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Application Number: 16409515 Document Date: 05/10/2019

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Form Revision Date: March 1, 2019

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:	Jeroen Poeze	Nonprovisional Application Number (if known):	Herewith
Title of Invention:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS		

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 /Scott Cromar/	Date 2019-05-10
Name (Print/Typed) Scott Cromar	Practitioner Registration Number 65066

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.**

☑ *Total of 1 forms are submitted.

Privacy Act Statement

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

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

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

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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	Unknown
Filing Date	Herewith
First Named Inventor	Jeroen Poeze
Title	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
Art Unit	Unknown
Examiner Name	Unknown
Attorney Docket Number	MASCER.002C8

SIGNATURE of Applicant or Patent Practitioner

Signature	/Scott Cromar/	Date (Optional)	2019-05-10
Name	Scott Cromar	Registration Number	65066
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

Doc Code: PA..

Document Description: Power of Attorney

PTO/AIA/82B(07-12)
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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):

64735

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	/TCM/	Date	7/12/13
Name	Thomas McClenahan	Telephone	(949) 297-7000
Title and Company	Executive Vice President and General Counsel, Masimo Corporation		

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 1 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.

Please Direct All Correspondence to Customer Number 64735

RESCISSION OF ANY PRIOR DISCLAIMERS AND REQUEST TO REVISIT ART

Inventor	:	Jeroen Poeze
App. No	:	Unknown
Filed	:	Herewith
For	:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
Examiner	:	Unknown
Art Unit	:	Unknown
Conf #	:	Unknown

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

Dear Commissioner:

The claims of the present application are different and possibly broader in scope than the claims pursued in the parent application(s). To the extent any prior amendments or characterizations of the scope of any claim or referenced art could be construed as a disclaimer of any subject matter supported by the present disclosure, Applicant hereby rescinds and retracts such disclaimer. Accordingly, the references previously considered in the parent application(s) may need to be re-visited.

Knobbe, Martens, Olson & Bear, LLP

Respectfully submitted,

Dated: May 10, 2019

/Scott Cromar/_____
Scott A. Cromar
Registration No. 65,066
Registered Practitioner
Customer No. 64735
(949) 760-0404

30489688

Electronic Patent Application Fee Transmittal	
Application Number:	
Filing Date:	
Title of Invention:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
First Named Inventor/Applicant Name:	Jeroen Poeze
Filer:	Scott Cromar/Frances Tsai
Attorney Docket Number:	MASCER.002C8
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:				
UTILITY APPL SIZE FEE PER 50 SHEETS >100	1081	1	400	400
Claims:				
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**6260**

Electronic Acknowledgement Receipt	
EFS ID:	35979477
Application Number:	16409515
International Application Number:	
Confirmation Number:	8759
Title of Invention:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
First Named Inventor/Applicant Name:	Jeroen Poeze
Customer Number:	64735
Filer:	Scott Cromar/Jennifer Neat
Filer Authorized By:	Scott Cromar
Attorney Docket Number:	MASCER.002C8
Receipt Date:	10-MAY-2019
Filing Date:	
Time Stamp:	17:39:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$6260
RAM confirmation Number	051319INTEFSW17403700
Deposit Account	111410
Authorized User	Jennifer Neat
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	ADS_MASCER002C8.PDF	1258060 22c06d6f402f827fe36a5cdaef18e152a6455ea4	no	14
Warnings:					
Information:					
2		SPEC_MASCER002C8.pdf	353407 a37c9a406d5bc1568828abd4455de53cf3b1cef9	yes	76

Multipart Description/PDF files in .zip description

Document Description	Start	End
Abstract	76	76
Claims	75	75
Specification	1	74

Warnings:					
Information:					
3	Drawings-other than black and white line drawings	FIGS_MASCER002C8.pdf	1408200 4a641fba9dcf76755e6869d8884cf2ffe26af8cf	no	65
Warnings:					
Information:					
4	Oath or Declaration filed	DEC_MASCER002C8.PDF	2491038 477f3018977f0a209ae755e2c3415f3b930710e9	no	12
Warnings:					

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Information:

5	TrackOne Request	TRACK1_MASCER002C8.PDF	128265 a9351feeac00c0a43ab7fa82c62d4a4ec7f69c12	no	2
Warnings:					
Information:					
6	Power of Attorney	POA_MASCER002C8.PDF	541539 a8ad47632ce2e1996d782fc888b567966e3c98fe	no	2
Warnings:					
Information:					
7	Miscellaneous Incoming Letter	RESC_MASCER002C8.PDF	16028 ee3c41a45a617a988f19e5b079b30fac23dd88b0	no	1
Warnings:					
Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	41680 bee439a7ac12863e122dee652c3fbd54d69547b9	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	6238217		

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.

