a first electrode positioned on the carrier member" and "a second electrode positioned on the carrier member." Figure 4A of the instant application, reproduced below, illustrates a nonlimiting example of a watch with a housing member (e.g., the housing 206) and a carrier assembly coupled to the housing member, the carrier assembly including a carrier member (e.g., the "carrier 404") and first and second electrodes 412, 414 on the carrier member.

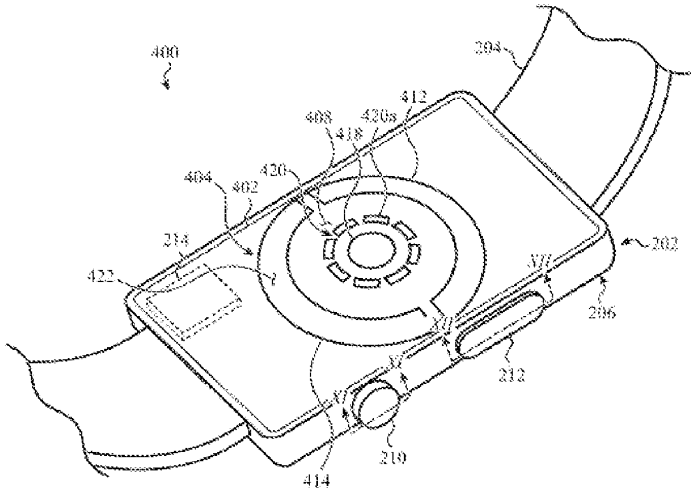


FIG. 4A

Figure 9A of the instant application, reproduced below, is a cross-sectional view of a nonlimiting example of an electronic watch, showing how a carrier member (e.g., the "carrier 904") has electrodes (e.g., electrode 900) positioned thereon, and how the carrier member is a different structural component than the housing member 914 to which it is coupled.

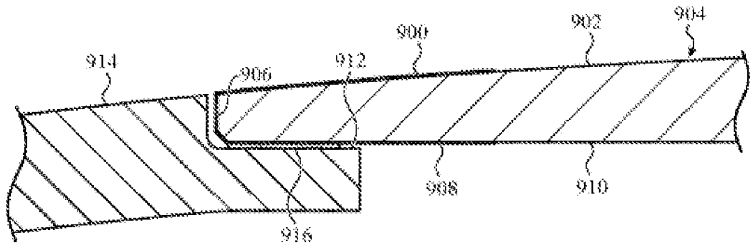
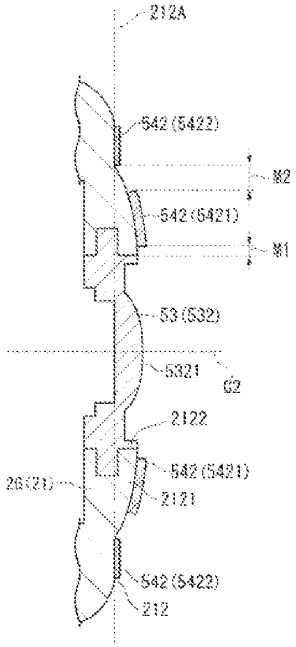


FIG. 9A

Thus, as illustrated in the examples shown in figures 4A and 9A, above, a carrier assembly that includes a carrier member and first and second electrodes may be coupled to a housing member (e.g., a different component than the carrier member) of an electronic watch.

Kegasawa, on the other hand, does not disclose at least "a housing member," and "a carrier assembly coupled to the housing member and comprising: carrier member formed from a transparent material; a first electrode positioned on the carrier member… [and] a second electrode positioned on the carrier member," as recited by claim 21. For example, and as described in the Examiner interview held on September 18, 2020, Kegasawa describes a sensing system in which electrodes are arranged along various surfaces of the housing, but are not positioned on a component that is analogous to the claimed carrier member (which is a

different component than the housing member of claim 21. A representative figure from Kegasawa is reproduced below showing electrodes 542 positioned along various regions of the housing.



Furthermore, as noted in the Substance of the Interview, above, the Examiner indicated that amendments similar to those submitted herein appear to overcome the rejections of record. For at least the foregoing reasons, the Assignee respectfully submits that claim 21 is patentable, along with its dependent claims, over the rejections of record.

Claim 35 is believed to be patentable, along with its dependent claims, over the rejections of record for at least similar reasons to those describe above with respect to claim 21. For example, amended claim 35 recites, in part, "**a housing member**; [and] … **a carrier assembly coupled to the housing member and comprising: a carrier member** protruding outward from an external surface of the housing member; **and a rear electrode positioned on the carrier member**." The Assignee therefore respectfully requests that the rejections of claims 21 and 35, along with their dependent claims, be reconsidered and withdrawn.

III. Claim Rejections Under 35 U.S.C. § 103

The Examiner rejected claim 22 under 35 U.S.C. § 103(a) as being obvious over Kegasawa in view of Rothkopf (U.S. Patent Pub. No. 2016/0058375; hereinafter "Rothkopf").

The Examiner rejected claims 24, 26, 28, 32, and 39 under 35 U.S.C. § 103(a) as being obvious over Kegasawa in view of Yuen et al. (U.S. Patent Pub. No. 2018/0235542; hereinafter "Yuen").

The Examiner rejected claim 25 under 35 U.S.C. § 103(a) as being obvious over Kegasawa in view of in view of Kub et al. (U.S. Patent Pub. No. 2016/0120472; hereinafter "Kub").

The Examiner rejected claims 27, 29-31, 33-34, and 40 under 35 U.S.C. § 103(a) as being obvious over Kegasawa in view of Ely (U.S. Patent Pub. No. 2015/0041289; hereinafter "Ely").

The rejected claims include independent claim 29. Amended independent claim 29 is believed to be patentable over Kegasawa in view of Ely at least because, as noted above, Kegasawa fails to describe "a rectangular **housing member** defining a rectangular front opening and a circular rear opening; … [and] **a carrier assembly coupled to the rectangular housing member and comprising: a carrier member** having a circular carrier profile and positioned over the circular rear opening; [and] **a rear electrode positioned on the carrier member**," as recited by claim 29. Ely is not cited for the missing limitations, and therefore does not cure the deficiency of Kegasawa.

The rejected claims also include claims 22, 24-28, 30-34, and 39-40 each depend from independent claims 21, 29, or 35, and are believed to be allowable at least insofar as the claims depend from patentably distinct base claims. Accordingly, the Assignee submits that dependent claims 22, 24-28, 30-34, and 39-40 are in condition for allowance. The Assignee makes this statement without waiving and without reference to any independent bases of patentability within the claims and thus reserves the right to argue such bases in a future paper if necessary.

IV. Nonstatutory Double Patenting

Claims 21-40 were rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-20 of U.S. Pat. No. 10,610,167 and claim 1 of U.S. App. No. 16/118,282.

The Assignee notes that the First Action Interview Office action is ambiguous as to whether or not the rejection is provisional (stating that "claims 21-40 are rejected / provisionally rejected"). Regardless of the status of the rejection, the Assignee will consider filing a terminal disclaimer once the claims are otherwise in condition for allowance.

V. Conclusion

The Assignee thanks the Examiner for the thorough review of the application. The Assignee respectfully submits the present application, as amended, is in condition for allowance and respectfully requests the issuance of a Notice of Allowability as soon as practicable.

The Assignee believes no 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: November 23, 2020 .

Respectfully submitted,

/Peter J. Nagle/
Peter J. Nagle, Registration No. 70,361
Attorney for Assignee
USPTO Customer No. 62579

Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, Colorado 80202
Phone: 303-223-1100
Fax: 303-223-1111

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/841,543	Filing Date 04/06/2020	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	11/23/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 20	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	*** 3	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

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

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Masimo Ex. 1002
IPR Petition - USP 10,987,054

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/841,543	04/06/2020	Sameer Pandya	P35079USC2	6983

62579 7590 09/23/2020

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

EXAMINER	
KIM, EUN HWA	

ART UNIT	PAPER NUMBER
3794	

NOTIFICATION DATE	DELIVERY MODE
09/23/2020	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

PTOL-90A (Rev. 04/07)

First Action Interview Office Action Summary	Application No. 16/841,543	Applicant(s) Pandya et al.	
	Examiner EUNHWA KIM	Art Unit 3794	AIA (FITF) Status Yes

The MAILING OR NOTIFICATION DATE of this communication appears on the cover sheet with the correspondence address.

THE SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE **TWO MONTHS** FROM THE MAILING OR NOTIFICATION DATE OF THIS COMMUNICATION.

This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

☐ Applicant's request to not have a first-action interview is acknowledged (or the time period for reply set forth in the Pre-Interview Communication has expired and the Office did not receive any reply).

Status

1) ☑ Responsive to communication(s) filed on 4/15/2020 and interview conducted on 18 September 2020.

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

2) ☐ 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

3) ☑ Claim(s) 21-40 is/are pending in the application.

3a) Of the above claim(s) _____ is/are withdrawn from consideration.

4) ☐ Claim(s) _____ is/are allowed.

5) ☑ Claim(s) 21-40 is/are rejected.

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

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

Application Papers

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

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

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

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

a) ☐ All b) ☐ Some * c) ☐ None of:

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.

Contact Information

Examiner's Telephone Number: (571)270-1265
Examiner's Typical Work Schedule: 9AM-5:30PM
Supervisor's Name: JOSEPH STOKLOSA
Supervisor's Telephone Number: (571) 272-1213

Attachment(s)	
1) ☐ Notice of References Cited (PTO-892)	3) ☑ Interview Summary (PTO-413) Paper No(s)/Mail Date. 20200918 .
2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.	4) ☐ Other: _____ .

First Action Interview Office Action Summary	Application No. 16/841,543	Applicant(s) Pandya et al.	
	Examiner EUNHWA KIM	Art Unit 3794	AIA (FITF) Status Yes

Notification of Rejection(s) and/or Objection(s)

#	Claim(s)	Reference(s) (if applicable)	Rejection Statutory Basis	Brief Explanation of Rejection
1	21,23 and 35	Kegasawa 'D1 '	102 (a)(1)/(a)(2)	D1 discloses an electronic watch (Figs. 1A & 15-18) comprising: a rectangular housing (see Fig. 15-17), a display (61 in Flg. 1A, [0067]); a carrier (532 in Fig. 15); an optical sensor system ([0172]: light emitting and receiving devices); first electrode (arc shape 5421 in Figs. 17-18);
2	22	Rothkopf 'D2'	103	D1 fails to disclose a second light receiver. D2 teaches providing a plurality of light detectors for monitoring heart rate ([0193]-[0194]) in an electronic watch. It would have been obvious to provide an additional light receiver for more accurate heart rate measurement.
3	24	Yuen 'D3'	103	D1 fails to disclose the first and second electrodes include conductive coating. D3 teaches that electrodes can be coated onto a user's watch ([0039], [0091]). It would have been obvious to coat the electrode onto the rectangular housing of D1.
4	25	Kub 'D4'	103	D1/D3 does not disclose the specific material of the conductive coating. D4 teaches a plurality of materials that can be used as electrodes including diamond like carbon material ([0047]) and AlTiN ([0004]). It would have been obvious to choose any of the known materials as electrodes.
5	27, 29 and 40	Ely 'D5'	103	D1 is silent as to the configuration of the third electrode. D5 teaches a side electrode having a button (tactile switch assembly 110 including a button, [0019]) as a third electrode for sensing ECG signal. It would have been obvious to incorporate the side electrode of D5 as the third electrode.

Expanded Discussion/Commentary

1		Second electrode (arc shape 5422 in Figs. 17 & 18); third electrode ([0178]: another electrode); a processor (ECG measurement section 3 in Fig. 3, [0082]-[0085], [0087]: processor processes ECG signal and displays the information in the display section 61). Optical sensor system measures heart rate and the first, second and third electrodes measure ECG signal ([0087], [0187]).
3		**Claims 26, 32 and 39:** D1/D3 discloses that the electrodes 5421/5422 are deposited along the lateral protrusions of the carrier that abuts the housing 2G in Flg. 18. Therefore, the electrodes/coating extends around an edge of the carrier and along an inner portion of the carrier that is internal to the wearable electronic device (electrodes 5421/5422 extends around the lateral inner protrusions of the carrier). D4 discloses aluminum titanium nitride material ([0004]).
3		**Claim 28:** D1/D3 discloses that the electrodes 5421/5422 are deposited along the lateral protrusions of the carrier/member 532 that abuts the housing 2G in Flg. 18. The lateral protrusions of the member 532 protrudes from lateral surfaces of the case 2G as shown in Fig. 18. D6 (Yuen) teaches providing an optically opaque portion and optically transparent portion on a carrier similar to D1 ([0063]). It would have been obvious to provide the opaque ink mask to allow specific wavelengths to be transmitted and reflected for pulse rate/heart rate monitoring ([0060], [0062], [0063]).
5		**Claim 30:** D1/D5 discloses that electrodes 5421 and 5422 are rear electrodes and one is a ground electrode ([0178]). **Claim 31**: The electrodes 5421 and 5422 are arc-shaped (see Figs. 17-18) and partially surround the emitter/receivers disposed within the carrier 532. **Claims 33 & 34:** Optical sensor system measures heart rate and the first, second and third electrodes measure ECG signal ([0087], [0187]).
1		**Claim 36:** the carrier defines a circular outer profile (see Fig. 17); the optical sensor comprises light emitter and receiver ([0172]) and the rear electrode is positioned along a peripheral region of the carrier and partially surrounds a first and second regions of the carrier (electrodes 5421 and 5422 partially surrounds element 532 and the emitter/receiver disposed within the element 532 as shown in Figs. 17 &18). **Claim 37:** see claim 24. **Claim 38:** electrode 5422 is a ground electrode ([0178]).
6		Claims 21-40 are rejected /provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 10,610,167 and claim 1 of Application No. 16/118,282. Although the claims at issue are not identical, they are not patentably distinct from each other.

DATE: 22 July 2020	/EUN HWA KIM/ Primary Examiner, Art Unit 3794	

Applicant-Initiated Interview Summary	**Application No.** 16/841,543	**Applicant(s)** Pandya et al.	
	Examiner EUNHWA KIM	**Art Unit** 3794	**AIA (FITF) Status** Yes

All participants (applicant, applicants representative, PTO personnel):

(1) EUNHWA KIM. (3) _____.

(2) Peter Nagle. (4) _____.

Date of Interview: 18 September 2020.

Type: ☑ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☑ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☑102 ☐103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: 21.

Identification of prior art discussed: Kagasawa (U.S. PGPub. No. 20160338598).

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

An interview was conducted under the FAI program. Applicant proposed to further distinguish the structural relationship between the carrier and the electrodes. Applicant pointed out that the novelty of the invention is forming the electrode directly on a carrier substrate formed from glass/sapphire dome. Examiner explained that Kagasawa does not disclose that the electrodes are directly disposed on the carrier substrate and therefore incorporating such feature would overcome the Kagasawa reference. Examiner explained that further search and/or consideration would be required once the claims are formally filed.

Examiner noted that Newberry reference 'D3' in the pre-interview first office action should be Yuen reference. Yuen reference was originally cited in the PTO-892 form..

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/EUN HWA KIM/ Primary Examiner, Art Unit 3794	

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiners responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicants correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,-
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
(The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicants record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiners version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, Interview Record OK on the paper recording the substance of the interview along with the date and the examiners initials.

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Doc Code: M865 or FAI.REQ.INTV

PTOL-413A (07-16)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Applicant Initiated Interview Request Form

Application No.: 16/841,543 First Named Applicant: Sameer Pandya
Examiner: Kim, Eun Hwa Art Unit: 3794 Status of Application: Pending

Tentative Participants:
(1) Examiner Kim (2) Peter Nagle

(3) Ryan Sydenham (4)

Proposed Date of Interview: September 10, 2020 **Proposed Time:** 9:00 EST (◉AM ◉PM)

Type of Interview Requested:
(1) ☑ Telephonic (2) ☐ Personal (3) ☐ Video Conference

Exhibit To Be Shown or Demonstrated: ☐ YES ☑ NO
If yes, provide brief description:

Issues To Be Discussed

Issues (Rej., Obj., etc)	Claims/ Fig. #s	Prior Art	Discussed	Agreed	Not Agreed
(1) Rej.	All	Kegasawa	☐	☐	☐
(2)			☐	☐	☐
(3)			☐	☐	☐
(4)			☐	☐	☐

☐ Continuation Sheet Attached ☐ Proposed Amendment or Arguments Attached

Brief Description of Arguments to be Presented: Discuss differences between Kegasawa's system and how the structure of the carrier and the electrodes of the instant claims differs from Kegasawa; discuss potential amendments re: same.

An interview was conducted on the above-identified application on

NOTE: This form should be completed and filed by applicant in advance of the interview (see MPEP § 713.01). If this form is signed by a registered practitioner not of record, the Office will accept this as an indication that he or she is authorized to conduct an interview on behalf of the principal (37 CFR 1.32(a)(3)) pursuant to 37 CFR 1.34. This is not a power of attorney to any above named practitioner. See the Instruction Sheet for this form, which is incorporated by reference. By signing this form, applicant or practitioner is certifying that he or she has read the Instruction Sheet. After the interview is conducted, applicant is advised to file a statement of the substance of this interview (37 CFR 1.133(b)) as soon as possible. This application will not be delayed from issue because of applicant's failure to submit a written record of this interview.

/Peter J. Nagle/
Applicant/Applicant's Representative Signature

Examiner/SPE Signature

Peter J. Nagle
Typed/Printed Name of Applicant or Representative

303-223-1100
Applicant's/Applicant's Representative's Telephone Number

70,361
Registration Number, if applicable

This collection of information is required by 37 CFR 1.133. 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 24 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.

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

Masimo Ex. 1002
IPR Petition - USP 10,987,054

PTOL-413A (08-10)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Instruction Sheet for:
APPLICANT INITIATED INTERVIEW REQUEST FORM

(Not to be Submitted to the USPTO)

1. If this form is signed by a registered practitioner not of record, the authority to submit the Applicant Initiated Interview Request Form is pursuant to limited authority to act in a representative capacity under 37 CFR 1.34 and further proof of authority to act in a representative capacity may be required. *See* 37 CFR 1.34.

   The Office will accept the signed form as an indication that the registered practitioner not of record is authorized to conduct an interview on behalf of the principal in pursuant to 37 CFR 1.34.

   For more information, see the "Conducting an Interview with a Registered Practitioner Acting in a Representative Capacity" notice which is available on the USPTO Web site at: http://www.uspto.gov/patents/law/notices/2010.jsp.

2. This is not a power of attorney to any named practitioner. Accordingly, any registered practitioner not of record named on the form does not have authority to sign a request to change the correspondence address, a request for express abandonment, a disclaimer, a power of attorney, or other document requiring the signature of the applicant, assignee of the entire interest or an attorney of record. If appropriate, a separate power of attorney to the named practitioner should be executed and filed in the US Patent and Trademark Office.

3. Any interview concerning an unpublished application under 35 U.S.C. § 122(b) with a registered practitioner not of record who obtains authorization through use of the PTOL-413A will be conducted based on the information and files supplied by the practitioner in view of the confidentiality requirements of 35 U.S.C. § 122(a).

Masimo Ex. 1002
IPR Petition - USP 10,987,054

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.

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Electronic Acknowledgement Receipt	
EFS ID:	40417575
Application Number:	16841543
International Application Number:	
Confirmation Number:	6983
Title of Invention:	Wearable Electronic Device with Electrodes for Sensing Biological Parameters
First Named Inventor/Applicant Name:	Sameer Pandya
Customer Number:	62579
Filer:	Peter James Nagle/Valerie Brown
Filer Authorized By:	Peter James Nagle
Attorney Docket Number:	P35079USC2
Receipt Date:	28-AUG-2020
Filing Date:	06-APR-2020
Time Stamp:	17:19:05
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	First Action Interview - Schedule Interview request	P35079USC2InterviewRequest.pdf	594633 42a9924ca6fd0d36bea5c7ba5b579ae7d49b6a64	no	3
Warnings:					

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Information:	
Total Files Size (in bytes):	594633

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.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/841,543	04/06/2020	Sameer Pandya	P35079USC2	6983

62579 7590 07/28/2020

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

EXAMINER	
KIM, EUN HWA	

ART UNIT	PAPER NUMBER
3794	

NOTIFICATION DATE	DELIVERY MODE
07/28/2020	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

PTOL-90A (Rev. 04/07)

First Action Interview Pilot Program Pre-Interview Communication	**Application No.** 16/841,543	**Applicant(s)** Pandya et al.	
	Examiner EUNHWA KIM	**Art Unit** 3794	**AIA (FITF) Status** Yes

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

THE SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE **ONE MONTH OR THIRTY (30) DAYS,** WHICHEVER IS LONGER, FROM THE MAILING OR NOTIFICATION DATE OF THIS COMMUNICATION.

This time period for reply is extendable under 37 CFR 1.136(a) for only ONE additional MONTH.

This communication constitutes notice under 37 CFR 1.136(a)(1)(i).

Applicant must, within the time period for reply, file: (1) A letter requesting not to have a first action interview; (2) A reply under 37 CFR 1.111 waiving the first action interview and First Action Interview Office Action; or (3) An Applicant Initiated Interview Request Form (PTOL-413A) electronically via EFS-Web, accompanied by a proposed amendment or arguments, and schedule the interview within 2 months from the filing of the request. A failure to respond to this communication will be treated as a request not to have an interview. If applicant waives the First Action Interview Office Action, the instant Pre-Interview Communication is deemed the first Office Action on the Merits. The next subsequent Office action may be made final if appropriate. See MPEP 706.07(a).

Status

1) ☑ Responsive to communication(s) filed on 4/15/2020 .

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

Disposition of Claims

2) ☑ Claim(s) 21-40 is/are pending in the application.

2a) Of the above claim(s) _____ is/are withdrawn from consideration.

3) ☐ Claim(s) _____ is/are allowed.

4) ☑ Claim(s) 21-40 is/are rejected.

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

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

Application Papers

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

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

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

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

a) ☐ All b) ☐ Some * c) ☐ None of:

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.

Contact Information

Examiner's Telephone Number: (571)270-1265

Examiner's Typical Work Schedule: 9AM-5:30PM

Supervisor's Name: JOSEPH STOKLOSA Supervisor's Telephone Number: (571) 272-1213

Attachment(s)

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

2) ☑ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ .

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

4) ☐ Other: _____ .

First Action Interview Pilot Program Pre-Interview Communication	Application No. 16/841,543	Applicant(s) Pandya et al.	
	Examiner EUNHWA KIM	Art Unit 3794	AIA (FITF) Status Yes

Notification of Rejection(s) and/or Objection(s)

#	Claim(s)	Reference(s) (if applicable)	Rejection Statutory Basis	Brief Explanation of Rejection
1	21,23 and 35	Kegasawa 'D1 '	102 (a)(1)/(a)(2)	D1 discloses an electronic watch (Figs. 1A & 15-18) comprising: a rectangular housing (see Fig. 15-17), a display (61 in Flg. 1A, [0067]); a carrier (532 in Fig. 15); an optical sensor system ([0172]: light emitting and receiving devices); first electrode (arc shape 5421 in Figs. 17-18);
2	22	Rothkopf 'D2'	103	D1 fails to disclose a second light receiver. D2 teaches providing a plurality of light detectors for monitoring heart rate ([0193]-[0194]) in an electronic watch. It would have been obvious to provide an additional light receiver for more accurate heart rate measurement.
3	24	Newberry 'D3'	103	D1 fails to disclose the first and second electrodes include conductive coating. D3 teaches that electrodes can be coated onto a user's watch ([0039], [0091]). It would have been obvious to coat the electrode onto the rectangular housing of D1.
4	25	Kub 'D4'	103	D1/D3 does not disclose the specific material of the conductive coating. D4 teaches a plurality of materials that can be used as electrodes including diamond like carbon material ([0047]) and AlTiN ([0004]). It would have been obvious to choose any of the known materials as electrodes.
5	27, 29 and 40	Ely 'D5'	103	D1 is silent as to the configuration of the third electrode. D5 teaches a side electrode having a button (tactile switch assembly 110 including a button, [0019]) as a third electrode for sensing ECG signal. It would have been obvious to incorporate the side electrode of D5 as the third electrode.

Expanded Discussion/Commentary

1		Second electrode (arc shape 5422 in Figs. 17 & 18); third electrode ([0178]: another electrode); a processor (ECG measurement section 3 in Fig . 3, [0082]-[0085], [0087]: processor processes ECG signal and displays the information in the display section 61). Optical sensor system measures heart rate and the first, second and third electrodes measure ECG signal ([0087], [0187]).
3		**Claims 26, 32 and 39:** D1/D3 discloses that the electrodes 5421/5422 are deposited along the lateral protrusions of the carrier that abuts the housing 2G in Flg. 18. Therefore, the electrodes/coating extends around an edge of the carrier and along an inner portion of the carrier that is internal to the wearable electronic device (electrodes 5421/5422 extends around the lateral inner protrusions of the carrier). D4 discloses aluminum titanium nitride material ([0004]).
3		**Claim 28:** D1/D3 discloses that the electrodes 5421/5422 are deposited along the lateral protrusions of the carrier/member 532 that abuts the housing 2G in Flg. 18. The lateral protrusions of the member 532 protrudes from lateral surfaces of the case 2G as shown in Fig. 18. D6 (Yuen) teaches providing an optically opaque portion and optically transparent portion on a carrier similar to D1 ([0063]). It would have been obvious to provide the opaque ink mask to allow specific wavelengths to be transmitted and reflected for pulse rate/heart rate monitoring ([0060], [0062], [0063]).
5		**Claim 30:** D1/D5 discloses that electrodes 5421 and 5422 are rear electrodes and one is a ground electrode ([0178]). **Claim 31**: The electrodes 5421 and 5422 are arc-shaped (see Figs. 17-18) and partially surround the emitter/receivers disposed within the carrier 532. **Claims 33 & 34:** O ptical sensor system measures heart rate and the first, second and third electrodes measure ECG signal ([0087], [0187]).
1		**Claim 36:** the carrier defines a circular outer profile (see Fig. 17); the optical sensor comprises light emitter and receiver ([0172]) and the rear electrode is positioned along a peripheral region of the carrier and partially surrounds a first and second regions of the carrier (electrodes 5421 and 5422 partially surrounds element 532 and the emitter/receiver disposed within the element 532 as shown in Figs. 17 &18). **Claim 37:** see claim 24. **Claim 38:** electrode 5422 is a ground electrode ([0178]).
6		Claims 21-40 are rejected /provisionally rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-20 of U.S. Patent No. 10,610,167 and claim 1 of Application No. 16/118,282. Although the claims at issue are not identical, they are not patentably distinct from each other.

DATE: 22 July 2020	/EUN HWA KIM/ Primary Examiner, Art Unit 3794	

Notice of References Cited	Application/Control No. 16/841,543	Applicant(s)/Patent Under Reexamination Pandya et al.	
	Examiner EUNHWA KIM	Art Unit 3794	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-20180235532-A1	08-2018	Newberry; Robert Steven	G16H40/63	1/1
*	B	US-20160338598-A1	11-2016	KEGASAWA; Kazuyoshi	A61B5/0205	1/1
*	C	US-20160120472-A1	05-2016	Kub; Francis J.	C23C16/34	600/377
*	D	US-20160058375-A1	03-2016	Rothkopf; Fletcher R.	G06F3/015	600/301
*	E	US-20150041289-A1	02-2015	Ely; Colin M.	G06F1/163	200/4
*	F	US-20140107493-A1	04-2014	Yuen; Shelten Gee Jao	A61B5/0002	600/473
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

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

NON-PATENT DOCUMENTS

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

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

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/841,543	Pandya et al.
	Examiner	Art Unit
	EUNHWA KIM	3794

CPC - Searched*		
Symbol	Date	Examiner
A61B5/0404,04085,02427,02438,681,6824,6898	07/22/2020	EK

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
Inventor and Assignee Search	07/22/2020	EK
CPC based text search (see EAST search history printout)	07/22/2020	EK

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

/EUN HWA KIM/ Primary Examiner, Art Unit 3794	

PTO/SB/08A and B (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.:** Not Yet Assigned	**FILING DATE:** Herewith
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P35079USC2

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.	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.	6,996,428	02/2006	Kislov et al.	
	A2.	7,486,386	02/2009	Holcombe	
	A3.	7,729,748	06/2010	Florian	
	A4.	7,822,469	10/2010	Lo	
	A5.	7,915,601	03/2011	Setlak et al.	
	A6.	7,957,762	06/2011	Herz et al.	
	A7.	8,954,135	02/2015	Yuen et al.	
	A8.	8,988,372	03/2015	Messerschmidt et al.	
	A9.	9,042,971	05/2015	Brumback et al.	
	A10.	9,100,579	06/2014	Schatvet et al.	
	A11.	9,348,322	05/2016	Fraser et al.	
	A12.	9,427,191	08/2016	LeBoeuf	
	A13.	9,485,345	11/2016	Dantu	
	A14.	9,557,716	01/2017	Inamdar	
	A15.	9,620,312	04/2017	Ely et al.	
	A16.	9,627,163	04/2017	Ely et al.	
	A17.	9,723,997	08/2017	Lamego	
	A18.	9,737,221	08/2017	Sato	
	A19.	9,848,823	12/2017	Raghuram et al.	
	A20.	10,092,197	10/2018	Han	
	A21.	10,123,710	11/2018	Gassoway et al.	
	A22.	10,126,194	11/2018	Lee	
	A23.	10,172,562	01/2019	Lim et al.	
	A24.	10,254,804	04/2019	Dusan	
	A25.	10,524,671	01/2019	Lamego	
	A26.	10,534,900	01/2020	Cheong et al.	
	A27.	10,599,101	03/2020	Rothkopf et al.	
	A28.	10,610,157	04/2020	Pandya et al.	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.K/

PTO/SB/08A and B (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.:** Not Yet Assigned	**FILING DATE:** Herewith
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P35079USC2

U.S. PUBLICATION DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PUBLICATION NUMBER Number – Kind Code[2] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	B1.	2011/0015496	01/2011	Sherman et al.	
	B2.	2014/0275832	09/2014	Muehlsteff et al.	
	B3.	2016/0198966	07/2016	Uematsu et al.	
	B4.	2016/0242659	08/2016	Yamashita et al.	
	B5.	2016/0338598	11/2016	Kegasawa	
	B6.	2016/0338642	11/2016	Parara et al.	
	B7.	2016/0378071	12/2016	Rothkopf	
	B8.	2017/0090599	03/2017	Kuboyama et al.	
	B9.	2017/0181644	06/2017	Meer et al.	
	B10.	2017/0230754	08/2017	Dusan	
	B11.	2018/0235542	08/2018	Yun et al.	
	B12.	2019/0072912	03/2019	Pandya et al.	
	B13.	2019/0090806	03/2019	Harrison-Noonan et al.	
	B14.	2019/0101870	04/2019	Pandya et al.	
	B15.	2019/0220069	07/2019	Dusan	
	B16.	2020/0100684	04/2020	Lamego	

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.	CN 1572252	02/2005	ETA SA MFT Horlogere Suisse		✓
	C2.	CN 102483608	05/2012	ETA SA MFT Horlogere Suisse		✓
	C3.	CN 203732900	07/2014	Qu Weibing		✓
	C4.	CN 104050444	09/2014	Fitbit Inc.		✓
	C5.	CN 105339871	02/2016	Apple Inc.		✓
	C6.	CN 205121417	03/2016	Apple Inc.		✓
	C7.	CN 105556433	05/2016	Apple Inc.		✓
	C8.	CN 105955519	09/2016	Apple Inc.		✓
	C9.	CN 106236051	12/2016	Shenzhen Qianhai Leadcent Intelligent Tech Co. Ltd.		✓

20525905.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.K/

PTO/SB/08A and B (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.:** Not Yet Assigned	**FILING DATE:** Herewith
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P35079USC2

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]
	C10.	CN 106462665	02/2017	Microsoft Technology Licensing LLC		✓
	C11.	CN 206209589	05/2017	Apple Inc.		✓
	C12.	JP 2001145607	05/2001	Casio Computer Co. Ltd.		✓
	C13.	JP 2009519737	05/2009	Koninkl Philips Electronics NV		✓
	C14.	KR 20110012784	02/2011	Bionet Co., Ltd.		✓
	C15.	KR 1020160145284	12/2016	LG Electronics Inc.		✓
	C16.	TW 201610621	03/2016	Mitac International Corp.		✓
	C17.	TW 201621491	06/2016	Samsung Electronics Co. Ltd.		✓
	C18.	WO 15/030712	03/2015	Bodhi Technology Ventures LLC		
	C19.	WO 16/204443	12/2016	Samsung Electronics Co. Ltd.		

NONPATENT LITERATURE DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	Include name of Author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	D1.	DOZZA et al., "A Portable Audio-biofeedback System to Improve Postural Control," Proceedings of the 26th Annual International Conference of the IEEE EMBS, San Francisco, CA, September 1-5, 2004, pp. 4799-4802	
	D2.	OHGI et al., "Stroke phase discrimination in breaststroke swimming using a tri-axial acceleration sensor device," *Sports Engineering*, Vol. 6, No. 2, June 1, 2003, pp. 113-123	
	D3.	ONIZUKA et al., "Head Ballistocardiogram Based on Wireless Multi-Location Sensors, 2015 EEE, pp. 1275-1278	
	D4.	ZIJLSTRA et al., "Assessment of spatio-temporal gait parameters from trunk accelerations during human walking," *Gait & Posture*, Vol. 18, No. 2, October 1, 2003, pp. 1-10	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.K/

PTO/SB/08A and B (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.:** Not Yet Assigned	**FILING DATE:** Herewith
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P35079USC2

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 Signature	/EUN HWA KIM/	Date Considered	07/22/2020

[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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.K/

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	"10610157"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:22
L2	79	(US-20110012784-$ | US-0015496-$ | US-0072912-$ | US-0090599-$ | US-0090806-$ | US-0100684-$ | US-0101870-$ | US-0181644-$ | US-0198966-$ | US-0220069-$ | US-0230754-$ | US-0235542-$ | US-0242659-$ | US-0275832-$ | US-0338598-$ | US-0338642-$ | US-0378071-$ | US-10092197-$ | US-10123710-$ | US-10126194-$ | US-10172562-$ | US-10254804-$ | US-10524671-$ | US-10534900-$ | US-10599101-$ | US-10610157-$ | US-1572252-$ | US-20110015496-$ | US-20140275832-$ | US-20160198966-$ | US-20160242659-$ | US-20160338598-$ | US-20160338642-$ | US-20160378071-$ | US-20170090599-$ | US-20170181644-$ | US-20170230754-$ | US-20180235542-$ | US-20190072912-$ | US-20190090806-$ | US-20190101870-$ | US-20190220069-$ | US-20200100684-$ | US-20525905-$ | US-6996428-$ | US-7486386-$ | US-7729748-$ | US-7822469-$ | US-7915601-$ | US-7957762-$ | US-8954135-$ | US-8988372-$ | US-9042971-$ | US-9100579-$ | US-9348322-$ | US-9427191-$ | US-9485345-$ | US-9557716-$ | US-9620312-$ | US-9627163-$ | US-9723997-$ | US-9737221-$ | US-9848823-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:37
L3	18	(CN-102483608-$ | CN-104050444-$ | CN-105339871-$ | CN-105556433-$ | CN-105955519-$ | CN-106236051-$ | CN-106462665-$ | CN-1572252-$ | CN-203732900-$ | CN-205121417-$ | CN-206209589-$ | JP-2001145607-$ | JP-2009519737-$ | KR-20110012784-$ | TW-201610621-$ | TW-201621491-$ | WO-15030712-$ | WO-16204443-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:37

L4	3	(15/030712 | 16/204443).APP.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:38
L5	100	2 3 4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:38
L6	22	"20150041289" "20160338598" "20160058375" "20170235532" "20160120472" "20140107493"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:40
L7	22	"20150041289" "20160338598" "20160058375" "20180235532" "20160120472" "20140107493"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 21:41
S1	2	"16193836"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:28
S2	6	(US-0072912-$ | US-0090806-$ | US-19387086-$ | US-20190072912-$ | US-20190090806-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:28
S3	0	(TW-201610621-$ | TW-201621491-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:28
S4	12	(US-0058375-$ | US-0090599-$ | US-0181644-$ | US-10123710-$ | US-18783990-$ | US-20160058375-$ | US-20170090599-$ | US-20170181644-$ | US-9348322-$ | US-9627163-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:29

S5	0	(WO-16204443-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:29
S6	45	(US-0011210-$ | US-0015496-$ | US-0058309-$ | US-0198966-$ | US-0230754-$ | US-0242659-$ | US-0275832-$ | US-0310656-$ | US-0349803-$ | US-0354332-$ | US-0378071-$ | US-17848348-$ | US-20110015496-$ | US-20130310656-$ | US-20140275832-$ | US-20160058309-$ | US-20160198966-$ | US-20160242659-$ | US-20160349803-$ | US-20160378071-$ | US-20170011210-$ | US-20170230754-$ | US-20170354332-$ | US-7486386-$ | US-7729748-$ | US-7822469-$ | US-7915601-$ | US-7957762-$ | US-8988372-$ | US-9100579-$ | US-9485345-$ | US-9620312-$ | US-9723997-$ | US-9737221-$ | US-9848823-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:30
S7	1	(JP-2001145607-$ | WO-15030712-$ | WO-16040392-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:30
S8	63	S2 S4 S6	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:31
S9	7	("20030142291" | "5002387" | "6597438" | "7911617").PN. OR ("9348322").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/07/29 13:56
S10	11,028	a61b5/681.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:58
S11	40,542	(first and second and third) adj (electrode)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 13:59

S12	59	S10 and S11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 14:00
S13	100	a61b5/681.cpc. and crown	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 14:58
S14	117	a61b5/681.cpc. and (button pin crown) with (electrode)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 14:59
S15	93	S13 not S14	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 15:38
S16	21	"14455375"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:01
S17	7	a61b5/681.cpc. and arc with electrode	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:09
S18	18	"20040111087"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:13
S19	1	"20150250049"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:14

S20	6,642	a61b5/6824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:36
S21	6,180	a61b5/6898.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:36
S22	3,206	a61b5/0404.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:37
S23	16,604	a61b5/0404,0408,04085,04284,044.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:38
S24	487	S23 and wrist and watch	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:38
S25	602	S23 and (wrist and watch or wristwatch or wrist adj watch)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:39
S26	28,134	S20 S21 S23	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:39
S27	783	S26 and wrist near5 watch	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:39

S28	26	S26 and wrist near5 watch and S11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:40
S29	148	wrist near5 watch and S11	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 16:50
S30	18,747	(G04G21/025 or G04G21/08 or G04G9/0005 or G06F1/163).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 17:12
S31	5,554	S30 and (watch wristwatch)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 17:12
S32	64	S30 and (watch wristwatch) and (first and second and third) near5 electrode	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 17:13
S33	6,259	a61b2562/0209,0214.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 17:32
S34	14	S33 and wrist adj watch	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 17:33
S35	63	S33 and (wrist adj watch wristwatch wrist near3 watch)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/07/29 17:33

S36	2	"16193836"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/06 11:04
S37	1	"20160287172"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/06 15:34
S38	5	"16165391"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/06 15:44
S39	1	"20160338598"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/08 10:12
S40	3	"20150041289"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/08 10:16
S41	2	"16193836"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 17:28
S42	18	watch and crown same2 (split trim) same2 insulat$4	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 17:32
S43	15	watch and insulat$4 near5 (crown)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 17:35

S44	1,958	watch and (pulse adj wave or heart adj rate) and opaque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 17:49
S45	374	smart adj watch and (pulse adj wave or heart adj rate) and opaque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 17:49
S46	18	"20150041289" "20160338598" "2014007493" "9557716".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 18:31
S47	12	"20150041289" "20160338598" "20140107493" "9557716".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/08/09 18:32
S48	9	"9042971".pn. "9427191".pn. "10126194".pn.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 13:28
S49	11	"9042971".pn. "9427191".pn. "10126194".pn. "20160338642" "20190220069"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 13:29
S50	2	"16193836"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 14:38
S51	10	"20040181141" "20140107493" "20180235542"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 15:05

S52	510	((("PANDYA") near3 ("Sameer")) OR (("CLAVELLE") near3 ("Adam")) OR (("DE") near3 ("JONG") near3 ("Erik")) OR (("WITTENBERG") near3 ("Michael")) OR (("HARRISON-NOONAN") near3 ("Tobias")) OR (("MELCHER") near3 ("Martin")) OR (("ZHANG") near3 ("Zhipeng")) OR (("ROACH") near3 ("Steven")) OR (("CARDINALI") near3 ("Steven"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2019/11/21 15:12
S53	162	S52 and watch	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 15:13
S54	180	S52 and (hand near2 held watch)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 15:13
S55	3	S52 and (hand near2 held watch) and (ecg) and (pulse adj wave heart near2 (rate monitor$4 wave))	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 15:14
S56	396	S52 and (optic$4 transpar$4 light)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 15:15
S57	26	S52 and (optic$4 transpar$4 light) same2 (skin)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2019/11/21 15:15
S62	578	((("PANDYA") near3 ("Sameer")) OR (("CLAVELLE") near3 ("Adam")) OR (("DE") near3 ("JONG") near3 ("Erik")) OR (("WITTENBERG") near3 ("Michael")) OR (("HARRISON-NOONAN") near3 ("Tobias")) OR (("MELCHER") near3 ("Martin")) OR (("ZHANG") near3 ("Zhipeng")) OR (("ROACH") near3 ("Steven")) OR (("CARDINALI") near3 ("Steven"))).INV.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/07/22 10:26

S63	197	S62 and watch	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/07/22 10:44
S64	4	"10285645".pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/07/22 10:47
S65	4	"20170086743"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/07/22 10:48
S66	12	("20080049560" | "20110007468" | "20130261405" | "20130272103" | "20160058375" | "20160069371" | "20160313700" | "4903253" | "7126483" | "9721452").PN. OR ("10285643").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 10:52
S67	14	("20080049560" | "20110007468" | "20130235546" | "20130261405" | "20130272103" | "20160058375" | "20160069371" | "20160128209" | "20160313700" | "4903253" | "4958279" | "6971789" | "7126483" | "9721452").PN. OR ("10548529").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 10:53
S68	40	("10381881" | "20020055763" | "20030011527" | "20040051617" | "20040220485" | "20070228833" | "20080074112" | "20080079420" | "20080303479" | "20100289341" | "20110115735" | "20110127951" | "20110164471" | "20120032632" | "20120112552" | "20120200169" | "20130049484" | "20130113422" | "20140143933" | "20140232330" | "20150015180" | "20150123604" | "20150164422" | "20150195009" | "20150223709" | "20150326028" | "20150364938" | "20150371768" | "20160064137" | "20160111887" | "20170047635" | "20170049352" | "20170133880" | "20170224218" | "20180062430" | "3646562" | "4230127" | "5814900" | "6300920" | "6950695").PN. OR ("10491041").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 10:53

S69	56	S66 S67 S68	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 11:04
S70	3,579	a61b5/0404.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:41
S71	7,169	a61b5/04085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:41
S72	13,534	a61b5/02438.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:42
S73	16,055	a61b5/02427,02438.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:42
S74	18,842	a61b5/681,6824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:43
S75	7,435	a61b5/6898.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:43
S76	42,503	S70 S71 S72 S73 S74 S75	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:44
S77	6,443	S76 and watch	US-PGPUB; USPAT;	OR	OFF	2020/07/22 11:44

			USOCR; FPRS; EPO; JPO			
S78	33,691	S70 S71 S74 S75	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:44
S79	7,243	S78 and S73	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:44
S80	1,770	S79 and watch	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:45
S81	956	S79 and watch and (sapphire zirconia plastic crystal crystalline glass)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:47
S82	47	S79 and watch and (sapphire zirconia plastic crystal crystalline glass) same2 (coat$4 depost$4) with (electrode conduct$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 11:48
S83	0	samsung.as. and (eunhwa near2 kim).xp.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 12:21
S84	22	(eunhwa near2 kim).xp.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 12:21
S85	269,740	samsung.as.	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/07/22 12:23

			FPRS; EPO; JPO			
S86	3,292	samsung.as. and (gsr and impedance ecg)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 12:23
S87	11	samsung.as. and (gsr and impedance and bia and ecg)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 12:23
S88	37	(US-20110015496-$ or US-20160058309-$ or US-20160058375-$ or US-20160242659-$ or US-20170090599-$ or US-20170181644-$ or US-20040181141-$ or US-20160338598-$ or US-20140215246-$ or US-20090312655-$ or US-20190076089-$ or US-20150041289-$ or US-20160287095-$ or US-20180235542-$ or US-20170090614-$ or US-20170357419-$ or US-20150342525-$ or US-20140107493-$ or US-20190090806-$ or US-20170224218-$ or US-20170049352-$ or US-20080049560-$ or US-20190001131-$ or US-20180212449-$).did. or (US-10123710-$ or US-7729748-$ or US-9348322-$ or US-9620312-$ or US-9848823-$ or US-9737221-$ or US-5001687-$ or US-9557716-$ or US-10585467-$).did. or (EP-3451117-$ or EP-3327520-$).did. or (JP-2016214641-$).did.	US-PGPUB; USPAT; FPRS; JPO	OR	OFF	2020/07/22 14:48
S89	21	S88 and light near5 (detect$4 receiv$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 14:48
S90	20	S88 and (coat$4 plat$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:36
S91	9	S88 and (coat$4 plat$4 deposit$4) near5 (electrode conduct$4)	US-PGPUB; USPAT;	OR	OFF	2020/07/22 15:36

			USOCR; FPRS; EPO; JPO			
S92	3,579	a61b5/0404.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S93	7,169	a61b5/04085.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S94	16,055	a61b5/02427,02438.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S95	18,842	a61b5/681,6824.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S96	7,435	a61b5/6898.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S97	33,691	S92 S93 S95 S96	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S98	7,243	S97 and S94	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S99	1,770	S98 and watch	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/07/22 15:43

			FPRS; EPO; JPO			
S100	156	S99 and (coat$4 plat$4 deposit$4) near5 (electrode conduct$4)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:43
S101	14	S99 and (coat$4 deposit$4) near5 (electrode conduct$4) same (aluminum titanium nitride chronium silicon carbon diamond)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 15:45
S102	21	("20020013534" | "20070265140" | "20070287923" | "20080033275" | "20080194917" | "20110247321" | "20140018648" | "20140276134" | "20140277739" | "20140288390" | "20140296658" | "20140364749" | "20150207914" | "20170319136" | "4987900" | "5261412" | "6491647" | "6876135" | "7339572" | "7641614" | "8471438").PN. OR ("10575780").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 16:19
S103	5	S102 and coat$4	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 16:20
S104	37	("10061350" | "20050075542" | "20060100530" | "20080171915" | "20100024573" | "20110125037" | "20130053661" | "20140031705" | "20140174958" | "20140180137" | "20140200412" | "20140257050" | "20140296749" | "20150091711" | "20150135410" | "20150173633" | "20150297132" | "20150305675" | "20160058388" | "20160066844" | "20160071408" | "20160074649" | "20160143584" | "20160256116" | "20170086742" | "20170086743" | "8033916" | "8541745" | "8684900" | "8764651" | "8781791" | "8920332" | "9274507" | "9609921" | "9781984" | "9875008" | "9898120").PN. OR ("10285645").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2020/07/22 16:23
S105	86	S99 and (coat$4 deposit$4) near5 (electrode conduct$4)	US-PGPUB; USPAT; USOCR;	OR	OFF	2020/07/22 16:27

			FPRS; EPO; JPO			
S106	125	S99 and (electrode conduct$4) same (aluminum titanium nitride chronium silicon carbon diamond)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 16:32
S107	3	S99 and (electrode conduct$4) same (diamond dlc)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 16:39
S108	1,255	a61b5/$5.cpc. and (electrode conduct$4) same (diamond dlc)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 16:40
S109	199	a61b5/$5.cpc. and (coat$4) same (electrode conduct$4) same (diamond dlc)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 16:43
S110	2	"20180235532"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 17:34
S111	8	"20160058375"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 18:19
S112	40	(US-20110015496-$ or US-20160058309-$ or US-20160058375-$ or US-20160242659-$ or US-20170090599-$ or US-20170181644-$ or US-20040181141-$ or US-20160338598-$ or US-20140215246-$ or US-20090312655-$ or US-20190076089-$ or US-20150041289-$ or US-20160287095-$ or US-20180235542-$ or US-20170090614-$ or US-20170357419-$ or US-20150342525-$ or US-20140107493-$ or US-20190090806-$ or US-20170224218-$ or	US-PGPUB; USPAT; FPRS; JPO	OR	OFF	2020/07/22 18:20

		US-20170049352-$ or US-20080049560-$ or US-20190001131-$ or US-20180212449-$ or US-20150335283-$ or US-20180369587-$).did. or (US-10123710-$ or US-7729748-$ or US-9348322-$ or US-9620312-$ or US-9848823-$ or US-9737221-$ or US-5001687-$ or US-9557716-$ or US-10585467-$ or US-9999392-$).did. or (EP-3451117-$ or EP-3327520-$).did. or (JP-2016214641-$).did.				
S113	8	S112 and opaque	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO	OR	OFF	2020/07/22 18:20

7/22/2020 9:45:05 PM
C:\Users\ekim4\Documents\EAST\Workspaces\16841543.wsp

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/841,543	04/06/2020	Sameer Pandya	P35079USC2

CONFIRMATION NO. 6983

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

PUBLICATION NOTICE

OC000000118666539

Title: Wearable Electronic Device with Electrodes for Sensing Biological Parameters

Publication No.US-2020-0229761-A1
Publication Date:07/23/2020

NOTICE OF PUBLICATION OF APPLICATION

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

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

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

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

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

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

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/841,543	04/06/2020	Sameer Pandya	P35079USC2	6983

62579 7590 04/16/2020

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

EXAMINER	
ART UNIT	PAPER NUMBER
3794	

NOTIFICATION DATE	DELIVERY MODE
04/16/2020	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

PTOL-90A (Rev. 04/07)

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Decision Granting Request for Prioritized Examination (Track I)	**Application No.** 16/841,543	**Applicant(s)** Pandya et al.	
	Examiner BRIAN W BROWN	**Art Unit** OPET	**AIA (FITF) Status** Yes

1. THE REQUEST FILED 06 April 2020 IS **GRANTED** .

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

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

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

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

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

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

D. filing a notice of appeal;

E. filing a request for suspension of action;

F. mailing of a notice of allowance;

G. mailing of a final Office action;

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

I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to BRIAN BROWN at (571)272-5338. In his/her absence, calls may be directed to Petition Help Desk at (571) 272-3282.