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

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

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
	Jeroen		Poeze	

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

City	Rancho Santa Margarita	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	53 Tierra Seguro		
Address 2			
City	Rancho Santa Margarita	State/Province	CA
Postal Code	92688	Country	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Marcelo		Lamego	

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

City	Cupertino	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	10292 Orange Avenue		
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
	Sean		Merritt	

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

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

City	Lake Forest	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	25111 Paseo Arboleda		
Address 2			
City	Lake Forest	State/Province	CA
Postal Code	92630	Country	US

Inventor 4 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Cristiano		Dalvi	

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

City	Lake Forest	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	23972 Oswego St.		
Address 2			
City	Lake Forest	State/Province	CA
Postal Code	92630	Country	US

Inventor 5 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Hung		Vo	

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

City	Fountain Valley	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	18849 Teton Cir		
Address 2			
City	Fountain Valley	State/Province	CA
Postal Code	92708	Country	US

Inventor 6 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Johannes		Bruinsma	

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

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

City	Opeinde	Country of Residence i	NL

Mailing Address of Inventor:

Address 1	Teije Blauwsingel 45		
Address 2			
City	Opeinde	State/Province	
Postal Code	9218 RT	Country i	NL

Inventor 7 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Ferdyan		Lesmana	

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

City	Irvine	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	42 New Season		
Address 2			
City	Irvine	State/Province	CA
Postal Code	92602	Country i	US

Inventor 8 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Massi	Joe E.	Kiani	

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

City	Laguna Niguel	State/Province	CA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	1 Point Catalina		
Address 2			
City	Laguna Niguel	State/Province	CA
Postal Code	92677	Country i	US

Inventor 9 — Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Greg		Olsen	

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

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
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

City	Lake Forest	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	24498 Copper Cliff Court		
Address 2			
City	Lake Forest	**State/Province**	CA
Postal Code	92630	**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	64735		
Email Address	efiling@knobbe.com	Add Email	Remove Email

Application Information:

Title of the Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS		
Attorney Docket Number	MASCER.002C8	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	65	**Suggested Figure for Publication (if any)**	

Filing By Reference:

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

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

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

Publication Information:

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

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

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

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	64735		

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	16/261326	2019-01-29
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16/261326	Continuation of	16/212537	2018-12-06	10258266	2019-04-16

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
16/212537	Continuation of	14/981290	2015-12-28
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14/981290	Continuation of	12/829352	2010-07-01	9277880	2016-03-08

Prior Application Status	Abandoned		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/829352	Continuation of	12/534827	2009-08-03

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/534827	Claims benefit of provisional	61/086060	2008-08-04
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/534827	Claims benefit of provisional	61/086108	2008-08-04
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/534827	Claims benefit of provisional	61/086063	2008-08-04
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/534827	Claims benefit of provisional	61/086057	2008-08-04
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/534827	Claims benefit of provisional	61/091732	2008-08-25
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12/829352	Continuation in part of	12/497528	2009-07-02	8577431	2013-11-05

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/497528	Claims benefit of provisional	61/086060	2008-08-04
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/497528	Claims benefit of provisional	61/086108	2008-08-04
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/497528	Claims benefit of provisional	61/086063	2008-08-04

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/497528	Claims benefit of provisional	61/086057	2008-08-04
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/497528	Claims benefit of provisional	61/078228	2008-07-03
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/497528	Claims benefit of provisional	61/078207	2008-07-03
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/497528	Claims benefit of provisional	61/091732	2008-08-25
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12/497528	Continuation in part of	29/323408	2008-08-25	D606659	2009-12-22
Prior Application Status	Patented				Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12/497528	Continuation in part of	29/323409	2008-08-25	D621516	2010-08-10
Prior Application Status	Patented				Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12/829352	Continuation in part of	12/497523	2009-07-02	8437825	2013-05-07
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number			Filing or 371(c) Date (YYYY-MM-DD)
12/497523	Claims benefit of provisional	61/086060			2008-08-04
Prior Application Status	Expired				Remove
Application Number	Continuity Type	Prior Application Number			Filing or 371(c) Date (YYYY-MM-DD)
12/497523	Claims benefit of provisional	61/086108			2008-08-04

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/497523	Claims benefit of provisional	61/086063	2008-08-04
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/497523	Claims benefit of provisional	61/086057	2008-08-04
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/497523	Claims benefit of provisional	61/078228	2008-07-03
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/497523	Claims benefit of provisional	61/078207	2008-07-03
Prior Application Status	Expired		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
12/497523	Claims benefit of provisional	61/091732	2008-08-25
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12/497523	Continuation in part of	29/323408	2008-08-25	D606659	2009-12-22

Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12/497523	Continuation in part of	29/323409	2008-08-25	D621516	2010-08-10

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

Foreign Priority Information:

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

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)

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

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

Applicant Information:

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

Applicant 1 Remove

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

Clear

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

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

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name	Masimo Corporation		
Mailing Address Information For Applicant:			
Address 1	52 Discovery		
Address 2			
City	Irvine	**State/Province**	CA
Country	US	Postal Code	92618
Phone Number		Fax Number	
Email Address			

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

Assignee Information including Non-Applicant Assignee Information:

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

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

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.

Remove

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 i		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. Add

Signature:

Remove

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	/Scott Cromar/			Date (YYYY-MM-DD)	2019-05-10
First Name	Scott	Last Name	Cromar	Registration Number	65066

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	MASCER.002C8
	Application Number	
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	

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.**

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

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

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether 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.

ABSTRACT OF THE DISCLOSURE

The present disclosure relates to noninvasive methods, devices, and systems for measuring various blood constituents or analytes, such as glucose. In an embodiment, a light source comprises LEDs and super-luminescent LEDs. The light source emits light at least wavelengths of about 1610 nm, about 1640 nm, and about 1665 nm. In an embodiment, the detector comprises a plurality of photodetectors arranged in a special geometry comprising one of a substantially linear substantially equal spaced geometry, a substantially linear substantially non-equal spaced geometry, and a substantially grid geometry.

WHAT IS CLAIMED IS:

1. A noninvasive device capable of producing a signal responsive to light attenuated by tissue at a measurement site, the device comprising:

an optical source configured to emit optical radiation at least at wavelengths between about 1600 nm and about 1700 nm; and

a plurality of photodetectors each configured to detect the optical radiation from said optical source after attenuation by said tissue of said measurement site and each output a respective signal stream responsive to said detected optical radiation.

MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

RELATED APPLICATIONS

[0001] This application is a continuation of U.S. Patent Application No. 16/261326, filed January 29, 2019, which is a continuation of U.S. Patent Application No. 16/212,537, filed December 6, 2018, which is a continuation of U.S. Patent Application No. 14/981,290 filed December 28, 2015, which is a continuation of U.S. Patent Application No. 12/829,352 filed July 1, 2010, which is a continuation of U.S. Patent Application No. 12/534,827 filed August 3, 2009, which claims the benefit of priority under 35 U.S.C. § 119(e) of the following U.S. Provisional Patent Application Nos. 61/086,060 filed August 4, 2008, 61/086,108 filed August 4, 2008, 61/086,063 filed August 4, 2008, 61/086,057 filed August 4, 2008, and 61/091,732 filed August 25, 2008. U.S. Patent Application No. 12/829,352 is also a continuation-in-part of U.S. Patent Application No. 12/497,528 filed July 2, 2009, which claims the benefit of priority under 35 U.S.C. § 119(e) of the following U.S. Provisional Patent Application Nos. 61/086,060 filed August 4, 2008, 61/086,108 filed August 4, 2008, 61/086,063 filed August 4, 2008, 61/086,057 filed August 4, 2008, 61/078,228 filed July 3, 2008, 61/078,207 filed July 3, 2008, and 61/091,732 filed August 25, 2008. U.S. Patent Application No. 12/497,528 also claims the benefit of priority under 35 U.S.C. § 120 as a continuation-in-part of the following U.S. Design Patent Application Nos. 29/323,409 filed August 25, 2008 and 29/323,408 filed August 25, 2008. U.S. Patent Application No. 12/829,352 is also a continuation-in-part of U.S. Patent Application No. 12/497,523 filed July 2, 2009, which claims the benefit of priority under 35 U.S.C. § 119(e) of the following U.S. Provisional Patent Application Nos. 61/086,060 filed August 4, 2008, 61/086,108 filed August 4, 2008, 61/086,063 filed August 4, 2008, 61/086,057 filed August 4, 2008, 61/078,228 filed July 3, 2008, 61/078,207 filed July 3, 2008, and 61/091,732 filed August 25, 2008. U.S. Patent Application No. 12/497,523 also claims the benefit of priority under 35 U.S.C. § 120 as a continuation-in-part of the following