/BRIAN W BROWN/ Petitions Examiner, OPET	

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

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Electronic Acknowledgement Receipt	
EFS ID:	39170297
Application Number:	16841543
International Application Number:	
Confirmation Number:	6983
Title of Invention:	Wearable Electronic Device with Electrodes for Sensing Biological Parameters
First Named Inventor/Applicant Name:	Sameer Pandya
Customer Number:	62579
Filer:	Benno Maxim Guggenheimer/Valerie Brown
Filer Authorized By:	Benno Maxim Guggenheimer
Attorney Docket Number:	P35079USC2
Receipt Date:	15-APR-2020
Filing Date:	06-APR-2020
Time Stamp:	17:34:58
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	Preliminary Amendment	P35079USC2PreliminaryAmendment.pdf	30971 973c0d742532f0ec6191dfcc3425077ea4e6d591	no	6
Warnings:					

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Information:	
Total Files Size (in bytes):	30971

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

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor(s):	Sameer Pandya, et al.		
App. No.:	16/841,543	Con. No.:	6983
Filed:	April 5, 2020	Art Unit:	Not Yet Assigned
Title:	WEARABLE ELECTRONIC DEVICE WITH ELECTRODES FOR SENSING BIOLOGICAL PARAMETERS	Examiner:	Not Yet Assigned

PRELIMINARY AMENDMENT

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

Sir:

Prior to examination of the above-referenced application, please enter the following Preliminary Amendment and remarks:

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

Remarks begin on page 6 of this paper.

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Amendments to the Claims:

1-20. (Cancelled)

21. (New) An electronic watch comprising:

a housing;

a display at least partially enclosed by the housing;

a carrier coupled to the housing and formed from a transparent material;

a light emitter positioned below a first region of the carrier;

a light receiver positioned below a second region of the carrier and configured to receive light reflected from a wrist;

a first electrode positioned on the carrier, operably coupled to a processor and configured to detect a first voltage;

a second electrode positioned on the carrier, operably coupled to the processor and configured to detect a second voltage, the first and second electrodes at least partially surrounding the first and second regions of the carrier;

a third electrode coupled to the housing, operably coupled to the processor, and configured to detect a third voltage; and

the processor positioned within the housing and configured to determine an electrocardiogram using the first voltage, the second voltage, and the third voltage.

22. The electronic watch of claim 21, wherein:

the light receiver is a first light receiver;

the electronic watch further comprises a second light receiver; and

the first and second light receivers are configured to measure a heart rate using the light reflected from the wrist.

23. The electronic watch of claim 21, wherein:

the housing defines a rectangular outer housing profile;

the display is a rectangular display; and

the carrier defines a circular outer carrier profile.

24. The electronic watch of claim 21, wherein:

the first electrode includes a first conductive coating deposited on the carrier; and

the second electrode includes a second conductive coating deposited on the carrier.

25. The electronic watch of claim 24, wherein the first and second conductive coatings include one or more of an aluminum titanium nitride material, a chromium silicon carbon nitride material, or a diamond like carbon material.

26. The electronic watch of claim 24, wherein:

the first conductive coating is deposited along an exterior surface of the carrier, an edge of the carrier, and an interior surface of the carrier; and

the processor is operably coupled to the first electrode along a portion of the first conductive coating positioned along the interior surface of the carrier.

27. The electronic watch of claim 21, wherein:

the electronic watch further comprises a button having a conductive button cap; and

the conductive button cap defines the third electrode.

28. The electronic watch of claim 21, wherein:

the carrier includes an opaque ink mask deposited along an inner surface of the carrier surrounding the first and second regions;

the first and second electrodes are positioned along an exterior surface of the carrier that is over the opaque ink mask; and

the exterior surface of the carrier protrudes outward from an external surface of the housing.

29. A wearable electronic device comprising:

a rectangular housing defining a rectangular front opening and a circular rear opening;

a cover having a rectangular cover profile and positioned over the rectangular front opening;

a display positioned below the cover;

a carrier having a circular carrier profile and positioned over the circular rear opening;

an optical sensor system comprising:

an optical emitter positioned below a first region of the carrier; and

an optical receiver positioned below a second region of the carrier;

a rear electrode positioned on the carrier and configured to receive a first voltage signal from a wrist of a user;

a side electrode positioned along an exterior of the rectangular housing and configured to receive a second voltage signal from a finger of the user; and

a processor positioned within the rectangular housing and configured to determine a biological parameter using the first and second voltage signals.

30. The wearable electronic device of claim 29, wherein:

the rear electrode is a first rear electrode; and

the wearable electronic device further comprises a second rear electrode positioned on the carrier and configured to ground the wearable electronic device to the user.

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

the first rear electrode defines a first arc that partially surrounds the optical sensor system; and

the second rear electrode defines a second arc that partially surrounds the optical sensor system.

32. The wearable electronic device of claim 29, wherein:

the rear electrode is formed from a conductive coating deposited along an exterior surface of the carrier; and

the conductive coating extends around an edge of the carrier and along an inner portion of the carrier that is internal to the wearable electronic device.

33. The wearable electronic device of claim 29, wherein the optical sensor system is an optical heart rate sensor that is configured to measure a heart rate of the user.

34. The wearable electronic device of claim 29, wherein:

the optical sensor system is configured to measure a heart rate of the user; and

the biological parameter is an electrocardiogram (ECG) of the user.

35. A watch comprising:

a housing;

a display configured to display a graphical output;

a carrier coupled to the housing and protruding outward from an external surface of the housing;

an optical sensor positioned below the carrier and configured to transmit optical signals through the carrier;

a rear electrode positioned on the carrier, the rear electrode operably coupled to a processor and configured to detect a first voltage;

a side electrode positioned along an exterior of the watch, the side electrode operably coupled to the processor and configured to detect a second voltage; and

the processor positioned within the housing and configured to:

determine a biological parameter; and

cause a change to the graphical output in response to determining the biological parameter.

36. The watch of claim 35, wherein:

the carrier defines a circular outer profile;

the optical sensor comprises a light emitter configured to emit light through a first region of the carrier;

the optical sensor comprises an optical receiver configured to receive reflected light through a second region of the carrier; and

the rear electrode is positioned along a peripheral region of the carrier and at least partially surrounds the first and second regions of the carrier.

37. The watch of claim 35, wherein:

the rear electrode is a first rear electrode;

the watch further comprises a second rear electrode positioned on the carrier; and

the first rear electrode and the second rear electrode are defined by a conductive coating deposited on a surface of the carrier.

38. The watch of claim 37, wherein the second rear electrode is configured to ground the watch to a portion of a skin of a user wearing the watch.

39. The watch of claim 35, wherein:

the rear electrode includes a conductive coating that includes one or more of an aluminum titanium nitride or a chromium silicon carbon nitride material; and

the conductive coating extends along an edge of the carrier and along an interior surface of the carrier.

40. The watch of claim 35, wherein:

the watch further comprises a button; and

the side electrode is positioned along a surface of the button.

REMARKS

This preliminary amendment cancels claims 1-20 and adds new claims 21-40. No new matter is added.

The Assignee believes no 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.

Dated: April 15, 2020.

Respectfully submitted,

/Benno M. Guggenheimer/

Benno M. Guggenheimer,
Registration No. 66,686
Attorney for Assignee
USPTO Customer No. 62579

Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, Colorado 80202
Phone: 303-223-1100
Fax: 303-223-1111

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/841,543	04/06/2020	2833	1720	P35079USC2	20	3

CONFIRMATION NO. 6983

FILING RECEIPT

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



Date Mailed: 04/15/2020

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)

Sameer Pandya, Sunnyvale, CA;
Adam T. Clavelle, San Francisco, CA;
Erik G. de Jong, San Francisco, CA;
Michael B. Wittenberg, San Francisco, CA;
Tobias J. Harrison-Noonan, San Francisco, CA;
Martin Melcher, Mountain View, CA;
Zhipeng Zhang, Santa Clara, CA;
Steven C. Roach, San Francisco, CA;
Steven P. Cardinali, Campbell, 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 16/193,836 11/16/2018 PAT 10610157
which is a CON of 16/118,282 08/30/2018
which claims benefit of 62/554,196 09/05/2017
and claims benefit of 62/644,886 03/19/2018

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.

Masimo Ex. 1002
IPR Petition - USP 10,987,054

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: 04/14/2020

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/841,543**

Projected Publication Date: 07/23/2020

Non-Publication Request: No

Early Publication Request: No

Title

Wearable Electronic Device with Electrodes for Sensing Biological Parameters

Preliminary Class

368

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

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

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.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/841,543

APPLICATION AS FILED - PART I

	(Column 1)	(Column 2)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE($)	FEE($)		RATE($)	FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 460 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1720

APPLICATION AS AMENDED - PART II

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

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

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

Masimo Ex. 1002
IPR Petition - USP 10,987,054

PTO/SB/08A and B (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.:** Not Yet Assigned	**FILING DATE:** Herewith
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P35079USC2

U.S. PATENT DOCUMENTS

EXAMINER INITIALS*	Cite No.	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.	6,996,428	02/2006	Kislov et al.	
	A2.	7,486,386	02/2009	Holcombe	
	A3.	7,729,748	06/2010	Florian	
	A4.	7,822,469	10/2010	Lo	
	A5.	7,915,601	03/2011	Setlak et al.	
	A6.	7,957,762	06/2011	Herz et al.	
	A7.	8,954,135	02/2015	Yuen et al.	
	A8.	8,988,372	03/2015	Messerschmidt et al.	
	A9.	9,042,971	05/2015	Brumback et al.	
	A10.	9,100,579	06/2014	Schatvet et al.	
	A11.	9,348,322	05/2016	Fraser et al.	
	A12.	9,427,191	08/2016	LeBoeuf	
	A13.	9,485,345	11/2016	Dantu	
	A14.	9,557,716	01/2017	Inamdar	
	A15.	9,620,312	04/2017	Ely et al.	
	A16.	9,627,163	04/2017	Ely et al.	
	A17.	9,723,997	08/2017	Lamego	
	A18.	9,737,221	08/2017	Sato	
	A19.	9,848,823	12/2017	Raghuram et al.	
	A20.	10,092,197	10/2018	Han	
	A21.	10,123,710	11/2018	Gassoway et al.	
	A22.	10,126,194	11/2018	Lee	
	A23.	10,172,562	01/2019	Lim et al.	
	A24.	10,254,804	04/2019	Dusan	
	A25.	10,524,671	01/2019	Lamego	
	A26.	10,534,900	01/2020	Cheong et al.	
	A27.	10,599,101	03/2020	Rothkopf et al.	
	A28.	10,610,157	04/2020	Pandya et al.	

PTO/SB/08A and B (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.:** Not Yet Assigned	**FILING DATE:** Herewith
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P35079USC2

U.S. PUBLICATION DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	PUBLICATION NUMBER Number – Kind Code[2] (if known)	PUBLICATION DATE MM-DD-YYYY	Name of Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	B1.	2011/0015496	01/2011	Sherman et al.	
	B2.	2014/0275832	09/2014	Muehlsteff et al.	
	B3.	2016/0198966	07/2016	Uematsu et al.	
	B4.	2016/0242659	08/2016	Yamashita et al.	
	B5.	2016/0338598	11/2016	Kegasawa	
	B6.	2016/0338642	11/2016	Parara et al.	
	B7.	2016/0378071	12/2016	Rothkopf	
	B8.	2017/0090599	03/2017	Kuboyama et al.	
	B9.	2017/0181644	06/2017	Meer et al.	
	B10.	2017/0230754	08/2017	Dusan	
	B11.	2018/0235542	08/2018	Yun et al.	
	B12.	2019/0072912	03/2019	Pandya et al.	
	B13.	2019/0090806	03/2019	Harrison-Noonan et al.	
	B14.	2019/0101870	04/2019	Pandya et al.	
	B15.	2019/0220069	07/2019	Dusan	
	B16.	2020/0100684	04/2020	Lamego	

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.	CN 1572252	02/2005	ETA SA MFT Horlogere Suisse		✓
	C2.	CN 102483608	05/2012	ETA SA MFT Horlogere Suisse		✓
	C3.	CN 203732900	07/2014	Qu Weibing		✓
	C4.	CN 104050444	09/2014	Fitbit Inc.		✓
	C5.	CN 105339871	02/2016	Apple Inc.		✓
	C6.	CN 205121417	03/2016	Apple Inc.		✓
	C7.	CN 105556433	05/2016	Apple Inc.		✓
	C8.	CN 105955519	09/2016	Apple Inc.		✓
	C9.	CN 106236051	12/2016	Shenzhen Qianhai Leadcent Intelligent Tech Co. Ltd.		✓

PTO/SB/08A and B (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.:** Not Yet Assigned	**FILING DATE:** Herewith
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P35079USC2

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]
	C10.	CN 106462665	02/2017	Microsoft Technology Licensing LLC		✓
	C11.	CN 206209589	05/2017	Apple Inc.		✓
	C12.	JP 2001145607	05/2001	Casio Computer Co. Ltd.		✓
	C13.	JP 2009519737	05/2009	Koninkl Philips Electronics NV		✓
	C14.	KR 20110012784	02/2011	Bionet Co., Ltd.		✓
	C15.	KR 1020160145284	12/2016	LG Electronics Inc.		✓
	C16.	TW 201610621	03/2016	Mitac International Corp.		✓
	C17.	TW 201621491	06/2016	Samsung Electronics Co. Ltd.		✓
	C18.	WO 15/030712	03/2015	Bodhi Technology Ventures LLC		
	C19.	WO 16/204443	12/2016	Samsung Electronics Co. Ltd.		

NONPATENT LITERATURE DOCUMENTS

EXAMINER INITIALS*	Cite No.[1]	Include name of Author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[6]
	D1.	DOZZA et al., "A Portable Audio-biofeedback System to Improve Postural Control," Proceedings of the 26th Annual International Conference of the IEEE EMBS, San Francisco, CA, September 1-5, 2004, pp. 4799-4802	
	D2.	OHGI et al., "Stroke phase discrimination in breaststroke swimming using a tri-axial acceleration sensor device," *Sports Engineering*, Vol. 6, No. 2, June 1, 2003, pp. 113-123	
	D3.	ONIZUKA et al., "Head Ballistocardiogram Based on Wireless Multi-Location Sensors, 2015 EEE, pp. 1275-1278	
	D4.	ZIJLSTRA et al., "Assessment of spatio-temporal gait parameters from trunk accelerations during human walking," *Gait & Posture*, Vol. 18, No. 2, October 1, 2003, pp. 1-10	

PTO/SB/08A and B (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.:** Not Yet Assigned	**FILING DATE:** Herewith
	FIRST NAMED INVENTOR: Sameer Pandya	**ART UNIT:** Not Yet Assigned
	EXAMINER NAME: Not Yet Assigned	**ATTY. DOCKET NO.:** P35079USC2

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 Signature		Date Considered	

[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.

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:	Wearable Electronic Device with Electrodes for Sensing Biological Parameters			
First Named Inventor/Applicant Name:	Sameer Pandya			
Filer:	Peter James Nagle/Valerie Brown			
Attorney Docket Number:	P35079USC2			
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	300	300
UTILITY SEARCH FEE	1111	1	660	660
UTILITY EXAMINATION FEE	1311	1	760	760
REQUEST FOR PRIORITIZED EXAMINATION	1817	1	4000	4000
Pages:				
Claims:				
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**5860**

Electronic Acknowledgement Receipt	
EFS ID:	39078566
Application Number:	16841543
International Application Number:	
Confirmation Number:	6983
Title of Invention:	Wearable Electronic Device with Electrodes for Sensing Biological Parameters
First Named Inventor/Applicant Name:	Sameer Pandya
Customer Number:	62579
Filer:	Peter James Nagle/Valerie Brown
Filer Authorized By:	Peter James Nagle
Attorney Docket Number:	P35079USC2
Receipt Date:	06-APR-2020
Filing Date:	
Time Stamp:	20:16:14
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$5860
RAM confirmation Number	E202046K17045509
Deposit Account	504621
Authorized User	Valerie Brown
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.17 (Patent application and reexamination processing fees) 37 CFR 1.19 (Document supply fees)	

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal of New Application	P35079USC2ApplicationTransmittal.pdf	115446 67b08878ffcba28b5e6b19c262a9ea8a0f2d4039	no	1
Warnings:					
Information:					
2	Application Data Sheet	P35079USC2ApplicationDataSheet.pdf	1868932 708031176b071112fcf3d57c441d5b14e131175c	no	11
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
3	Oath or Declaration filed	P35079USC2ExecutedDeclarations.pdf	1179264 cb4fe90fcfb57e0a8730f9df0c5ae2be14f928bb	no	9
Warnings:					
Information:					
4	Power of Attorney	P35079USC2TransmittalOfPower.pdf	204181 557b14e5c4d08513fc7bb948b41ddde10818fe3e	no	1
Warnings:					
Information:					
5	Power of Attorney	P35079USC2PowerOfAttorney.pdf	206999 ee30dfc789fa2a0b8384a4896ae2afd2cf9f150b	no	1
Warnings:					
Information:					
6	TrackOne Request	P35079USC2TrackOneRequest.pdf	107069 0937a3533148204eb4db22efb5bbca8404c46dd5	no	1
Warnings:					

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Information:					
7	First Action Interview - Enrollment Request	P35079USC2FAIP.pdf	81804 7266b2a51f0b0ca7814a59e409b878a48b91f68d	no	1
Warnings:					
Information:					
8		P35079USC2Specification.pdf	407864 4e688185449cadcec636fe61d3d8938db1964982	yes	91
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Abstract		91	91	
	Claims		86	90	
	Specification		1	85	
Warnings:					
Information:					
9	Drawings-only black and white line drawings	P35079USC2Drawings.pdf	3500435 47000d0abf989c7002b0d9a0dc9bc140990b61db	no	41
Warnings:					
Information:					
10	Transmittal Letter	P35079USC2IDS.pdf	16584 81b83ef6462e48d8b9a131459577ebc7aacbaa6d	no	2
Warnings:					
Information:					
11	Information Disclosure Statement (IDS) Form (SB08)	P35079USC2PTOSB08.pdf	53361 15d091b4ff1ba09324e40be03799f097ccd2e814	no	4
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					

12	Foreign Reference	CN1572252A.PDF	1472876 138274b57f1a30e68c33c67db6cc675df3ed58ea	no	13
Warnings:					
Information:					
13	Foreign Reference	CN102483608A.pdf	1291918 62c9793062e0bc1e5c80f608942d5178e3d2fde8	no	16
Warnings:					
Information:					
14	Foreign Reference	CN104050444A.pdf	5544339 f8570f01e94d56735bdb49822e2a826fe5d07c1d	no	57
Warnings:					
Information:					
15	Foreign Reference	CN105339871A.pdf	4816560 86cb6475eb4ae18ea3d05c7a904b201f33a5bec9	no	39
Warnings:					
Information:					
16	Foreign Reference	CN105556433A.PDF	1752987 1b906607f2cdd568b9c03516e2f14b13f0f1b701	no	22
Warnings:					
Information:					
17	Foreign Reference	CN105955519A.PDF	2358918 1d4b9f86e20ca04c678280377ff1683b3db1f38a	no	23
Warnings:					
Information:					
18	Foreign Reference	CN106236051A.PDF	739229 aeb848a62ae3ea1bc04bc3d47fa7bdc436c3ee1b	no	11
Warnings:					
Information:					

19	Foreign Reference	CN106462665A.pdf	1886300 add261452ecfb733be79f9fb62b29e967bf36be4	no	18
Warnings:					
Information:					
20	Foreign Reference	CN203732900U.pdf	599371 fb88d09bf11acb3b286e0788c46c7188dcc4d3b8	no	8
Warnings:					
Information:					
21	Foreign Reference	CN205121417U.PDF	8971107 bff76b4f9f051a9bbdff7539c86b7d63ba2d5c52	no	72
Warnings:					
Information:					
22	Foreign Reference	CN206209589U.PDF	1855369 676fa98a2d786a23960c67e82bbac43a76af44dd	no	27
Warnings:					
Information:					
23	Foreign Reference	JP2001145607.PDF	6433051 0466d29dd6d4096f6341b94bb9c1a39cd761d59e	no	53
Warnings:					
Information:					
24	Foreign Reference	JP2009519737A.PDF	963344 ce95b8ad68040d8f9ee283f143fdbf14ce15954a	no	25
Warnings:					
Information:					
25	Foreign Reference	KR20110012784ACute.pdf	2998515 0f48d59e3cebb74d7bd28fa79c8f5b7dc54478f3	no	17
Warnings:					
Information:					

26	Foreign Reference	KR1020160145284A.PDF	2754875 e4af657a8221bfef3c13d90803123bcf29a01cba	no	37
Warnings:					
Information:					
27	Foreign Reference	TW201610621A.PDF	796402 cdc78b4f0355ac0bdb5159d9d174e1e33a51efaf	no	21
Warnings:					
Information:					
28	Foreign Reference	TW201621491A.PDF	17692816 5a713d9ede91e7497b091840de783be1683eef12	no	479
Warnings:					
Information:					
29	Foreign Reference	WO2015-030712A1.PDF	4125641 8538ccfe3349ee6811a6694958e20c455416aa6d	no	43
Warnings:					
Information:					
30	Foreign Reference	WO2016-204443A1.PDF	3902485 e98a1431b98bc3368d9a40d38e1f6e859f34dc94	no	86
Warnings:					
Information:					
31	Non Patent Literature	Dozza2004.pdf	562210 aeb347f61a874cde8407ad76553df76d16ca5789	no	4
Warnings:					
Information:					
32	Non Patent Literature	Ohgi.PDF	830669 4d15980dc72e2fcdc4d76a2d68f1ab871f5f3d7c	no	11
Warnings:					
Information:					

33	Non Patent Literature	Onizuka2015.pdf	571744 e1989efe1e9babf97c0c0386afc334e454d55d4d	no	4
Warnings:					
Information:					
34	Non Patent Literature	Zijlstra.PDF	2700602 8a1b03e784618dbdbdfdd5bf9a9c534b26881ef0	no	10
Warnings:					
Information:					
35	Fee Worksheet (SB06)	fee-info.pdf	40712 fed67be0a7aa29d27cd0ea89caa9e3a59451d903	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	83403979	

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.

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:	Sameer Pandya	Nonprovisional Application Number (if known):	
Title of Invention:	Wearable Electronic Device with Electrodes for Sensing Biological Parameters		

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 /Peter J. Nagle/	Date April 6, 2020
Name (Print/Typed) Peter J. Nagle	Practitioner Registration Number 70,361

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.

PTO/AIA/82B(07-12)
Approved for use through 11/30/2014. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in the attached transmittal letter.

☒ I hereby appoint 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 equivalent): 62579

OR

☐ I hereby appoint Practitioner(s) named below 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 equivalent):

Name	Registration Number	Name	Registration Number

Please recognize or change the correspondence address for the application identified in the attached transmittal letter 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:

☐ Inventor or Joint Inventor

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor

☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign

☐ 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)

SIGNATURE of Applicant for Patent

Signature		Date	9/27/16
Name	BJ Watrous	Telephone	408 974-0015
Title and Company	Vice President and Chief IP Counsel, Apple Inc.		

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. Submit multiple forms for more than one signature, see below *.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.31, 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.**

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

Doc Code: FAI.REQ
Document Description: Request First Action Interview

PTO/SB/413C (05-11)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

REQUEST FOR FIRST ACTION INTERVIEW (FULL PILOT PROGRAM)

Attorney Docket Number: P35079USC2	Application Number (if known):	Filing date: Herewith
First Named Inventor: Sameer Pandya	Title: Wearable Electronic Device with Electrodes for Sensing Biological Parameters	

APPLICANT HEREBY REQUESTS A FIRST ACTION INTERVIEW IN THE ABOVE-IDENTIFIED APPLICATION. See Instruction Sheet on page 2.

1. The application must contain three (3) or fewer independent claims and twenty (20) or fewer total claims.

2. The application must not contain any multiple dependent claims.

3. By filing this request:

   Applicant is agreeing to make an election without traverse if the Office determines that the claims are not obviously directed to a single invention; and

   Applicant is agreeing not to request for a refund of the search fee and any excess claims fee paid in the application after the mailing or notification of the pre-interview communication prepared by the examiner.

4. Other attachments: _____

Signature /Peter J. Nagle/	Date April 6, 2020
Name (Print/Typed) Peter J. Nagle	Registration Number 70,361

***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, see below*.*

☐ *Total of _____ forms are submitted.

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 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, 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.

Masimo Ex. 1002
IPR Petition - USP 10,987,054

ABSTRACT

An electronic device, such as a watch, has a housing to which a carrier is attached. The carrier has a first surface interior to the electronic device, and a second surface exterior to the electronic device. A set of electrodes is deposited on the exterior surface of the carrier. An additional electrode is operable to be contacted by a finger of a user of the electronic device while the first electrode is positioned against skin of the user. The additional electrode may be positioned on a user-rotatable crown of the electronic device, on a button of the electronic device, or on another surface of the housing of the electronic device. A processor of the electronic device is operable to determine a biological parameter of the user based on voltages at the electrodes. The biological parameter may be an electrocardiogram.

Masimo Ex. 1002
IPR Petition - USP 10,987,054

CLAIMS

What is claimed is:

1. An electronic watch, comprising:

a housing;

a crown comprising:

a crown body; and

a shaft connected to the crown body and passing through the housing;

a carrier connected to the housing;

a transparent cover connected to the housing;

a touch-sensitive display at least partially within the housing and viewable through the transparent cover;

a first electrode on the carrier;

a second electrode on the crown body; and

a processor within the housing and operationally connected to the first electrode and the second electrode; wherein:

the first electrode is configured to measure a first voltage;

the second electrode is configured to measure a second voltage;

the processor is configured to determine an electrocardiogram using the first voltage and the second voltage; and

the touch-sensitive display is configured to display the electrocardiogram.

2. The electronic watch of claim 1, wherein:

the touch-sensitive display is further configured to display a graphic other than the electrocardiogram; and

the touch-sensitive display is further configured to change from displaying the graphic to displaying the electrocardiogram.

3. The electronic watch of claim 2, wherein the touch-sensitive display is further configured to change from displaying the graphic to displaying the electrocardiogram in response to a crown input.

4. The electronic watch of claim 1, wherein:

the crown is configured to rotate about an axis of rotation and translate along the axis of rotation; and

the axis of rotation extends along a center of the shaft.

5. The electronic watch of claim 1, wherein the crown further comprises:

an electrically insulating split around the crown body; and

a trim around the electrically insulating split; wherein:

the electrically insulating split is configured to electrically insulate the trim from the crown body; and

the crown body comprises the second electrode.

6. The electronic watch of claim 1, wherein the shaft and crown body are integrally formed with one another.

7. The electronic watch of claim 1, further comprising an insulating coating on at least one of the crown body, the shaft, or the housing.

8. An electronic watch, comprising:

a housing;

a carrier attached to the housing;

a first electrode on the carrier;

a crown extending through the housing and configured to translate and rotate, comprising a second electrode; and

a processor operable to determine a biological parameter of a user based on voltages measured at the first electrode and the second electrode; wherein:

Masimo Ex. 1002
IPR Petition - USP 10,987,054

the voltages are measured while the user is in contact with the first electrode and the second electrode.

9. The electronic watch of claim 8, further comprising:

a collar receiving the crown;

a first collar coating on the collar and configured to reduce friction between the collar and the crown; and

a second collar coating on the first collar coating and configured to obscure the first collar coating.

10. The electronic watch of claim 8, wherein:

the carrier is attached to a rear of the housing;

the crown comprises:

a shaft extending through an opening in the housing; and

a crown body integrally formed with the shaft, exterior to the housing, and configured to be rotated by the user;

the first electrode extends from an interior of the housing, around an edge of the carrier, and to an exterior of the carrier;

the second electrode is a surface of the crown body; and

the crown body and the shaft are in electrical communication with the processor.

11. The electronic watch of claim 8, further comprising:

a transparent cover attached to the housing; and

a display viewable through the transparent cover; wherein

rotating the crown changes a graphic on the display in a first manner;

translating the crown changes the graphic in a second manner; and

the biological parameter is an electrocardiogram.

12. The electronic watch of claim 8, wherein one of rotating or translating the crown initiates determining the biological parameter.

13. The electronic watch of claim 8, further comprising a touch-sensitive display at least partially within the housing; and wherein:

touching the touch-sensitive display initiates determining the biological parameter.

14. The electronic watch of claim 13, wherein:

the biological parameter is a first biological parameter;

the carrier is optically transparent; and

the electronic watch further comprises an optical sensor subsystem configured to sense a second biological parameter through the carrier.

15. The electronic watch of claim 13, wherein:

the first biological parameter is an electrocardiogram; and

the second biological parameter is a heart rate.

16. The electronic watch of claim 8, further comprising a touch-sensitive display; wherein:

the biological parameter is an electrocardiogram; and

the electrocardiogram is shown on the touch-sensitive display.

17. A method for determining and displaying an electrocardiogram by an electronic watch, comprising:

measuring a first voltage at a first electrode on a crown of the electronic watch;

measuring a second voltage at a second electrode on a carrier of the electronic watch;

determining, by a processor of the electronic watch, the electrocardiogram using the first voltage and the second voltage; and

displaying the electrocardiogram on a display of the electronic watch.

18. The method of claim 17, further comprising:

sensing a touch on the crown of the electronic watch; wherein:

initiating measuring the first voltage and measuring the second voltage occurs in response to sensing the touch.

19. The method of claim 17, further comprising:

sensing a touch on the display of the electronic watch; wherein:

initiating measuring the first voltage and measuring the second voltage occurs in response to sensing the touch.

20. The method of claim 17, further comprising:

measuring a third voltage at a third electrode on the carrier of the electronic watch; and

the operation of determining, by the processor of the electronic watch, the electrocardiogram using the first voltage and the second voltage comprises determining, by the processor of the electronic watch, the electrocardiogram using the first voltage, the second voltage; and the third voltage.

WEARABLE ELECTRONIC DEVICE WITH ELECTRODES FOR SENSING BIOLOGICAL PARAMETERS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. Patent Application No. 16/193,836, filed November 16, 2018, and titled "Wearable Electronic Device with Electrodes for Sensing Biological Parameters," which is a continuation of U.S. Patent Application No. 16/118,282, filed August 30, 2018, and titled "Wearable Electronic Device with Electrodes for Sensing Biological Parameters," which claims the benefit under 35 U.S.C. § 119(e) of U.S. Provisional Patent Application No. 62/554,196, filed September 5, 2017, and titled "Wearable Device with Electrodes for Sensing Biological Parameters," and U.S. Provisional Patent Application No. 62/644,886, filed March 19, 2018, and titled "Wearable Device with Electrodes for Sensing Biological Parameters," the contents of which are incorporated herein by reference as if fully disclosed herein.

FIELD

[0002] The described embodiments relate generally to an electronic watch or other wearable electronic device. More particularly, the described embodiments relate to techniques for providing, on a watch or other wearable electronic device, electrodes for sensing biological parameters. The electrodes may be variously provided on a surface of an optical component, crown, button, or housing member of the watch or other wearable electronic device.

BACKGROUND

[0003] A wearable electronic device may include a set of sensors for determining a set of biological parameters of a user that wears the wearable electronic device. Circuitry associated with the set of sensors may generate, for example, electrical signals or measurements corresponding to voltages at, forces applied to, or amounts of light incident on, the sensors. The various signals or measurements may be correlated to, or used to derive, various biological parameters of the user, such as a heart rate of the user.

SUMMARY

[0004] Embodiments of the systems, devices, methods, and apparatuses described in the present disclosure are directed to an electronic watch or other wearable electronic device having a set of electrodes that may be used to sense or determine biological parameters of a user that wears the wearable electronic device. The biological parameters may include, for example, an electrocardiogram (ECG) of the user.

[0005] One embodiment takes the form of an electronic watch, comprising: a housing; a crown comprising: a crown body; and a shaft connected to the crown body and passing through the housing; a carrier connected to the housing; a transparent cover connected to the housing; a touch-sensitive display at least partially within the housing and viewable through the transparent cover; a first electrode on the carrier; a second electrode on the crown body; and a processor within the housing and operationally connected to the first electrode and the second electrode; wherein: the first electrode is configured to measure a first voltage; the second electrode is configured to measure a second voltage; the processor is configured to determine an electrocardiogram using the first voltage and the second voltage; and the touch-sensitive display is configured to display the electrocardiogram.

[0006] Another embodiment takes the form of an electronic watch, comprising: a housing; a carrier attached to the housing; a first electrode on the carrier; a crown extending through the housing and configured to translate and rotate, comprising a second electrode; and a processor operable to determine a biological parameter of a user based on voltages measured at the first electrode and the second electrode; wherein: the voltages are measured while the user is in contact with the first electrode and the second electrode.

[0007] Yet another embodiment takes the form of a method for determining and displaying an electrocardiogram by an electronic watch, comprising: measuring a first voltage at a first electrode on a crown of the electronic watch; measuring a second voltage at a second electrode on a carrier of the electronic watch; determining, by a processor of the electronic watch, the electrocardiogram using the first voltage and the second voltage; and displaying the electrocardiogram on a display of the electronic watch.

[0008] In addition to the example aspects and embodiments described above, further aspects and embodiments will become apparent by reference to the drawings and by study of the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] 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, and in which:

[0010] FIG. 1A shows a functional block diagram of a wearable electronic device;

[0011] FIG. 1B shows an example of an electronic device having a set of electrodes disposed thereon;

[0012] FIGs. 2A-2C show an example of an electronic watch that incorporates a set of electrodes;

[0013] FIG. 3 shows another example of an electronic watch that incorporates a set of electrodes;

[0014] FIGs. 4A-4D show an additional example of an electronic watch that incorporates a set of electrodes on a carrier;

[0015] FIGs. 5A-5E illustrate an example of coatings that may be deposited on the interior and exterior surfaces of the carrier shown in FIGs. 4A-4C;

[0016] FIG. 6 shows a cross-section of the carrier shown in FIG. 5B;

[0017] FIG. 7 shows a cross-section of the carrier shown in FIGS. 5C and 5D;

[0018] FIG. 8 shows an example layer construction of an ITO-based electrode;

[0019] FIGs. 9A-9C show alternative electrical connections between an electrode on an exterior surface of a carrier that forms part of a housing of an electronic device and an electrical contact interior to the electronic device;

[0020] FIGS. 10A-10D show alternative carrier configurations, and alternative attachments or connections of carriers to other housing members of an electronic device;

[0021] FIG. 11A is a cross-section of an example crown assembly;

[0022] FIG. 11B is a cross-section of another example crown assembly;

[0023] FIGs. 12A & 12B show another example of a crown assembly;

[0024] FIGs. 13 & 14 show cross-sections of additional examples of crown assemblies;

[0025] FIGs. 15-22 show various examples of button assemblies;

[0026] FIG. 23 shows a schematic of an electronic device that may be used for acquiring an ECG or other biological parameter from a user of the electronic device;

[0027] FIG. 24 shows an example method of determining a biological parameter of a user wearing a watch or other wearable electronic device;

[0028] FIG. 25 shows a sample electrical block diagram of an electronic device such as a watch or other wearable electronic device;

[0029] FIG. 26A illustrates a sample electronic watch displaying a list;

[0030] FIG. 26B illustrates the sample electronic watch of FIG. 26A, with an updated list in response to a crown input;

[0031] FIG. 27A illustrates a sample electronic watch displaying a graphic;

[0032] FIG. 27B illustrates the sample electronic watch of FIG. 27A with the graphic updated in response to a crown input;

[0033] FIG. 28A illustrates a sample electronic watch displaying a first graphic; and

[0034] FIG. 28B illustrates the sample electronic watch of FIG. 28A displaying a second graphic in response to a crown input.

[0035] The use of cross-hatching or shading in the accompanying figures is generally provided to clarify the boundaries between adjacent elements and also to facilitate legibility of the figures. Accordingly, neither the presence nor the absence of cross-hatching or shading conveys or indicates any preference or requirement for particular materials, material properties, element proportions, element dimensions, commonalities of similarly illustrated elements, or any other characteristic, attribute, or property for any element illustrated in the accompanying figures.

[0036] Additionally, it should be understood that the proportions and dimensions (either relative or absolute) of the various features and elements (and collections and groupings thereof) and the boundaries, separations, and positional relationships presented therebetween, are provided in the accompanying figures merely to facilitate an understanding of the various

embodiments described herein and, accordingly, may not necessarily be presented or illustrated to scale, and are not intended to indicate any preference or requirement for an illustrated embodiment to the exclusion of embodiments described with reference thereto.

DETAILED DESCRIPTION

[0037] Reference will now be made in detail to representative embodiments illustrated in the accompanying drawings. It should be understood that the following description is not intended to limit the embodiments to one preferred embodiment. To the contrary, it is intended to cover alternatives, modifications, and equivalents as can be included within the spirit and scope of the described embodiments as defined by the appended claims.

[0038] The following disclosure relates to techniques for distributing a set of electrodes over a set of surfaces of a wearable electronic device, such as an electronic watch, and to techniques for electrically isolating the electrodes from other components of the device and/or mitigating effects of environmental factors when sensing voltages or signals indicative of one or more biological parameters of a user who is in contact with the electrodes, and to techniques for routing the voltages or signals within the device.

[0039] Embodiments further may take the form of an electronic watch, or other portable and/or wearable device, configured to detect an electrocardiogram ("ECG") of a person wearing or otherwise interacting with the electronic device. As one non-limiting example, a person may wear an electronic watch that has two external electrodes configured to be touched by the user. A first electrode may be placed on a rear surface of the watch and be in contact with skin on the wrist of the person. A second electrode may be defined by or on a crown of the watch and may be configured to be touched by a finger (or other body part) of the person.

[0040] FIG. 1A shows a functional block diagram of a wearable electronic device 100. In some examples, the device 100 may be an electronic watch or electronic health monitoring device. The wearable electronic device 100 may include one or more input devices 102, one or more output devices 104, and a processor 106. Broadly, the input devices 102 may detect various types of input, and the output devices 104 may provide various types of output. The processor 106 may receive input signals from the input devices 102, in response to inputs detected by the input devices. The processor 106 may interpret input signals received from one or more of the input devices 102 and transmit output signals to one or more of the output devices 104. The output signals may cause the output devices 104 to provide one or more outputs. Detected input

at one or more of the input devices 102 may be used to control one or more functions of the device 100. In some cases, one or more of the output devices 104 may be configured to provide outputs that are dependent on, or manipulated in response to, the input detected by one or more of the input devices 102. The outputs provided by one or more of the output devices 104 may also be responsive to, or initiated by, a program or application executed by the processor 106 and/or an associated companion device.