U.S. Design Patent Application Nos. 29/323,409 filed August 25, 2008 and 29/323,408 filed August 25, 2008.

[0002] This application is related to the following U.S. Patent Applications:

App. No.	Filing Date	Title	Attorney Docket
12/497,528	7/2/09	*Noise Shielding for Noninvasive Device*	MASCER.006A
12/497,523	7/2/09	*Contoured Protrusion for Improving Spectroscopic Measurement of Blood Constituents*	MASCER.007A
12/497,506	7/2/09	*Heat Sink for Noninvasive Medical Sensor*	MASCER.011A
12/534,812	8/3/09	*Multi-Stream Sensor Front Ends for Non-Invasive Measurement of Blood Constituents*	MASCER.003A
12/534,823	8/3/09	*Multi-Stream Sensor for Non-Invasive Measurement of Blood Constituents*	MASCER.004A
12/534,825	8/3/09	*Multi-Stream Emitter for Non-Invasive Measurement of Blood Constituents*	CERCA.005A

[0003] The foregoing applications are hereby incorporated by reference in their entirety.

BACKGROUND

[0004] The standard of care in caregiver environments includes patient monitoring through spectroscopic analysis using, for example, a pulse oximeter. Devices capable of spectroscopic analysis generally include a light source(s) transmitting optical radiation into or reflecting off a measurement site, such as, body tissue carrying pulsing blood. After attenuation by tissue and fluids of the measurement site, a photodetection device(s) detects the attenuated light and outputs a detector signal(s) responsive to the detected attenuated light. A signal

processing device(s) process the detector(s) signal(s) and outputs a measurement indicative of a blood constituent of interest, such as glucose, oxygen, met hemoglobin, total hemoglobin, other physiological parameters, or other data or combinations of data useful in determining a state or trend of wellness of a patient.

[0005] In noninvasive devices and methods, a sensor is often adapted to position a finger proximate the light source and light detector. For example, noninvasive sensors often include a clothespin-shaped housing that includes a contoured bed conforming generally to the shape of a finger.

SUMMARY

[0006] This disclosure describes embodiments of noninvasive methods, devices, and systems for measuring a blood constituent or analyte, such as oxygen, carbon monoxide, methemoglobin, total hemoglobin, glucose, proteins, glucose, lipids, a percentage thereof (e.g., saturation) or for measuring many other physiologically relevant patient characteristics. These characteristics can relate, for example, to pulse rate, hydration, trending information and analysis, and the like.

[0007] In an embodiment, the system includes a noninvasive sensor and a patient monitor communicating with the noninvasive sensor. The non-invasive sensor may include different architectures to implement some or all of the disclosed features. In addition, an artisan will recognize that the non-invasive sensor may include or may be coupled to other components, such as a network interface, and the like. Moreover, the patient monitor may include a display device, a network interface communicating with any one or combination of a computer network, a handheld computing device, a mobile phone, the Internet, or the like. In addition, embodiments may include multiple optical sources that emit light at a plurality of wavelengths and that are arranged from the perspective of the light detector(s) as a point source.