[0041] In various embodiments, the input devices 102 may include any suitable components for detecting inputs. Examples of input devices 102 include audio sensors (*e.g.*, microphones), optical or visual sensors (*e.g.*, cameras, visible light sensors, or invisible light sensors), proximity sensors, touch sensors, force sensors, mechanical devices (*e.g.*, crowns, switches, buttons, or keys), vibration sensors, orientation sensors, motion sensors (*e.g.*, accelerometers or velocity sensors), location sensors (*e.g.*, global positioning system (GPS) devices), thermal sensors, communication devices (*e.g.*, wired or wireless communication devices), resistive sensors, magnetic sensors, electroactive polymers (EAPs), strain gauges, electrodes, and so on, or some combination thereof. Each input device 102 may be configured to detect one or more particular types of input and provide a signal (*e.g.*, an input signal) corresponding to the detected input. The signal may be provided, for example, to the processor 106.

[0042] The output devices 104 may include any suitable components for providing outputs. Examples of output devices 104 include audio output devices (*e.g.*, speakers), visual output devices (*e.g.*, lights or displays), tactile output devices (*e.g.*, haptic output devices), communication devices (*e.g.*, wired or wireless communication devices), and so on, or some combination thereof. Each output device 104 may be configured to receive one or more signals (*e.g.*, an output signal provided by the processor 106) and provide an output corresponding to the signal.

[0043] The processor 106 may be operably coupled to the input devices 102 and the output devices 104. The processor 106 may be adapted to exchange signals with the input devices 102 and the output devices 104. For example, the processor 106 may receive an input signal from an input device 102 that corresponds to an input detected by the input device 102. The processor 106 may interpret the received input signal to determine whether to provide and/or change one or

more outputs in response to the input signal. The processor 106 may then send an output signal to one or more of the output devices 104, to provide and/or change outputs as appropriate. Examples of suitable processors are discussed in more detail below with respect to FIG. 25.

[0044] In some examples, the input devices 102 may include a set of electrodes. The electrodes may be disposed on one or more exterior surfaces of the device 100. The processor 106 may monitor for voltages or signals received on at least one of the electrodes. In some embodiments, one of the electrodes may be permanently or switchably coupled to a device ground. The electrodes may be used to provide an ECG function for the device 100. For example, a 2-lead ECG function may be provided when a user of the device 100 contacts first and second electrodes that receive signals from the user. As another example, a 3-lead ECG function may be provided when a user of the device 100 contacts first and second electrodes that receive signals from the user, and a third electrode that grounds the user to the device 100. In both the 2-lead and 3-lead ECG embodiments, the user may press the first electrode against a first part of their body and press the second electrode against a second part of their body. The third electrode may be pressed against the first or second body part, depending on where it is located on the device 100.

[0045] FIG. 1B shows an example of an electronic device 110 (here, an electronic watch) having a set of electrodes 112, 114 disposed thereon. The device 110 may be an example of the wearable electronic device described with reference to FIG. 1A, or may be an example of an electronic device that is not wearable. In some embodiments, the set of electrodes 112, 114 may be provided on one surface of the device 110. In other embodiments (as shown), the set of electrodes 112, 114 may include electrodes provided on different surfaces of the device 100, such as a first electrode 112 provided on a first surface 116 of the device 110, and a second electrode 114 provided on a second surface 118 of the device 110. Providing electrodes on different surfaces of a device may make it easier for a user to place different body parts in contact with different electrodes. For example, a user may place one or more of the electrodes (*e.g.*, the first electrode 112) in contact with their wrist, and may touch another one or more of the electrodes (*e.g.*, the second electrode 114) with a finger of their opposite hand. Alternatively, the user may press the electrodes 112, 114 against different parts of their body. A processor 120 of the device 110, or a processor remote from the device 110, may determine, from the voltages

or signals (*e.g.*, from stored digital samples or values representing the voltages or signals), the biological parameter(s) of the user. The biological parameter(s) may include, for example, an electrocardiogram (ECG) of the user, an indication of whether the user is experiencing atrial fibrillation, an indication of whether the user is experiencing premature atrial contraction or premature ventricular contraction, an indication of whether the user is experiencing a sinus arrhythmia, and so on.

[0046] In some embodiments, one or two thin film electrodes may be PVD deposited on an exterior surface of a structure that forms part of a housing of an electronic device. The surface may be any transparent, semi-transparent, translucent, or opaque surface made out of an amorphous solid, glass, a crystal or crystalline material (such as sapphire or zirconia), plastic, or the like. In the case of a watch (*i.e.*, a type of electronic device), an additional electrode may be positioned on a user-rotatable crown of a watch body, on a button of the watch body, or on another surface of a housing that defines the watch body.

[0047] When an electrode is formed on a carrier that forms part of a housing of an electronic device, the electrode may be connected to an electrical contact within the electronic device by depositing the electrode material such that it wraps around an edge or perimeter of the carrier, and onto an interior surface of the carrier. The electrical contact may be on the interior surface of the carrier. In other embodiments, the electrode may be formed on the exterior surface of the carrier, and a thru-carrier via that is filled or coated with a conductive material may connect the electrode to an electrical contact within the electronic device. The carrier may be any appropriate structure that supports the electrodes, on which the electrodes are formed, or to which the electrodes are attached. In certain embodiments described herein, the carrier is an optically transparent material having a dome shape. It should be appreciated that the carrier may have different shapes (flat, stepped, parallelepiped, and so on) and may be made from different materials, including opaque materials.

[0048] Generally, the term "attached" means that two elements, objects, structures, or objects are separate but affixed or retained to one another, whether removably, as with an electronic device attached to a user by a band, or fixedly, as with two elements that are affixed to one another with a mechanical fastener not meant to be decoupled (a screw, bolt, or the like), by an

adhesive, by plating or depositing one material on another (as with an electrode deposited on the carrier), and so on. The term "connected" means that two elements may be attached to one another, or may be two parts of a unitary whole (as with a shaft and crown body formed from the same material as a single piece). Thus, while two elements that are attached to one another are necessarily connected to one another, the reverse is not necessarily true. For example, two elements may be formed as a single piece or part and thus connected to one another, although they are not attached to one another.

[0049] When an electrode is provided on a crown of an electronic device, the crown may be conductive or have a conductive surface, and the conductive portion of the crown may be coupled to a conductive rotatable shaft that extends through an opening in a device housing. An end of the shaft interior to the housing, or a conductive shaft retainer interior to the housing, may be in mechanical and electrical contact with a spring-biased conductor that carries electrical signals between the shaft or shaft retainer and a circuit, thereby providing electrical communication between the crown and the circuit.

[0050] A processor of an electronic device (*e.g.*, the processor 120) may be operable to determine a biological parameter of a user based on voltages at various electrodes (*e.g.*, at the set of electrodes 112, 114). In some cases, the biological parameter may be an ECG of a user of the electronic device. For example, when a watch has a first electrode on an exterior surface of a carrier and a second electrode on a crown, the user's fastening of the watch to their wrist may place the first electrode in contact with skin on the user's wrist. To acquire an ECG, the user may touch a conductive portion of the crown with a finger on their opposite hand. For example, the carrier or housing of the watch may touch a wrist adjacent one hand, and the crown may be touched with a finger of the opposite hand. In some cases, the watch may have a third electrode, also on the exterior surface of the carrier, which grounds the user to the watch. The third electrode may be used to reject noise from ECG signals. The electrodes may be positioned on different surfaces, or different portions of surfaces, in various embodiments.

[0051] The electrode(s) on the exterior surface of the carrier may be positioned at the periphery of the carrier, or otherwise positioned to enable an optical sensor subsystem to emit and receive light through the carrier. The light may be emitted into, and reflected from, a user's

skin to determine other biological parameters of the user, such as a heart rate, blood pressure, pulse, blood oxygenation, glucose level, and so on.

[0052] These and other embodiments are discussed with reference to FIGS. 1-25. However, those skilled in the art will readily appreciate that the detailed description given herein with respect to these figures is for explanatory purposes only and should not be construed as limiting.

[0053] FIGs. 2A-2C show an example of an electronic watch 200 that incorporates a set of electrodes. The watch 200 may be an example of the wearable electronic device 100 or 110 described with reference to FIG. 1A or 1B. The watch 200 may include a watch body 202 and a watch band 204. The watch body 202 may include an input or selection device, such as a crown 210 or a button 212. FIG. 2A shows an isometric view of the watch body's front face. FIG. 2B shows an example cross-section of the crown 210. FIG. 2C shows an isometric view of the watch body's rear face. In figures 2A & 2C, only a portion of the watch band 204 is shown (*i.e.*, only the portions of the watch band 204 that attach to the watch body 202).

[0054] The watch body 202 may include a housing 206. The housing 206 may include a front side housing member 206a that faces away from a user's skin when the watch 200 is worn by a user (see FIG. 2A), and a back side housing member 206b (or rear cover) that faces toward the user's skin (see FIG. 2C). Alternatively, the housing 206 may include a singular housing member, or more than two housing members. The one or more housing members may be metallic, plastic, ceramic, crystal, or other types of housing members (or may include combinations of such materials).

[0055] As shown in FIG. 2A, a transparent cover 208 may be attached to a front side of the watch body 202 (*i.e.*, facing away from a user's skin), over or within an opening in the housing 206, and may protect a display positioned at least partially within the housing 206. The display may be viewable by a user through the cover 208. In some embodiments, the display may depict an ECG waveform of a person who is wearing or otherwise using the watch 200. In some cases, the cover 208 may be part of a display stack, which display stack may include a touch sensing or force sensing capability. The display may be configured to depict a graphical output of the watch 200, and a user may interact with the graphical output (*e.g.*, using a finger or stylus that touches or hovers over the cover 208, or using the crown 210 or button 212). As one example, the user

may select (or otherwise interact with) a graphic, icon, indicator, message, or the like (collectively, "graphic") presented on the display by touching or pressing on the display at the location of the graphic. In some embodiments, the user may receive confirmation of their selection by means of haptic output provided by the watch body 202 through the display or cover 208. The exterior surface of the cover 208 may therefore function as a means for receiving input (*i.e.*, function as an input device) and a means for providing output (*i.e.*, function as an output device). The cover 208 may be attached to the housing 206 or part of the housing 206 (*e.g.*, connected to the housing). In some embodiments, the cover 208 may be considered part of the housing 206 because it forms part of an outer shell that defines an interior volume (or houses internal components) of the watch body 202. In some examples, the cover 208 may be or include a crystal, such as a sapphire crystal. Alternatively, the cover 208 may be formed of glass, plastic, or other materials.

[0056] The watch body 202 may include at least one input device or selection device, such as a crown 210, scroll wheel, knob, dial, button 212, or the like, which input device may be operated by a user of the watch 200. In some embodiments, the crown 210, scroll wheel, knob, dial, button 212, or the like may be conductive, or have a conductive surface, and a signal route may be provided between the conductive portion of the crown 210, scroll wheel, knob, dial, button 212, or the like and a circuit (including a processor) within the watch body 202.

[0057] The operation of determining and/or displaying a user's ECG may be initiated by rotating the crown 210, translating the crown, tilting the crown, touching the crown, and so on. Likewise the operation of determining the ECG may be initiated by interacting with a touch-sensitive cover 208 or display of the electronic watch. As discussed above, the display may be partially or fully within the housing of the electronic watch.

[0058] Turning primarily to FIG. 2B, it is shown that the housing 206 may include an opening through which a shaft 224 extends. A crown 210 may be connected to the shaft 224, and may be accessible to a user exterior to the housing 206. The crown 210 may be manipulated by a user to rotate or translate the shaft, as indicated by arrows 218 and 220. Such manipulations are examples of crown inputs. The shaft may be mechanically, electrically, magnetically, and/or

optically coupled to components within the housing 206. In some embodiments, the crown 210 may be part of a crown assembly, as described with reference to FIG. 11, 12A, 12B, 13, or 14.

[0059] A user's manipulation of the crown 210 (and thus the shaft 224) may be used to manipulate or select various textual or graphical elements displayed by the watch 200, to adjust a volume of a speaker, to turn the watch 200 on or off, and so on. In some embodiments, the crown 210 may be manipulated (*e.g.*, rotated or pressed) to select or activate a health monitoring function of the watch 200 (*e.g.*, an ECG or other heart monitoring function). For example, a user may rotate the crown to select an ECG application, and may press the crown to activate the ECG application (*e.g.*, initiate determination and display of a wearer's ECG). Alternatively, a user's touch or press of the crown (or touch or press of the crown for a predetermined period of time) may activate the ECG application and cause a heart rhythm of the user to be displayed. As yet another example, the user may interact with the touch-sensitive display to select and/or activate the ECG application. By way of example, a user's activation of an ECG application is indicated by the watch's display of the ECG 222 in FIG. 2A. Alternatively, the user's selection of an ECG application may be indicated by another graphic or text displayed by the watch 200. Generally, the watch 200 (and specifically its display) may change from displaying some graphic or text to displaying the ECG 222 once the ECG (or its corresponding application, or function) is initiated, selected, or determined.

[0060] As shown in FIG. 2B, the crown 210 may be connected to the shaft 224 (and may be unitary with the shaft), and the shaft 224 may extend through an opening in the housing 206. In some embodiments, the shaft 224 may be separated from the housing 206 by a bushing or other component, or retained to the housing 206 by a retention mechanism. The shaft 224 may rotate or translate with respect to the housing 206, as indicated by arrows 218 and 220, thereby providing one or more crown inputs to a processor of the electronic device 200. A first sensor 226 within the housing 206 may sense aspects of shaft movement such as direction of rotation, speed of rotation, rotational acceleration, or angular position of the shaft 224. In some embodiments, the first sensor 226 may be an optical sensor positioned adjacent the shaft 224, such that light 227 is emitted onto, and reflected from, the shaft 224. Light 227 may be reflected from the shaft by a pattern of surface features (such as scallops, grooves, indentation, projections, or the like) or by byproducts of machining the shaft, such as bumps, scratches,

irregularities, and so on. The pattern and speed of light 227 reflected onto the optical sensor 226 maybe used to determine a direction and/or speed of rotation of the shaft 224. In other embodiments, different sensors may be used to detection direction and/or speed of rotation of the shaft 224, including mechanical sensors, electrical sensors, capacitive sensors, brush contacts, magnetic sensors, and so on.

[0061] A second sensor 228 within the housing 206 may sense aspects of shaft movement such as translation or direction of translation. In some embodiments, the second sensor 228 may be a tactile switch, optical sensor, magnetic sensor, capacitive sensor or the like positioned at an end of the shaft 224.

[0062] A third sensor 230 within the housing 206 may sense when a user is touching the crown 210, or may sense signals (*e.g.*, a heart rhythm) received by the crown 210 when a user touches the crown 210. In some embodiments, the third sensor 230 may be electrically coupled to the crown 210 or shaft 224. In some cases, the sensors 226, 228, 230 may be provide signals or information to the processor 214, or may be partly or wholly integrated with the processor 214 or other components of the watch 200. In some embodiments, two or more of the sensors 226, 228, 230 may be combined into a multipurpose sensor. In some embodiments, one or more of the sensors 226, 228, 230 may not be provided. In some embodiments, the functions of one of the sensors 226, 228, 230 may be distributed among multiple sensors, or additional crown sensors may be provided.

[0063] Any or all of the first sensor 226, second sensor 228, and third sensor 230 may be attached to or otherwise supported by one or more internal supports 232, as shown in FIG. 2B.

[0064] Turning primarily to FIG. 2C, the housing 206 may include structures for attaching the watch band 204 to the watch body 202. In some cases, the structures may include elongate recesses or openings through which ends of the watch band 204 may be inserted and attached to the watch body 202. In other cases (not shown), the structures may include indents (*e.g.*, dimples or depressions) in the housing 206, which indents may receive ends of spring pins that are attached to or threaded through ends of a watch band to attach the watch band to the watch body 202.

[0065] The watch band 204 may be used to secure the watch 200 to a user, another device, a retaining mechanism, and so on.

[0066] As previously mentioned, the watch 200 may include a set of electrodes. The set of electrodes may be configured, in some cases, as described with reference to FIG. 1A or 1B. The set of electrodes may be used by a processor 214 that is internal to the watch body 202, to sense biological parameters (*e.g.*, an ECG) of a person who wears the watch 200 and presses the electrodes against their skin. In some embodiments, the set of electrodes may include a rear-facing electrode 216 on the back of the watch body 202 (*e.g.*, on the back side housing member 206b). The set of electrodes may also include an electrode on the crown 210 and/or an electrode on the button 212.

[0067] The rear-facing electrode 216 may be formed (*e.g.*, printed, plated, or otherwise deposited) on the back side housing member 206b. If the back side housing member 206b is non-conductive, the rear-facing electrode 216 may be formed directly on the back side housing member 206b and connected to circuitry internal to the watch body 202 (*e.g.*, the processor 214) by, for example, conductive vias formed through the back side housing member 206b. If the back side housing member 206b is conductive, the rear-facing electrode 216 may be separated from the back side housing member 206b by an insulator or insulating layer, and conductive vias formed through the back side housing member 206b may likewise be insulated from the back side housing member 206b. Alternatively, the back side housing member 206b may have an opening to which the rear-facing electrode 216 is mated. In some embodiments, the opening may define a ledge in the back side housing member 206b, and the rear-facing electrode 216 may rest on the ledge (and in some cases may be separated from the back side housing member 206b by an insulator (*e.g.*, a seal) or an insulating layer).

[0068] The electrode(s) on the crown 210 or button 212 may be conductive surfaces of the crown 210 or button 212. In some cases, the crown 210 or button 212 may be conductive over its entire exterior surface. In other cases, the crown 210 or button 212 may have conductive portions (*e.g.*, cores or inserts). When the front side housing member 206a is conductive, the crown 210 or button 212 (or the conductive components thereof) may be insulated from the front side housing member 206a by an insulator (*e.g.*, a set of seals, non-conductive coatings, and so on).

[0069] In some embodiments, one of the crown 210 or button 212 may have an electrode thereon, and a user wearing the watch 200 on one of their wrists may touch the electrode on the crown 210 or button 212 with a finger of their opposite hand. The processor 214 may then use the electrodes to acquire an ECG for the user. In other embodiments, both the crown 210 and the button 212 may have an electrode thereon, and a user wearing the watch 200 on one of their wrists may touch the electrodes on the crown 210 and button 212 with a finger of their opposite hand. In still other embodiments, the entirety of the back side housing member 206b (or even the entirety of the housing 206) may be an electrode. In these latter embodiments, electrical isolation may be provided between the housing 206 and the crown 210 and/or between the housing 206 and the button 212.

[0070] In some examples, the watch 200 may lack the display, the crown 210, or the button 212. For example, the watch 200 may include an audio input or output interface, a touch input interface, a haptic (force) input or output interface, or other input or output interface that does not require the display, crown 210, or button 212. The watch 200 may also include the afore-mentioned input or output interfaces in addition to the display, crown 210, or button 212. When the watch 200 lacks the display, the front face of the watch 200 may be covered by the cover 208, or by a metallic or other type of housing member (*e.g.*, the opening for the cover 208 may not exist, and the front side housing member 206a may extend over the area defined by the cover 208). In these embodiments, the electrode(s) on the crown 210 or button 212 may be replaced by (or supplemented with) an electrode on the front face of the watch body 202. A user may touch the front-facing electrode with a finger, similarly to how they would touch an electrode on the crown 210 and/or button 212. Alternatively, a user could place the front-facing electrode in contact with, for example, an opposite wrist, part of their leg, or their torso or forehead.

[0071] In some embodiments, the watch 200 may lack the rear-facing electrode 216, and each of the crown 210 and the button 212 may have a conductive surface that serves as an electrode. In these embodiments, the watch 200 may need to be removed from a user's wrist to enable the user to press different parts of their body against the crown and button electrodes. In some embodiments, the crown 210 or the button 212 may be moved to an opposite side of the watch body 202, thereby increasing the separation between the crown 210 and the button 212 and

making it easier for a user to press different parts of their body against the crown and button electrodes.

[0072] Other electronic devices that may incorporate a set of electrodes include other wearable electronic devices, other timekeeping devices, other health monitoring or fitness devices, other portable computing devices, mobile phones (including smart phones), tablet computing devices, digital media players, or the like.

[0073] Because the voltages or signals provided at, propagated from, or monitored at the various electrodes of a set electrodes may be low voltage or have low amplitudes, the materials, positions, electrical connections to, and electrical routing paths for the set of electrodes can have a significant impact on a processor's ability to discern useful signals representing an ECG or other biological parameter of a person wearing the watch 200 or a similar device (*e.g.*, one of the other watches or electronic devices described herein). The materials, positions, electrical connections to, and electrical routing paths for the set of electrodes can determine how well the electrodes receive voltages/signals from the person's skin (*e.g.*, a signal-to-noise ratio (SNR) of a device-to-user interface through which the voltages/signals pass); how well voltages/signals are transferred between the electrodes and internal components of the watch 200 (*e.g.*, a voltage/signal propagation SNR); and how well the electrodes operate in the face of environmental factors, such as temperature, humidity, moisture, electromagnetic radiation, dust, and so on. Techniques described in the present disclosure may improve the usability of a set of electrodes under some or all of these conditions.

[0074] FIG. 3 shows another example of an electronic watch 300 that incorporates a set of electrodes. The watch 300 may be an example of the wearable electronic device 100 or 110 described with reference to FIG. 1 or 1B, and may include many of the components of the watch 200 described with reference to FIGs. 2A-2C. The watch 300 may include a watch body 202 and a watch band 204. FIG. 3 shows an isometric view of the watch body's rear face. Only a portion of the watch band 204 is shown (*i.e.*, only the portions of the watch band 204 that attach to the watch body 202).

[0075] The watch 300 in FIG. 3 differs from the watch 200 of prior figures in that it has a different set of internal components, a different back side housing member 302, and a different

set of elements that are provided or exposed on the back side housing member 302. For example, the watch 300 may include a sensor subsystem that includes both electrical and optical components. The electrical components may include one or more electrodes 304, 306 formed on the back side housing member 302. In some cases, each of the electrodes 304, 306 may have a circular shape and may be PVD deposited on the back side housing member 302. Alternatively, only one, or more than two electrodes may be formed on the back side housing member 302, or the electrodes 304, 306 may be positioned over (or inset into) openings in the back side housing member 302.

[0076] The optical components of the sensor system may include a set of one or more windows 308, 310, 312, 314 in the back side housing member 302. Each of the windows 308, 310, 312, 314 may pass at least one wavelength of light. In some cases, each of the windows 308, 310, 312, 314 may have a semicircular shape. The windows may alternatively have other shapes. The windows may be formed of crystal, glass, plastic or another material that passes at least one wavelength of light emitted or received by the sensor subsystem.

[0077] In some embodiments, the back side housing member 302 may be or include a transparent cover (*e.g.*, a cover including a crystal, such as a sapphire crystal, or glass, or plastic, or the like), and may be substantially flat or planar (as shown) or may be curved or otherwise non-planar. A mask (*e.g.*, an ink mask and/or dark mask) may be applied to the transparent cover to define the windows 308, 310, 312, 314. The electrodes 304, 306 may be formed on top of the mask or over openings in the mask.

[0078] In some embodiments, the back side housing member 302 may be an opaque substrate, such as a metal or plastic substrate, and one or more transparent windows 308, 310, 312, 314 may be fitted to openings in the substrate. The transparent windows may be fitted to the openings internally to (or externally from) the watch body 202. The electrodes 304, 306 may be fitted to additional openings that enable the electrodes 304, 306 to protrude outward from the external surface of the back side housing member 302, or the electrodes 304, 306 may be formed on the surface of the back side housing member 302 and the electrically connected to components internal to the watch body 202 by conductive vias or other elements formed through the surface of the back side housing member 302.

[0079] By way of example, FIG. 3 shows the electrodes 304, 306 aligned along a first axis that divides the back side housing member 302 into two halves, and shows the windows 308, 310, 312, 314 aligned along a second axis, perpendicular to the first axis, that divides the back side housing member 302 into a different two halves. In this manner, the electrodes 304, 306 and windows 308, 310, 312, 314 may form four circular areas on the exterior surface of the back side housing member 302, with the circular areas that contain the windows 308, 310, 312, 314 appearing bifurcated.

[0080] In use, each pair of windows 308/310, 312/314 forming a circular area may include a first window under which one or more light emitters are positioned, and a second window under which one or more light receivers are positioned, with an optional set of one or more light blocking walls positioned between the one or more light emitters and the one or more light receivers (or around the light emitter(s), or around the light receiver(s)).

[0081] FIGs. 4A-4D show an additional example of an electronic watch 400 that incorporates a set of electrodes. The watch 400 may be an example of the wearable electronic device 100 or 110 described with reference to FIG. 1A or 1B, and may include many of the components of the watch 200 described with reference to FIGs. 2A-2C. The watch 400 may include a watch body 202 and a watch band 204. FIG. 4A shows an isometric view of the watch body's rear face. Only a portion of the watch band 204 is shown (*i.e.*, only the portions of the watch band 204 that attach to the watch body 202).

[0082] Similarly to the watch 300 described with reference to FIG. 3, the watch 400 may include a sensor subsystem that includes both electrical and optical components. However, the electrical and optical components of the watch 400 may be arranged differently than the electrical and optical components of the watch 300.

[0083] Referring primarily to FIG. 4A, a light-transmissive element such as a carrier 404 (*e.g.*, a rear-facing or skin-facing carrier) may be coupled to or otherwise attached to a back side housing member 402 of the watch 400, and in some cases may be considered to form a part of the housing 206 of the watch body 202. The carrier 404 may have a first surface 406 that is interior to the watch body 202 (see FIG. 4C) and a second surface 408 that is exterior to the watch body 202 (see FIG. 4A). The carrier 404 may be dome-shaped or otherwise non-planar, as

shown in FIGs. 4A-4C, such that the second surface 408 protrudes or extends away from a back member 402 of the watch 400. This is best illustrated in FIGs. 4B and 4C.

[0084] By way of example, the carrier 404 is shown as having a round perimeter and fitted to a round opening in the back side housing member 402. In other examples, the carrier 404 may have a perimeter that is square, oval, or some other shape. Similarly, the opening in the back side housing member 402 may be square, oval, or some other shape. The perimeter of the carrier 204 and the perimeter of the opening need not have the same size or shape (*e.g.*, the perimeter of the opening in the back side housing member 402 may be smaller or differently shaped than the perimeter of the carrier 404). In some examples, the carrier 404 may be a sapphire crystal. Alternatively, the carrier 404 may be formed from (or replaced by) a light-transmissive element formed of glass, plastic, or another material. The carrier 404 may be transparent to all wavelengths of light or just some wavelengths (and even one wavelength) of light.

[0085] The exterior surface 408 of the carrier 404 may have a set of electrodes (*e.g.*, first and second (or rear-facing) electrodes 412, 414) thereon, although in some embodiments a single electrode or more than two electrodes may be used. In some embodiments, the electrodes 412, 414 may be PVD deposited on the carrier 404. Example constructions of the electrodes 412, 414 and masks 422 are described with reference to FIGS. 5A-5E, 6-8, 9A-9C, & 10A-10D. In some embodiments, the electrodes 412, 414 may be opaque. In other examples, the electrodes 412, 414 may be formed of a transparent material, as described with reference to FIG. 6, and the optical sensor subsystem 416 may transmit/receive light through the electrodes 412, 414. The optical sensor subsyste4m 416 may be, for example, an optical heart rate sensor.

[0086] In some cases, the first and second electrodes 412, 414 may be arc-shaped (*e.g.*, semi-circle-shaped), and may be positioned around a central opening 418 and concentric ring of openings 420 formed in the masks 422. The first and second electrodes 412, 414 may extend to the edge of the carrier 404, and in some cases may wrap around the perimeter of the carrier 404 to the interior surface 406 of the carrier 404, or be connected to conductive vias formed in the carrier 404, or otherwise be electrically connected to elements within the watch body 202 that receive a signal sensed by one or both of the first and second electrodes 412, 414. In some cases, the first and second electrodes 412, 414 may be electrically insulated from the back side housing

member 402 (*e.g.*, by a non-conductive gasket or adhesive), or the back side housing member 402 may be non-conductive. In some cases, the first and second electrodes 412, 414 may be formed of, or include, stainless steel (SUS) or diamond like carbon (DLC).

[0087] The electrodes 412, 414 may be positioned (*e.g.*, at the periphery of the carrier 404 or in other locations) so as not to interfere with optical communication between an optical sensor subsystem 416 interior to the watch body 202 (see FIG. 4C) and a medium (*e.g.*, skin) exterior to the watch body 202. The optical communication may occur through the carrier 404, and in some cases may occur through a number of openings 418, 420 formed in one or more masks 422 applied to the carrier 404. The optical sensing subsystem is discussed in more detail, below.

[0088] FIG. 4B shows an elevation of the watch body 202 shown in FIG. 4A. The exterior of the watch body 202 is defined primarily by the housing 206, the transparent cover 208, and the carrier 404. The carrier 404 supports the rear-facing electrodes 412, 414 (*e.g.*, as described with reference to FIGS. 4A, 4C, 5C, 5D, 5E, 6-8, 9A-9C, & 10A-10D). The element 430 may represent the crown 210 or button 212. For ease of explanation, it is noted that the positions of the electrodes 412, 414 on the carrier 404 have been rotated 90 degrees with respect to their positions in FIGs. 4A & 4C.

[0089] The watch body 202 may be abutted to a user's wrist 432 or other body part, and may be adhered to the user by the watch band 204 or another element. When abutted to a user's wrist 432, the electrodes 412, 414 on the carrier 404 may contact the user's skin. The user may touch a conductive portion of the element 430 with a finger 434. The user may touch the element 430 in various ways, depending on where the element 430 is conductive, and depending on the user's preference. In some cases, the user may touch the element 430 while also touching their wrist 432. However, high skin-to-skin impedance tends to reduce the likelihood that signals will travel from the electrodes 412, 414, through their wrist 432 to their finger 434, and subsequently to the element 430 (or vice versa). In some cases, the user may touch the element 430 while also touching the housing 206, which may be okay if the housing 206 is not conductive.

[0090] FIG. 4C shows an exploded view of components that may be attached to the interior surface 406 of the carrier 404 shown in FIGs. 4A & 4B. When the watch body 202 shown in FIGS. 4A & 4B is assembled, the components shown in FIG. 4C may reside within the housing

206. By way of example, FIG. 4C shows the components in relation to the back side housing member 402 (*i.e.*, in relation to a skin-facing housing member).

[0091] In some cases, the interior components shown in FIG. 4C may be attached to (and in some cases directly on) the interior surface 406 of the carrier 404. The interior surface 406 may sometimes be referred to as a first surface of the carrier 404. The components attached to the carrier 404 may include a lens 436, a light filter 438, one or more adhesives 440, 442, the optical sensor subsystem 416, circuitry or a processing subsystem 444, a magnet 446, or a magnetic shield 448.

[0092] The lens 436 may abut, be attached to (and optionally, directly on), or be formed on the first or interior surface 406 of the carrier 404. By way of example, the lens 436 is aligned with the center of the carrier 404. In some cases, the interior or exterior surface 406, 408 of the carrier 404 may have a mask 422 thereon (*e.g.*, an ink mask or dark mask, and in some cases a plurality of masks). The mask 422 may define an opening 418 (*e.g.*, a first opening or central opening) that allows light of at least one wavelength to pass through the carrier 404, and the lens 436 may be aligned with the opening 418. In some cases, the lens 436 may be or include a Fresnel lens, a spherical lens, a diffuser film, or the like.

[0093] In some cases, the light filter 438 may include one or more segments 450, and each segment 450 may be attached to (*e.g.*, laminated to) the interior surface 406 of the carrier 404 and positioned on the interior surface (*e.g.*, adjacent or around the lens 436) to prevent a set of one or more light receivers of the optical sensor subsystem 416 from receiving a portion of the light that is emitted by a set of one or more light emitters of the optical sensor subsystem 416. The set of light emitters and set of light receivers are not shown in FIG. 4C, and may be attached to an underside of the optical sensor subsystem 416. When the carrier 404 includes the mask 422, the mask 422 may further define a second opening 420a, or a set of openings 420 including the second opening 420a. The second opening 420a or set of openings 420 may be positioned adjacent or around the first opening 418. In these embodiments, the segments 450 of the light filter 438 (or a light filter ring or other light filter configuration) may be aligned with (*e.g.*, may cover) each of the openings in the set of openings 420.

[0094] As an example, FIG. 4C shows a mask 422 that defines a set of eight radial openings 420 around a central opening 418. Each segment 450 of the light filter 438 may block (*e.g.*, absorb) a portion of light emitted by a set of light emitters that is attached to the optical sensor subsystem 416, which portion of light reflects from a surface too close to (or within) the carrier 404 (*e.g.*, the exterior surface 408 of the carrier 404, imperfections within the carrier 404, or a medium too close to the carrier 404), such that the reflected light is not useful in a sensing operation for which the optical sensor subsystem 416 is designed. For example, when the optical sensor subsystem 416 is configured to determine a biological parameter of a user, light reflected from the carrier 404, or from the outer layer of skin of the user, may not have any relation to the biological parameter determined and may not be useful. Accordingly, the filter may be configured to filter out light frequencies associated with light reflected from the carrier and/or a skin surface, allowing light reflected from deeper skin layers, blood vessels, and the like to be received by the receiver(s). In some examples, the light filter 438 or segments 450 thereof may include at least one of a light control film, a light polarizer, an anti-reflective film, a reflective film, or a light absorber. Accordingly and as one non-limiting example, the optical sensor subsystem 416 may act as an optical heart rate detector.

[0095] In some embodiments, the mask 422 may represent multiple masks, and different masks may allow different wavelengths of light to pass through the carrier 404, as described for example with reference to FIGS. 5A-5E & 6.

[0096] The optical sensor subsystem 416 may include a substrate 452 on which the set of one or more light emitters (*e.g.*, LEDs) and the set of one or more light receivers (*e.g.*, photodetectors, such as photodiodes) are attached. The light emitter(s) and light receiver(s) may be attached or positioned on the substrate 452 to emit and receive light through the carrier 404. The sensor subsystem 416 may be attached to the carrier 404 by one or more adhesives 440/442, such as pressure sensitive adhesives (PSAs) or heat-activated films (HAFs). In some cases, the set of light emitters may be centrally attached on the substrate 452, and a first wall may be attached to (*e.g.*, formed on or bonded to) an underside of the substrate 452 surrounding the set of light emitters. The first wall may be attached to the interior surface 406 of the carrier 404 using a first adhesive 440. The set of light receivers may be attached on the substrate 452 around the set of light emitters, between the first wall and a second wall attached to (*e.g.*, formed on or

bonded to) the underside of the substrate 452. The second wall may be attached to the interior surface 406 of the carrier 404 using a second ring of adhesive 442.

[0097] The substrate 452 of the optical sensor subsystem 416 may include various contacts, pads, traces, or other conductive structures 454 that enable the processing subsystem 444 to be electrically coupled to the set of light emitters and set of light receivers of the optical sensor subsystem 416. The processing subsystem 444 may include a substrate 456 (*e.g.*, a printed circuit board (PCB)) that is attached to the optical sensor subsystem 416, and thereby to the carrier 404, via the conductive structures 454 and/or additional adhesive between the substrates 452, 456 of the optical sensor subsystem 416 and the processing subsystem 444. The substrates 452, 456 may also or alternatively be connected using mechanical fasteners (*e.g.*, screws). The processing subsystem 444 may activate the light emitters and light receivers to perform a sensor function (*e.g.*, to determine a heart rate). In some cases, the processing subsystem 444 may be attached to another structure within the watch body, and may be electrically connected to the conductive structures 454 of the optical sensor subsystem 416 by a flex circuit or other conductors.

[0098] In some embodiments, the substrate 456 of the processing subsystem 444 may have a hole 458 therein, and the magnet 446 may be aligned with the hole 458 and abutted to (or attached to) the substrate 452. In some cases, the magnet 446 may be adhesively bonded to the substrate 452 of the optical sensor subsystem 416. The magnet 446 may inductively couple to a battery charger used for charging a battery included within the watch body, which battery may power components of the watch including the components of the optical sensor subsystem 416 and the processing subsystem 444.

[0099] The magnetic shield 448 may abut (or be attached to) the magnet 446. In some cases, the magnetic shield 448 may be adhesively bonded to the magnet 446. The magnetic shield 448 may direct magnetic flux associated with the magnet 446 toward and out the carrier 404 to improve inductive battery charging performance for a battery included within the watch body 202.

[0100] Direct or indirect connection of the components shown in FIG. 4C to the interior surface 406 of the carrier 404 can reduce the height of the components when stacked.

[0101] FIG. 4D shows the sensor subsystem 416 attached to the carrier 404 shown in FIGs. 4A-4C. FIG. 4B also shows a flex circuit 460, surrounding the sensor subsystem 416, which may provide electrical connections between the electrodes 412, 414 and the sensor subsystem 416 while also providing a ground that operates as an electrical noise mitigation barrier (or E-shield) between the sensor subsystem 416 and the electrodes 412, 414. The electrodes 412, 414 may be connected to the electrical contacts 462, 464, which electrical contacts 462, 464 are on the interior surface of the carrier 404 and connected to both traces in the flex circuit 460 and the electrodes 412, 414. Traces in the flex circuit 460 may be connected to the electrical contacts 462, 464 via a conductive epoxy, and may connect the electrical contacts 462, 464 to the sensor subsystem 416. A processor may be part of the sensor subsystem 416, and the processor may be connected to another processor or other circuitry via a flex circuit 466.

[0102] FIGS. 5A-5E illustrate an example of coatings that may be deposited on the interior and exterior surfaces of the carrier 404 shown in FIGs. 4A-4C. As shown in FIG. 5A, a first mask 500 (*e.g.*, a first ink mask) that is opaque to infrared (IR) and visible light may be deposited (*e.g.*, PVD deposited) on the interior surface 406 of the carrier 404. In some examples, the first mask 500 may include an inner ring 500a and an outer ring 500b that define a central first opening 418 and a concentric second opening 506 (*i.e.*, a second opening 506 that is concentric with the first opening 418). The central first opening 418 may be positioned over light emitters of the optical sensor subsystem 416 described with reference to FIG. 4C (and over the optional lens 436), and the concentric second opening 506 may be positioned above light receivers of the sensor subsystem 416. The inner ring 500a of the first mask may prevent the light receivers from receiving light that is unlikely to have passed through a user's skin after passing through the central first opening 418. The outer ring 500b of the first mask 500 may in some cases be provided for cosmetic reasons, and in some cases may not be provided.

[0103] FIG. 5B shows a second mask 508 (*e.g.*, a second ink mask) that is opaque to visible light but transparent to IR light. The second mask 508 may be deposited (*e.g.*, PVD deposited) on the interior surface 406 of the carrier 404. The second mask 508 may be deposited on the carrier 404 over the concentric second opening 506 in the first mask 500, and may overlap the inner and outer rings 500a, 500b of the first mask, as shown in FIG. 6. The second mask 508 may define a plurality of visible light openings 420 above respective light receivers of the optical

sensor subsystem 416, while allowing IR light to pass through the entirety of the concentric second opening 506. This may increase the amount of IR light received by the light receivers. The second mask 508 may also define an optional opening above a condensation detector 512. In some cases, the second mask 508 may look visually similar to the first mask 500 (*e.g.*, both masks may be dark masks, such that it may be impossible or difficult for a user to visually distinguish the first and second masks 500, 508).

[0104] FIGS. 5C and 5D show an example of PVD deposited first and second electrodes 514a, 514b on the interior and exterior surfaces 406, 408 of the carrier 404. The first and second electrodes 412, 414 may be arc-shaped and positioned at the periphery of the carrier 404. The first and second electrodes 412, 414 may be sized based on factors such as: providing a sufficient area to provide good electrical contact between the electrodes 412, 414 and skin (which may improve electrical sensor efficiency); providing electrodes 412, 414 of a size that do not substantially interfere with an antenna or other electrical structures of a device (which may improve wireless communication efficiency); or providing electrodes 412, 414 positioned to allow optical communication through the carrier 404 (which may improve optical communication efficiency). The first and second electrodes 412, 414 may be separated from one another by a pair of gaps 518a, 518b.

[0105] The first and second electrodes 412, 414 may be deposited on both the interior and exterior surfaces 406, 408 of the carrier 404 and may wrap around the edge (or perimeter) of the carrier 404. The material used to form the first and second electrodes 412, 414 may be patterned to form electrical contacts 520a, 520b (*e.g.*, tabs) on the interior surface 406 of the carrier 404. The first and second electrodes 412, 414 may overlap the first mask 500 (or outer ring 500b of the first mask) on the interior surface 406 of the carrier 404, such that the first mask 500 is positioned between the first and second electrodes 412, 414 and the interior surface 406 of the carrier 404. Thus, the material used to form the electrodes 412, 414 may need to have properties that enable the material to adhere to a carrier surface (*e.g.*, a sapphire surface) and a mask (*e.g.*, an ink mask). The material or materials used to form the electrodes 412, 414 may also have properties, singularly or in combination, such as: a low impedance and good conductivity (*e.g.*, a low DC resistance); a low electrode-to-skin impedance; a high hardness to reduce scratching of the electrodes 412, 414; a higher elastic modulus than the carrier 404 (*e.g.*, to mitigate the

likelihood that a crack in an electrode 412, 414 propagates through the carrier 404); compatibility with a HAF or other adhesive; and good biocompatibility (*e.g.*, not likely to cause an adverse reaction to a user of a device). In some embodiments, the electrodes 412, 414 may include aluminum titanium nitride (AlTiN) or chromium silicon carbonitride (CrSiCN). AlTiN and CrSiCN hold up well to abrasion and corrosion and tend not to place undue stresses on a sapphire carrier.

[0106] FIG. 5E shows an example deposition of adhesive on the interior surface 406 of the carrier 404. The adhesive may be deposited in inner and outer rings 440, 442, as described with reference to FIG. 4C. The inner ring 440 of adhesive may be positioned on the inner ring 500a of the first mask. The outer ring 442 of adhesive may be positioned on the second mask 508, outward from the plurality of openings 420 in the second mask 508. In some cases, the adhesive may include a PSA or HAF.

[0107] FIG. 6 shows a cross-section of the carrier 404 shown in FIG. 5B, and illustrates an overlap between the first and second masks 500, 508. The second mask 508 may overlap the first mask (*e.g.*, outer ring 500b) on the interior surface 406 of the carrier 404 such that the first mask 500 is positioned between the second mask 508 and the interior surface 406 of the carrier 404.

[0108] FIG. 7 shows a cross-section of the carrier 404 shown in FIG. 5C or 5D, and illustrates an overlap between the first electrode 412 (or second electrode) and the first mask 500 (*e.g.*, outer ring 500b of the first mask). The first electrode 412 may overlap the first mask 500 (or outer ring 500b of the first mask) on the interior surface 406 of the carrier 404, such that the first mask 500 is positioned between the first electrode 412 and the interior surface 406 of the carrier 404.

[0109] In some embodiments, the electrodes 412, 414 shown in FIGS. 5C, 5D, and 7 may be formed using indium titanium oxide (ITO) or another transparent material. In these embodiments, the electrodes 412, 414 may be transparent to light emitted by a sensor subsystem positioned below the carrier 404, and thus the electrodes 412, 414 may extend over a greater portion (or all) of the exterior surface 408 of the carrier 404. FIG. 8 shows an example layer construction of an ITO-based electrode. As shown, the stack 800 may include a layer 802 of aluminum oxide (Al_2O_3) on the carrier, a layer 804 of ITO on the layer 802 of aluminum oxide, a

first layer 806 of silicon dioxide (SiO_2) on the layer 804 of aluminum oxide, a layer 808 of silicon nitride (Si_3N_4) on the first layer 806 of silicon dioxide, a second layer 810 of silicon dioxide on the layer 808 of silicon nitride, and a layer 812 of diamond like carbon, or another hard coating, on the second layer 810 of silicon dioxide. Alternatively, the layer 808 of silicon nitride and second layer 810 of silicon dioxide may not be deposited, or only the layer 804 of ITO may be deposited, or just the layer 804 of ITO layer and first layer 806 of silicon dioxide may be deposited. Other variations in the number or types of layers may also be used to form the stack 800. Each of the layers may be transparent to IR or visible light.

[0110] FIGS. 9A-9C show alternative electrical connections between an electrode (*e.g.*, an electrode on an exterior surface of a carrier that forms part of a housing of an electronic device) and an electrical contact interior to the electronic device. In some examples, the carriers shown in cross-section in FIGS. 9A-9C may have circular perimeters. In other examples, the carriers may have perimeters that are oval-shaped, square-shaped, rectangular-shaped, and so on. The techniques described with reference to FIGS. 9A-9C can be applied to carriers having various perimeter shapes, to carriers having different compositions, and so on. In some embodiments, the features shown in FIGS.9-9C may be replicated to electrically connect more than one electrode on an exterior surface of an electronic device to components interior to the electronic device.