[0008] In an embodiment, a noninvasive device is capable of producing a signal responsive to light attenuated by tissue at a measurement site. The device may comprise an optical source and a plurality of photodetectors. The optical source is configured to emit optical radiation at least at wavelengths between about 1600 nm and about 1700 nm. The photodetectors are configured to detect the optical radiation from said optical source after attenuation by the tissue of the measurement site and each output a respective signal stream responsive to the detected optical radiation.

[0009] In an embodiment, a noninvasive, physiological sensor is capable of outputting a signal responsive to a blood analyte present in a monitored patient. The sensor may comprise a sensor housing, an optical source, and photodetectors. The optical source is positioned by the housing with respect to a tissue site of a patient when said housing is applied to the patient. The photodetectors are

positioned by the housing with respect to said tissue site when the housing is applied to the patient with a variation in path length among at least some of the photodetectors from the optical source. The photodetectors are configured to detect a sequence of optical radiation from the optical source after attenuation by tissue of the tissue site. The photodetectors may be each configured to output a respective signal stream responsive to the detected sequence of optical radiation. An output signal responsive to one or more of the signal streams is then usable to determine the blood analyte based at least in part on the variation in path length.

[0010] In an embodiment, a method of measuring an analyte based on multiple streams of optical radiation measured from a measurement site is provided. A sequence of optical radiation pulses is emitted to the measurement site. At a first location, a first stream of optical radiation is detected from the measurement site. At least at one additional location different from the first location, an additional stream of optical radiation is detected from the measurement site. An output measurement value indicative of the analyte is then determined based on the detected streams of optical radiation.

[0011] In various embodiments, the present disclosure relates to an interface for a noninvasive sensor that comprises a front-end adapted to receive an input signals from optical detectors and provide corresponding output signals. In an embodiment, the front-end is comprised of switched-capacitor circuits that are capable of handling multiple streams of signals from the optical detectors. In another embodiment, the front-end comprises transimpedance amplifiers that are capable of handling multiple streams of input signals. In addition, the transimpedance amplifiers may be configured based on the characteristics of the transimpedance amplifier itself, the characteristics of the photodiodes, and the number of photodiodes coupled to the transimpedance amplifier.

[0012] In disclosed embodiments, the front-ends are employed in noninvasive sensors to assist in measuring and detecting various analytes. The disclosed noninvasive sensor may also include, among other things, emitters and detectors positioned to produce multi-stream sensor information. An artisan will recognize that the noninvasive sensor may have different architectures and may

include or be coupled to other components, such as a display device, a network interface, and the like. An artisan will also recognize that the front-ends may be employed in any type of noninvasive sensor.

[0013] In an embodiment, a front-end interface for a noninvasive, physiological sensor comprises: a set of inputs configured to receive signals from a plurality of detectors in the sensor; a set of transimpedance amplifiers configured to convert the signals from the plurality of detectors into an output signal having a stream for each of the plurality of detectors; and an output configured to provide the output signal.

[0014] In an embodiment, a front-end interface for a noninvasive, physiological sensor comprises: a set of inputs configured to receive signals from a plurality of detectors in the sensor; a set of switched capacitor circuits configured to convert the signals from the plurality of detectors into a digital output signal having a stream for each of the plurality of detectors; and an output configured to provide the digital output signal.

[0015] In an embodiment, a conversion processor for a physiological, noninvasive sensor comprises: a multi-stream input configured to receive signals from a plurality of detectors in the sensor, wherein the signals are responsive to optical radiation from a tissue site; a modulator that converts the multi-stream input into a digital bit-stream; and a signal processor that produces an output signal from the digital bit-stream.

[0016] In an embodiment, a front-end interface for a noninvasive, physiological sensor comprises: a set of inputs configured to receive signals from a plurality of detectors in the sensor; a set of respective transimpedance amplifiers for each detector configured to convert the signals from the plurality of detectors into an output signal having a stream for each of the plurality of detectors; and an output configured to provide the output signal.

[0017] In certain embodiments, a noninvasive sensor interfaces with tissue at a measurement site and deforms the tissue in a way that increases signal gain in certain desired wavelengths.

[0018] In some embodiments, a detector for the sensor may comprise a set of photodiodes that are arranged in a spatial configuration. This spatial configuration may allow, for example, signal analysis for measuring analytes like glucose. In various embodiments, the detectors can be arranged across multiple locations in a spatial configuration. The spatial configuration provides a geometry having a diversity of path lengths among the detectors. For example, the detector in the sensor may comprise multiple detectors that are arranged to have a sufficient difference in mean path length to allow for noise cancellation and noise reduction.

[0019] In an embodiment, a physiological, noninvasive detector is configured to detect optical radiation from a tissue site. The detector comprises a set of photodetectors and a conversion processor. The set of photodetectors each provide a signal stream indicating optical radiation from the tissue site. The set of photodetectors are arranged in a spatial configuration that provides a variation in path lengths between at least some of the photodetectors. The conversion processor that provides information indicating an analyte in the tissue site based on ratios of pairs of the signal streams.

[0020] The present disclosure, according to various embodiments, relates to noninvasive methods, devices, and systems for measuring a blood analyte, such as glucose. In the present disclosure, blood analytes are measured noninvasively based on multi-stream infrared and near-infrared spectroscopy. In some embodiments, an emitter may include one or more sources that are configured as a point optical source. In addition, the emitter may be operated in a manner that allows for the measurement of an analyte like glucose. In embodiments, the emitter may comprise a plurality of LEDs that emit a sequence of pulses of optical radiation across a spectrum of wavelengths. In addition, in order to achieve the desired SNR for detecting analytes like glucose, the emitter may be driven using a progression from low power to higher power. The emitter may also have its duty cycle modified to achieve a desired SNR.

[0021] In an embodiment, a multi-stream emitter for a noninvasive, physiological device configured to transmit optical radiation in a tissue site comprises: a set of optical sources arranged as a point optical source; and a driver

configured to drive the at least one light emitting diode and at least one optical source to transmit near-infrared optical radiation at sufficient power to measure an analyte in tissue that responds to near-infrared optical radiation.

[0022] In an embodiment, an emitter for a noninvasive, physiological device configured to transmit optical radiation in a tissue site comprises: a point optical source comprising an optical source configured to transmit infrared and near-infrared optical radiation to a tissue site; and a driver configured to drive the point optical source at a sufficient power and noise tolerance to effectively provide attenuated optical radiation from a tissue site that indicates an amount of glucose in the tissue site.

[0023] In an embodiment, a method of transmitting a stream of pulses of optical radiation in a tissue site is provided. At least one pulse of infrared optical radiation having a first pulse width is transmitted at a first power. At least one pulse of near-infrared optical radiation is transmitted at a power that is higher than the first power.

[0024] In an embodiment, a method of transmitting a stream of pulses of optical radiation in a tissue site is provided. At least one pulse of infrared optical radiation having a first pulse width is transmitted at a first power. At least one pulse of near-infrared optical radiation is then transmitted, at a second power that is higher than the first power.

[0025] For purposes of summarizing the disclosure, certain aspects, advantages and novel features of the inventions have been described herein. It is to be understood that not necessarily all such advantages can be achieved in accordance with any particular embodiment of the inventions disclosed herein. Thus, the inventions disclosed herein can be embodied or carried out in a manner that achieves or optimizes one advantage or group of advantages as taught herein without necessarily achieving other advantages as can be taught or suggested herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] Throughout the drawings, reference numbers can be re-used to indicate correspondence between referenced elements. The drawings are provided to illustrate embodiments of the inventions described herein and not to limit the scope thereof.

[0027] FIGURE 1 illustrates a block diagram of an example data collection system capable of noninvasively measuring one or more blood analytes in a monitored patient, according to an embodiment of the disclosure;

[0028] FIGURES 2A – 2D illustrate an exemplary handheld monitor and an exemplary noninvasive optical sensor of the patient monitoring system of Figure 1, according to embodiments of the disclosure;

[0029] FIGURES 3A – 3C illustrate side and perspective views of an exemplary noninvasive sensor housing including a finger bed protrusion and heat sink, according to an embodiment of the disclosure;

[0030] FIGURE 3D illustrates a side view of another example noninvasive sensor housing including a heat sink, according to an embodiment of the disclosure;

[0031] FIGURE 3E illustrates a perspective view of an example noninvasive sensor detector shell including example detectors, according to an embodiment of the disclosure;