[0111] In FIG. 9A, the electrode 900 may be a thin film electrode that is PVD deposited on a surface 902 of a carrier 904. The surface 902 on which the electrode 900 is deposited may be a surface of the carrier 904 that is exterior to an electronic device (*i.e.*, the electrode 900 may be deposited on an exterior surface 902 of the carrier 904). As shown, a conductive material used to form the electrode 900 may be deposited on the carrier 904 such that the material wraps around an edge 906 or perimeter of the carrier 904 to form an electrical contact 908 on a surface 910 of the carrier 904 that is interior to the electronic device (*i.e.*, on an interior surface 910 of the carrier 904). In some cases, the electrical contact 908 may be a tab that traces a much smaller arc about the periphery of the carrier 904 than the electrode 900 (as shown, for example, in FIGS. 5C, 5D, and 5E). In other cases, the electrical contact 908 may be arc-shaped and trace an arc that is similar in size to an arc traced by the electrode 900 on the exterior surface 902 of the carrier 904.

[0112] In some cases, the conductive material(s) used to form the electrode 900 and electrical contact 908 may be deposited on the exterior surface 902, edge 906, and interior surface 910 of the carrier 904 in a single operation (or single set of operations in which the material(s) are deposited on the exterior surface 902, edge 906, and interior surface 910 of the carrier 904). In other cases, the material(s) used to form the electrode 900 may be deposited on the edge 906 or interior surface 910 of the carrier 904 in operations that are performed separately from one or more operations in which the electrode 900 is deposited on the exterior surface 902 of the carrier 904. In these latter examples, the material(s) may be deposited such that the materials overlap. In some cases, a set of one or more materials used to form the electrode 900 may differ from a set of one or more materials deposited on the edge 906 or interior surface 910 of the carrier 904.

[0113] In some embodiments, the conductive material(s) deposited on the exterior surface 902, edge 906, and interior surface 910 of the carrier 904 may include a layer of SUS or a layer of DLC. In other embodiments, only the electrode 900 or edge 906 of the carrier 904 may be coated with a layer of stainless steel or DLC. In some examples, the conductive material(s) may include a PVD deposited layer of AlTiN or CrSiCN.

[0114] In some embodiments, one or more masks (*e.g.*, one or more ink masks) may be applied to the interior surface of the carrier (*e.g.*, as described with reference to FIGS. 5A-5E, 6, & 7). In these embodiments, one or more of the conductive materials used to form the electrode 900 and electrical contact 908 may be applied over the mask(s). The conductive material(s), and the manner in which the conductive material(s) are deposited on the carrier 904, may therefore be selected to ensure adhesion of the conductive material(s) to the carrier 904 and to the ink or other material used to form the mask(s).

[0115] As shown in FIG. 9A, a peripheral band of the interior surface 910 of the carrier 904 may be attached to a recessed ledge 912 in another housing member 914 of the electronic device (*e.g.*, with the carrier 904 overlapping the housing member 914). In such an embodiment, the carrier 904 may be attached to the housing member 914 using an adhesive 916, such as a heat-activated film (HAF). The adhesive 916 or conductive material(s), and the manner in which the carrier 904 is attached to the housing member 914, may therefore be selected to ensure adhesion of the carrier 904 to the housing member 914.

[0116] The electrical contact 908 may have a great enough width (*e.g.*, a great enough width along a radius of the carrier 904) that the electrical contact 908 extends past the recessed ledge 912 in the housing member 914 when the carrier 904 is attached to the housing member 914, making the electrical contact 908 accessible interior to the electronic device. In some cases, a flex circuit, other flexible conductor, or other conductive element may be soldered or otherwise electrically connected to the electrical contact 908, to enable a signal to be received from or applied to the electrode 900.

[0117] In FIG. 9B, the electrode 918 may be a thin film electrode that is PVD deposited on a surface 920 of a carrier 922. The surface 920 on which the electrode 918 is deposited may be a surface of the carrier 922 that is exterior to an electronic device (*i.e.*, the electrode 918 may be deposited on an exterior surface 920 of the carrier 922). Prior to or after depositing the electrode 918 on the carrier 922, a thru-carrier via 924 may be drilled or otherwise cut into the carrier 922. The thru-carrier via 924 may extend from the exterior surface 920 of the carrier 922 (or electrode 918) to the interior surface 926 of the carrier 922. The via 924 may be coated or filled with a conductive material 928 such as stainless steel (SUS), and the conductive material 928 may be covered by, overlap, or otherwise electrically connect to the electrode 918. In some cases, the conductive material 928 in the via 924 may be molded or glued in the via 924. The conductive material 928 may provide an electrical contact 930 on a surface 926 of the carrier 922 that is interior to an electronic device (*i.e.*, on an interior surface of the carrier). In some cases, the conductive material 928 in the via 924 may overlap a portion of the interior surface 926 of the carrier 922, or may be connected to another conductive element deposited on the interior surface 926 of the carrier 922.

[0118] The conductive material(s) used to form the electrode 918 and deposited in the via 924 may be the same or different. In some embodiments, the conductive material(s) used to form the electrode 918 may include a layer of stainless steel (SUS) or a layer of diamond like carbon (DLC). In some examples, the conductive material(s) may include a PVD deposited layer of Aluminum Titanium Nitride (AlTiN) or Chromium Silicon Carbon Nitride (CrSiCN).

[0119] As shown in FIG. 9B, a peripheral band of the interior surface 926 of the carrier 922 may be attached to a recessed ledge 932 in another housing member 934 of the electronic device

(*e.g.*, with the carrier 922 overlapping the housing member 934). In such an embodiment, the carrier 922 may be attached to the housing member 934 using an adhesive 936, such as a HAF. The adhesive 936, and the manner in which the carrier 922 is attached to the housing member 934, may therefore be selected to ensure adhesion of the carrier 922 to the housing member 934.

[0120] When the carrier 922 is attached to the housing member 934, the via 924 may be positioned such that it overlaps the recessed ledge 932 or is interior to the recessed ledge 932, making the electrical contact 930 accessible interior to the electronic device. In some cases, a flex circuit, other flexible conductor, or other conductive element may be soldered or otherwise electrically connected to the electrical contact 930, to enable a signal to be received from or applied to the electrode 918.

[0121] In FIG. 9C, the electrode 938 may be a metallic arc-shaped element positioned between a carrier 940 and another housing member 942 of an electronic device. In some embodiments, the electrode 938 may be a singular metallic ring-shaped electrode (*e.g.*, one electrode). In these embodiments, a peripheral band of a surface of the carrier 940 that is interior to the electronic device (*e.g.*, an interior surface 944 of the carrier 940) may be attached to a recessed ledge 946 in the electrode 938 (*e.g.*, with the carrier 940 overlapping the electrode 938), and the electrode 938 may be attached to a recessed ledge 950 in the housing member 942 (*e.g.*, with the electrode 938 overlapping the housing member 942). In other embodiments, the electrode 938 may be arc-shaped and may be one of two or more arc-shaped electrodes between the carrier 940 and the housing member 942. In these embodiments, a peripheral band of the interior surface of the carrier 940 may be attached to recessed ledges 946 in multiple arc-shaped electrodes 938 (*e.g.*, with the carrier 940 overlapping the electrodes 938), and each of the arc-shaped electrodes 938 may be attached to the recessed ledge 950 in the housing member 942 (*e.g.*, with the electrodes 938 overlapping the housing member 942). In some cases, the multiple arc-shaped electrodes 938 may be electrically isolated from each other by flexible seals or gaskets, or by rigid separators (*e.g.*, rigid extensions of the housing member 942, which rigid extensions may include extensions of the recessed ledge 950 to which the electrodes 938 are attached. In some cases, the electrode 938 may be attached to the housing member 942 before the carrier 940 is attached to the electrode 938.

[0122] The electrode 938 may be formed of a conductive material including a layer of stainless steel (SUS) or DLC. In some examples, the conductive material may include a PVD deposited layer of Aluminum Titanium Nitride (AlTiN) or Chromium Silicon Carbon Nitride (CrSiCN). A surface 954 of the electrode 938 interior to the electronic device may provide an electrical contact for connecting components interior to the electronic device to the electrode 938.

[0123] In some cases, an edge 956 or perimeter of the carrier 940 may be abutted directly to the electrode 938, and an edge 958 of the electrode 938 may be abutted directly to the housing member 942. In other cases, an adhesive, seal, gasket, or filler may fill a gap between the carrier 940 and the electrode 938 or a gap between the electrode 938 and the housing member 942.

[0124] As shown in FIG. 9C, a peripheral band of the interior surface 944 of the carrier 940 may be attached to a recessed ledge 946 in the electrode 938, and a peripheral band of an interior surface 954 of the electrode 938 may be attached to the housing member 942. In such an embodiment, the carrier 940 may be attached to the electrode 938 or the electrode 938 may be attached to the housing member 942 using an adhesive 948 or 952, such as a HAF. The adhesive 948 or 952, and manner in which the respective elements are attached, may therefore be selected to ensure adhesion of the carrier 940 to the electrode 938 (or adhesion of the electrode 938 to the housing member 942).

[0125] When the electrode 938 is attached to the housing member 942, the electrode 938 may be positioned such that it overlaps the recessed ledge 950 or is interior to the recessed ledge 950, making the electrode 938 accessible interior to the electronic device. In some cases, a flex circuit, other flexible conductor, or other conductive element may be soldered or otherwise electrically connected to the electrode 938, to enable a signal to be received from or applied to the electrode 938.

[0126] FIGs. 10A-10D show alternative carrier profiles, and alternative attachments (*e.g.*, structural attachments) of carriers to other housing members of an electronic device. In some examples, the carriers may have circular perimeters. In other examples, the carriers may have perimeters that are oval-shaped, square-shaped, rectangular-shaped, and so on. The techniques described with reference to FIGs. 10A-10D can be applied to carriers having various perimeter

shapes, to carriers having different compositions, and so on. Each of FIGs. 10A-10D shows an exterior surface (*e.g.*, a back surface) of an electronic device, such as an electronic watch, and a cross-section of the exterior surface of the electronic device.

[0127] In FIG. 10A, a carrier 1000 is attached to another housing member 1002 of an electronic device. The carrier 1000 includes an exterior surface 1004 that forms a part of the exterior surface of the electronic device, and an interior surface 1006 that faces components interior to the electronic device.

[0128] A peripheral band of the interior surface 1006 of the carrier 1000 may be attached to a recessed ledge 1064 in the housing member 1002 (*e.g.*, with the carrier 1000 overlapping the housing member 1002). In such an embodiment, the carrier 1000 may be attached to the housing member 1002 using an adhesive, such as a HAF. The adhesive, and the manner in which the carrier 1000 is attached to the housing member 1002, may be selected to ensure adhesion of the carrier 1000 to the housing member 1002.

[0129] The carrier 1000 may be variously configured, but in FIG. 10A, an inner portion 1008 of the interior surface 1006 of the carrier 1000, such as a portion of the carrier interior to a number of thru-carrier vias 1010, is flat. An outer portion 1012 of the interior surface 1006, such as a portion outside the number of thru-carrier vias 1010, is concave or inwardly-sloped (downwardly-sloped in the figure) with respect to the inner portion 1008 of the interior surface 1006. In contrast, the exterior surface 1004 of the carrier 1000 may be convex. Thus, the thickness of the carrier 1000 may vary to some degree from its center axis to its perimeter.

[0130] In some embodiments, one or more arc-shaped electrodes 1014 (*e.g.*, two electrodes) may be positioned around the exterior surface 1004 of the carrier 1000, inward from the perimeter of the carrier 1000. In other embodiments, the electrodes 1014 may have other shapes or may extend to or around the perimeter. The electrodes 1014 may be PVD deposited thin film electrodes. In some cases, the electrodes 1014 may be connected to interior components of the electronic device by the thru-carrier vias 1010, which in some cases may be drilled or formed through the flat inner portion 1008 of the interior surface 1006 of the carrier 1000. In other cases, the electrodes 1014 may be connected to interior components of the electronic device by

conductive material that wraps around the edge or perimeter of the carrier 1000, or in any of the ways shown in FIGs. 9A-9C.

[0131] In some cases, components such as a sensor subsystem may be attached to the inner, flat portion of the interior surface 1006 of the carrier 1000.

[0132] In FIG. 10B, a carrier 1016 is attached to another housing member 1018 of an electronic device. The carrier 1016 includes an exterior surface 1020 that forms a part of the exterior surface of the electronic device, and an interior surface 1022 that faces components interior to the electronic device.

[0133] A peripheral band of the interior surface 1022 of the carrier 1016 may be attached to a recessed ledge 1024 in the housing member 1018 (*e.g.*, with the carrier 1016 overlapping the housing member 1018). In such an embodiment, the carrier 1016 may be attached to the housing member 1018 using an adhesive, such as a HAF. The adhesive, and the manner in which the carrier 1016 is attached to the housing member 1018, may be selected to ensure adhesion of the carrier 1016 to the housing member 1018.

[0134] The carrier 1016 may be variously configured, but in FIG. 10B, the carrier 1016 has a uniform thickness. The interior surface 1022 of the carrier 1016 may be concave, and the exterior surface 1020 of the carrier 1016 may be convex. To provide a flat surface for connecting components (*e.g.*, a sensor subsystem) to the carrier 1016, a secondary carrier 1026 having a convex exterior surface 1028 and a flat interior surface 1066 may be attached to an inner portion of the interior surface 1022 of the carrier 1016. The secondary (or interior) carrier 1026 may be attached to the primary (or exterior) carrier 1016 using a transparent adhesive. In some cases, the secondary carrier 1026 may be attached to the primary carrier 1016 interior to a number of thru-carrier vias 1030.

[0135] In some embodiments, one or more arc-shaped electrodes 1032 (*e.g.*, two electrodes) may be positioned around the exterior surface of the carrier 1016, inward from the perimeter of the carrier 1016. In other embodiments, the electrodes 1032 may have other shapes or may extend to or around the perimeter. The electrodes 1032 may be PVD deposited thin film electrodes. In some cases, the electrodes 1032 may be connected to interior components of the

electronic device by the thru-carrier vias 1030. In other cases, the electrodes 1032 may be connected to interior components of the electronic device by conductive material that wraps around the edge or perimeter of the carrier 1016, or in any of the ways shown in FIGs. 9A-9C.

[0136] FIGs. 10C & 10D each show a carrier attached to another housing member of an electronic device. The carrier includes an exterior surface that forms a part of the exterior surface of the electronic device, and an interior surface that faces components interior to the electronic device. In each of FIGs. 10C & 10D, the carrier has a flat interior surface and a convex exterior surface. The carriers shown in FIGS. 10C & 10D may be easier to manufacture than the carriers shown in FIGs. 10A & 10B.

[0137] In FIG. 10C, a carrier 1034 is attached to another housing member 1036 of an electronic device. The carrier 1034 includes an exterior surface 1038 that forms a part of the exterior surface of the electronic device, and an interior surface 1040 that faces components interior to the electronic device.

[0138] A peripheral band of the interior surface 1040 of the carrier 1034 may be attached to a recessed ledge 1042 in the housing member (*e.g.*, with the carrier 1034 overlapping the housing member 1036). In such an embodiment, the carrier 1034 may be attached to the housing member 1036 using an adhesive, such as a HAF. The adhesive, and the manner in which the carrier 1034 is attached to the housing member 1036, may be selected to ensure adhesion of the carrier 1034 to the housing member 1036.

[0139] In some embodiments, one or more arc-shaped electrodes 1044 (*e.g.*, two electrodes) may be positioned around the perimeter of the exterior surface 1038 of the carrier 1034. In other embodiments, the electrodes 1044 may have other shapes or other positions on the exterior surface 1038 of the carrier 1034. The electrodes 1044 may be PVD deposited thin film electrodes. In some cases, the electrodes 1044 may be connected to interior components of the electronic device by conductive material that wraps around the edge or perimeter of the carrier 1034, or in any of the ways shown in FIGs. 9A-9C.

[0140] In some cases, components such as a sensor subsystem may be attached to the interior surface 1040 of the carrier 1034.

[0141] In FIG. 10D, a carrier 1060 is attached to another housing member 1046 of an electronic device (*e.g.*, an electronic watch), similarly to how the carrier 1034 is attached to another housing member 1036 in FIG. 10C. For example, a peripheral band of the interior surface 1048 of the carrier 1060 may be attached to a recessed ledge 1050 in the housing member 1046 (*e.g.*, with the carrier 1060 overlapping the housing member 1046). The carrier 1060 may be attached to the housing member 1046 using an adhesive, such as a HAF. The adhesive, and the manner in which the carrier 1060 is attached to the housing member 1046, may be selected to ensure adhesion of the carrier 1060 to the housing member 1046.

[0142] The housing member 1046 to which the carrier 1060 is attached may be attached to yet another housing member (*e.g.*, a second housing member 1052). A peripheral band of the interior surface 1054 of the first housing member 1046 may be attached to a recessed ledge 1056 in the second housing member 1052 (*e.g.*, with the first housing member 1046 overlapping the second housing member 1052). The first housing member 1046 may be attached to the second housing member 1052 using an adhesive, such as a HAF. The adhesive, and the manner in which the first housing member 1046 is attached to the second housing member 1052, may be selected to ensure adhesion of the first housing member 1046 to the second housing member 1052. In some cases, the first housing member 1046 may electrically insulate the electrodes 1058 on the carrier 1060 from the second housing member 1052, or may provide a transition between incompatible materials, or may provide a support for the carrier 1060, or may facilitate assembly of the housing of the electronic device.

[0143] In some embodiments, one or more arc-shaped electrodes 1058 (*e.g.*, two electrodes) may be positioned around the perimeter of the exterior surface of the carrier 1060. In other embodiments, the electrodes 1058 may have other shapes or other positions on the exterior surface 1062 of the carrier 1060. The electrodes 1058 may be PVD deposited thin film electrodes. In some cases, the electrodes 1058 may be connected to interior components of the electronic device by conductive material that wraps around the edge or perimeter of the carrier, or in any of the ways shown in FIGs. 9A-9C.

[0144] In some cases, components such as a sensor subsystem may be attached to the interior surface 1048 of the carrier 1060.

[0145] Turning now to the implementation of an electrode on a crown, FIG. 11A shows an example elevation of a crown assembly 1100. The crown assembly 1100 may be an example of a crown assembly included in any of the electronic devices described with reference to FIGs. 1A, 1B, 2A-2C, 3, 4A, or 4B. The crown assembly 1100 may include a crown 210.

[0146] The crown 210 may be mechanically and electrically connected to a shaft 1102 that extends through an opening in a housing. By way of example, the housing is shown to be the housing 206 of the watch body 202 described with reference to FIGs. 2A-2C, 3, 4A, & 4B. The crown 210 may be integrally formed from a single piece of material that includes the shaft 1102 (that is, they may be connected to one another), or the shaft 1102 may be semi-permanently attached to a crown body 1104 using a fastening means such as solder, threads, or an adhesive. The crown 210 (or at least the crown body 1104) may be external to the housing 206, and may be rotated and/or translated by a user of the electronic device incorporating the crown assembly 1100. Further, although the crown body 1104 and shaft 1102 are shown as integrally formed in FIGs. 11A and 11B, it should be appreciated that they may be separate pieces that are joined together.

[0147] The crown assembly 1100 may further include a shaft retainer 1106 receiving an end of the shaft 1102. The shaft retainer 1106 may be mechanically and/or electrically connected to the shaft 1102 (*e.g.*, using solder, threads, or an adhesive), interior to the housing 206. The shaft retainer 1106 may retain the crown 210 in position in relation to the housing 206.

[0148] One or more insulators 1108 (*e.g.*, electrical insulators) may electrically insulate the crown 210 and/or shaft 1102 from the housing 206. The term "insulator" encompasses both a single insulator and multiple insulators taken as a set. The insulator 1108 is generally shown in FIG. 11 as an annular seal having an L-shaped profile, functioning as a collar for the shaft. The shaft 1102 and crown body 1104 may translate, moving toward and away from the housing 206 while the insulator 1108 and shaft retainer 1106 move with the shaft 1102. In some embodiments, the insulator 1108 may be stationary relative to the housing 206 while the shaft 1102, crown body 1104 and shaft retainer 1106 move.

[0149] The insulator 1108 or seal electrically insulates the shaft 1102 from the housing 206, and may also electrically insulate the housing 206 from the shaft retainer 1106. In some

embodiments, the insulator 1108 may alternatively include more than one element and/or be positioned elsewhere within the crown assembly 1100. For example, the insulator 1108 may include an element, layer, or coating 1108a applied to a surface of the housing 206 that faces an underside of the crown 210, or to other elements that face the underside of the crown 210.

[0150] A tactile switch 1110 may be axially aligned with the shaft 1102 and positioned at an end of the shaft 1102 opposite the crown body 1104. By way of example, the tactile switch 1110 may be attached on a substrate 1112. The tactile switch 1110 may be actuated (*e.g.*, switched between two or more states) as the shaft 1102 translates along an axis of the shaft 1102 to provide a crown input. A spring-biased conductor 1114 may be mechanically and electrically connected to at least one of the shaft 1102 or the shaft retainer 1106, and in FIG. 11 is shown to be connected to the shaft retainer 1106. The spring-biased conductor 1114 may be biased to electrically contact the shaft 1102 and/or shaft retainer 1106 during all phases of rotation and translation of the crown 210, and may electrically connect the shaft 1102 and/or shaft retainer 1106 to a circuit 1116 (*e.g.*, a processor). When the crown is translated by a user, the spring-biased conductor 1114 may deform to maintain electrical contact with the shaft 1102 and/or shaft retainer 1106.

[0151] The crown assembly 1100 may further include an optical encoder 1118. The optical encoder 1118 may be used to detect rotation and/or translation of the shaft 1102 or shaft retainer 1106. In some embodiments, the circuit 1116 and optical encoder 1118 may be attached to the same substrate as the tactile switch 1110.

[0152] In some embodiments, the entirety of the crown 210 or crown body 1104 may be conductive and function as an electrode. The conductive crown body 1104 may be electrically connected to the circuit 1116 via the shaft 1102, shaft retainer 1106, and spring-biased conductor 1114. In other embodiments, only a portion of the crown 210 or crown body 1104 may be conductive and function as an electrode, and the conductive portion of the crown body 1104 may be electrically connected to the circuit 1116 via the shaft 1102, shaft retainer 1106, and spring-biased conductor 1114.

[0153] Because the signals received by or propagated from the crown 210 may be low voltage or low amplitude signals, the materials, positions, electrical connections to, and electrical routing

paths for an electrode formed on or by the crown 210 can have a significant impact on the ability of the circuit 1116 to discern useful signals representing an ECG or other biological parameter of a person wearing an electronic device including the crown assembly 1100. The materials, positions, electrical connections to, and electrical routing paths for the crown assembly 1100 can also determine how well the crown assembly 1100 receives voltages/signals from a person's skin (*e.g.*, a SNR of a device-to-user interface through which the voltages/signals pass); how well voltages/signals are transferred between the crown 210 and internal components of an electronic device (*e.g.*, a voltage/signal propagation SNR); and how well the crown assembly 1100 operates in the face of environmental factors, such as temperature, humidity, moisture, electromagnetic radiation, dust, and so on. In some cases, the insulator 1108 may be positioned to prevent moisture from electrically shorting the crown 210 to the housing 206, or the housing 206 may be grounded to provide electrical shielding for some or all of the signals propagated through the crown assembly 1100, or the interfaces between the shaft 1102 and the shaft retainer 1106, or between the shaft retainer 1106 and the spring-biased conductor 1114, may be configured to increase SNR and reduce signal attenuation.

[0154] In some embodiments, the crown 210 may include a coating, layer, or the like 1120 ("coating 1120") that electrically isolates the crown 210. The coating may thus function as, have similar properties to, and/or be made from the same or similar materials as, the insulator 1108. Generally, the coating 1120 prevents electrical connection between the crown 210 and the housing 206, for example when water is present in the space between the crown and housing.

[0155] In the absence of the coating 1120, water, sweat, or another conductor may electrically bridge or short the crown 210 to the housing 206, presuming both the crown and housing are made from (or incorporate) an electrical conductor such as metal. In the event the crown 210 or some portion thereof serves as an electrode for measuring an electrocardiogram, shorting the crown 210 to the housing 206 (and thus to the skin of a wearer) may render the crown inoperable or the electrocardiogram unreliable.

[0156] The coating 1120 serves as a barrier against shorting the crown 210 to the housing 206 or other electrically conductive material or body, thereby ensuring the electrical functionality of the crown 210. In some embodiments the coating 1120 coats only those surfaces of the crown

that oppose or face the housing; in other embodiments and as shown in FIG. 11A, the coating 1108a may extend across one or more sides of the crown 210. Further, the coating 1120 may extend onto a top or outer surface of the crown 210 (e.g., the surface of the crown that does not oppose or face the housing 206), although typically at least a portion of the outer surface is not covered by the coating in order to define an area of the crown that can electrically couple to a wearer's finger.

[0157] The coating 1120 also may extend at least partly down a shaft of the crown 210, as discussed in more detail with respect to FIG. 11B.

[0158] In some embodiments, a second coating 1122 may be applied to the housing 206 instead of, or in addition to, the coating 1120 on the crown 210. This housing coating 1122 serves the same function as the crown coating 1120, namely electrically insulating the housing 206 from the crown 210 when water or other electrical conductors are in the gap between the housing and crown. The housing coating 1122 may extend across the insulator 1108 (or a non-insulating collar), in some embodiments. Likewise, the housing coating 1122 may extend between the housing 206 and insulator 1108 in some embodiments, or may be an extension of the insulator.

[0159] In some embodiments, the coatings 1120, 1122 may improve wear or provide a cosmetic function (e.g., provide an accent or visually conceal a surface of the shaft, crown, and/or housing) for the crown assembly 1100. Alternatively, the housing 206, or that portion of the housing 206 that faces the crown 210, may be formed from a material that operates as an electrical insulator (e.g., plastic, ceramic, or the like). In some embodiments, one or more of the insulators 1108 (including element, layer, or coating 1108a or 1120) may by overmolded liquid crystal polymer (LCP) elements or coatings, which can provide very good separation resistance (high separation resistance) between moving or other parts. LCP layers may also be used in place of polyimide layers in flex circuits and other elements, and may not require the use of temperature or moisture-sensitive adhesives. LCP elements, layers, and coatings absorb less moisture than polyimides in high temperature and high humidity environments, which can be useful in maintaining high separation resistance between components when sensing low voltage signals (e.g., biometric signals of a person) under varying conditions (e.g., under non-controlled

conditions outside a doctor's office or hospital). LCP elements, layers, and coatings also maintain good separation resistance high temperatures. Other elements, layers, or coatings that may be used to provide electrical isolation include silicone or acrylic elements, layers, or coatings, or other elements having a high surface resistance. Other examples of insulators or insulator positions are described with reference to FIGs. 11B, 12A, 12B, 13, & 14.

[0160] FIG. 11B shows another example crown 210 extending through a housing 206 of an electronic watch. As with other embodiments described herein, the crown 210 may be used to provide multiple types of input. For example, the crown may rotate about an axis of rotation (typically extending along a center length of the shaft 1102, from an exterior of the housing 206 to an interior of the housing) to provide a first type of crown input, translate along the axis of rotation (e.g., move towards and/or away from the housing 206) to provide a second type of crown input, and be touch-sensitive to provide a third type of crown input. The first and second types of input may control graphical output on the electronic watch's display, as described below in more detail with respect to FIGs. 26A-28B. The third type of input may be a measurement of an electrical signal (such as voltage, capacitance, current, or the like), or facilitating measurements of a differential in an electrical signal, to provide an ECG of a user. That is and as discussed in greater detail herein, the third type of input may be the crown 210 functioning as one of two electrodes in an electrical circuit configured to measure a user's ECG. Typically, although not necessarily, the second electrode is positioned a back of the electronic watch. This second electrode and its functionality is discussed in more detail elsewhere in this document.

[0161] The crown 210 may be formed from multiple elements attached together, as discussed in more detail below, or may be a single piece and connected to one another. The crown 210 generally includes a crown body 1104 coupled to (or formed with) a shaft 1102. The shaft 1102 of the crown may extend through the housing 206 and is typically received in, or passes through, a collar 1124. The collar 1124 may restrict tilting of the shaft 1102 and crown body 1104. Further, the collar 1124 may permit translation of the shaft 1102 and crown body 1104 toward and away from the housing and rotation of the shaft and crown body 1104 about the axis of rotation. The collar 1124 may be the same as, or similar to, the shaft retainer 1106 and/or insulator 1108 of FIG. 11A.

[0162] One or more O-rings 1134 are fitted about the shaft 1102 and within the collar 1124. The O-rings 1134 may be received within grooves, depressions, or the like within one or both of the shaft 1102 and collar 1124. The O-rings form a watertight seal and likewise reduce or eliminate contaminants passing into an interior of the housing 206 through the gap 1136 between the crown 210 and housing 206. The O-rings 1134 may also permit the shat to rotate and/or translate while restricting (or helping to restrict) how far the shaft 1102 translates.

[0163] As with the embodiment shown in FIG. 11A, the crown 210 may short to the housing 206 if water or another conductor is present in the gap 1136 between the crown and housing and the two are not electrically insulated from one another. Shorting the crown 210 to the housing 206 results in the electronic watch unreliably measuring and displaying an ECG of a user or not functioning at all.

[0164] Accordingly and similar to the embodiment of FIG. 11A, an underside of the crown 210 may be coated with an electrically insulating coating 1132. The coating 1132 may prevent water or another contaminant from acting as a short or ground path between the crown 210 and housing 206. As discussed with respect to FIG. 11A and shown in that figure, such a coating may be applied to the housing 206 in addition to, or instead of, the crown 210.

[0165] The crown 210 shown in FIG. 11B is not formed from a single piece of material but instead is formed from multiple elements. The crown body 1104 and shaft 1102 may be formed from or as a single piece of material, for example metal or another suitable conductor, and provide an electrical path between an object touching the crown body 1104 and a sensor within the housing 206, such as the third sensor 230 discussed above. An insulating split 1146 may separate the crown body from a trim 1148; the trim 1148 may be annular, square, or any other suitable shape. The trim and split 1146 may provide various aesthetic looks as well as functional properties, such as different wear resistance, environmental resistance, and the like as compared to the crown body 1104. Accordingly, the trim 1148 may be made from the same material or a different material as the crown body 1104 and the shaft 1102.

[0166] Insofar as the split 1146 is an electrical insulator, the coating 1132 need not extend across the split or onto any portion of the trim 1148 (although it can in some embodiments). Thus, the coating 1132 may stop at an edge of the crown body 1104 abutting the split 1146. This

may reduce manufacturing and assembly complexity of embodiments, as well as provide cost savings.

[0167] In addition to, or instead of, providing a coating 1132 on the crown 210 or housing 206, the collar 1124 may be coated. For example, an electrically insulating coating 1126 may be deposited on the collar 1124 and serve to electrically insulate the collar from the housing 206 and/or crown 210. This may be useful when the collar is made from an electrically conductive material and the crown 210 may be shorted to the collar 1124, in addition to or instead of to the housing 206.

[0168] As one non-limiting example, capillary action may retain water (or another liquid) in a portion of the gap between the collar 1124 and crown 210 while the part of the gap 1136 between the crown and housing 206 is sized to permit water to drain out. Thus, in such an embodiment the crown 210 may be at risk of electrically shorting to the collar 1124 but not the housing 206. It should be appreciated that in some embodiments the housing 206 and/or crown 210 may be coated as well as the collar 1124. It should likewise be appreciated that any or all of the electrically insulating coatings described herein may attenuate noise with respect to a signal conducted from the crown body 1104 through the shaft 1102 to a sensor, thereby providing more accurate and/or faster readings of a biological parameter such as an ECG.

[0169] Although the coating 1126 (and coating 1132) has been discussed as an electrical insulator, it should be appreciated that the coating(s) may provide other properties in addition to, or instead of, electrical insulation. For example, the coating 1126 may reduce friction between the collar 1124 and shaft 1102 as the shaft 1102 rotates and/or translates. The coating 1126 may reduce wear on either or both of the collar 1124 and shaft 1102 as another example.

[0170] Further, in some embodiments the gap 1136 between the crown 210 and housing 206 may be large enough that the collar 1124 may be visible. In order to obscure the first collar coating and/or the collar, a second collar coating 1128 may be applied over the first, insulating collar coating 1126. The second collar coating 1128 may be darker or otherwise visually conceal the first collar coating 1128 and collar 1124 from the naked eye.

[0171] As yet another option, the second coating 1128 may also provide environmental resistance and/or resist wear, tear, and/or friction between the collar 1124 and shaft 1102, as described above. Thus, the first collar coating 1126 may be an electrical insulator while the second collar coating 1128 may be chosen for its other material properties and/or resistances. Similarly, the first collar coating may be chosen for its material properties and/or resistances (including functioning as an electrical insulator) and the second collar coating may be used to obscure the first collar coating.

[0172] Any or all of the coatings described herein may be deposited in a number of ways, including electrophoretic deposition or other manners that are suitable and known in the art. Likewise, any or all of the coatings may incorporate materials such as titanium dioxide, Teflon, or the like to provide or enhance properties such as resistance to wear, lowering of friction between adjacent elements, and the like. In some embodiments the first collar coating 1126 (or any other coating) may be approximately 10-30 microns thick or even 5-50 microns. The second collar coating 1128 (or any other coating) may be thinner on the order of 3-5 microns or even 2-10 microns.

[0173] More detailed examples of the crown assembly 1100 described with reference to FIG. 11A are shown in FIGs. 12A, 12B, 13, & 14.

[0174] Turning now to FIGs. 12A & 12B, there is shown an example of a crown assembly 1200, as may be included in any of the electronic devices described with reference to FIGs. 1A, 1B, 2A-2C, 3, 4A, or 4B. FIG. 12A shows an exploded view of the crown assembly 1200, and FIG. 12B shows an assembled cross-section of the crown assembly 1200, as viewed from the front or rear face of an electronic device such as the watch body 202 described with reference to FIGs. 2A-2C, 3, 4A, & 4B.

[0175] The crown assembly 1200 is an example of the crown assembly 1100 shown in FIG. 11, and includes components corresponding to the crown 210, shaft retainer 1106, insulator 1108, tactile switch 1110, substrate 1112, spring-biased conductor 1114, circuit 1116, and optical encoder 1118.

[0176] The crown assembly 1200 may include a conductive rotatable shaft 1202 configured to extend through an opening in a housing 1242 (see FIG. 12B), such as the housing described with reference to FIG. 2A, 2C, 3, 4A, 4B, or 11. A user-rotatable crown 1204 may be mechanically attached to the shaft 1202 exterior to the housing 1242. The crown 1204 may be rotated by a user of an electronic watch, to in turn rotate the shaft 1202. In some cases, the crown 1204 may also be pulled or pushed by the user to translate the shaft 1202 along its axis. The crown 1204 may be electrically connected to a circuit within the housing 1242, but electrically isolated from the housing 1242.

[0177] The crown 1204 may be electrically connected to the shaft 1202. In some cases, at least part of the crown 1204 and at least part of the shaft 1202 may be molded, machined, or otherwise formed together (*e.g.*, from a same material, such as a conductive ceramic or stainless steel).

[0178] In some embodiments, the crown 1204 may be formed of a conductive ceramic or stainless steel (or have a conductive ceramic or stainless steel core). The core may be coated in a PVD deposited layer of SUS or DLC, or an electro-deposited (ED) layer of AlTiN or CrSiCN, and may function as an electrode. In some embodiments, the crown 1204 may have a conductive crown body 1244 surrounded by a ring 1246 of non-conductive material (or other insulator). See, FIG. 12B. The non-conductive ring 1246 may help prevent shorting of the crown 1204 to the housing 1242. The ring 1246 of non-conductive material may in some cases be surrounded by another ring 1248 of conductive material. In the configuration shown, the ring 1248 may optionally contact and electrically short to a grounded housing 1242 when the crown is pressed, thereby helping to electrically shield the conductive crown body 1244 of the crown 1204 from some sources of interference. In some embodiments, the crown 1204 may have a conductive surface covered by a thin non-conductive coating. The non-conductive coating may provide a dielectric for capacitive coupling between the conductive surface and skin of a user of the crown 1204 (or an electronic watch or other device that includes the crown assembly 1200). In the same or different embodiments, the crown 1204 may have a non-conductive coating on a surface of the crown 1204 facing the housing 1242.

[0179] A shaft retainer 1206 may be mechanically connected to the shaft 1202, interior to the housing 1242 (*e.g.*, interior to a watch body housing), after the shaft is inserted through the opening in the housing 1242 with the crown 1204 positioned exterior to the housing 1242. In some cases, the shaft retainer 1206 may include a nut, and the shaft 1202 may have a threaded male portion that engages a threaded female portion of the nut. In some cases, the shaft retainer 1206 may be conductive, or have a conductive coating thereon, and mechanical connection of the shaft retainer 1206 to the shaft 1202 may form an electrical connection between the shaft retainer 1206 and the shaft 1202. In an alternative embodiment (not shown), the shaft retainer 1206 may be integrally formed with the shaft 1202, and the shaft 1202 may be inserted through the opening in the housing 1242 from inside the housing 1242 and then attached to the crown 1204 (*e.g.*, the crown 1204 may screw onto the shaft 1202).

[0180] In some embodiments, a collar 1208 may be aligned with the opening in the housing 1242, and a collar retainer 1210 may be coupled to the collar 1208 to retain the collar 1208 to the housing 1242 from a side of the housing 1242 opposite a side of the housing 1242 in which the collar 1208 is inserted. In some embodiments, the collar retainer 1210 may be coupled to the collar 1208 via threads on a male portion of the collar 1208 and corresponding threads on a female portion of the collar retainer 1210. Optionally, a gasket 1212 (*e.g.*, an I-ring) made of a synthetic rubber and fluoropolymer elastomer (*e.g.*, Viton), silicone, or another compressible material may be placed over the collar 1208 prior to insertion of the collar 1208 through the opening, and attachment of the collar retainer 1210 to the collar 1208 may compress the gasket 1212. The compressed gasket 1212 may provide stability to the collar 1208 and collar retainer 1210, or provide a moisture barrier between the collar 1208 and the housing 1242. The collar 1208 and collar retainer 1210 may be attached to one another, and thereby to the housing 1242, prior to insertion of the shaft 1202 through the collar 1208. Another gasket 1214 (*e.g.*, a Y-ring) made of Viton, silicone, or another compressible material may be placed over the collar 1208, before or after insertion of the collar 1208 through the opening, but before the shaft 1202 is inserted through the collar 1208. The second gasket 1214 may provide a moisture barrier between the crown 1204 and the housing 1242 or the crown 1204 and the collar 1208.

[0181] Also prior to inserting the shaft 1202 through the collar 1208, and in some cases prior to inserting the collar 1208 into the opening in the housing 1242, an insulator 1216 may be

inserted into or deposited on the interior of the collar 1208, or placed around or deposited on the shaft 1202. The insulator 1216 may also be inserted, placed, or deposited as the shaft 1202 is inserted into the collar 1208. In some cases, the insulator 1216 may include a non-conductive sleeve or bushing (*e.g.*, a plastic sleeve) inserted (*e.g.*, press-fit) into the collar 1208 (*e.g.*, into a portion of the collar 1208 positioned interior to the housing 1242). The insulator 1216 may also or alternatively include a non-conductive sleeve overmolded on the collar (*e.g.*, molded within the opening in the collar 1208 and over a surface of the collar 1208 facing the crown 1204). In some cases, the insulator 1216 may be an overmolded liquid crystal polymer (LCP) insulator 1216. The insulator 1216 may also or alternatively include a non-conductive coating on the collar 1208 (*e.g.*, on an inner surface of the collar 1208), or a non-conductive coating on the shaft 1202, or a set of one or more non-conductive gaskets surrounding the shaft 1202. When the shaft 1202 is inserted into the collar 1208, the insulator 1216 may be positioned between the shaft 1202 and the collar 1208 and help to insulate a conductive portion of the shaft 1202 (or the entire shaft 1202) from the collar 1208.

[0182] Another insulator 1218 may be positioned between the shaft retainer 1206 and the collar retainer 1210. For example, a non-conductive (*e.g.*, plastic) washer, plate, or shim may be attached to the interior of the collar retainer 1210, between the shaft retainer 1206 and the collar retainer 1210. In some cases, the non-conductive washer may be carried by a plate 1220, such as a plate formed of stainless steel (*e.g.*, the insulator 1218 may be an overmolded LCP insulator 1218). In these cases, the non-conductive washer may be attached to the interior of the collar retainer 1210 by welding (*e.g.*, laser welding) the plate 1220 to the collar retainer 1210. The non-conductive washer or other element may provide a bearing surface for the shaft retainer 1206.

[0183] As shown in FIGs. 12A & 12B, one or more O-rings 1222, 1224 or other gaskets may be placed over the shaft 1202 before the shaft 1202 is inserted into the collar 1208. The O-rings 1222, 1224 may be formed of a synthetic rubber, fluoropolymer elastomer, silicone, or another compressible material. The O-rings 1222, 1224 may maintain the shaft 1202 in a position that is centered within the collar 1208. In some cases, the O-rings 1222, 1224 may provide a seal between the shaft 1202 and the collar 1208. The O-rings 1222, 1224 may also function as an insulator between the shaft 1202 and the collar 1208. In some embodiments, the O-rings 1222, 1224 may be fitted to recesses in the shaft 1202. Additionally, a low-friction ring 1306 or filler

may be placed around the top of the collar 1208, between the crown 1204 and the collar 1208. Alternatively, the low-friction ring 1250 or filler may be attached to the crown 1204, between the crown 1204 and the collar 1208. In some embodiments, the shaft 1202 may be smooth (not shown) and rotate within a thicker or closer fitting insulator 1216 without use of the O-rings 1222, 1224.

[0184] In some embodiments, a bracket 1226 may be attached (*e.g.*, laser welded) to the collar retainer 1210 or another element within the housing 1242. The bracket 1226 may support a spring-biased conductor 1228 and maintain the spring-biased conductor 1228 in mechanical and electrical contact with the shaft retainer 1206 (or in some cases with an end of the shaft 1202, such as when the shaft extends through the shaft retainer (not shown)). As shown, the spring-biased conductor 1228 may include a shear plate that is spring-biased about an axis 1238, which axis 1238 is perpendicular to and radially outward from a second axis 1240 of the shaft 1202. By way of example, the shear plate is shown to be circular, although the shear plate could also have other shapes. In some embodiments, the surface of the shear plate that abuts the shaft retainer 1206 or shaft end may be hardened (*e.g.*, with a PVD deposited coating of cobalt chromium (CoCr or hard chromium)) to mitigate the likelihood of the shaft retainer 1206 or shaft end wearing through the shear plate after multiple rotations or translations of the shaft 1202. The shear plate (and in some cases the entirety of the spring-biased conductor 1228) may be plated with gold or another material to improve electrical conductivity (*e.g.*, prior to coating the shear plate with a hardener). In some cases, the spring-biased conductor 1228 may be formed (*e.g.*, stamped or bent) from a piece of metal (*e.g.*, stainless steel). In other cases, the spring-biased conductor 1228 may be formed in other ways. The length and thickness of the shear plate, perpendicular to the axis of the shaft 1202, can be optimized to provide a balance between a high enough spring constant to ensure good electrical contact between the shear plate and the shaft retainer 1206 or shaft end (even during rotation of the shaft 1202), on one hand, and a low enough spring constant to mitigate the likelihood that the shaft retainer 1206 or shaft end will wear through the shear plate (or through a coating thereon). A flat or relatively flat shear plate can reduce the dimension of the crown assembly 1200 along the axis 1240 of the shaft 1202.

[0185] In some embodiments, a majority or entirety of the shaft 1202, shaft retainer 1206, or crown 1204 may be coated with a non-conductive coating, but for an external conductive surface

of the crown 1204 and a portion of the shaft 1202 or shaft retainer 1206 that contacts the spring-biased conductor 1228.

[0186] When the shaft 1202 is translatable, translation of the shaft 1202 into the housing 1242 (*e.g.*, into the housing of a watch body) may cause the spring-biased conductor 1228 (or the shear plate thereof) to deform. However, the spring bias of the spring-biased conductor 1228 may cause the spring-biased conductor 1228 (or the shear plate thereof) to maintain electrical contact with the shaft retainer or shaft end, regardless of whether the shaft 1202 is in a first position or a second position with reference to translation of the shaft 1202. The spring-biased conductor 1228 may be electrically connected to a circuit, such as a circuit formed on or in a substrate 1230 such as a flex circuit or printed circuit board (PCB). In some cases, the spring-biased conductor 1228 may be surface-attached to the circuit substrate 1230 (such as soldered or otherwise mechanically connected, for example by using a surface-mount technology process), which circuit substrate 1230 may be supported by the rigid support member (or sub-housing frame member) 1226. A conductive grease may be deposited between the shaft retainer 1206 or shaft 1202 and the shear plate or other member of the spring-biased conductor 1228. The circuit may be in electrical communication with the crown 1204 via the spring-biased conductor 1228, the shaft retainer 1206, and the shaft 1202 (or when an end of the shaft 1202 protrudes through the shaft retainer 1206, the circuit may be in electrical communication with the crown 1204 via the spring-biased conductor 1228 and the shaft 1202).