[0032] FIGURE 3F illustrates a side view of an example noninvasive sensor housing including a finger bed protrusion and heat sink, according to an embodiment of the disclosure;

[0033] FIGURES 4A through 4C illustrate top elevation, side and top perspective views of an example protrusion, according to an embodiment of the disclosure;

[0034] FIGURE 5 illustrates an example graph depicting possible effects of a protrusion on light transmittance, according to an embodiment of the disclosure;

[0035] FIGURES 6A through 6D illustrate perspective, front elevation, side and top views of another example protrusion, according to an embodiment of the disclosure;

[0036] FIGURE 6E illustrates an example sensor incorporating the protrusion of FIGURES 6A through 6D, according to an embodiment of the disclosure;

[0037] FIGURES 7A through 7B illustrate example arrangements of conductive glass that may be employed in the system of FIGURE 1, according to embodiments of the disclosure.

[0038] FIGURES 8A through 8D illustrate an example top elevation view, side views, and a bottom elevation view of the conductive glass that may be employed in the system of FIGURE 1, according to embodiments of the disclosure;

[0039] FIGURE 9 shows example comparative results obtained by an embodiment of a sensor;

[0040] FIGURES 10A and 10B illustrate comparative noise floors of various embodiments of the present disclosure;

[0041] FIGURE 11A illustrates an exemplary emitter that may be employed in the sensor, according to an embodiment of the disclosure;

[0042] FIGURE 11B illustrates a configuration of emitting optical radiation into a measurement site for measuring blood constituents, according to an embodiment of the disclosure;

[0043] FIGURE 11C illustrates another exemplary emitter that may be employed in the sensor according to an embodiment of the disclosure;

[0044] FIGURE 11D illustrates another exemplary emitter that may be employed in the sensor according to an embodiment of the disclosure.

[0045] FIGURE 12A illustrates an example detector portion that may be employed in an embodiment of a sensor, according to an embodiment of the disclosure;

[0046] FIGURES 12B through 12D illustrate exemplary arrangements of detectors that may be employed in an embodiment of the sensor, according to some embodiments of the disclosure;

[0047] FIGURES 12E through 12H illustrate exemplary structures of photodiodes that may be employed in embodiments of the detectors, according to some embodiments of the disclosure;

[0048] FIGURE 13 illustrates an example multi-stream operation of the system of FIGURE 1, according to an embodiment of the disclosure;

[0049] FIGURE 14A illustrates another example detector portion having a partially cylindrical protrusion that can be employed in an embodiment of a sensor, according to an embodiment of the disclosure;

[0050] FIGURE 14B depicts a front elevation view of the partially cylindrical protrusion of FIGURE 14A;

[0051] FIGURES 14C through 14E illustrate embodiments of a detector submount;

[0052] FIGURES 14F through 14H illustrate embodiment of portions of a detector shell;

[0053] FIGURE 14I illustrates a cutaway view of an embodiment of a sensor;

[0054] FIGURES 15A through 15F illustrate embodiments of sensors that include heat sink features;

[0055] FIGURES 15G and 15H illustrate embodiments of connector features that can be used with any of the sensors described herein;

[0056] FIGURE 15I illustrates an exemplary architecture for a transimpedance-based front-end that may be employed in any of the sensors described herein;

[0057] FIGURE 15J illustrates an exemplary noise model for configuring the transimpedance-based front-ends shown in FIGURE 15I;

[0058] FIGURE 15K shows different architectures and layouts for various embodiments of a sensor and its detectors;

[0059] FIGURE 15L illustrates an exemplary architecture for a switched-capacitor-based front-end that may be employed in any of the sensors described herein;

[0060] FIGURES 16A and 16B illustrate embodiments of disposable optical sensors;

[0061] FIGURE 17 illustrates an exploded view of certain components of an example sensor; and

[0062] FIGURES 18 through 22 illustrate various results obtained by an exemplary sensor of the disclosure.