[0187] A tactile (tac) switch 1252, such as a dome switch, may be electrically connected to the circuit and mechanically connected to the circuit substrate 1230. In some cases, the tac switch 1252 may be surface-attached to the circuit substrate 1230 (such as soldered or otherwise mechanically connected). The shear plate of the spring-biased conductor 1228 may be positioned between the shaft retainer 1206 and the tac switch 1252. The tac switch 1252 may be actuated or change state in response to translation of the shaft 1202. Thus, when a user presses on the crown 1204, the shaft 1202 may translate into the housing 1242 (*e.g.*, into the housing of a watch body) and actuate the tac switch 1252, placing the tac switch 1252 in one of a number of states. When the user releases pressure on the crown 1204 or pulls the crown 1204 outward from the housing 1242, the tac switch 1252 may retain the state in which it was placed when pressed, or advance

to another state, or toggle between two states, depending on the type or configuration of the tac switch 1252.

[0188] The circuit to which the tac switch 1252 and spring-biased conductor 1228 are electrically connected may be part of, or electrically connected to, one or more circuits that carry portions of an optical encoder 1232 and other circuit elements, such as an interface 1234 to the electrodes described with reference to FIGs. 5C, 5D, 5E, 6-8, 9A-9C, & 10A-10D, or a processor that receives and processes signals received from or provided to the crown 1204 or other electrodes. By way of example, FIG. 12A shows a circuit 1236 (*e.g.*, a flex circuit or PCB) to which a set of one or more light emitters and light detectors of an optical encoder 1232 is connected. The light emitter(s) may illuminate an encoder pattern or other rotating portion of the optical encoder 1232, which encoder pattern or other rotating portion of the optical encoder 1232 may be carried on (*e.g.*, formed on, printed on, *etc.*) the shaft retainer 1206. The light detector(s) may receive reflections of the light emitted by the light emitter(s), and a processor may determine a direction of rotation, speed of rotation, angular position, translation, or other state(s) of the crown 1204 and shaft 1202.

[0189] The spring-biased conductor 1228 may be connected to a processor. The processor may be attached or coupled to one or more of the circuits shown in FIG. 12A. The processor may determine whether a user is touching the crown 1204, or determine a biological parameter of the user based on a signal received from or provided to the user via the crown 1204, or determine other parameters based on signals received from or provided to the crown 1204. In some cases, the processor may operate the crown and electrodes described in FIGs. 5C, 5D, 5E, 6-8, 9A-9C, 10A-10D, 11, 12A, & 12B as an electrocardiogram and provide an ECG to a user of a watch including the crown and electrodes.

[0190] In an alternate embodiment of the crown assembly 1200 shown in FIGs. 12A & 12B, the spring-biased conductor 1228 may include a conductive brush that is biased to contact a side of the shaft 1202 or a side of the shaft retainer 1206. The conductive brush may maintain electrical contact with the shaft 1202 or shaft retainer 1206 through rotation or translation of the shaft 1202, and may be electrically connected to a circuit such as the circuit that supports the tac switch 1352.

[0191] FIG. 13 shows a cross-section of a crown assembly 1300 as viewed from an edge of a watch body (*e.g.*, an edge to which a watch band might be attached). The crown assembly 1300 shown in FIG. 13 differs from the crown assembly 1200 shown in FIGs. 12A & 12B in that the crown 1302 has a somewhat different configuration. For example, the crown 1302 has a conductive crown body 1304 surrounded by a non-conductive ring 1306. The non-conductive ring 1306 may be attached to the conductive crown body 1304 by an adhesive 1308. Alternatively, the ring 1306 may be conductive, and may be insulated from the conductive crown body 1304 by the adhesive 1308 (*e.g.*, when the adhesive 1308 is non-conductive) or electrically connected to the conductive crown body 1304 (*e.g.*, when the adhesive 1308 is conductive).

[0192] As shown in FIG. 13, the crown assembly 1300 may be positioned adjacent a transparent cover 1310 (*e.g.*, a carrier) under which a display may be attached, such that the display is at least partially or fully within the housing. In some cases, the display may be a touch-sensitive display. In some embodiments, the display may also be a force-sensitive display. FIG. 13 shows one example of a force sensor 1312 for a force-sensitive display, in which a compressible gasket 1314 is bounded by first and second capacitive plates 1316, 1318 and positioned between the carrier 1310 and the housing 1242.

[0193] FIG. 14 shows a cross-section of a crown assembly 1400, as may be included in any of the electronic devices described with reference to FIGs. 1A, 1B, 2A-2C, 3, 4A, or 4B. Similarly to the crown assemblies 1200 and 1300 shown in FIGs. 12A, 12B, & 13, the crown assembly 1400 is an example of the crown assembly 1100 shown in FIG. 11.

[0194] The crown assembly 1400 is similar to the crown assembly 1200 in that its crown 1402 has a conductive crown body 1404 surrounded by an inner ring 1406 of non-conductive material and an outer ring 1408 of conductive material. The conductive crown body 1404 may be formed of a conductive ceramic or stainless steel, and may be coated in a PVD deposited layer of SUS or DLC, or an ED layer of AlTiN or CrSiCN, and may function as an electrode. The non-conductive inner ring 1406 may help prevent shorting of the crown 1402 to the housing 1242, and may be formed of a plastic or elastomer, for example. The conductive outer ring 1408 may be formed of the same or different material(s) as the conductive crown body 1404.

[0195] The non-conductive inner ring 1406 may extend from an outer surface of the crown 1402 to under a portion of the conductive crown body 1404. In this manner, the non-conductive inner ring 1406 may prevent the conductive crown body 1404 from contacting the collar 1208 when the crown 1402 is translated toward the housing 1242.

[0196] The conductive outer ring 1408 may extend from an outer surface of the crown 1402 to under a portion of the non-conductive inner ring 1406. In this manner, if the housing 1242 is grounded and the conductive outer ring 1408 contacts the housing 1242, the conductive outer ring 1408 may be grounded to the housing 1242.

[0197] In contrast to the crown assemblies 1200 and 1300, the crown assembly 1400 has an insulator 1410 (*e.g.*, a non-conductive element, layer, or coating) applied to at least one surface of the collar 1208 (*e.g.*, to at least a portion of the surface or surfaces that face an underside of the conductive crown body 1404). The insulator 1410 may further prevent the conductive crown body 1404 from contacting the collar 1208 when the crown 1402 is translated toward the housing 1242 and may provide increased separation resistance between the collar 1208 and the crown 210. In some embodiments, the insulator 1410 may include a layer of plastic that is overmolded (*e.g.*, LCP overmolded) on at least a portion (or all) of the collar 1208 that faces the crown 210 (or a plastic element that is placed over or adhered to at least a portion (or all) of the collar 1208, or a coating that is applied to at least a portion of the collar 1208). In some embodiments, the plastic may extend to adjacent surfaces of the housing 206, or into the central opening in the collar 1208. In some embodiments, the insulator 1410 may include a coating (*e.g.*, an electro-deposited (ED) acrylic-based polymer coating). Alternatively or additionally, an insulator (*e.g.*, an element, layer, or coating) may be applied to the underside of the conductive crown body 1404, or to surfaces of the shaft 1202 that face the collar 1208 and/or housing 206. Alternatively, the collar 1208 may be formed from plastic or another material that is non-conductive or otherwise electrically isolates the conductive crown body 1404 of the crown 1402, or the shaft 1202, from other conductive components of the crown assembly 1500.

[0198] In any of the crown assemblies 1200, 1300, 1400 described in the present disclosure, the crown 1204, 1302, or 1402 may alternately be a monolithic structure and not include

additional conductive or non-conductive rings, or may include a single non-conductive (*e.g.*, plastic) ring surrounding a conductive central portion.

[0199] Turning now to the implementation of an electrode on a button, FIG. 15 shows an example cross-section of a button assembly 1500. The button assembly 1500 may be an example of a button assembly included in any of the electronic devices described with reference to FIGs. 1A, 1B, 2A-2C, 3, 4A, or 4B.

[0200] The button assembly 1500 may include a conductive button cap 1502. The conductive button cap 1502 may be retained within an opening in a housing by a button cap retention assembly 1504. The button cap retention assembly 1504, or parts thereof, may be conductive. By way of example, the housing is shown to be the housing 206 of the watch body 202 described with reference to FIGs. 2A-2C, 3, 4A, & 4B. The button cap retention assembly 1504 may be attached to the housing 206 and extend through the opening in the housing 206. In some embodiments, the button cap retention assembly 1504 may include a first component 1506 that is inserted through the opening from one side of the housing 206, and a second component 1508 that fastens to the first component 1506 on the other side of the housing 206 (*e.g.*, by threads, screws, solder, or an adhesive).

[0201] A set of one or more insulators 1510 (*e.g.*, electrical insulators) may electrically insulate the button cap retention assembly 1504 from the housing 206. The insulator 1510 may also electrically insulate the conductive button cap 1502 from the housing 206. Although the insulator 1510 is generally shown in FIG. 15 as a singular annular seal around the perimeter of the button assembly 1500, the insulator 1510 may alternatively include more than one element or be positioned elsewhere within the button assembly 1500, as described with reference to FIGs. 16A, 16B, 17A, 17B, 18A, & 18C.

[0202] The conductive button cap 1502 may translate toward and away from the housing 206, and may be in electrical contact with the button cap retention assembly 1504 during all phases of translation. When the conductive button cap 1502 is pressed by a user and translates toward the housing 206, a tactile switch 1512 may be actuated (*e.g.*, switched between two or more states). A shaft 1514 may extend from an interior surface of, or be formed integrally with, the conductive button cap 1502 and a depressible surface of the tactile switch 1512. The tactile switch 1512 and

shaft 1514, or other elements not shown in FIG. 15 (*e.g.*, springs), may bias the conductive button cap 1502 in an outwardly translated position.

[0203] The conductive button cap 1502 may function as an electrode, and an electrical signal may be routed between the conductive button cap 1502 and a circuit 1516, at least in part, via the button cap retention assembly 1504. In some embodiments, the button cap retention assembly 1504, tactile switch 1512, and circuit 1516 may be attached to a common substrate 1518.

[0204] Because the signals received by or propagated from the conductive button cap 1502 may be low voltage or low amplitude signals, the materials, positions, electrical connections to, and electrical routing paths for an electrode formed on or by the conductive button cap 1502 can have a significant impact on the ability of the circuit 1516 to discern useful signals representing an ECG or other biological parameter of a person wearing an electronic device including the button assembly 1500. The materials, positions, electrical connections to, and electrical routing paths for the button assembly 1500 can also determine how well the button assembly 1500 receives voltages/signals from a person's skin (*e.g.*, a SNR of a device-to-user interface through which the voltages/signals pass); how well voltages/signals are transferred between the conductive button cap 1502 and internal components of an electronic device (*e.g.*, a voltage/signal propagation SNR); and how well the button assembly 1500 operates in the face of environmental factors, such as temperature, humidity, moisture, electromagnetic radiation, dust, and so on. In some cases, the insulator 1510 may be positioned to prevent moisture from electrically shorting the conductive button cap 1502 to the housing 206, or the housing 206 may be grounded to provide electrical shielding for some or all of the signals propagated through the button assembly 1500.

[0205] More detailed examples of the button assembly 1500 described with reference to FIG. 15 are shown in FIGs. 16A, 16B, 17A, 17B, 18A, & 18B.

[0206] Turning now to FIGs. 16A & 16B, there is shown an example of a button assembly 1600 that may be included in any of the electronic devices described with reference to FIGs. 1A, 1B, 2A-2C, 3, 4A, or 4B. FIG. 16A shows an exploded view of the button assembly 1600, and FIG. 16B shows an assembled cross-section of the button assembly 1600, as viewed from the

front or rear face of an electronic device such as the watch body 202 described with reference to FIGs. 2A-2C, 3, 4A, and 4B.

[0207] The button assembly 1600 is an example of the button assembly 1500 shown in FIG. 15, and includes components corresponding to the conductive button cap 1502, button cap retention assembly 1504, insulator 1510, and tactile switch 1512.

[0208] The button assembly 1600 may be at least partially within an opening 1602 in a housing 1604 (*e.g.*, an opening in the housing described with reference to FIG. 2A, 2C, 3, 4A, or 4B), and attached to the housing or an internal structure. In some cases, and as shown, the housing 1604 may include a cavity 1606 (FIG. 16B) defined by a sidewall 1608 and a ledge 1610. The ledge 1610 may surround the opening 1602, and the sidewall 1608 may surround the ledge 1610.

[0209] The button assembly 1600 may include a conductive button cap 1612. The conductive button cap 1612 may be retained by a button cap retention assembly 1614, and may be translatable toward and away from the housing 1604. The button cap retention assembly 1614 may extend through the opening 1602 and be attached to the housing 1604. In some examples, the button cap retention assembly 1614 may include a bracket 1616 that overlaps the ledge 1610 interior to the housing 1604, and a retainer 1618 that overlaps the ledge 1610 exterior to the housing 1604. The retainer 1618 may be mechanically attached to the bracket 1616 by a set of screws 1620 or other mechanical fastener. The screws 1620 may be inserted into through-holes in the bracket 1616 and screwed into threaded holes in the retainer 1618, clamping the ledge 1610 between the bracket 1616 and the retainer 1618.

[0210] The conductive button cap 1612 may have an exterior surface 1622, a sidewall or set of sidewalls 1624 parallel to the sidewall 1608 of the cavity 1606, and an inward facing lip or set of lips 1626 (FIG. 16B) that extends between the retainer 1618 and the ledge 1610 and toward a center axis of the conductive button cap 1612. A set of one or more coil springs 1628 or other spring-biased members may be positioned between an outer surface of the retainer 1618 and an underside of the conductive button cap 1612, and may bias the conductive button cap 1612 in an outward state of translation.

[0211] The button cap retention assembly 1614, and in particular the retainer 1618, may have a through-hole 1629 defined therein, with an axis of the through-hole 1629 extending perpendicular to the opening 1602 in the housing 1604. A shaft 1630 may be positioned within the through-hole 1629, and may translate toward and away from the housing 1604. The shaft 1630 may be mechanically connected to the conductive button cap 1612, or may be biased to contact the conductive button cap 1612. By way of example, the shaft 1630 may be non-conductive. In a state of rest, the shaft 1630 and conductive button cap 1612 may be biased in an outward state of translation (*i.e.*, away from the opening 1602) by the coil springs 1628 and/or a spring-biased tactile switch 1632. When a user presses the conductive button cap 1612 toward the housing 1604, the press may overcome the bias provided by the coil springs 1628 and/or tactile switch 1632, and pressure on the conductive button cap 1612 may be transferred to the shaft 1630, which translates toward the housing 1604 and presses on the tactile switch 1632 to change the state of the tactile switch 1632 (*e.g.*, from ON to OFF or vice versa, from one functional state to another, *etc.*). The tactile switch 1632 may be aligned with an axis of the shaft 1630 and attached to the bracket 1616 using an adhesive 1634 (*e.g.*, a conductive PSA).

[0212] In some embodiments, a gasket 1636 (*e.g.*, an O-ring) may be positioned between the shaft 1630 and the through-hole. The shaft 1630 may have a circumferential groove 1638 in which a portion of the gasket 1636 is seated so that the gasket 1636 moves in a predictable way in response to movement of the shaft 1630. In some examples, the gasket 1636 may be non-conductive.

[0213] The button assembly 1600 may further include a set of electrical insulators (*i.e.*, one or more electrical insulators), which set of electrical insulators may electrically insulate the button cap retention assembly 1614 from the housing 1604, and electrically insulate the conductive button cap 1612 from the housing 1604. For example, the button assembly 1600 may include a first electrical insulator, such as a sleeve 1640 (or set of shims), positioned between the conductive button cap 1612 and the sidewall 1608 (or set of sidewalls) of the cavity 1606 in the housing 1604. In some cases, the sleeve 1640 may include a closed-shape sidewall and an inward facing lip 1642 (FIG. 16B). In other cases, the sleeve 1640 may not include the inward facing lip 1642 or have a sidewall that does not define a closed shape. In other cases, the first electrical insulator may be a planar perimeter gasket (*e.g.*, an insulator including the lip 1642 but not the

sidewall). A second electrical insulator may include an adhesive 1644 (*e.g.*, an adhesive ring) applied to a surface of the retainer 1618 facing the housing 1604, or to the outer surface of the ledge 1610 within the cavity 1606. In some cases, the adhesive 1644 may include a PSA. A gasket or seal 1646, external to the housing 1604, may be bonded to the adhesive 1644. The adhesive 1644 and seal 1646 may be compressed when the screws 1620 are tightened to clamp the housing 1604 between the bracket 1616 and retainer 1618 of the button cap retention assembly 1614. A third electrical insulator may include a spacer 1648, internal to the housing 1604, positioned between the bracket 1616 and the housing 1604. The third electrical insulator, in conjunction with the first and/or second electrical insulator, may electrically insulate the conductive button cap retention assembly 1614 (*e.g.*, the bracket 1616 and the retainer 1618) from the housing 1604. The first electrical insulator may electrically insulate the conductive button cap 1612 from the housing 1604. In some embodiments, additional or different electrical insulators may electrically insulate the conductive button cap 1612 or button cap retention assembly 1614 from the housing 1604.

[0214] In use, a signal may be applied to, or received from, the button cap retention assembly 1614 (*e.g.*, to/from the bracket 1616) via a circuit (*e.g.*, a flex circuit or other circuit element 1650) that is electrically connected to the bracket 1616 (*e.g.*, via a conductive adhesive 1652). A signal may travel through the conductive button cap 1612, coil springs 1628, retainer 1618, screws 1620, and bracket 1616 via a first electrical path, or through the conductive button cap 1612, retainer 1618, screws 1620, and bracket 1616 via a second electrical path. Although the second electrical path may be broken when the conductive button cap 1612 is pressed by a user, the conductive button cap 1612 may remain in electrical contact with the button cap retention assembly 1614 during all states of translation (*e.g.*, via the first electrical path).

[0215] With reference to FIGs. 17A & 17B, there is shown another example of a button assembly 1700 that may be included in any of the electronic devices described with reference to FIGs. 1A, 1B, 2A-2C, 3, 4A, or 4B. FIG. 17A shows an exploded view of the button assembly 1700, and FIG. 17B shows an assembled cross-section of the button assembly 1700, as viewed from the front or rear face of an electronic device such as the watch body 202 described with reference to FIGs. 2A-2C, 3, 4A, & 4B.

[0216] The button assembly 1700 is an example of the button assembly 1500 shown in FIG. 15, and includes components corresponding to the conductive button cap 1502, button cap retention assembly 1504, insulator 1510, and tactile switch 1512.

[0217] The button assembly 1700 may be at least partially within an opening 1702 in a housing 1704 (*e.g.*, an opening in the housing described with reference to FIG. 2A, 2C, 3, 4A, or 4B), and may be attached to any the housing or an internal structure. In some cases, and as shown, the housing 1704 may include a cavity 1706 (FIG. 17B) defined by at least one sidewall (*e.g.*, a single sidewall 1708 or set of sidewalls) and a ledge 1710. The ledge 1710 may define the opening 1702, and the sidewall 1708 may surround the ledge 1710.

[0218] The button assembly 1700 may include a conductive button cap 1712 (or button cap having a conductive portion). The conductive button cap 1712 may be retained by a button cap retention assembly 1714 (or button retainer), and may be translatable toward and away from the housing 1704. The button cap retention assembly 1714 may extend through the opening 1702 and be connected or otherwise attached to the housing 1704. In some examples, the button cap retention assembly 1714 may include a bracket 1716 that overlaps the ledge 1710 interior to the housing 1704, and a retainer 1718 that overlaps the ledge 1710 exterior to the housing 1704. The retainer 1718 may be mechanically attached to the bracket 1716 by a set of screws 1720 or other mechanical fastener. The screws 1720 may be inserted into through-holes in the bracket 1716 and screwed into threaded holes in the retainer 1718, clamping the ledge 1710 between the bracket 1716 and the retainer 1718.

[0219] The conductive button cap 1712 may have an exterior surface 1722, a sidewall or set of sidewalls 1724 parallel to the sidewall 1708 of the cavity 1706, and an inward facing lip or set of lips 1726 (FIG. 19) that extends between the retainer 1718 and the ledge 1710 and toward a center axis of the conductive button cap 1712. A set of one or more coil springs 1728 or other spring-biased members may be positioned between an outer surface of the retainer 1718 and an underside of the conductive button cap 1712, and may bias the conductive button cap 1712 in an outward state of translation.

[0220] The button cap retention assembly 1714, and in particular the retainer 1718, may have a through-hole 1729 defined therein, with an axis of the through-hole 1729 extending

perpendicular to the opening 1702 in the housing 1704. A shaft 1730 may be positioned within the through-hole 1729, and may translate toward and away from the housing 1704. The shaft 1730 may be mechanically connected to the conductive button cap 1712, or may be biased to contact the conductive button cap 1712. In some cases, the shaft 1730 may be mechanically and electrically connected to the conductive button cap 1712. In a state of rest, the shaft 1730 and conductive button cap 1712 may be biased in an outward state of translation (*i.e.*, away from the opening 1702) by the coil springs 1728 and/or a spring-biased tactile switch 1732. In some cases, a shim 1734, such as a non-conductive shim, may be attached to an end of the shaft 1730 facing the tactile switch 1732. When a user presses the conductive button cap 1712 toward the housing 1704, the press may overcome the bias provided by the coil springs 1728 and/or tactile switch 1732, and pressure on the conductive button cap 1712 may be transferred to the shaft 1730, which translates toward the housing 1704 and presses on the tactile switch 1732 to change the state of the tactile switch 1732 (*e.g.*, from ON to OFF or vice versa, from one functional state to another, *etc.*). The tactile switch 1732 may be aligned with an axis of the shaft 1730 and attached to the bracket 1716 using an adhesive 1736 (*e.g.*, a conductive PSA).

[0221] In some embodiments, a gasket 1738 (*e.g.*, an O-ring) may be positioned between the shaft 1730 and the through-hole. The shaft 1730 may have a circumferential groove 1740 (FIG. 17B) in which a portion of the gasket 1738 is seated so that the gasket 1738 moves in a predictable way in response to movement of the shaft 1730. In some examples, the gasket 1738 may be conductive.

[0222] The button assembly 1700 may further include a set of electrical insulators (*i.e.*, one or more electrical insulators), which set of electrical insulators may electrically insulate the button cap retention assembly 1714 from the housing 1704, and electrically insulate the conductive button cap 1712 from the housing 1704. For example, the button assembly 1700 may include a first electrical insulator, such as a sleeve 1742 (or set of shims), positioned between the conductive button cap 1712 and the sidewall 1708 (or set of sidewalls) of the cavity 1706 in the housing 1704. In some cases, the sleeve 1742 may include a closed-shape sidewall and an inward facing lip 1744 (FIG. 18B). In other cases, the sleeve 1742 may not include the inward facing lip 1744 or have a sidewall that does not define a closed shape. In other cases, the first electrical insulator may be a planar perimeter gasket (*e.g.*, an insulator including the lip 1744 but not the

sidewall). A second electrical insulator may include an adhesive 1746 (*e.g.*, an adhesive ring) applied to a surface of the retainer 1718 facing the housing 1704, or to the outer surface of the ledge 1710 within the cavity 1706. In some cases, the adhesive 1746 may include a PSA. A gasket or seal 1748, external to the housing 1704, may be bonded to the adhesive 1746. The adhesive 1746 and seal 1748 may be compressed when the screws 1720 are tightened to clamp the housing 1704 between the bracket 1716 and retainer 1718 of the button cap retention assembly 1714. A third electrical insulator may include a spacer 1750, internal to the housing 1704, positioned between the bracket 1716 and the housing 1704. The third electrical insulator, in conjunction with the first and/or second electrical insulator, may electrically insulate the conductive button cap retention assembly 1714 (*e.g.*, the bracket 1716 and the retainer 1718) from the housing 1704. The first electrical insulator may electrically insulate the conductive button cap 1712 from the housing 1704. In some embodiments, additional or different electrical insulators may electrically insulate the conductive button cap 1712 or button cap retention assembly 1714 from the housing 1704.

[0223] In use, a signal may be applied to, or received from, the button cap retention assembly 1714 (*e.g.*, to/from the bracket 1716) via a circuit (*e.g.*, a flex circuit or other circuit element) that is electrically connected to the bracket 1716 (*e.g.*, as described with reference to FIG. 17A). A signal may travel through the conductive button cap 1712, shaft 1730, conductive gasket 1738, retainer 1718, screws 1720, and bracket 1716 via a first electrical path. The signal may also travel through the conductive button cap 1712, coil springs 1728, retainer 1718, screws 1720, and bracket 1716 via a second electrical path, or through the conductive button cap 1712, retainer 1718, screws 1720, and bracket 1716 via a third electrical path. Although the third electrical path may be broken when the conductive button cap 1712 is pressed by a user, the conductive button cap 1712 may remain in electrical contact with the button cap retention assembly 1714 during all states of translation (*e.g.*, via the first and second electrical paths).

[0224] FIGs. 18A & 18B show another example of a button assembly 2000 that may be included in any of the electronic devices described with reference to FIGs. 1A, 1B, 2A-2C, 3, 4A, or 4B. FIG. 18A shows an exploded view of the button assembly 1800, and FIG. 18B shows an assembled cross-section of the button assembly 1800, as viewed from the front or rear face of

an electronic device such as the watch body 202 described with reference to FIGs. 2A-2C, 3, 4A, & 4B.

[0225] The button assembly 1800 is an example of the button assembly 1500 shown in FIG. 15, and includes components corresponding to the conductive button cap 1502, button cap retention assembly 1504, insulator 1510, and tactile switch 1512.

[0226] The button assembly 1800 may be at least partially within an opening 1802 in a housing 1804 (*e.g.*, an opening in the housing described with reference to FIG. 2A, 2C, 3, 4A, or 4B), and may be attached to the housing or an internal structure such as a support. In some cases, and as shown, the housing 1804 may include a cavity 1806 (FIG. 18B) defined by at least one sidewall (*e.g.*, a single sidewall 1808 or set of sidewalls) and a ledge 1810. The ledge 1810 may define the opening 1802, and the sidewall 1808 may surround the ledge 1810.

[0227] The button assembly 1800 may include a conductive button cap 1812 (or button cap having a conductive portion). The conductive button cap 1812 may be retained by a button cap retention assembly 1814 (or button retainer), and may be translatable toward and away from the housing 1804. The button cap retention assembly 1814 may extend through the opening 1802 and be connected or otherwise attached to the housing 1804. In some examples, the button cap retention assembly 1814 may include a bracket 1816 that overlaps the ledge 1810 interior to the housing 1804, and a retainer 1818 that overlaps the ledge 1810 exterior to the housing 1804. The retainer 1818 may be mechanically attached to the bracket 1816 by a set of screws 1820 or other mechanical fastener. The screws 1820 may be inserted into through-holes in the bracket 1816 and screwed into threaded holes in the retainer 1818, clamping the ledge 1810 between the bracket 1816 and the retainer 1818.

[0228] The conductive button cap 1812 may have an exterior surface 1822, a sidewall or set of sidewalls 1824 parallel to the sidewall 1808 of the cavity 1806, and an inward facing lip or set of lips 1826 (FIG. 18B) that extends between the retainer 1818 and the ledge 1810 and toward a center axis of the conductive button cap 1812. A set of one or more coil springs 1828 or other spring-biased members may be positioned between an outer surface of the retainer 1818 and an underside of the conductive button cap 1812, and may bias the conductive button cap 1812 in an outward state of translation.

[0229] The button cap retention assembly 1814, and in particular the retainer 1818, may have a through-hole 1829 defined therein, with an axis of the through-hole 1829 extending perpendicular to the opening 1802 in the housing 1804. A shaft 1830 may be positioned within the through-hole 1829, and may translate toward and away from the housing 1804. The shaft 1830 may be mechanically connected to the conductive button cap 1812, or may be biased to contact the conductive button cap 1812. In some cases, the shaft 1830 may be mechanically and electrically connected to the conductive button cap 1812. In a state of rest, the shaft 1830 and conductive button cap 1812 may be biased in an outward state of translation (*i.e.*, away from the opening 1802) by the coil springs 1828 and/or a spring-biased tactile switch 1832. In some cases, a spring-biased conductor (*e.g.*, a conductive shear plate 1834) may extend between the tactile switch 1832 and an end of the shaft 1830 facing the tactile switch 1832. When a user presses the conductive button cap 1812 toward the housing 1804, the press may overcome the bias provided by the coil springs 1828 and/or tactile switch 1832, and pressure on the conductive button cap 1812 may be transferred to the shaft 1830, which translates toward the housing 1804 and presses on the tactile switch 1832 to change the state of the tactile switch 1832 (*e.g.*, from ON to OFF or vice versa, from one functional state to another, *etc.*). The tactile switch 1832 may be aligned with an axis of the shaft 1830 and attached to the bracket 1816 using an adhesive 1836 (*e.g.*, a conductive PSA).

[0230] In some embodiments, a gasket 1838 (*e.g.*, an O-ring) may be positioned between the shaft 1830 and the through-hole. The shaft 1830 may have a circumferential groove 1840 in which a portion of the gasket 1838 is seated so that the gasket 1838 moves in a predictable way in response to movement of the shaft 1830. In some examples, the gasket 1838 may be non-conductive.

[0231] The button assembly 1800 may further include a set of electrical insulators (*i.e.*, one or more electrical insulators), which set of electrical insulators may electrically insulate the button cap retention assembly 1814 from the housing 1804, and electrically insulate the conductive button cap 1812 from the housing 1804. For example, the button assembly 1800 may include a first electrical insulator, such as a sleeve 1842 (or set of shims), positioned between the conductive button cap 1812 and the sidewall 1808 (or set of sidewalls) of the cavity 1806 in the housing 1804. In some cases, the sleeve 1842 may include a closed-shape sidewall and an inward

facing lip 1844 (FIG. 18B). In other cases, the sleeve 1842 may not include the inward facing lip 1844 or have a sidewall that does not define a closed shape. In other cases, the first electrical insulator may be a planar perimeter gasket (*e.g.*, an insulator including the lip 1844 but not the sidewall). A second electrical insulator may include an adhesive 1846 (*e.g.*, an adhesive ring) applied to a surface of the retainer 1818 facing the housing 1804, or to the outer surface of the ledge 1810 within the cavity 1806. In some cases, the adhesive 1846 may include a PSA. A gasket or seal 1848, external to the housing 1804, may be bonded to the adhesive 1846. The adhesive 1846 and seal 1848 may be compressed when the screws 1820 are tightened to clamp the housing 1804 between the bracket 1816 and retainer 1818 of the button cap retention assembly 1814. A third electrical insulator may include a spacer 1850, internal to the housing 1804, positioned between the bracket 1816 and the housing 1804. The third electrical insulator, in conjunction with the first and/or second electrical insulator, may electrically insulate the conductive button cap retention assembly 1814 (*e.g.*, the bracket 1816 and the retainer 1818) from the housing 1804. The first electrical insulator may electrically insulate the conductive button cap 1812 from the housing 1804. In some embodiments, additional or different electrical insulators may electrically insulate the conductive button cap 1812 or button cap retention assembly 1814 from the housing 1804.

[0232] The shear plate 1834 may be formed from a conductive sheet that is stamped, molded, or otherwise shaped to form an open (shown) or closed (not shown) shape conductive perimeter 1852 and an elevated tab 1854 (*e.g.*, a tab having an end positioned in a different plane than the conductive perimeter 1852). The conductive perimeter 1852 may be positioned between the bracket 1816 and spacer 1850, such that the conductive perimeter 1852 and shear plate 1834 are electrically insulated from the housing 1804. The shear plate 1834 deforms in response to translation of the shaft 1830.

[0233] In use, a signal may be applied to, or received from, the button cap retention assembly 1814 (*e.g.*, to/from the bracket 1816) via a circuit (*e.g.*, a flex circuit or other circuit element) that is electrically connected to the bracket 1816 (*e.g.*, as described with reference to FIG. 16B). A signal may travel through the conductive button cap 1812, shaft 1830, shear plate 1834, and bracket 1816 via a first electrical path. The signal may also travel through the conductive button cap 1812, coil springs 1828, retainer 1818, screws 1820, and bracket 1816 via a second electrical

path, or through the conductive button cap 1812, retainer 1818, screws 1820, and bracket 1816 via a third electrical path. Although the third electrical path may be broken when the conductive button cap 1812 is pressed by a user, the conductive button cap 1812 may remain in electrical contact with the button cap retention assembly 1814 during all states of translation (*e.g.*, via the first and second electrical paths).

[0234] FIG. 19 shows an example elevation of a button assembly 1900. The button assembly 1900 may be an example of a button assembly included in any of the electronic devices described with reference to FIGs. 1A, 1B, 2A-2C, 3, 4A, or 4B.

[0235] The button assembly 1900 may include a conductive button cap 1902. The conductive button cap 1902 may be retained within an opening in a housing by a button cap retention assembly 1904 (*e.g.*, a button retainer). The button cap retention assembly 1904, or parts thereof, may be conductive. By way of example, the housing is shown to be the housing 206 of the watch body 202 described with reference to FIGs. 2A-2C, 3, 4A, & 4B. The button cap retention assembly 1904 may be attached to the housing 206 and extend through the opening in the housing 206. In some embodiments, the button cap retention assembly 1904 may include a first component 1906 that is inserted through the opening from one side of the housing 206, and a second component 1908 that fastens to the first component 1906 on the other side of the housing 206 (*e.g.*, by threads, screws, solder, or an adhesive).

[0236] A set of one or more insulators 1910 (*e.g.*, electrical insulators) may electrically insulate the conductive button cap 1902 from the button cap retention assembly 1904. The insulator 1910 may also electrically insulate the conductive button cap 1902 from the housing 206. Although the insulator 1910 is generally shown in FIG. 19 to include a non-conductive liner 1910a on an underside of the conductive button cap 1902, a non-conductive sleeve 1910b positioned between the conductive button cap 1902 and the housing 206, and a non-conductive sleeve 1910c positioned between the button cap retention assembly 1904 and a shaft 1914, the insulator 1910 may alternatively include more or fewer elements, which elements may be positioned in different locations within the button assembly 1900, as described with reference to FIGs. 20, 21, & 22.

[0237] The conductive button cap 1902 may translate toward and away from the housing 206, and may be insulated from the button cap retention assembly 1904 during all phases of translation. When the conductive button cap 1902 is pressed by a user and translates toward the housing 206, a tactile switch 1912 may be actuated (*e.g.*, switched between two or more states). The shaft 1914 may extend between an interior surface of the conductive button cap 1902 and a depressible surface of the tactile switch 1912. The tactile switch 1912 and shaft 1914, or other elements not shown in FIG. 19 (*e.g.*, springs), may bias the conductive button cap 1902 in an outwardly translated position.

[0238] The conductive button cap 1902 may function as an electrode, and an electrical signal may be routed between the conductive button cap 1902 and a circuit 1916, at least in part, via the shaft 1914. In some embodiments, the button cap retention assembly 1904, tactile switch 1912, and circuit 1916 may be attached to a common substrate 1918.

[0239] Because the signals received by or propagated from the conductive button cap 1902 may be low voltage or low amplitude signals, the materials, positions, electrical connections to, and electrical routing paths for an electrode formed on or by the conductive button cap 1902 can have a significant impact on the ability of the circuit 1916 to discern useful signals representing an ECG or other biological parameter of a person wearing an electronic device including the button assembly 1900. The materials, positions, electrical connections to, and electrical routing paths for the button assembly 1900 can also determine how well the button assembly 1900 receives voltages/signals from a person's skin (*e.g.*, a SNR of a device-to-user interface through which the voltages/signals pass); how well voltages/signals are transferred between the conductive button cap 1902 and internal components of an electronic device (*e.g.*, a voltage/signal propagation SNR); and how well the button assembly 1900 operates in the face of environmental factors, such as temperature, humidity, moisture, electromagnetic radiation, dust, and so on. In some cases, the insulator 1910 may be positioned to prevent moisture from electrically shorting the conductive button cap 1902 to the housing 206, or the housing 206 may be grounded to provide electrical shielding for some or all of the signals propagated through the button assembly 1900.

[0240] More detailed examples of the button assembly 1900 described with reference to FIG. 19 are shown in FIGs. 20, 21, & 22.

[0241] Referring now to FIG. 20, there is shown an assembled cross-section of another example of a button assembly 2000 that may be included in any of the electronic devices described with reference to FIGs. 1A, 1B, 2A-2C, 3, 4A, or 4B. The button assembly 2000 may be at least partially within an opening 2002 in a housing 2004 (*e.g.*, an opening in the housing described with reference to FIG. 2A, 2C, 3, 4A, or 4B), and may be attached to the housing or an internal structure such as a support. In some cases, and as shown, the housing 2004 may include a cavity 2006 defined by at least one sidewall (*e.g.*, a single sidewall 2008 or set of sidewalls) and a ledge 2010. The ledge 2010 may define the opening 2002, and the sidewall 2008 may surround the ledge 2010.

[0242] The button assembly 2000 may include a conductive button cap 2012 (or button cap having a conductive portion). The conductive button cap 2012 may be retained by a button cap retention assembly 2014 (or button retainer), and may be translatable toward and away from the housing 2004. The button cap retention assembly 2014 may extend through the opening 2002 and be connected or otherwise attached to the housing 2004. In some examples, the button cap retention assembly 2014 may include a bracket 2016 that overlaps the ledge 2010 interior to the housing 2004, and a retainer 2018 that overlaps the ledge 2010 exterior to the housing 2004. The retainer 2018 may be mechanically attached to the bracket 2016 by a set of screws 2020 or other mechanical fastener. The screws 2020 may be inserted into through-holes in the bracket 2016 and screwed into threaded holes in the retainer 2018, clamping the ledge 2010 between the bracket 2016 and the retainer 2018.

[0243] The conductive button cap 2012 may have an exterior surface 2022, a sidewall or set of sidewalls 2024 parallel to the sidewall 2008 of the cavity 2006, and an inward facing lip or set of lips 2026 that extends between the retainer 2018 and the ledge 2010 and toward a center axis of the conductive button cap 2012. A set of one or more coil springs 2028 or other spring-biased members may be positioned between an outer surface of the retainer 2018 and an underside of the conductive button cap 2012, and may bias the conductive button cap 2012 in an outward state of translation.

[0244] The button cap retention assembly 2014, and in particular the retainer 2018, may have a through-hole defined therein, with an axis of the through-hole extending perpendicular to the opening 2002 in the housing 2004. A shaft 2030 may be positioned within the through-hole, and may translate toward and away from the housing 2004. The shaft 2030 may be mechanically and electrically connected to the conductive button cap 2012, or may be biased to contact the conductive button cap 2012. In a state of rest, the shaft 2030 and conductive button cap 2012 may be biased in an outward state of translation (*i.e.*, away from the opening 2002) by the coil springs 2028 and/or a spring-biased tactile switch 2032. In some cases, a shim 2034, such as a non-conductive shim, may be attached to an end of the shaft 2030 facing the tactile switch 2032. When a user presses the conductive button cap 2012 toward the housing 2004, the press may overcome the bias provided by the coil springs 2028 and/or tactile switch 2032, and pressure on the conductive button cap 2012 may be transferred to the shaft 2030, which translates toward the housing 2004 and presses on the tactile switch 2032 to change the state of the tactile switch 2032 (*e.g.*, from ON to OFF or vice versa, from one functional state to another, *etc.*). The tactile switch 2032 may be aligned with an axis of the shaft 2030 and attached to the bracket 2016 using an adhesive 2036 (*e.g.*, a non-conductive PSA).

[0245] In some embodiments, a gasket 2038 (*e.g.*, an O-ring) may be positioned between the shaft 2030 and the through-hole. In some cases, the gasket 2038 may be positioned between a first non-conductive liner 2044 and a second non-conductive liner 2046. In some examples, the gasket 2038 may be non-conductive.

[0246] The button assembly 2000 may further include a set of electrical insulators (*i.e.*, one or more electrical insulators), which set of electrical insulators may electrically insulate the conductive button cap 2012 from the button cap retention assembly 2014 and housing 2004. For example, the button assembly 2000 may include a first electrical insulator, such as a sleeve 2042 (or set of shims), positioned between the conductive button cap 2012 and the sidewall 2008 (or set of sidewalls) of the cavity 2006 in the housing 2004. In some cases, the sleeve 2042 may include a closed-shape sidewall. In other cases, the sleeve 2042 may also include an inward facing lip, or may not have a sidewall that defines a closed shape. A second electrical insulator may include a non-conductive liner 2044 between an interior surface of the conductive button cap 2012 and the button cap retention assembly 2014. In some cases, the non-conductive liner

2044 may be press-fit or adhesively bonded to the interior surface of the conductive button cap 2012. Alternatively, the non-conductive liner 2044 may be press-fit or adhesively bonded to an exterior surface of the retainer 2018. In some embodiments, the non-conductive liner 2044 may extend into the through-hole, between the shaft 2030 and the button cap retention assembly 2014 (*e.g.*, between the shaft 2030 and the retainer 2018). A third electrical insulator may include a second non-conductive liner 2046, positioned in the through-hole between the shaft 2030 and the retainer 2018, below the gasket 2038. The second electrical insulator, in some cases in conjunction with the third electrical insulator, may electrically insulate the conductive button cap 2012 from the button cap retention assembly 2014 (*e.g.*, from the retainer 2018). The first electrical insulator may electrically insulate the conductive button cap 2012 from the housing 2004. In some embodiments, additional or different electrical insulators may electrically insulate the conductive button cap 2012 from the button cap retention assembly 2014 or housing 2004.

[0247] A conductive flexure 2048 may be coupled to, but insulated from, the bracket 2016, and positioned (*e.g.*, angled) to contact the end of the shaft 2030 that faces the tactile switch 2032. The conductive flexure 2048 may be spring-biased to contact the end of the shaft 2030, and may be spring-biased to remain in contact with the end of the shaft 2030 during all states of translation of the shaft 2030.

[0248] In use, a signal may be applied to, or received from, the conductive button cap 2012 via a circuit (*e.g.*, a flex circuit or other circuit element) that is electrically connected to the conductive flexure 2048. A signal may travel through the conductive button cap 2012, shaft 2030, and conductive flexure 2048.

[0249] FIG. 21 shows an assembled cross-section of another example of a button assembly 2100 that may be included in any of the electronic devices described with reference to FIGs. 1A, 1B, 2A-2C, 3, 4A, or 4B. The button assembly 2100 may be at least partially within an opening 2102 in a housing 2104 (*e.g.*, an opening in the housing described with reference to FIG. 2A, 2C, 3, 4A, or 4B), and may be attached to the housing or an internal structure such as a support. In some cases, and as shown, the housing 2104 may include a cavity 2106 defined by at least one sidewall (*e.g.*, a single sidewall 2108 or set of sidewalls) and a ledge 2110. The ledge 2110 may define the opening 2102, and the sidewall 2108 may surround the ledge 2110.

[0250] The button assembly 2100 may include a conductive button cap 2112 (or button cap having a conduction portion). The conductive button cap 2112 may be retained by a button cap retention assembly 2114 (or button retainer), and may be translatable toward and away from the housing 2104. The button cap retention assembly 2114 may extend through the opening 2102 and be connected or otherwise attached to the housing 2104. In some examples, the button cap retention assembly 2114 may include a bracket 2116 that overlaps the ledge 2110 interior to the housing 2104, and a retainer 2118 that overlaps the ledge 2110 exterior to the housing 2104. The retainer 2118 may be mechanically attached to the bracket 2116 by a set of screws 2120 or other mechanical fastener. The screws 2120 may be inserted into through-holes in the bracket 2116 and screwed into threaded holes in the retainer 2118, clamping the ledge 2110 between the bracket 2116 and the retainer 2118.

[0251] The conductive button cap 2112 may have an exterior surface 2122, a sidewall or set of sidewalls 2124 parallel to the sidewall 2108 of the cavity 2106, and an inward facing lip or set of lips 2126 that extends between the retainer 2118 and the ledge 2110 and toward a center axis of the conductive button cap 2112.

[0252] The button cap retention assembly 2114, and in particular the retainer 2118, may have a through-hole defined therein, with an axis of the through-hole extending perpendicular to the opening 2102 in the housing 2104. A shaft 2128 may be positioned within the through-hole, and may translate toward and away from the housing 2104. The shaft 2128 may be mechanically and electrically connected to the conductive button cap 2112, or may be biased to contact the conductive button cap 2112. In a state of rest, the shaft 2128 and conductive button cap 2112 may be biased in an outward state of translation (*i.e.*, away from the opening 2102) by a conductive flexure 2130 or other spring-biased member positioned between the bracket 2116 and an end of the shaft 2128 that faces the bracket 2116.

[0253] The button cap retention assembly 2114, and in particular the retainer 2118, may also have a second through-hole formed therein, with an axis of the second through-hole extending perpendicular to the opening 2102 in the housing 2104. A piston 2132 may be positioned within the through-hole, and may translate toward and away from the housing 2104. In some cases, a shim 2134, such as a non-conductive shim, may be attached to an end of the piston 2132 facing a

spring-biased tactile switch 2136. When a user presses the conductive button cap 2112 toward the housing 2104, the press may overcome the bias provided by the conductive flexure 2130 and/or tactile switch 2136, and pressure on the conductive button cap 2112 may be transferred to the piston 2132, which translates toward the housing 2104 and presses on the tactile switch 2136 to change the state of the tactile switch 2136 (*e.g.*, from ON to OFF or vice versa, from one functional state to another, *etc.*). The tactile switch 2136 may be aligned with an axis of the piston 2132 and attached to the bracket 2116 using an adhesive 2138 (*e.g.*, a non-conductive PSA).

[0254] In some embodiments, a first gasket 2140 (*e.g.*, an O-ring) may be positioned between the shaft 2128 and the first through-hole, and a second gasket 2142 (*e.g.*, an O-ring) may be positioned between the piston 2132 and the second through-hole. In some cases, the first gasket 2140 may be positioned between a first non-conductive liner 2150 and a second non-conductive liner 2152. In some cases, the piston 2132 may have a circumferential groove 2146 in which a portion of the second gasket 2142 is seated so that the second gasket 2142 moves in a predictable way in response to movement of the piston 2132. In some examples, the first and second gaskets 2140, 2142 may be non-conductive.

[0255] The button assembly 2100 may further include a set of electrical insulators (*i.e.*, one or more electrical insulators), which set of electrical insulators may electrically insulate the conductive button cap 2112 from the button cap retention assembly 2114 and housing 2104. For example, the button assembly 2100 may include a first electrical insulator, such as a sleeve 2148 (or set of shims), positioned between the conductive button cap 2112 and the sidewall 2108 (or set of sidewalls) of the cavity 2106 in the housing 2104. In some cases, the sleeve 2148 may include a closed-shape sidewall. In other cases, the sleeve 2148 may also include an inward facing lip, or may not have a sidewall that defines a closed shape. A second electrical insulator may include a non-conductive liner 2150 between an interior surface of the conductive button cap 2112 and the button cap retention assembly 2114. In some cases, the non-conductive liner 2150 may be press-fit or adhesively bonded to the interior surface of the conductive button cap 2112. Alternatively, the non-conductive liner 2150 may be press-fit or adhesively bonded to an exterior surface of the retainer 2118. In some embodiments, the non-conductive liner 2150 may extend into the through-hole, between the shaft 2128 and the button cap retention assembly 2114

(*e.g.*, between the shaft 2128 and the retainer 2118). A third electrical insulator may include a second non-conductive liner 2152, positioned in the through-hole between the shaft 2128 and the retainer 2118, below the gasket 2140. The second electrical insulator, in some cases in conjunction with the third electrical insulator, may electrically insulate the conductive button cap 2112 from the button cap retention assembly 2114 (*e.g.*, from the retainer 2118). The first electrical insulator may electrically insulate the conductive button cap 2112 from the housing 2104. In some embodiments, additional or different electrical insulators may electrically insulate the conductive button cap 2112 from the button cap retention assembly 2114 or housing 2104.

[0256] In use, a signal may be applied to, or received from, the conductive button cap 2112 via a circuit (*e.g.*, a flex circuit or other circuit element) that is electrically connected to the conductive flexure 2130. A signal may travel through the conductive button cap 2112, shaft 2128, and conductive flexure 2130.

[0257] FIG. 22 shows an assembled cross-section of another example of a button assembly 2200 that may be included in any of the electronic devices described with reference to FIGs. 1A, 1B, 2A-2C, 3, 4A, or 4B. The button assembly 2200 may be at least partially within an opening 2202 in a housing 2204 (*e.g.*, an opening in the housing described with reference to FIG. 2A, 2C, 3, 4A, or 4B), and may be attached to the housing or an internal structure such as a support. In some cases, and as shown, the housing 2204 may include a cavity 2206 defined by at least one sidewall (*e.g.*, a single sidewall 2208 or set of sidewalls) and a ledge 2210. The ledge 2210 may define the opening 2202, and the sidewall 2208 may surround the ledge 2210.

[0258] The button assembly 2200 may include a conductive button cap 2212 (or button cap having a conductive portion). The conductive button cap 2212 may be retained by a button cap retention assembly 2214 (or button retainer), and may be translatable toward and away from the housing 2204. The button cap retention assembly 2214 may extend through the opening 2202 and be connected or otherwise attached to the housing 2204. In some examples, the button cap retention assembly 2214 may include a bracket 2216 that overlaps the ledge 2210 interior to the housing 2204, and a retainer 2218 that overlaps the ledge 2210 exterior to the housing 2204. The retainer 2218 may be mechanically attached to the bracket 2216 by a set of screws 2220 or other mechanical fastener. The screws 2220 may be inserted into through-holes in the bracket 2216

and screwed into threaded holes in the retainer 2218, clamping the ledge 2210 between the bracket 2216 and the retainer 2218.

[0259] The conductive button cap 2212 may have an exterior surface 2222, a sidewall or set of sidewalls 2224 parallel to the sidewall 2208 of the cavity 2206, and an inward facing lip or set of lips 2226 that extends between the retainer 2218 and the ledge 2210 and toward a center axis of the conductive button cap 2212.

[0260] The button cap retention assembly 2214, and in particular the retainer 2218, may have a through-hole defined therein, with an axis of the through-hole extending perpendicular to the opening 2202 in the housing 2204. A shaft 2228 may be positioned within the through-hole, and may translate toward and away from the housing 2204. The shaft 2228 may be mechanically and electrically connected to the conductive button cap 2212, or may be biased to contact the conductive button cap 2212. In a state of rest, the shaft 2228 and conductive button cap 2212 may be biased in an outward state of translation (*i.e.*, away from the opening 2202) by a conductive spring (*e.g.*, a coil spring 2230) or other spring-biased member positioned between the bracket 2216 and an end of the shaft 2228 that faces the bracket 2216.

[0261] The button cap retention assembly 2214, and in particular the retainer 2218, may also have a second through-hole formed therein, with an axis of the second through-hole extending perpendicular to the opening 2202 in the housing 2204. A piston 2232 may be positioned within the through-hole, and may translate toward and away from the housing 2204. When a user presses the conductive button cap 2212 toward the housing 2204, the press may overcome the bias provided by the coil spring 2230 and/or tactile switch 2234, and pressure on the conductive button cap 2212 may be transferred to the piston 2232, which translates toward the housing 2204 and presses on the tactile switch 2234 to change the state of the tactile switch 2234 (*e.g.*, from ON to OFF or vice versa, from one functional state to another, *etc.*). The tactile switch 2234 may be aligned with an axis of the piston 2232 and attached to the bracket 2216 using an adhesive 2236 (*e.g.*, a non-conductive PSA).

[0262] In some embodiments, a first gasket 2238 (*e.g.*, an O-ring) may be positioned between the shaft 2228 and the first through-hole, and a second gasket 2240 (*e.g.*, an O-ring) may be positioned between the piston 2232 and the second through-hole. In some cases, the first gasket

2238 may be positioned between a first non-conductive liner 2248 and a second non-conductive liner 2250. In some cases, the piston 2232 may have a circumferential groove 2244 in which a portion of the second gasket 2240 is seated so that the second gasket 2240 moves in a predictable way in response to movement of the piston 2232. In some examples, the first and second gaskets 2238, 2240 may be non-conductive.

[0263] The button assembly 2200 may further include a set of electrical insulators (*i.e.*, one or more electrical insulators), which set of electrical insulators may electrically insulate the conductive button cap 2212 from the button cap retention assembly 2214 and housing 2204. For example, the button assembly 2200 may include a first electrical insulator, such as a sleeve 2246 (or set of shims), positioned between the conductive button cap 2212 and the sidewall 2208 (or set of sidewalls) of the cavity 2206 in the housing 2204. In some cases, the sleeve 2246 may include a closed-shape sidewall. In other cases, the sleeve 2246 may also include an inward facing lip, or may not have a sidewall that defines a closed shape. A second electrical insulator may include a non-conductive liner 2248 between an interior surface of the conductive button cap 2212 and the button cap retention assembly 2214. In some cases, the non-conductive liner 2248 may be press-fit or adhesively bonded to the interior surface of the conductive button cap 2212. Alternatively, the non-conductive liner 2248 may be press-fit or adhesively bonded to an exterior surface of the retainer 2218. In some embodiments, the non-conductive liner 2248 may extend into the through-hole, between the shaft 2228 and the button cap retention assembly 2214 (*e.g.*, between the shaft 2228 and the retainer 2218). A third electrical insulator may include a second non-conductive liner 2250, positioned in the through-hole between the shaft 2228 and the retainer 2218, below the gasket 2238. The second electrical insulator, in some cases in conjunction with the third electrical insulator, may electrically insulate the conductive button cap 2212 from the button cap retention assembly 2214 (*e.g.*, from the retainer 2218). The first electrical insulator may electrically insulate the conductive button cap 2212 from the housing 2204. In some embodiments, additional or different electrical insulators may electrically insulate the conductive button cap 2212 from the button cap retention assembly 2214 or housing 2204.

[0264] In use, a signal may be applied to, or received from, the conductive button cap 2212 via a circuit (*e.g.*, a flex circuit or other circuit element) that is electrically connected to the coil

spring 2230. A signal may travel through the conductive button cap 2212, shaft 2228, and coil spring 2230.

[0265] FIG. 23 shows a schematic 2300 of an electronic device, such as an electronic watch, that may be used for acquiring an ECG or other biological parameter from a user of the electronic device. In some cases, the electronic device may include a watch body. As shown, the electronic device may include a first electrode 2302 on a carrier 2304, an optional second electrode 2306 on the carrier 2304, and a third electrode 2308 on the surface of a user-rotatable crown 2310 (or alternatively, on the surface of a button). The third electrode 2308 may be operable to be contacted by a finger of a user while the first electrode 2302 (and optional second electrode 2306) are positioned against a user's skin (*e.g.*, against the wrist of the user). A processor 2312, which in some cases may be provided in an integrated circuit (IC), an application-specific integrated circuit (ASIC), a field programmable gate array (FPGA), a system in package (SIP), a system on a chip (SOC), *etc.*, may be operable to acquire an ECG from the user, or determine another biological parameter of, the user. The ECG or other biological parameter may be determined based on voltages at the first, optional second, and third electrodes 2302, 2306, 2308 while the user is in contact with the first, optional second, and third electrodes 2302, 2306, 2308.

[0266] In some cases, voltages may be sensed at just the first and third electrodes 2302, 2308. In other cases, the second electrode 2306 may be grounded to the electronic device, thereby the user to the electronic device, and the voltage at the second electrode 2306 (*i.e.*, the ground voltage) may be used to remove noise generated by the electronic device or other environmental sources from the signals measured at the first and third electrodes 2302, 2308. This may result in more accurate readings (or processing) of the first and third voltages.

[0267] As shown, a signal or voltages at the first electrode 2302 may be amplified by a first amplifier 2314, and a signal or voltages at the third electrode 2308 may be amplified by a second amplifier 2316.

[0268] FIG. 24 shows an example method 2400 of determining a biological parameter of a user wearing an electronic watch or other wearable electronic device, such as a watch or wearable electronic device described herein.

[0269] At block 2402, a ground voltage is optionally applied to a user via a first electrode on the electronic device. The first electrode may be on an exterior surface of a carrier that forms part of a housing of the electronic device. The operation(s) at 2402 may be performed, for example, by the processor described with reference to FIG. 24, using one of the electrodes described with reference to FIGs. 1B, 2A-2C, 3, 4A-4C, 5D, 5E, 6-8, 9A-9C, 10A-10D, & 23.

[0270] At block 2404, a first voltage or signal is sensed at a second electrode on the electronic device. The second electrode may also be on the exterior surface of the carrier. The operation(s) at 2404 may be performed, for example, by the processor described with reference to FIG. 24, using one of the electrodes described with reference to FIGs. 1B, 2A-2C, 3, 4A-4C, 5D, 5E, 6-8, 9A-9C, 10A-10D, 11, 12A, 12B, 13, 14, 15, 16A, 16B, 17A, 17B, 18A, 18B, 19, 20, 21, 22, & 23.

[0271] At block 2406, a second voltage or signal is sensed at a third electrode on the electronic device. The third electrode may be on a user-rotatable crown of the electronic device, or on a button of the electronic device, or on another surface of the housing of the electronic device. In some embodiments, the ground voltage is applied and the first voltage or signal is sensed on a wrist of one arm of the user, and the second voltage or signal is sensed on a fingertip of the user (with the fingertip belonging to a finger on a hand on the other arm of the user). The operation(s) at 2406 may be performed, for example, by the processor described with reference to FIG. 24, using one of the electrodes described with reference to FIGs. 1B, 2A-2C, 3, 4A-4C, 5D, 5E, 6-8, 9A-9C, 10A-10D, 11, 12A, 12B, 13, 14, 15, 16A, 16B, 17A, 17B, 18A, 18B, 19, 20, 21, 22, & 23.

[0272] At block 2408, the biological parameter of the user may be determined from the optional ground voltage, the first voltage or signal, and the second voltage or signal. The ground voltage may provide a reference for the first and second voltages or signals, or may otherwise be used to reject noise from the first and second voltages or signals. When the first and second voltages are obtained from different parts of the user's body, the biological parameter may be an electrocardiogram for the user. The operation(s) at 2408 may be performed, for example, by the processor described with reference to FIG. 25.

[0273] FIG. 25 shows a sample electrical block diagram of an electronic device 2500, which electronic device may in some cases take the form of any of the electronic watches or other wearable electronic devices described with reference to FIGs. 1-23, or other portable or wearable electronic devices. The electronic device 2500 can include a display 2505 (*e.g.*, a light-emitting display), a processor 2510, a power source 2515, a memory 2520 or storage device, a sensor 2525, and an input/output (I/O) mechanism 2530 (*e.g.*, an input/output device, input/output port, or haptic input/output interface). The processor 2510 can control some or all of the operations of the electronic device 2500. The processor 2510 can communicate, either directly or indirectly, with some or all of the components of the electronic device 2500. For example, a system bus or other communication mechanism 2535 can provide communication between the processor 2510, the power source 2515, the memory 2520, the sensor 2525, and the input/output mechanism 2530.

[0274] The processor 2510 can be implemented as any electronic device capable of processing, receiving, or transmitting data or instructions. For example, the processor 2510 can be 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.

[0275] It should be noted that the components of the electronic device 2500 can be controlled by multiple processors. For example, select components of the electronic device 2500 (*e.g.*, a sensor 2525) may be controlled by a first processor and other components of the electronic device 2500 (*e.g.*, the display 2505) may be controlled by a second processor, where the first and second processors may or may not be in communication with each other. In some cases, the processor 2510 may determine a biological parameter of a user of the electronic device, such as an ECG for the user.

[0276] The power source 2515 can be implemented with any device capable of providing energy to the electronic device 2500. For example, the power source 2515 may be one or more batteries or rechargeable batteries. Additionally or alternatively, the power source 2515 can be a

power connector or power cord that connects the electronic device 2500 to another power source, such as a wall outlet.

[0277] The memory 2520 can store electronic data that can be used by the electronic device 2500. For example, the memory 2520 can store electrical data or content such as, for example, audio and video files, documents and applications, device settings and user preferences, timing signals, control signals, and data structures or databases. The memory 2520 can be configured as any type of memory. By way of example only, the memory 2520 can be implemented as random access memory, read-only memory, Flash memory, removable memory, other types of storage elements, or combinations of such devices.

[0278] The electronic device 2500 may also include one or more sensors 2525 positioned almost anywhere on the electronic device 2500. The sensor(s) 2525 can be configured to sense one or more type of parameters, such as but not limited to, pressure, light, touch, heat, movement, relative motion, biometric data (*e.g.*, biological parameters), and so on. For example, the sensor(s) 2525 may include a heat sensor, a position sensor, a light or optical sensor, an accelerometer, a pressure transducer, a gyroscope, a magnetometer, a health monitoring sensor, and so on. Additionally, the one or more sensors 2525 can utilize any suitable sensing technology, including, but not limited to, capacitive, ultrasonic, resistive, optical, ultrasound, piezoelectric, and thermal sensing technology. In some examples, the sensors 2525 may include one or more of the electrodes described herein (*e.g.*, one or more electrodes on an exterior surface of a carrier that forms part of a housing for the electronic device 2500 and/or an electrode on a crown, button, or other housing member of the electronic device).

[0279] The I/O mechanism 2530 can transmit and/or receive data from a user or another electronic device. An I/O device can include a display, a touch sensing input surface, one or more buttons (*e.g.*, a graphical user interface "home" button), one or more cameras, one or more microphones or speakers, one or more ports such as a microphone port, and/or a keyboard. Additionally or alternatively, an I/O device or port can transmit electronic signals via a communications network, such as a wireless and/or wired network connection. Examples of wireless and wired network connections include, but are not limited to, cellular, Wi-Fi, Bluetooth, IR, and Ethernet connections.

[0280] As discussed above, graphics displayed on the electronic devices herein may be manipulated through inputs provided to the crown. FIGS. 26A – 28B generally depict examples of changing a graphical output displayed on an electronic device through inputs provided by force and/or rotational inputs to a crown assembly of the device. This manipulation (e.g., selection, acknowledgement, motion, dismissal, magnification, and so on) of a graphic may result in changes in operation of the electronic device and/or graphical output displayed by the electronic device. Although specific examples are provided and discussed, many operations may be performed by rotating and/or applying force to a crown such as the examples described above. Accordingly, the following discussion is by way of example and not limitation.

[0281] FIG. 26A depicts an example electronic device 2600 (shown here as an electronic watch) having a crown 2602. The crown 2602 may be similar to the examples described above, and may receive force inputs along a first lateral direction, a second lateral direction, or an axial direction of the crown. The crown 2602 may also receive rotational inputs. A display 2606 provides a graphical output (e.g., shows information and/or other graphics). In some embodiments, the display 2606 may be configured as a touch-sensitive display capable of receiving touch and/or force input. In the current example, the display 2606 depicts a list of various items 2661, 2662, 2663, all of which are example graphics.

[0282] FIG. 26B illustrates how the graphical output shown on the display 2606 changes in a first manner as the crown 2602 rotates, partially or completely (as indicated by the arrow 2660). Rotating the crown 2602 causes the list to scroll or otherwise move on the screen, such that the first item 2661 is no longer displayed, the second and third items 2662, 2663 each move upwards on the display, and a fourth item 2664 is now shown at the bottom of the display. This is one example of a scrolling operation that can be executed by rotating the crown 2602. Such scrolling operations may provide a simple and efficient way to depict multiple items relatively quickly and in sequential order. A speed of the scrolling operation may be controlled by the amount of rotational force applied to the crown 2602 and/or the speed at which the crown 2602 is rotated. Faster or more forceful rotation may yield faster scrolling, while slower or less forceful rotation yields slower scrolling. The crown 2602 may receive an axial force (e.g., a force inward toward the display 2606 or watch body) to select an item from the list, in certain embodiments.

[0283] FIGS. 27A and 27B illustrate an example zoom operation. The display 2706 depicts a picture 2766 at a first magnification, shown in FIG. 27A; the picture 2766 is yet another example of a graphic. A user may apply a translating force (e.g., a force along the z-axis) or a lateral force (e.g., a force along the x-axis) to the crown 2702 of the electronic device 2700 (illustrated by arrow 2765), and in response the display may change a graphic in a second manner, such as zooming into the picture 2766 so that a portion 2767 of the picture is shown at an increased magnification. This is shown in FIG. 27B. The direction of zoom (in vs. out) and speed of zoom, or location of zoom, may be controlled through force applied to the crown 2702, and particularly through the direction of applied force and/or magnitude of applied force. Applying force to the crown 2702 in a first direction may zoom in, while applying force to the crown 2702 in an opposite direction may zoom out. Alternately, rotating or applying force to the crown 2702 in a first direction may change the portion of the picture subject to the zoom effect. In some embodiments, applying an axial or translating force (e.g., a force along the z-axis) to the crown 2702 may toggle between different zoom modes or inputs (e.g., direction of zoom vs. portion of picture subject to zoom), or otherwise change the displayed graphic in a second manner. In yet other embodiments, applying force to the crown 2702 along another direction, such as along the y-axis, may return the picture 2766 to the default magnification shown in FIG. 27A.

[0284] FIGS. 28A and 28B illustrate possible use of the crown 2802 to change an operational state of the electronic device 2800 or otherwise toggle between inputs. Turning first to FIG. 28A, the display 2806 depicts a question 2868, namely, "Would you like directions?" As shown in FIG. 28B, a lateral force may be applied to the crown 2802 (illustrated by arrow 2870) to answer the question. Applying force to the crown 2802 provides an input interpreted by the electronic device 2800 as "yes," and so "YES" is displayed as a graphic 2869 on the display 2806. Applying force to the crown 2802 in an opposite direction may provide a "no" input. Both the question 2868 and graphic 2869 are examples of graphics.

[0285] In the embodiment shown in FIGS. 28A and 28B, the force applied to the crown 2802 is used to directly provide the input, rather than select from options in a list (as discussed above with respect to FIGS. 26A and 26B).

[0286] As mentioned previously, force or rotational input to a crown of an electronic device may control many functions beyond those listed here. The crown may receive distinct force or rotational inputs to adjust a volume of an electronic device, a brightness of a display, or other operational parameters of the device. A force or rotational input applied to the crown may rotate to turn a display on or off, or turn the device on or off. A force or rotational input to the crown may launch or terminate an application on the electronic device. Further, combinations of inputs to the crown may likewise initiate or control any of the foregoing functions, as well.

[0287] In some cases, the graphical output of a display may be responsive to inputs applied to a touch-sensitive display (e.g., displays 2606, 2706, 2806, and the like) in addition to inputs applied to a crown. The touch-sensitive display may include or be associated with one or more touch and/or force sensors that extend along an output region of a display and which may use any suitable sensing elements and/or sensing techniques to detect touch and/or force inputs applied to the touch-sensitive display. The same or similar graphical output manipulations that are produced in response to inputs applied to the crown may also be produced in response to inputs applied to the touch-sensitive display. For example, a swipe gesture applied to the touch-sensitive display may cause the graphical output to move in a direction corresponding to the swipe gesture. As another example, a tap gesture applied to the touch-sensitive display may cause an item to be selected or activated. In this way, a user may have multiple different ways to interact with and control an electronic watch, and in particular the graphical output of an electronic watch. Further, while the crown may provide overlapping functionality with the touch-sensitive display, using the crown allows for the graphical output of the display to be visible (without being blocked by the finger that is providing the touch input).

[0288] As another example, and of the inputs described in FIGS. 26A-28B may be used to select, initiate, or display an ECG, or otherwise begin the operation of determining an ECG or launching an ECG application.

[0289] As described above, one aspect of the present technology is the gathering and use of data available from various sources, including the gathering and use of biological parameters of a user, to monitor or improve the user's health or fitness. The present disclosure contemplates that in some instances, this gathered data may include personal information data that uniquely

identifies a specific person, or can be used to contact, locate, or identify a specific person. Such personal information data can include demographic data, location-based data, telephone numbers, email addresses, twitter IDs, home addresses, data or records relating to a user's health or level of fitness (*e.g.*, vital sign measurements, medication information, exercise information), date of birth, or any other identifying or personal information.

[0290] The present disclosure recognizes that the use of such personal information data, in the present technology, can be used to the benefit of users. For example, the personal information data can be used to aid a user in monitoring or improving their health or fitness (*e.g.*, biological parameters or health and fitness data may be used to provide insights into a user's general wellness, or may be used as positive feedback to individuals using technology to pursue wellness goals).

[0291] The present disclosure contemplates that the entities responsible for the collection, analysis, disclosure, transfer, storage, or other use of such personal information data will comply with well-established privacy policies and/or privacy practices. In particular, such entities should implement and consistently use privacy policies and practices that are generally recognized as meeting or exceeding industry or governmental requirements for maintaining personal information data private and secure. Such policies should be easily accessible by users, and should be updated as the collection and/or use of data changes. Personal information from users should be collected for legitimate and reasonable uses of the entity and not shared or sold outside of those legitimate uses. Further, such collection/sharing should occur after receiving the informed consent of the users. Additionally, such entities should consider taking any needed steps for safeguarding and securing access to such personal information data and ensuring that others with access to the personal information data adhere to their privacy policies and procedures. Further, such entities can subject themselves to evaluation by third parties to certify their adherence to widely accepted privacy policies and practices. In addition, policies and practices should be adapted for the particular types of personal information data being collected and/or accessed and adapted to applicable laws and standards, including jurisdiction-specific considerations. For instance, in the US, collection of or access to certain health data may be governed by federal and/or state laws, such as the Health Insurance Portability and Accountability Act (HIPAA); whereas health data in other countries may be subject to other

regulations and policies and should be handled accordingly. Hence different privacy practices should be maintained for different personal data types in each country.

[0292] Despite the foregoing, the present disclosure also contemplates embodiments in which users selectively block the use of, or access to, personal information data. That is, the present disclosure contemplates that hardware and/or software elements can be provided to prevent or block access to such personal information data. For example, in the case of biological parameters or conditions identified therefrom, the present technology can be configured to allow users to select to "opt in" or "opt out" of participation in the collection of personal information data during registration for services or anytime thereafter. In another example, users can select not to provide health or fitness-associated data to the providers of applications or services, or can prevent the transmission of such data from the device on which it is collected or outside a collection of devices that are personal to a user from which the data is obtained. In yet another example, a user can select to limit the length of time health or fitness data, or biological parameters from which such data is derived, is maintained. In addition to providing “opt in” and “opt out” options, the present disclosure contemplates providing notifications relating to the access or use of personal information. For instance, a user may be notified upon downloading an app that their personal information data will be accessed and then reminded again just before personal information data is accessed by the app.

[0293] Moreover, it is the intent of the present disclosure that personal information data should be managed and handled in a way to minimize risks of unintentional or unauthorized access or use. Risk can be minimized by limiting the collection of data and deleting data once it is no longer needed. In addition, and when applicable, including in certain health related applications, data de-identification can be used to protect a user’s privacy. De-identification may be facilitated, when appropriate, by removing specific identifiers (*e.g.*, date of birth, etc.), controlling the amount or specificity of data stored (*e.g.*, collecting location data at a city level rather than at an address level), controlling how data is stored (*e.g.*, aggregating data across users), and/or other methods.

[0294] Therefore, although the present disclosure broadly covers use of personal information data to implement one or more various disclosed embodiments, the present disclosure also contemplates that the various embodiments can also be implemented without the need for

accessing at least some personal information data. That is, the various embodiments of the present technology are not rendered inoperable due to the lack of a portion of such personal information data. For example, biological parameters can be ascertained or stored without associating the biological parameters with information identifying a particular user from which they are obtained, or with a bare minimum amount of personal information, such as non-personal information already available to service providers or publicly available information.

[0295] The foregoing description, for purposes of explanation, uses specific nomenclature to provide a thorough understanding of the described embodiments. However, it will be apparent to one skilled in the art that the specific details are not required in order to practice the described embodiments. Thus, the foregoing descriptions of the specific embodiments described herein are presented for purposes of illustration and description. They are not targeted to be exhaustive or to limit the embodiments to the precise forms disclosed. It will be apparent to one of ordinary skill in the art that many modifications and variations are possible in view of the above teachings.

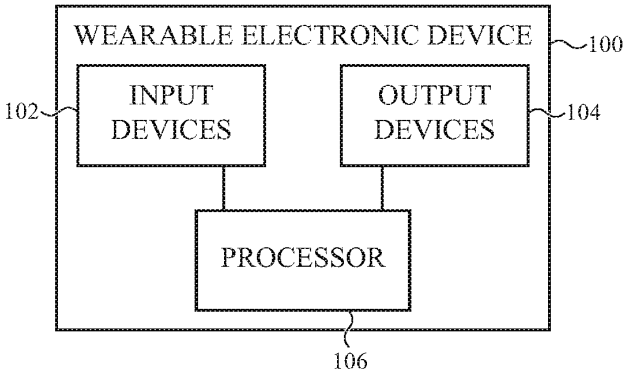

WEARABLE ELECTRONIC DEVICE
100
INPUT DEVICES
102
OUTPUT DEVICES
104
PROCESSOR
106

FIG. 1A

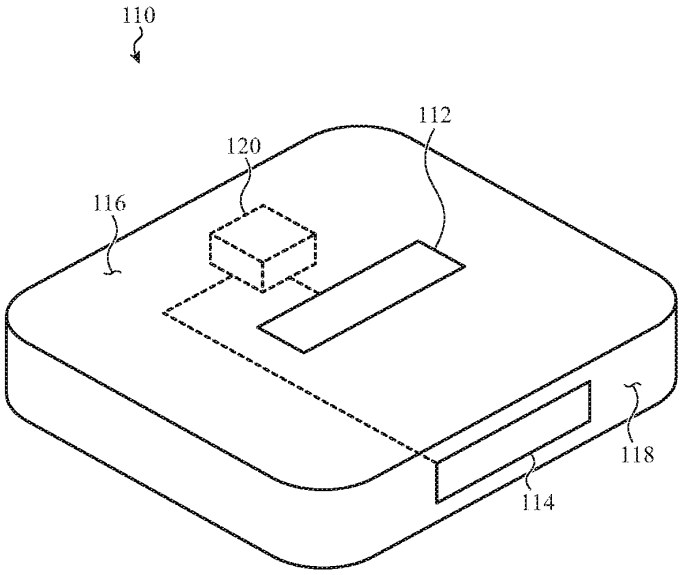

110
112
120
116
118
114

FIG. 1B

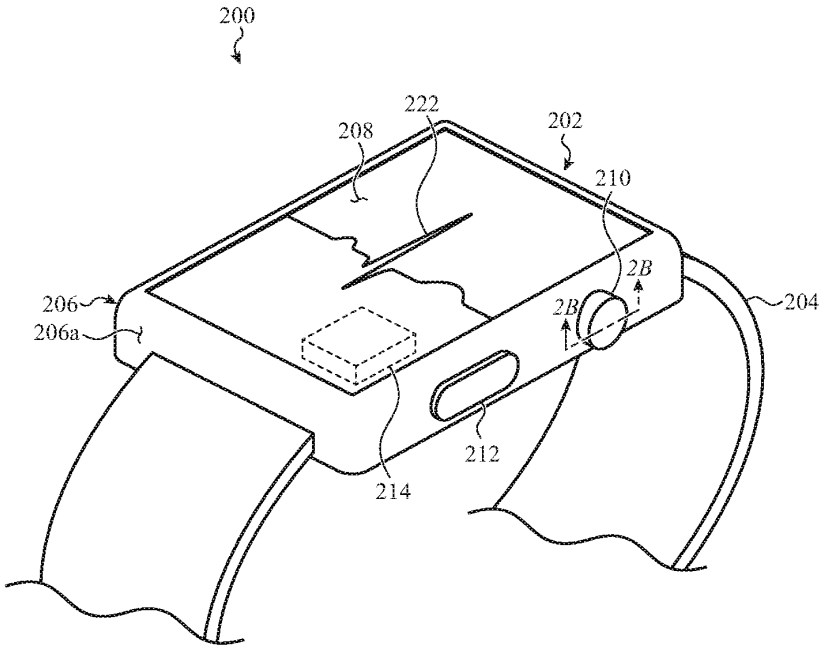


FIG. 2A

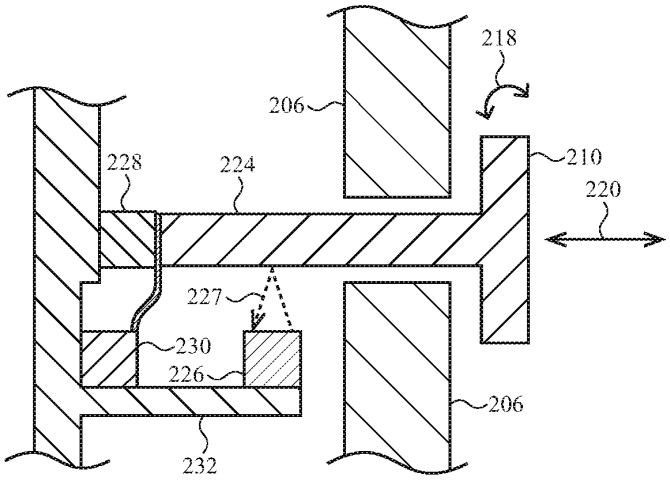


FIG. 2B

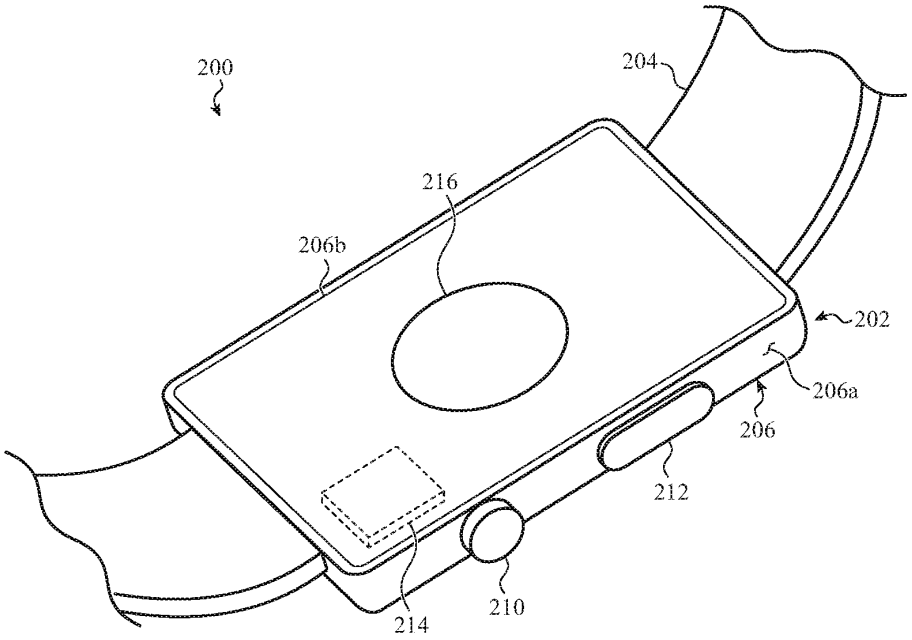


FIG. 2C

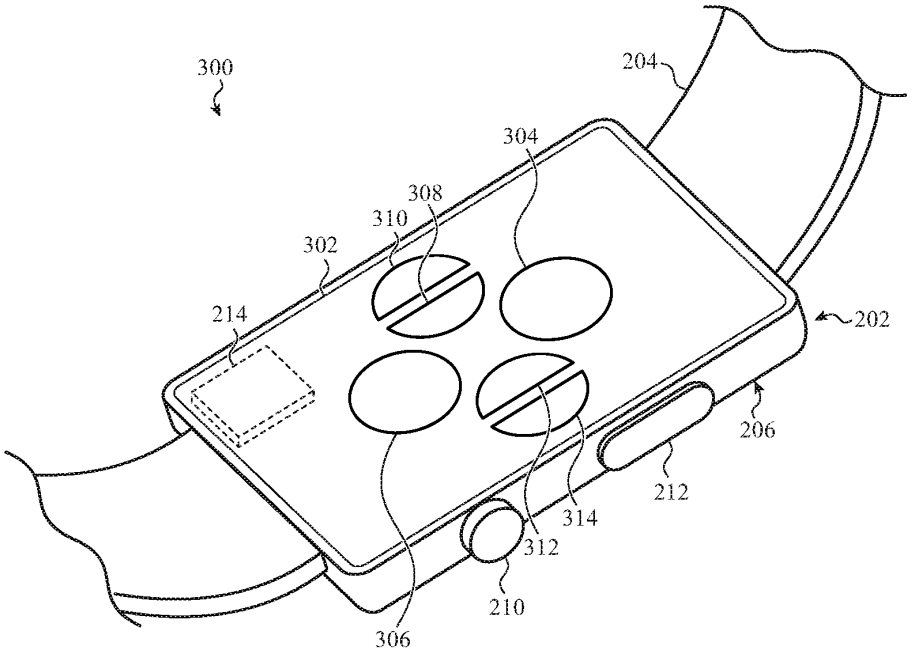


FIG. 3

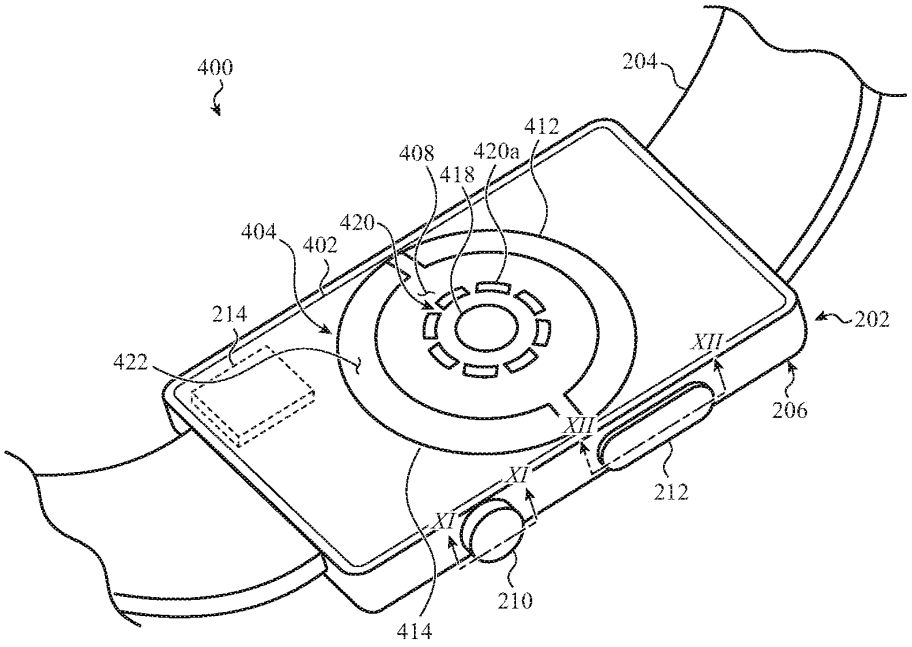

400
204
412
408
420a
418
420
404
402
214
422
202
XII
206
XII
212
XI
XI
210
414

FIG. 4A

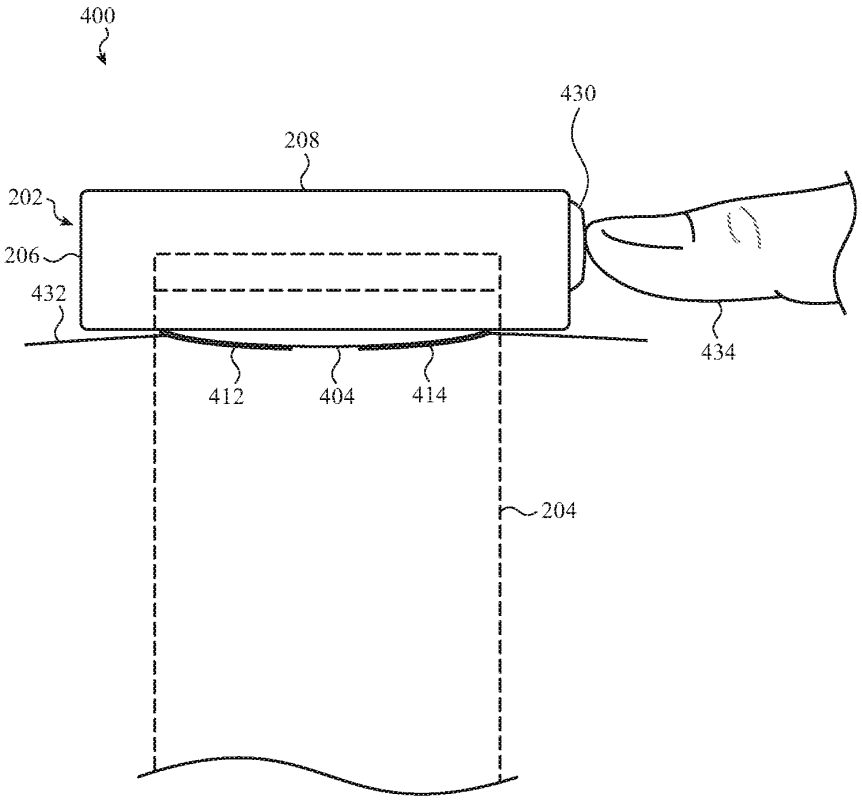


FIG. 4B

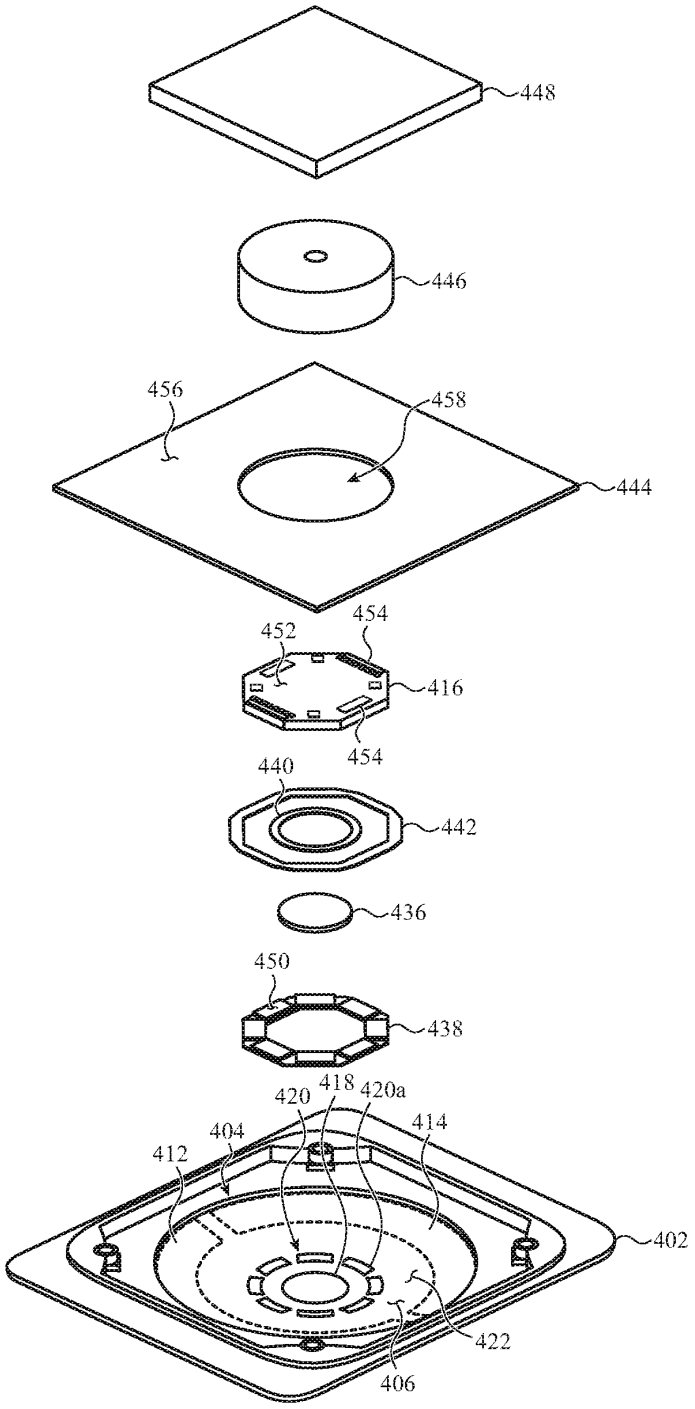

448
446
456
458
444
452
454
416
454
440
442
436
450
438
418
420
420a
414
404
412
402
422
406

FIG. 4C

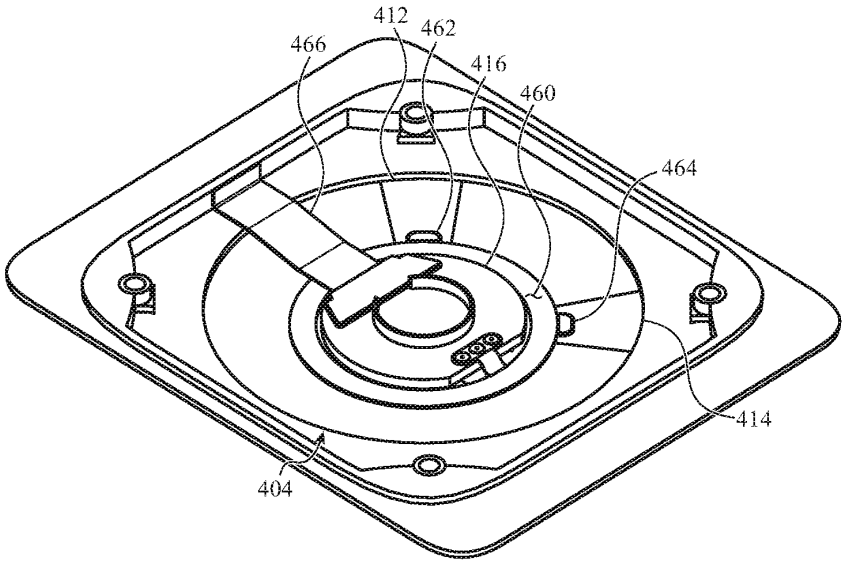


FIG. 4D

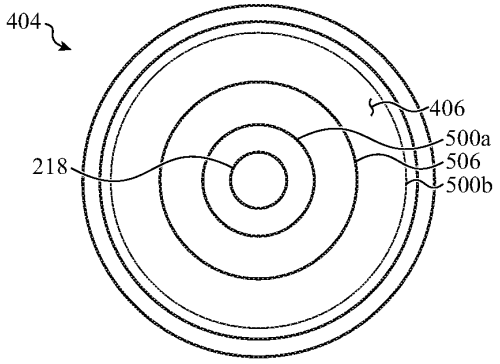


FIG. 5A

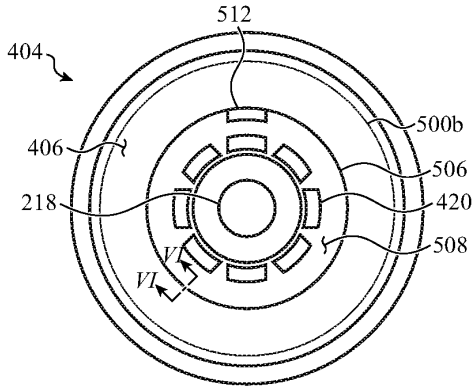


FIG. 5B

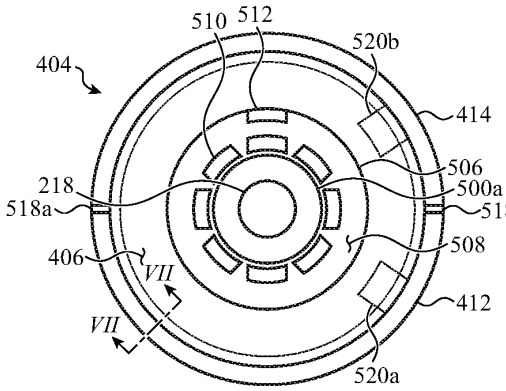


FIG. 5C

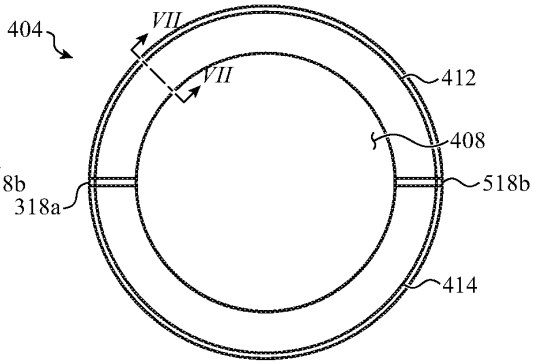


FIG. 5D

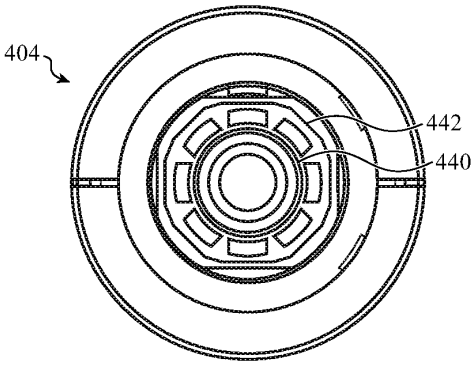


FIG. 5E

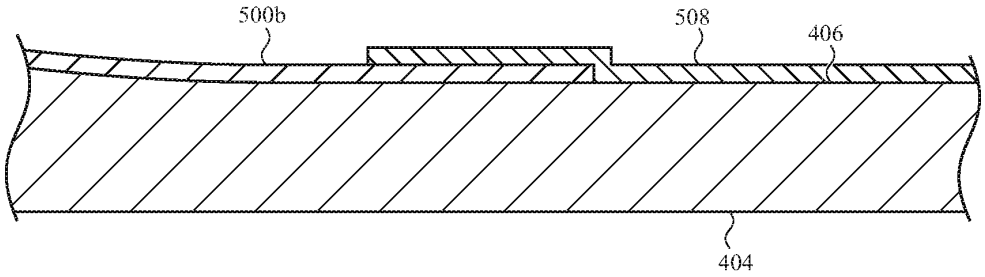


FIG. 6

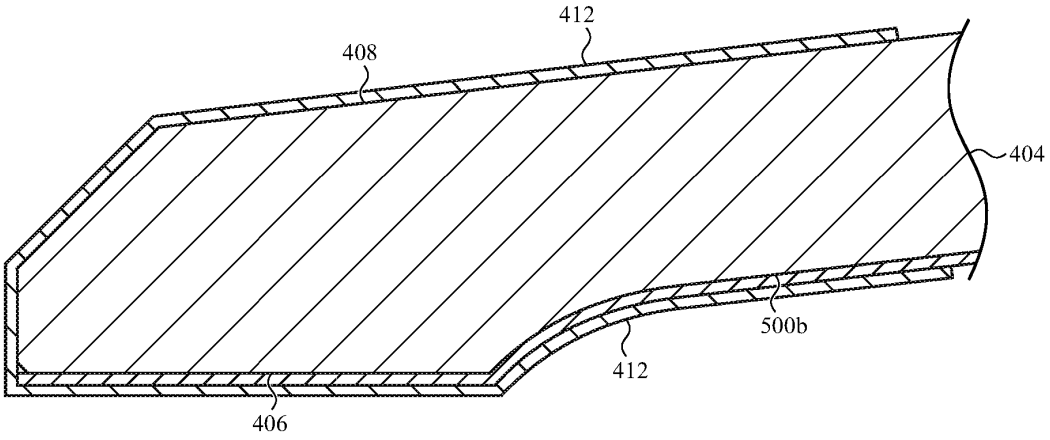


FIG. 7

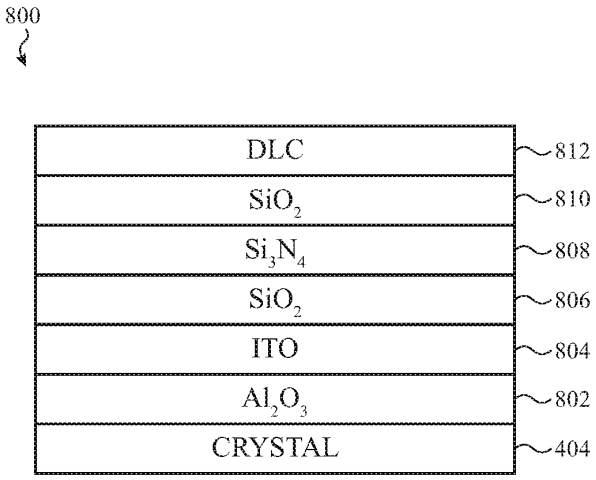

800
DLC
812
SiO_2
810
Si_3N_4
808
SiO_2
806
ITO
804
Al_2O_3
802
CRYSTAL
404

FIG. 8

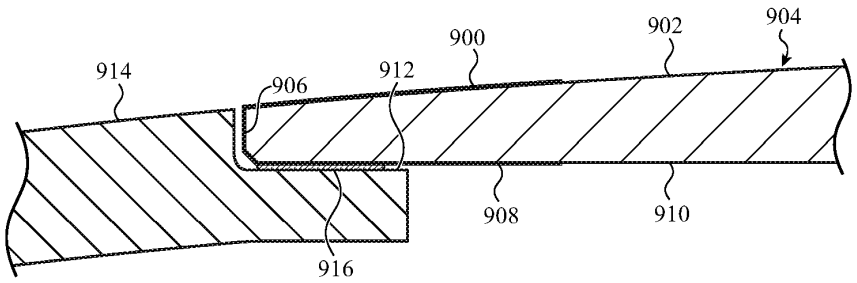


FIG. 9A

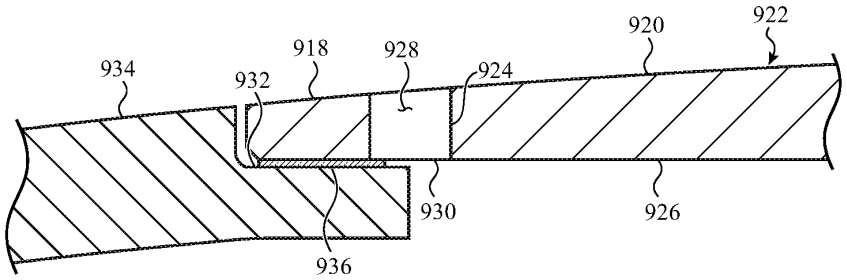


FIG. 9B

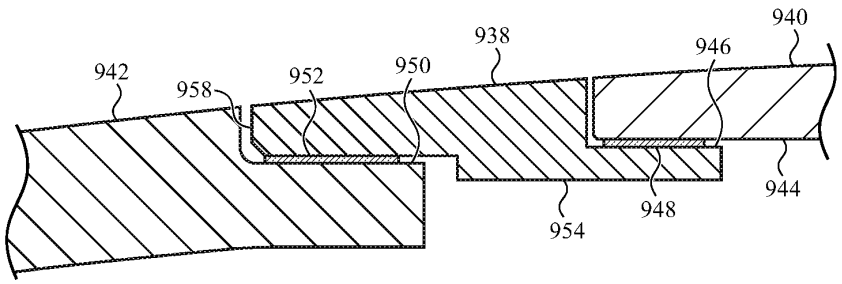


FIG. 9C

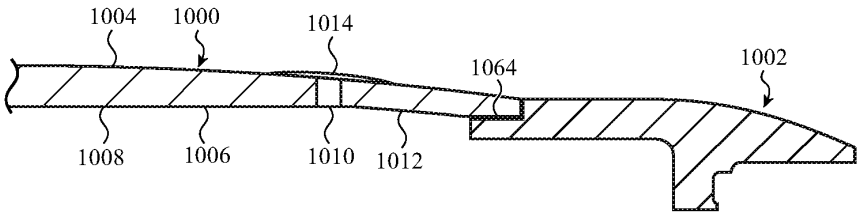


FIG. 10A

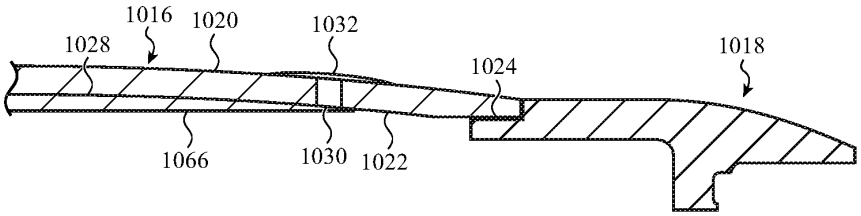


FIG. 10B

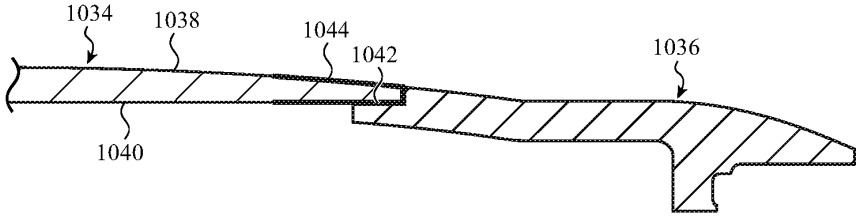


FIG. 10C

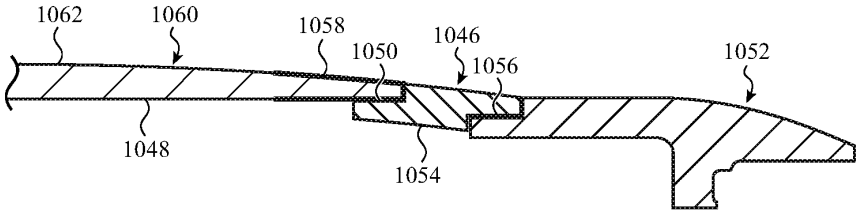


FIG. 10D

Masimo Ex. 1002
IPR Petition - USP 10,987,054

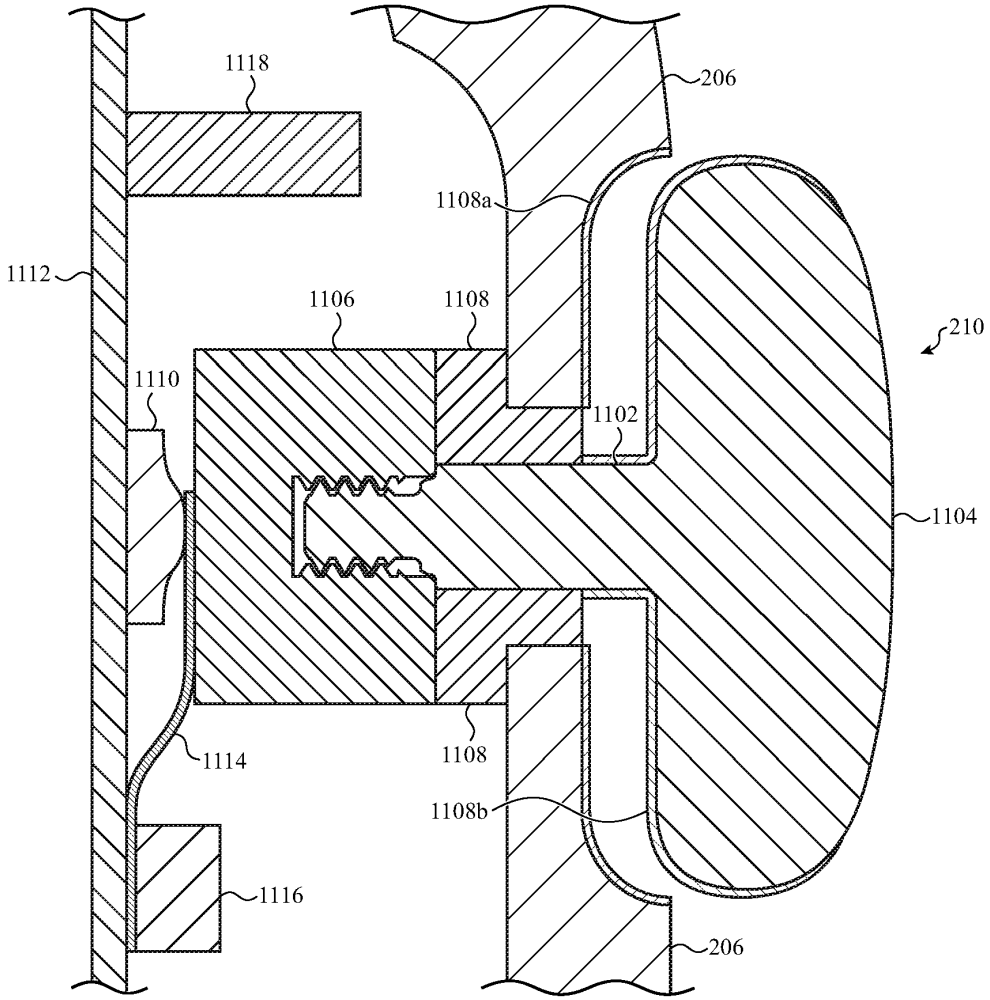

1118
206
1108a
1112
1106
1108
210
1110
1102
1104
1114
1108
1108b
1116
206

FIG. 11A

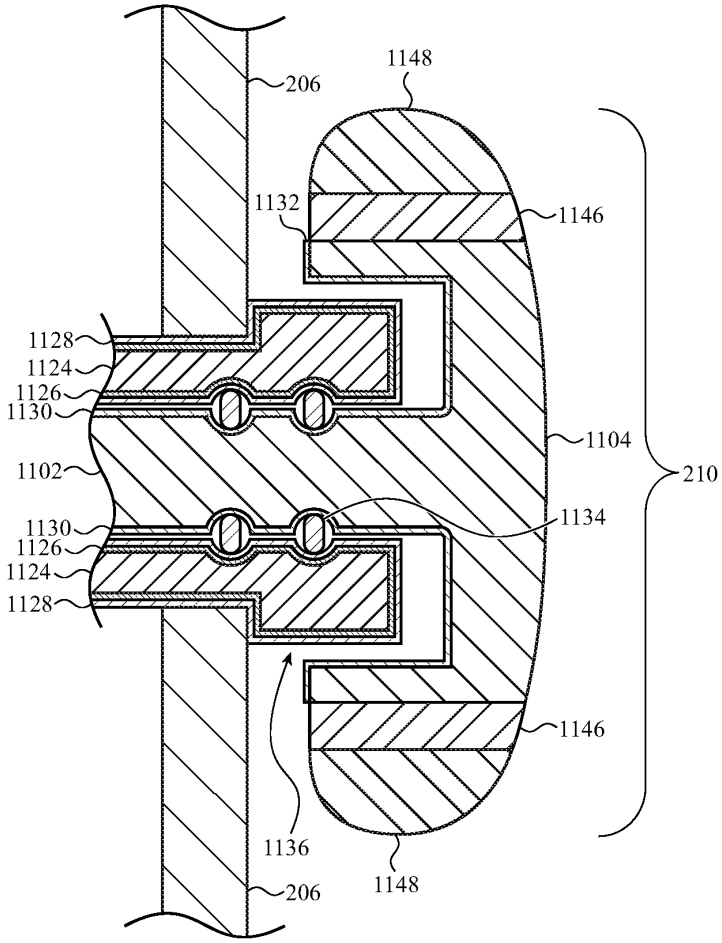

206
1148
1132
1146
1128
1124
1126
1130
1104
210
1102
1130
1134
1126
1124
1128
1146
1136
1148
206

FIG. 11B

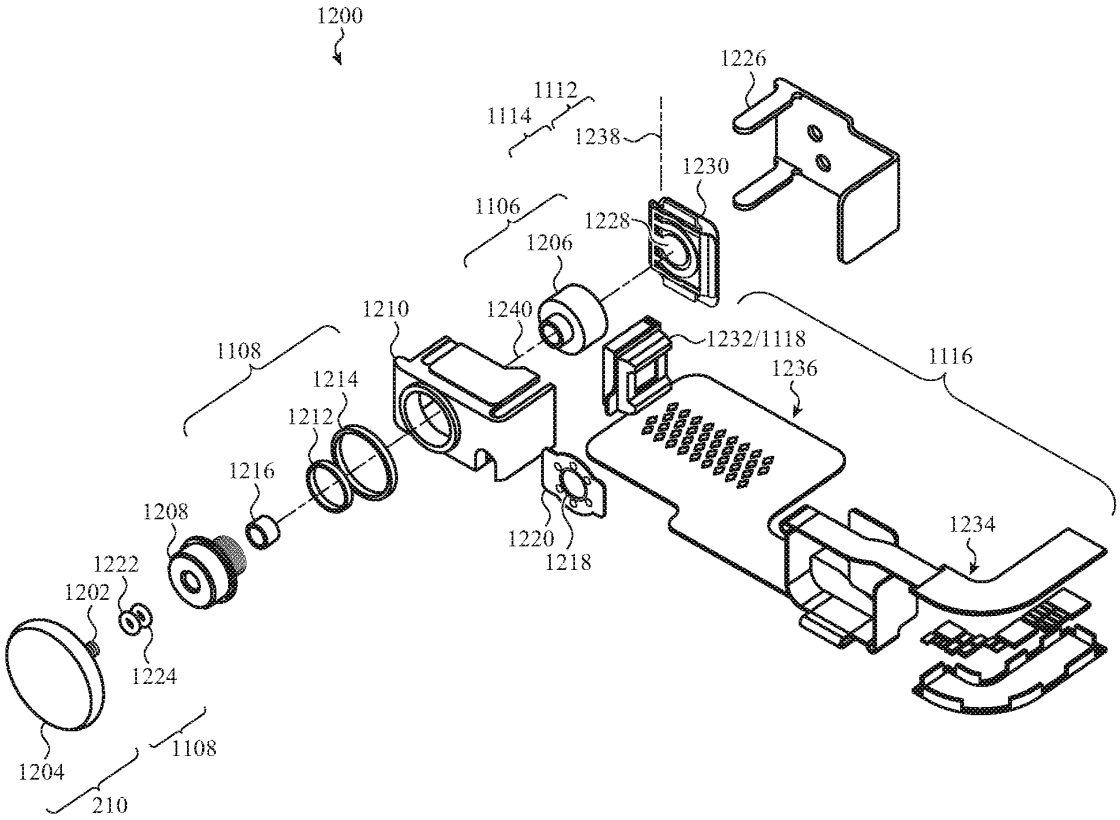

1200
1226
1112
1114
1238
1230
1106
1228
1206
1210
1240
1232/1118
1116
1108
1236
1214
1212
1216
1208
1220
1218
1234
1222
1202
1224
1204
1108
210

FIG. 12A

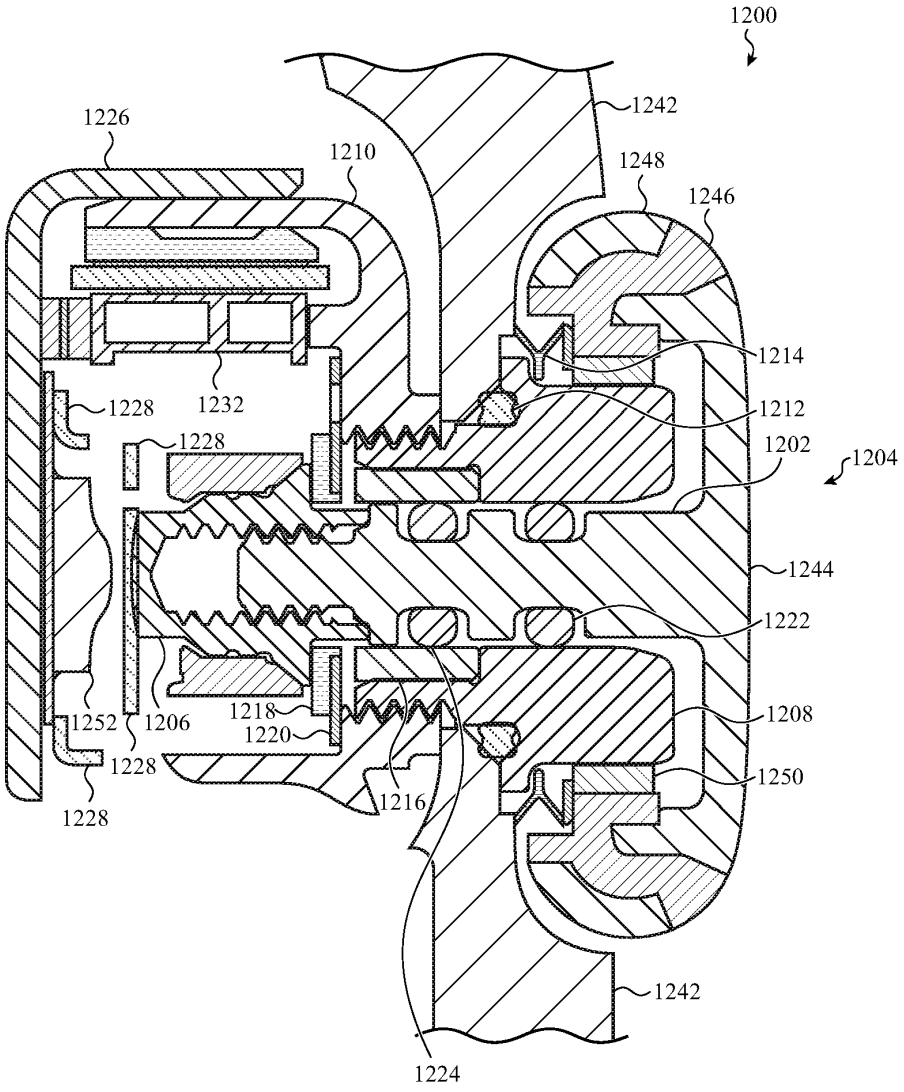

1200
1242
1226
1210
1248
1246
1214
1228
1232
1212
1228
1202
1204
1244
1222
1252
1206
1218
1220
1208
1228
1250
1228
1216
1242
1224

FIG. 12B

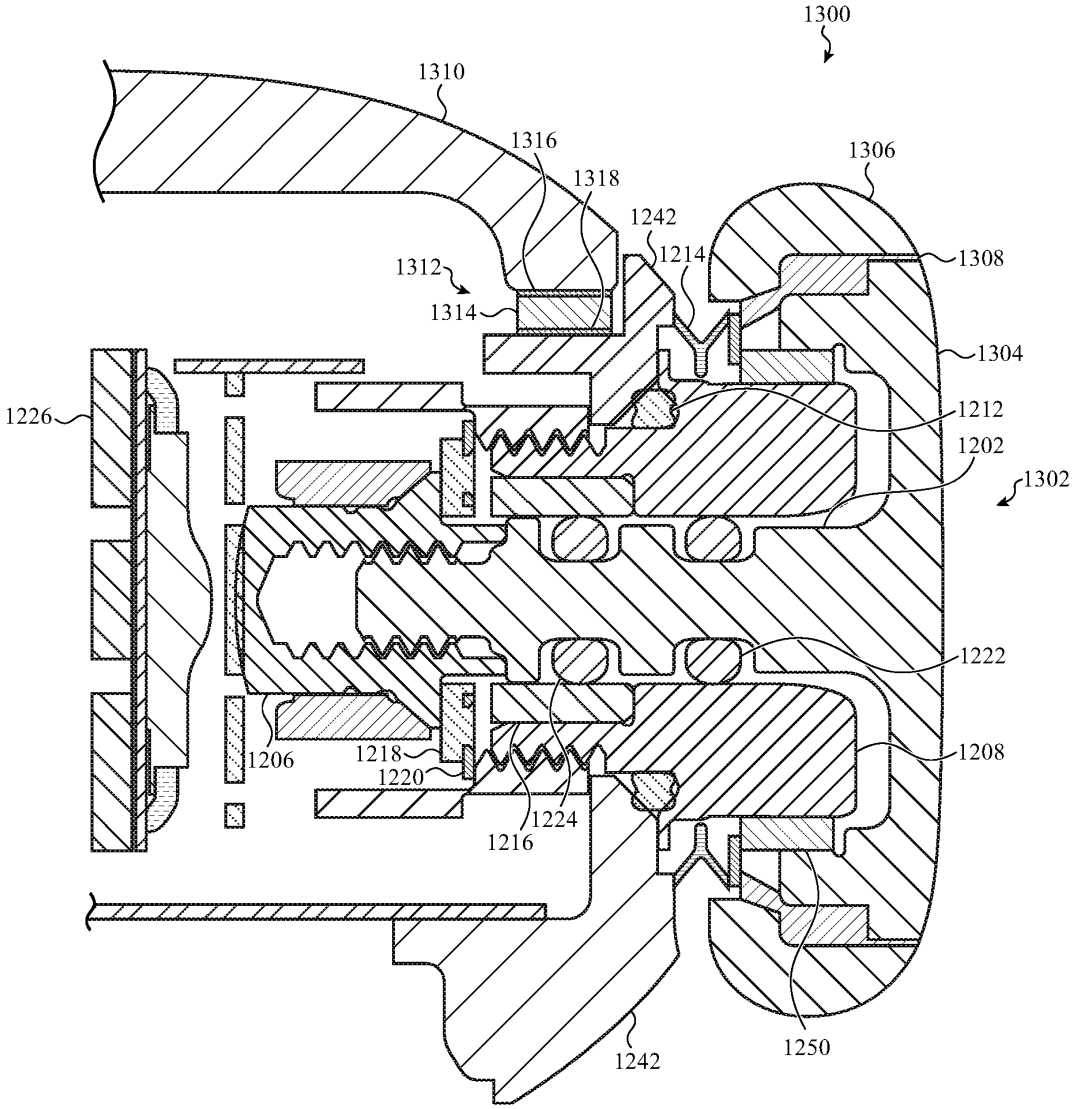

1300
1310
1316
1318
1306
1242
1214
1308
1312
1314
1304
1226
1212
1202
1302
1222
1206
1218
1220
1208
1224
1216
1242
1250

FIG. 13

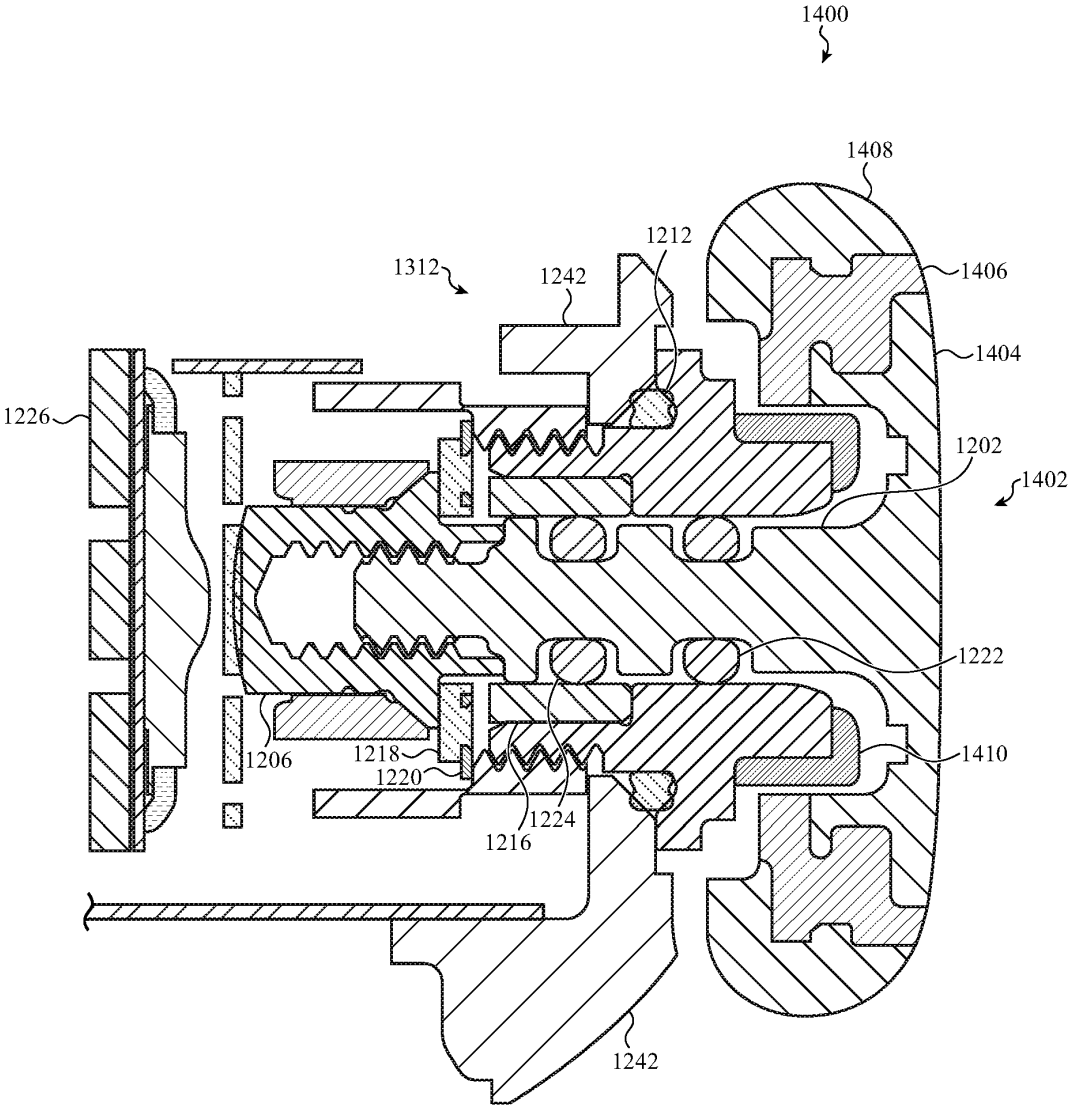

1400
1408
1212
1312
1242
1406
1404
1226
1202
1402
1222
1206
1218
1220
1410
1224
1216
1242

FIG. 14

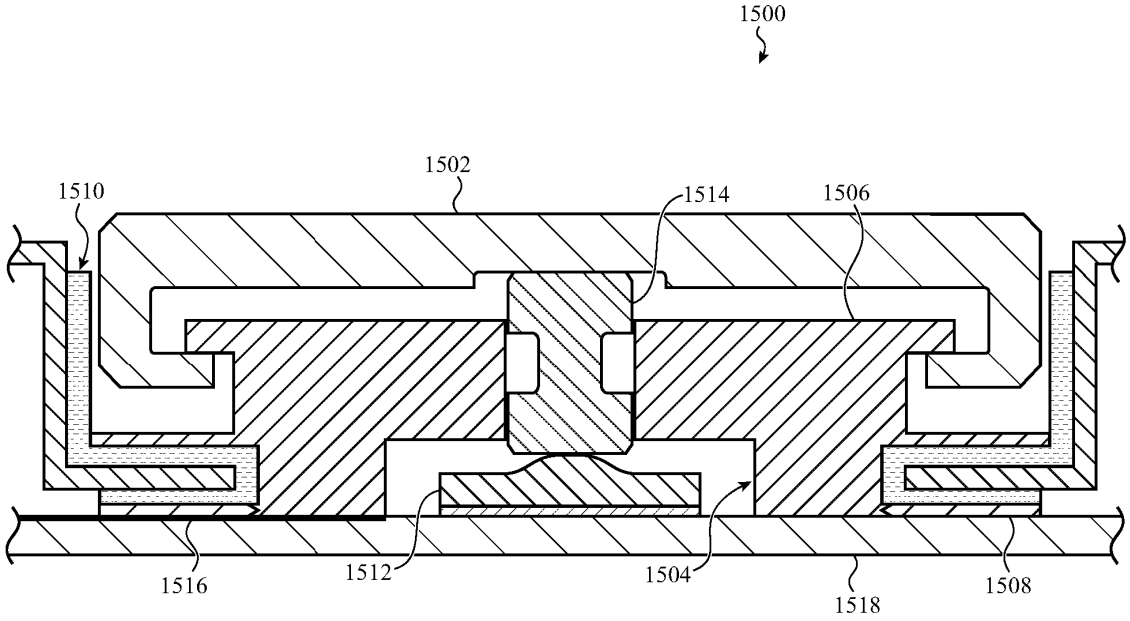


FIG. 15

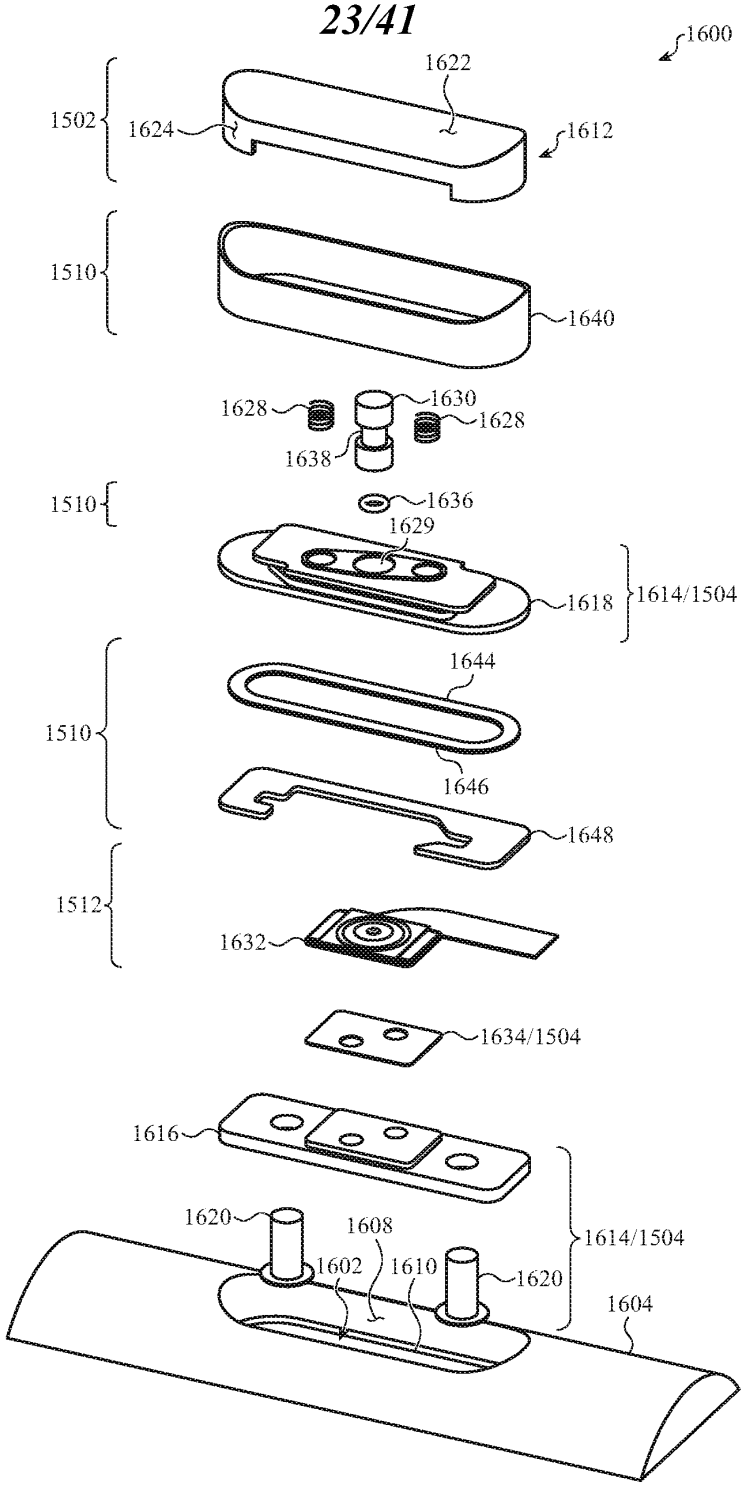

1600
1622
1502
1624
1612
1510
1640
1628
1630
1628
1638
1510
1636
1629
1618
1614/1504
1644
1510
1646
1648
1512
1632
1634/1504
1616
1620
1608
1614/1504
1602
1610
1620
1604

FIG. 16A

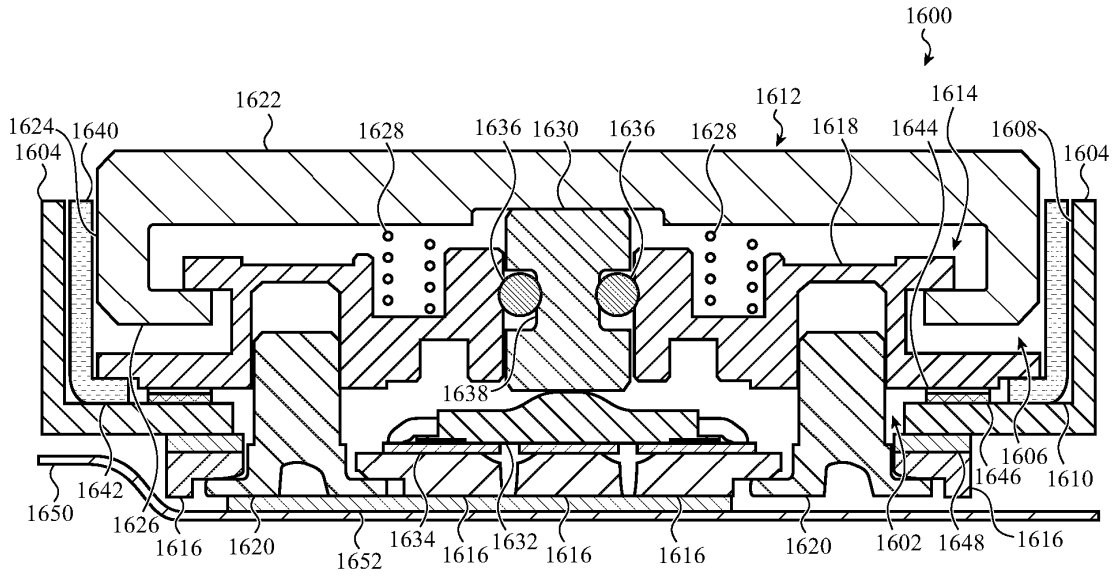

1600
1622
1612
1614
1624
1640
1628
1636
1630
1636
1628
1618
1644
1608
1604
1604
1638
1606
1646
1610
1642
1650
1626
1616
1620
1652
1634
1616
1632
1616
1616
1620
1602
1648
1616

FIG. 16B

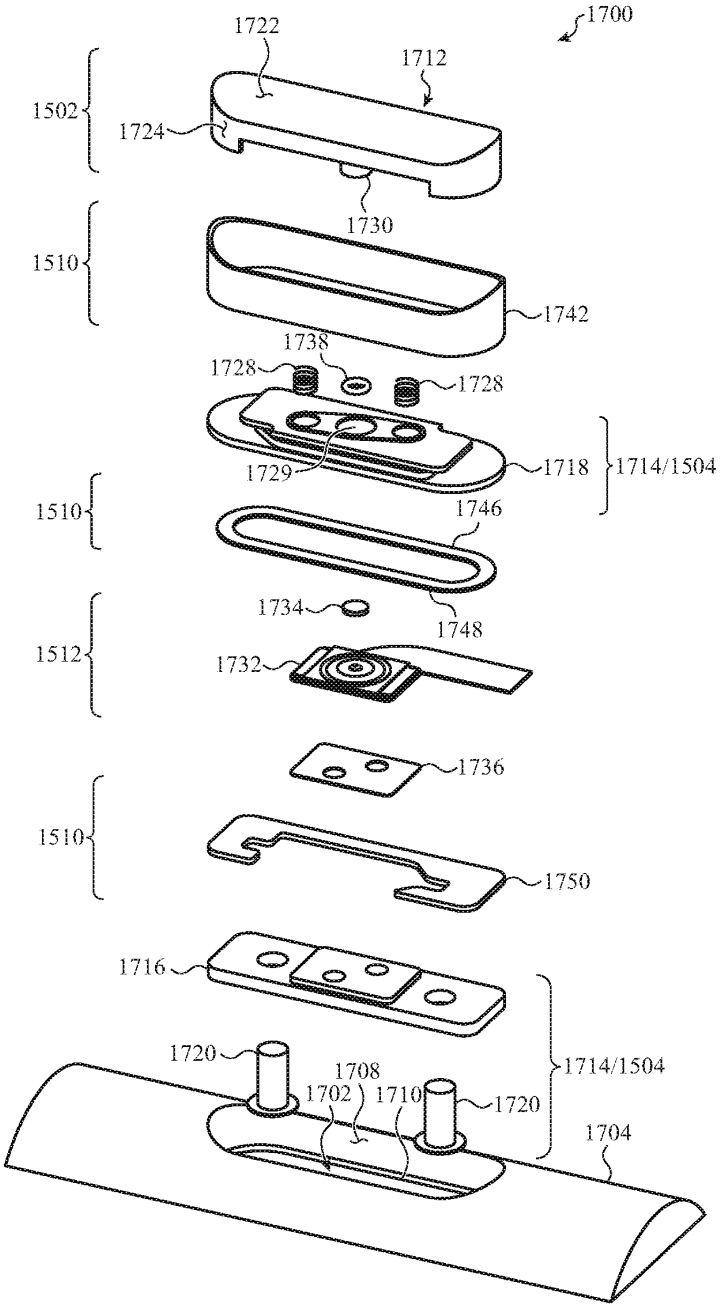

1700
1722
1712
1502
1724
1730
1510
1742
1738
1728
1728
1729
1718
1714/1504
1510
1746
1734
1748
1512
1732
1736
1510
1750
1716
1720
1708
1702
1710
1720
1714/1504
1704

FIG. 17A

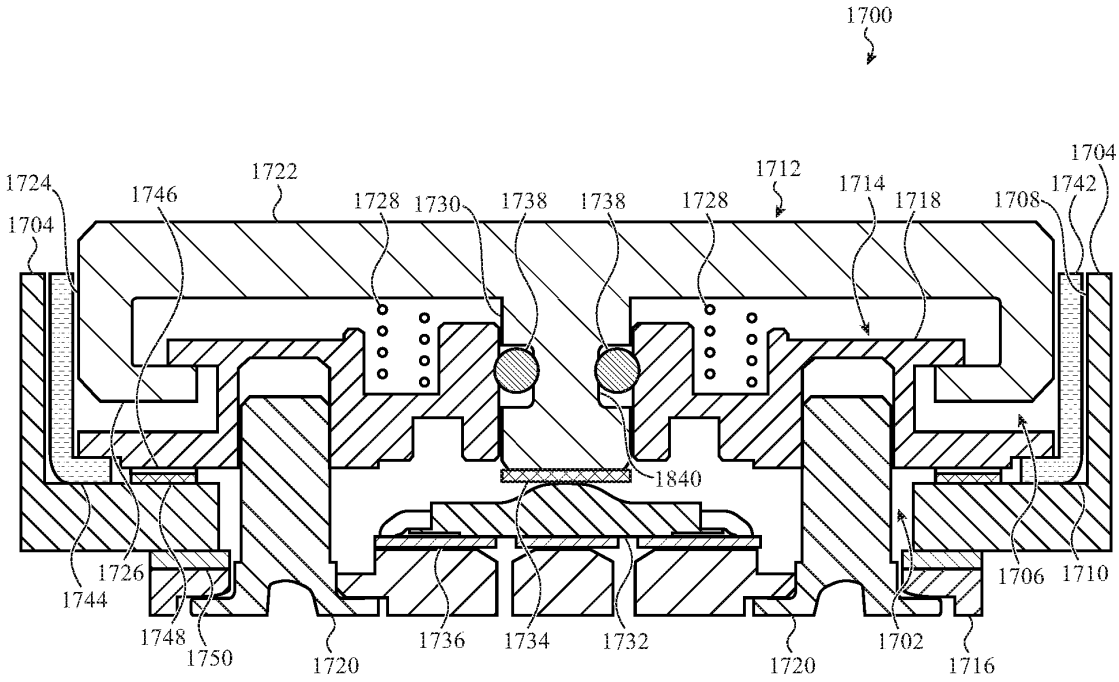

1700
1724
1704
1746
1722
1728
1730
1738
1738
1728
1712
1714
1718
1708
1742
1704
1840
1726
1744
1748
1750
1720
1736
1734
1732
1720
1702
1716
1706
1710

FIG. 17B

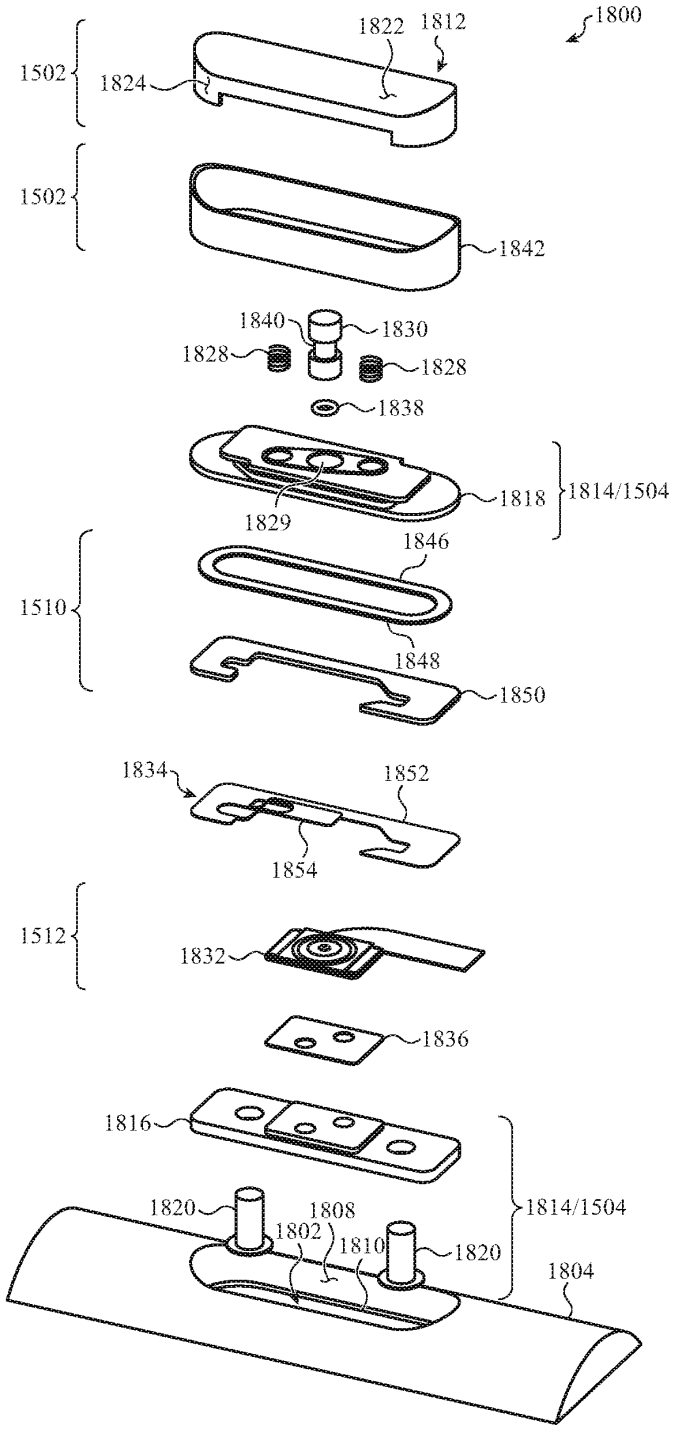

1800
1822
1812
1502
1824
1502
1842
1840
1830
1828
1828
1838
1818
1814/1504
1829
1846
1510
1848
1850
1834
1852
1854
1512
1832
1836
1816
1820
1808
1814/1504
1802
1810
1820
1804

FIG. 18A

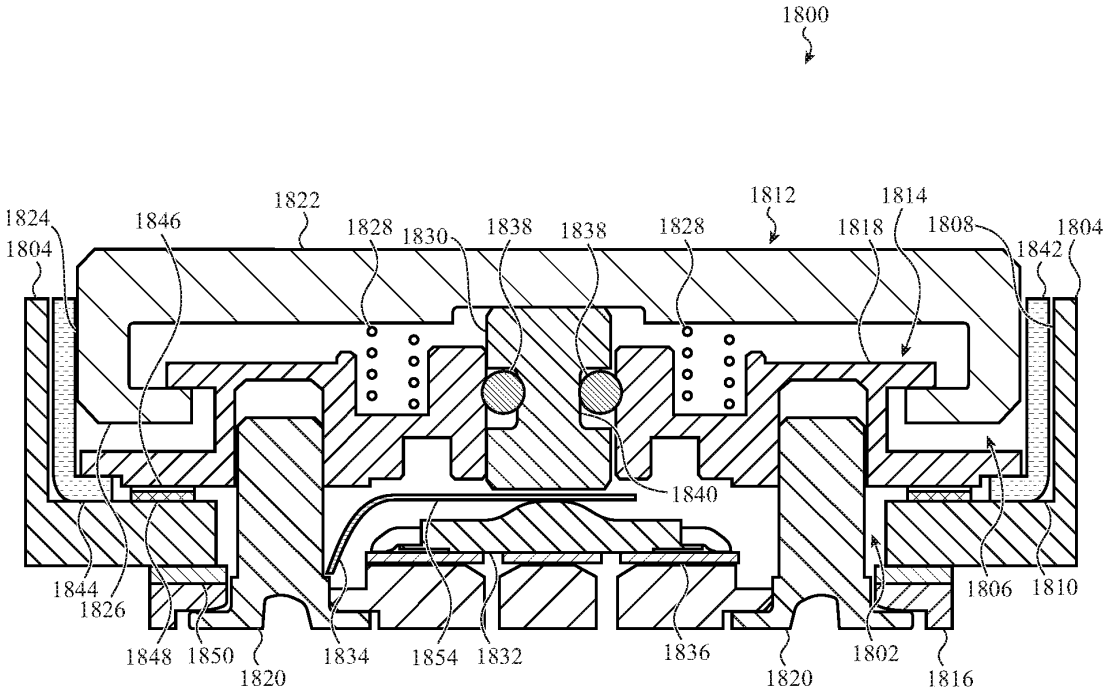

1800
1824
1804
1846
1822
1828
1830
1838
1838
1828
1812
1818
1814
1808
1804
1842
1840
1844
1826
1848
1850
1820
1834
1854
1832
1836
1820
1802
1816
1806
1810

FIG. 18B

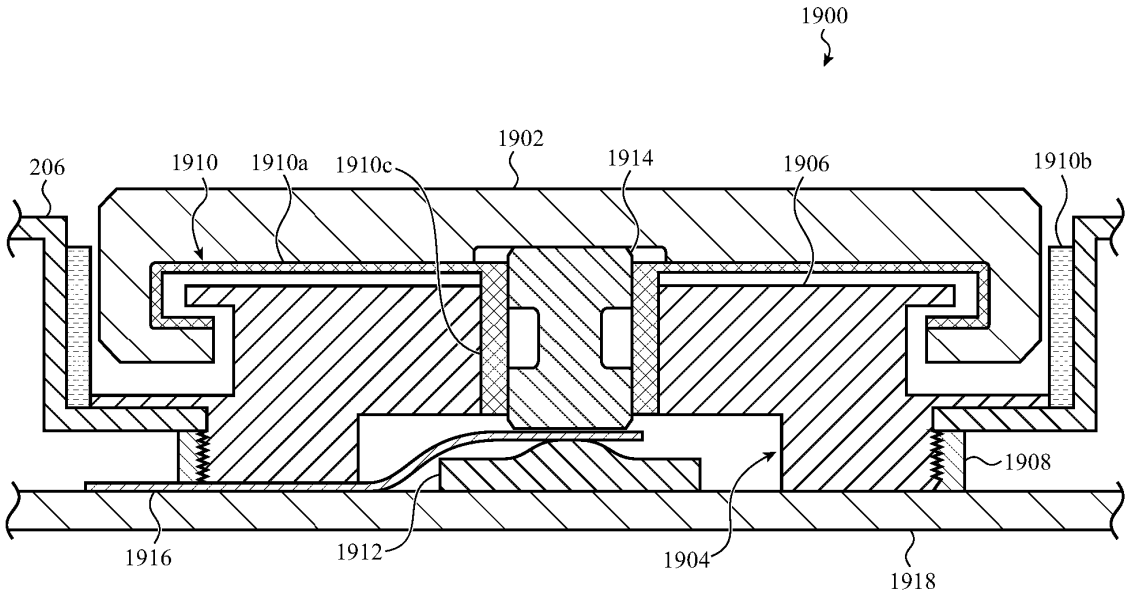

1900
206
1910
1910a
1910c
1902
1914
1906
1910b
1908
1916
1912
1904
1918

FIG. 19

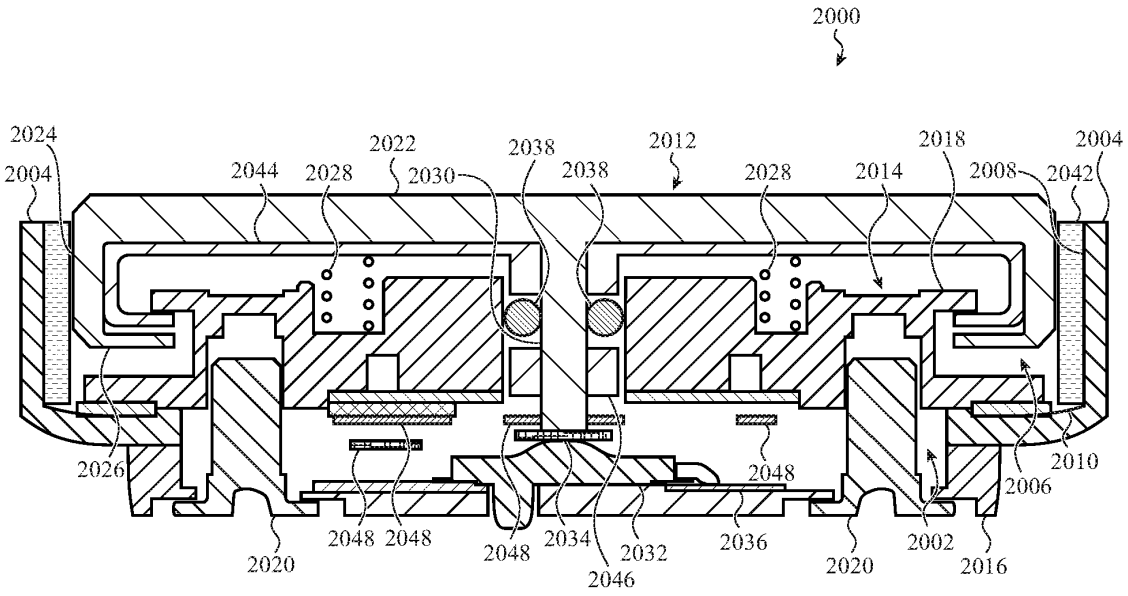

2000
2024
2004
2044
2028
2022
2030
2038
2038
2012
2028
2014
2018
2008
2042
2004
2026
2048
2048
2048
2048
2034
2032
2046
2036
2020
2002
2016
2020
2006
2010

FIG. 20

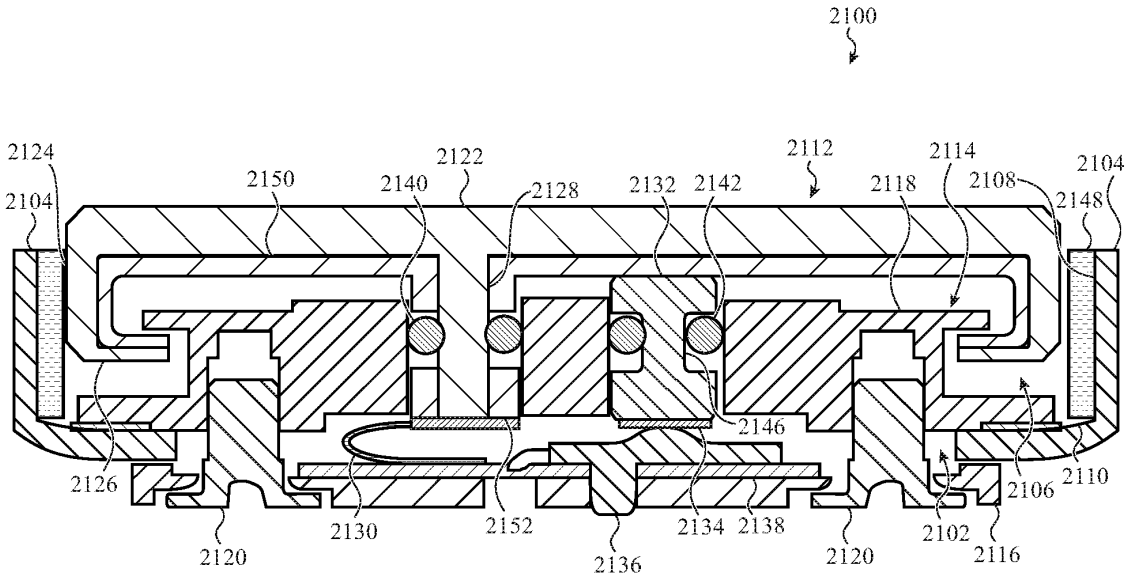

2100
2124
2104
2150
2140
2122
2128
2132
2142
2112
2118
2114
2108
2148
2104
2146
2126
2130
2152
2134
2138
2106
2110
2120
2136
2120
2102
2116

FIG. 21

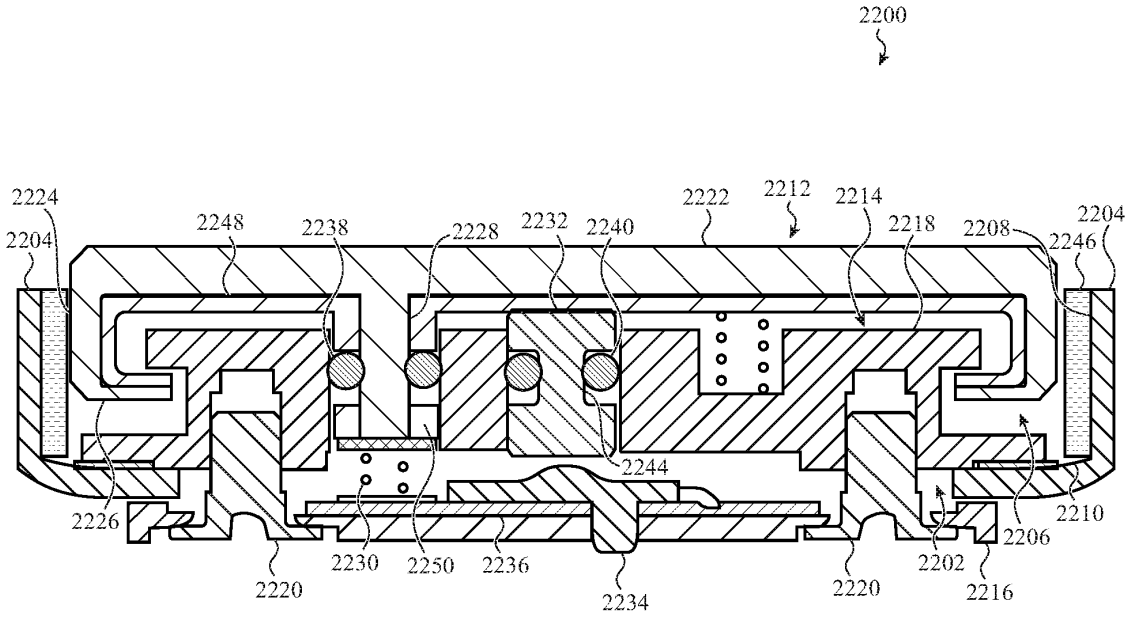

2200
2224
2204
2248
2238
2228
2232
2240
2222
2212
2214
2218
2208
2246
2204
2244
2226
2210
2206
2230
2250
2236
2202
2220
2220
2234
2216

FIG. 22

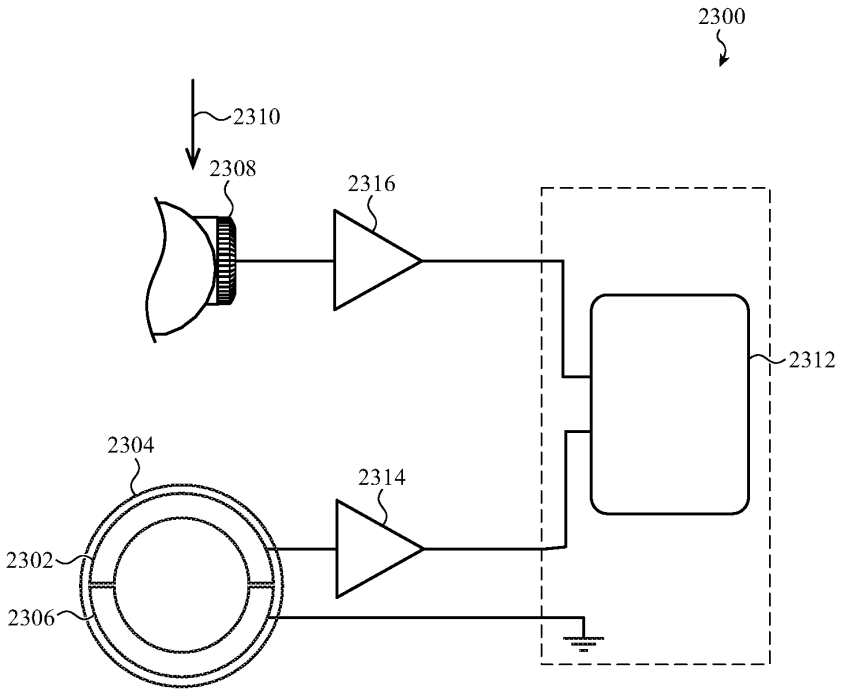


FIG. 23

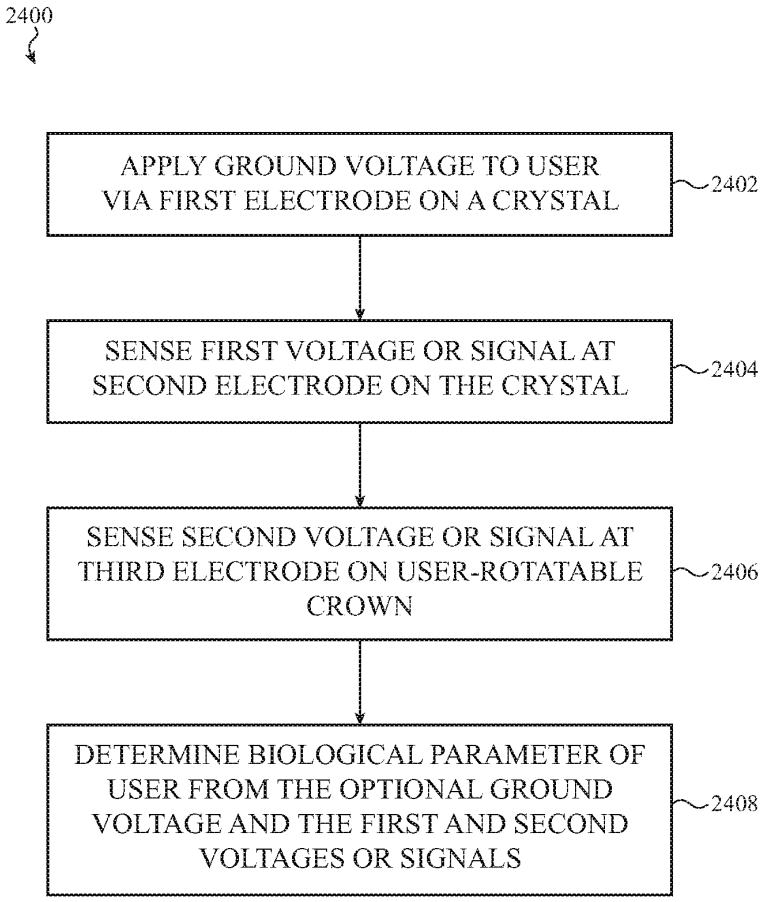

2400
APPLY GROUND VOLTAGE TO USER VIA FIRST ELECTRODE ON A CRYSTAL
2402
SENSE FIRST VOLTAGE OR SIGNAL AT SECOND ELECTRODE ON THE CRYSTAL
2404
SENSE SECOND VOLTAGE OR SIGNAL AT THIRD ELECTRODE ON USER-ROTATABLE CROWN
2406
DETERMINE BIOLOGICAL PARAMETER OF USER FROM THE OPTIONAL GROUND VOLTAGE AND THE FIRST AND SECOND VOLTAGES OR SIGNALS
2408

FIG. 24

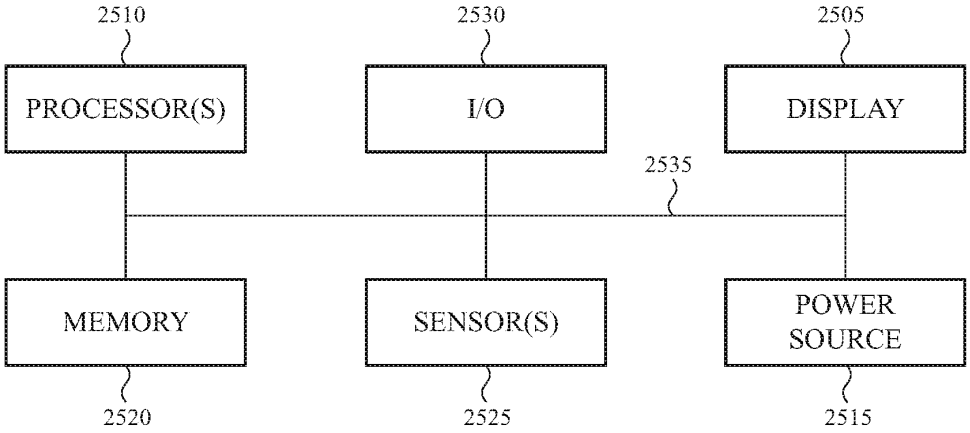

2510
2530
2505
PROCESSOR(S)
I/O
DISPLAY
2535
MEMORY
SENSOR(S)
POWER SOURCE
2520
2525
2515

FIG. 25

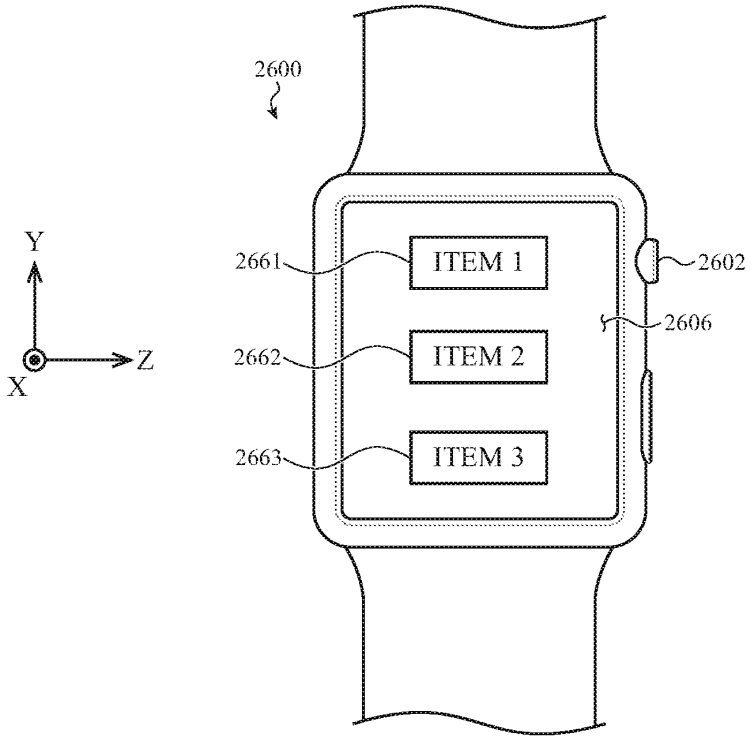


FIG. 26A

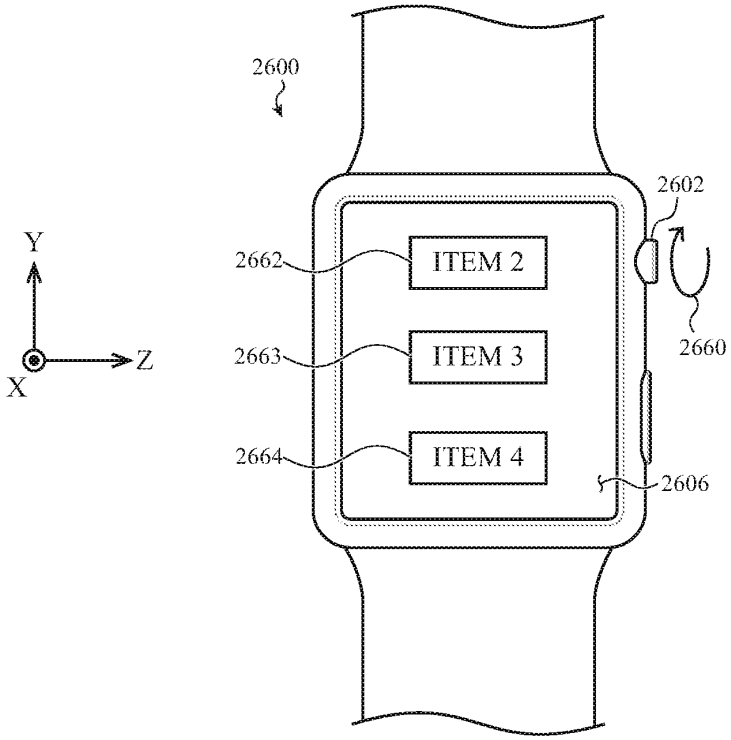


FIG. 26B

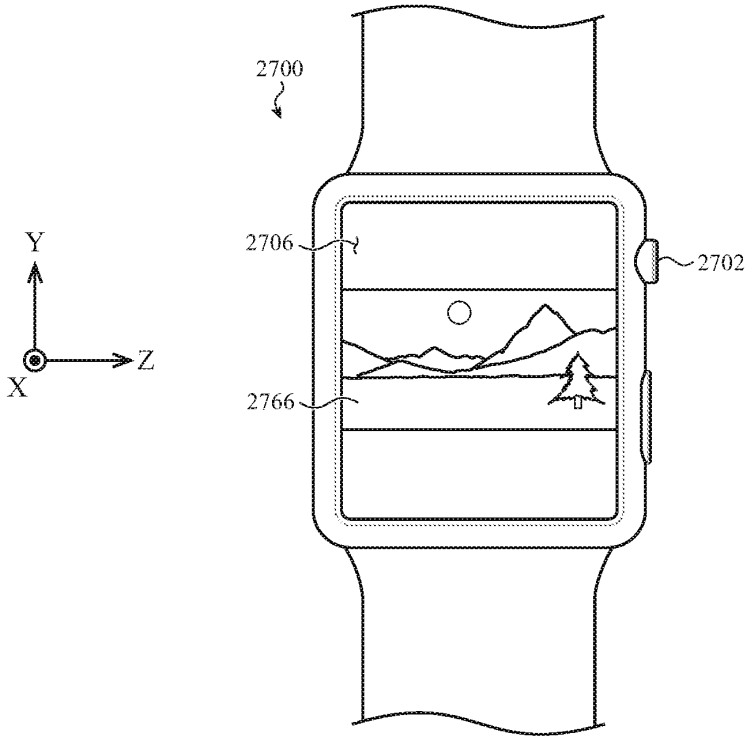


FIG. 27A

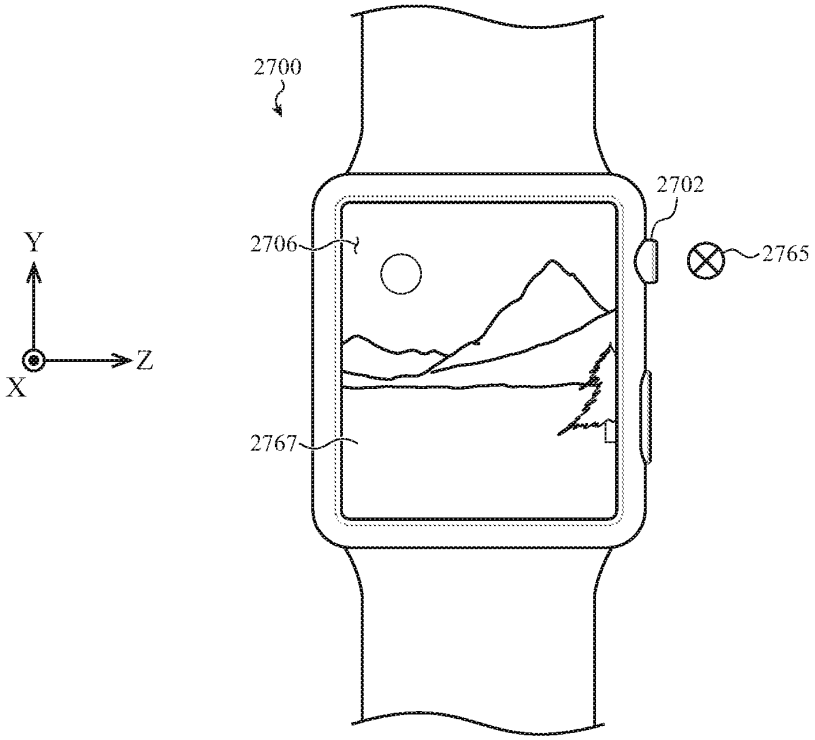


FIG. 27B

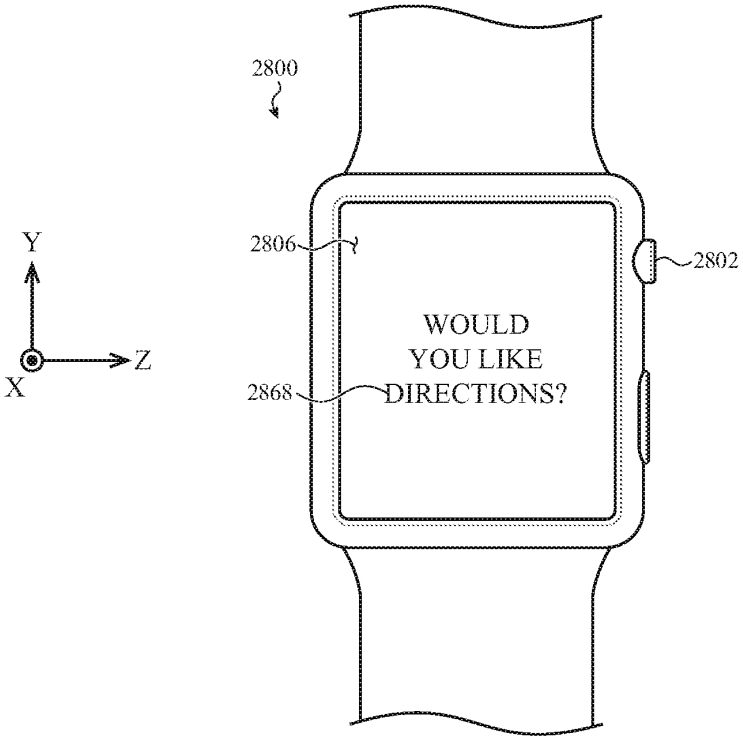


FIG. 28A

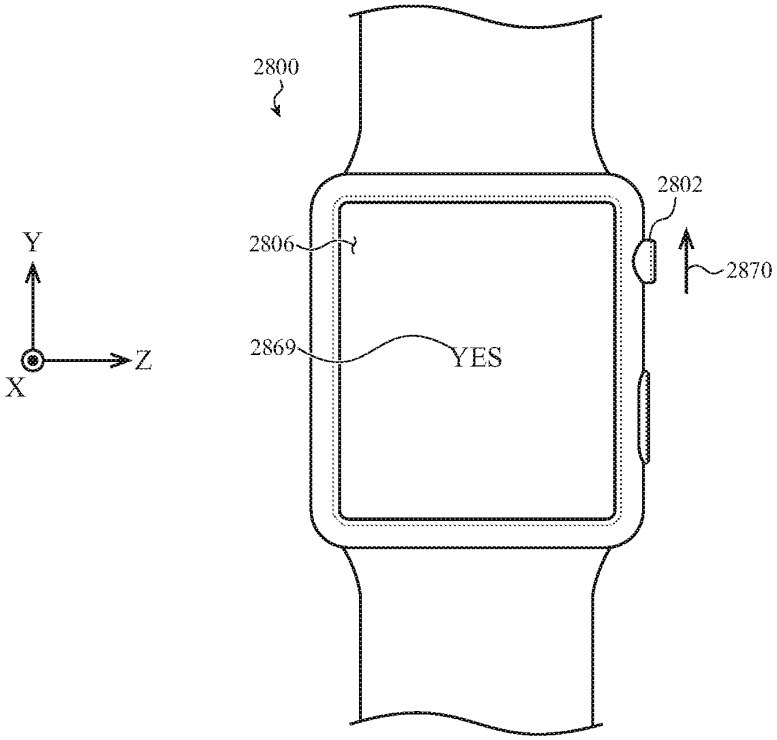


FIG. 28B

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:			
Sameer Pandya, et al.		Examiner:	Not Yet Assigned
Application No. Not Yet Assigned		Art Unit:	Not Yet Assigned
Filed: Herewith		Confirmation No.	Not Yet Assigned
For:	WEARABLE ELECTRONIC DEVICE WITH ELECTRODES FOR SENSING BIOLOGICAL PARAMETERS		

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97(b)(1) and 1.98

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 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 make his or her own determination of materiality. 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.

This Information Disclosure Statement is being filed concurrently with the application. Therefore, pursuant to 37 C.F.R. 1.97(b)(1), no fees are due with respect to 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 has any questions, please contact the undersigned attorney.

Dated: April 6, 2020.

Respectfully submitted,

/Peter J. Nagle/

Peter J. Nagle, Registration No. 70,361
Attorney for Assignee
USPTO Customer No. 62579

Brownstein Hyatt Farber Schreck, LLP
410 Seventeenth Street
Suite 2200
Denver, Colorado 80202
Phone: (303) 223-1100
Fax: (303) 223-1111

PTO/AIA/15 (10-17)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995 no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL

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

Attorney Docket No.	P35079USC2
First Named Inventor	Sameer Pandya
Title	Wearable Electronic Device...
Priority Mail Express® Label No.	Electronic Filing

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* 91] 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* 41]
6. **Inventor's Oath or Declaration** [*Total Pages* 9] *(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:** 1) Certification and Request for Prioritized Examination Under 37 C.F.R. 1.102(e) (Track One Request)
    2) Request for First Action Interview

***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	/Peter J. Nagle/	Date	April 6, 2020
Name (Print/Type)	Peter J. Nagle	Registration No. (Attorney/Agent)	70,361

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.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P35079USC2
	Application Number	
Title of Invention	Wearable Electronic Device with Electrodes for Sensing Biological Parameters	

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
	Sameer		Pandya	

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

City	Sunnyvale	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	One Apple Park Way, MS: 305-1PH		
Address 2			
City	Cupertino	State/Province	CA
Postal Code	95014	Country	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Adam	T.	Clavelle	

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	One Apple Park Way, MS: 305-1PH		
Address 2			
City	Cupertino	State/Province	CA
Postal Code	95014	Country	US

Inventor 3 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Erik	G.	de Jong	

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

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P35079USC2
	Application Number	
Title of Invention	Wearable Electronic Device with Electrodes for Sensing Biological Parameters	

City	San Francisco	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	One Apple Park Way, MS: 305-1DR		
Address 2			
City	Cupertino	State/Province	CA
Postal Code	95014	Country	US

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Michael	B.	Wittenberg	

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	One Apple Park Way, MS: 305-1PH		
Address 2			
City	Cupertino	State/Province	CA
Postal Code	95014	Country	US

Inventor 5 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Tobias	J.	Harrison-Noonan	

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	One Apple Park Way, MS: 83-T		
Address 2			
City	Cupertino	State/Province	CA
Postal Code	95014	Country	US

Inventor 6 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Martin		Melcher	

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

City	Mountain View	State/Province	CA	Country of Residence	US

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P35079USC2
	Application Number	
Title of Invention	Wearable Electronic Device with Electrodes for Sensing Biological Parameters	

Mailing Address of Inventor:

Address 1	One Apple Park Way, MS: 305-1PH		
Address 2			
City	Cupertino	**State/Province**	CA
Postal Code	95014	**Country**	US

Inventor 7 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Zhipeng		Zhang	

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

City	Santa Clara	**State/Province**	CA	**Country of Residence**	US

Mailing Address of Inventor:

Address 1	One Apple Park Way, MS: 305-1PH		
Address 2			
City	Cupertino	**State/Province**	CA
Postal Code	95014	**Country**	US

Inventor 8 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Steven	C.	Roach	

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	One Apple Park Way, MS: 305-1PH		
Address 2			
City	Cupertino	**State/Province**	CA
Postal Code	95014	**Country**	US

Inventor 9 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Steven	P.	Cardinali	

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

City	Campbell	**State/Province**	CA	**Country of Residence**	US

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P35079USC2
	Application Number	
Title of Invention	Wearable Electronic Device with Electrodes for Sensing Biological Parameters	

Mailing Address of Inventor:				
Address 1	601 Almarida Drive, Apt. H6			
Address 2				
City	Campbell	**State/Province**	CA	
Postal Code	95008	**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		Add Email	Remove Email

Application Information:

Title of the Invention	Wearable Electronic Device with Electrodes for Sensing Biological Parameters		
Attorney Docket Number	P35079USC2	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	41	**Suggested Figure for Publication (if any)**	1

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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P35079USC2
	Application Number	
Title of Invention	Wearable Electronic Device with Electrodes for Sensing Biological Parameters	

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	16/193836	2018-11-16
Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/193836	Continuation of	16/118282	2018-08-30
Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/118282	Claims benefit of provisional	62/554196	2017-09-05
Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/118282	Claims benefit of provisional	62/644886	2018-03-19

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

Foreign Priority Information:

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P35079USC2
	Application Number	
Title of Invention	Wearable Electronic Device with Electrodes for Sensing Biological Parameters	

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.

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.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P35079USC2
	Application Number	
Title of Invention	Wearable Electronic Device with Electrodes for Sensing Biological Parameters	

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.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P35079USC2
	Application Number	
Title of Invention	Wearable Electronic Device with Electrodes for Sensing Biological Parameters	

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

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. [x]

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.

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.

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P35079USC2
	Application Number	
Title of Invention	Wearable Electronic Device with Electrodes for Sensing Biological Parameters	

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.

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:

Address 1			
Address 2			
City		**State/Province**	
Country		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

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	/Peter J. Nagle/			Date (YYYY-MM-DD)	2020-04-06
First Name	Peter J.	Last Name	Nagle	Registration Number	70361

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

PTO/AIA/14 (02-18)
Approved for use through 11/30/2020. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	P35079USC2
	Application Number	
Title of Invention	Wearable Electronic Device with Electrodes for Sensing Biological Parameters	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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.**

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 the Freedom of Information Act requires disclosure of these records.

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 CooperationTreaty.

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 inspections or an issued patent.

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

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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 with Electrodes for Sensing Biological Parameters Attorney Docket No. P35079US1

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 16/118,282 filed on August 30, 2018.

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: Sameer Pandya Date (Optional): 9/28/2018

Signature: Sameer Pandya

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.**

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

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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 with Electrodes for Sensing Biological Parameters Attorney Docket No. P35079US1

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 16/118,282 filed on August 30, 2018.

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: Adam T. Clavelle Date (Optional) :

Signature: Adam T Clavelle

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.**

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

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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 with Electrodes for Sensing Biological Parameters Attorney Docket No. P35079US1

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 16/118,282 filed on August 30, 2018.

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.

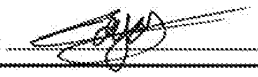
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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: Erik G. de Jong Date (Optional): 9/17/18

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.**

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

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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 with Electrodes for Sensing Biological Parameters Attorney Docket No. P35079US1

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 16/118,282 filed on August 30, 2018.

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: Michael B. Wittenberg Date (Optional): 9/13/18

Signature: Michael B. Wittenberg

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.**

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

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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 with Electrodes for Sensing Biological Parameters Attorney Docket No. P35079US1

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 16/118,282 filed on August 30, 2018.

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: Tobias J. Harrison-Noonan Date (Optional): 9/13/18

Signature: Tobias Harrison-Noonan

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.**

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

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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 with Electrodes for Sensing Biological Parameters Attorney Docket No. P35079US1

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 16/118,282 filed on August 30, 2018.

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: Martin Melcher Date (Optional): 9/20/2018

Signature: Martin Melcher

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.**

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

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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 with Electrodes for Sensing Biological Parameters Attorney Docket No. P35079US1

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 _____

  filed on _____.

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.

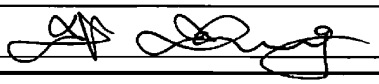
I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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: Zhipeng Zhang Date (Optional): 8/23/2018

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.**

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

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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 with Electrodes for Sensing Biological Parameters Attorney Docket No. P35079US1

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 _____

  filed on _____.

The above-identified application was made or authori ed 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 authori ation 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 authori ation 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: Steven C. Roach Date (Optional): 8/29/18

Signature: Steven C. Roach

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.**

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

PTO/SB/01 (08-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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 with Electrodes for Sensing Biological Parameters Attorney Docket No. P3607US1

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 16/118,282 filed on August 30, 2018

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: Steven P. Cardinali Date (Optional): 9/26/18

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.**

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

Masimo Ex. 1002
IPR Petition - USP 10,987,054

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 11/30/2014. OMB 0651-0051
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	Not Yet Assigned
Filing Date	Herewith
First Named Inventor	Sameer Pandya
Title	Wearable Electronic Device with Electrodes for Sensing Biological Parameters
Art Unit	Not Yet Assigned
Examiner Name	Not Yet Assigned
Attorney Docket Number	P35079USC2

SIGNATURE of Applicant or Patent Practitioner

Signature	/Peter J. Nagle/	Date (Optional)	April 6, 2020
Name	Peter J. Nagle	Registration Number	70,361
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 _____ 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.**

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

Masimo Ex. 1002
IPR Petition - USP 10,987,054

DocCode – SCORE

SCORE Placeholder Sheet for IFW Content

Application Number: 16841543 Document Date: 04/06/2020

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

- Drawing

At the time of document entry (noted above):

- USPTO employees may access SCORE content via DAV or via the SCORE web page.
- External customers may access SCORE content via PAIR using the Supplemental Content tab.

Form Revision Date: March 1, 2019

Masimo Ex. 1002
IPR Petition - USP 10,987,054