DETAILED DESCRIPTION

[0063] The present disclosure generally relates to non-invasive medical devices. In the present disclosure, a sensor can measure various blood constituents or analytes noninvasively using multi-stream spectroscopy. In an embodiment, the multi-stream spectroscopy can employ visible, infrared and near infrared wavelengths. As disclosed herein, the sensor is capable of noninvasively measuring blood analytes or percentages thereof (e.g., saturation) based on various combinations of features and components.

[0064] In various embodiments, the present disclosure relates to an interface for a noninvasive glucose sensor that comprises a front-end adapted to receive an input signals from optical detectors and provide corresponding output signals. The front-end may comprise, among other things, switched capacitor circuits or transimpedance amplifiers. In an embodiment, the front-end may comprise switched capacitor circuits that are configured to convert the output of sensor's detectors into a digital signal. In another embodiment, the front-end may comprise transimpedance amplifiers. These transimpedance amplifiers may be configured to match one or more photodiodes in a detector based on a noise model that accounts for characteristics, such as the impedance, of the transimpedance amplifier, characteristics of each photodiode, such as the impedance, and the number of photodiodes coupled to the transimpedance amplifier.

[0065] In the present disclosure, the front-ends are employed in a sensor that measures various blood analytes noninvasively using multi-stream spectroscopy. In an embodiment, the multi-stream spectroscopy can employ visible, infrared and near infrared wavelengths. As disclosed herein, the sensor is capable of noninvasively measuring blood analytes, such as glucose, total hemoglobin, methemoglobin, oxygen content, and the like, based on various combinations of features and components.

[0066] In an embodiment, a physiological sensor includes a detector housing that can be coupled to a measurement site, such as a patient's finger. The sensor housing can include a curved bed that can generally conform to the shape of the measurement site. In addition, the curved bed can include a protrusion shaped

to increase an amount of light radiation from the measurement site. In an embodiment, the protrusion is used to thin out the measurement site. This allows the light radiation to pass through less tissue, and accordingly is attenuated less. In an embodiment, the protrusion can be used to increase the area from which attenuated light can be measured. In an embodiment, this is done through the use of a lens which collects attenuated light exiting the measurement site and focuses onto one or more detectors. The protrusion can advantageously include plastic, including a hard opaque plastic, such as a black or other colored plastic, helpful in reducing light noise. In an embodiment, such light noise includes light that would otherwise be detected at a photodetector that has not been attenuated by tissue of the measurement site of a patient sufficient to cause the light to adequately included information indicative of one or more physiological parameters of the patient. Such light noise includes light piping.

[0067] In an embodiment, the protrusion can be formed from the curved bed, or can be a separate component that is positionable with respect to the bed. In an embodiment, a lens made from any appropriate material is used as the protrusion. The protrusion can be convex in shape. The protrusion can also be sized and shaped to conform the measurement site into a flat or relatively flat surface. The protrusion can also be sized to conform the measurement site into a rounded surface, such as, for example, a concave or convex surface. The protrusion can include a cylindrical or partially cylindrical shape. The protrusion can be sized or shaped differently for different types of patients, such as an adult, child, or infant. The protrusion can also be sized or shaped differently for different measurement sites, including, for example, a finger, toe, hand, foot, ear, forehead, or the like. The protrusion can thus be helpful in any type of noninvasive sensor. The external surface of the protrusion can include one or more openings or windows. The openings can be made from glass to allow attenuated light from a measurement site, such as a finger, to pass through to one or more detectors. Alternatively, some of all of the protrusion can be a lens, such as a partially cylindrical lens.

[0068] The sensor can also include a shielding, such as a metal enclosure as described below or embedded within the protrusion to reduce noise. The shielding can be constructed from a conductive material, such as copper, in the form of a metal cage or enclosure, such as a box. The shielding can include a second set of one or more openings or windows. The second set of openings can be made from glass and allow light that has passed through the first set of windows of the external surface of the protrusion to pass through to one or more detectors that can be enclosed, for example, as described below.

[0069] In various embodiments, the shielding can include any substantially transparent, conductive material placed in the optical path between an emitter and a detector. The shielding can be constructed from a transparent material, such as glass, plastic, and the like. The shielding can have an electrically conductive material or coating that is at least partially transparent. The electrically conductive coating can be located on one or both sides of the shielding, or within the body of the shielding. In addition, the electrically conductive coating can be uniformly spread over the shielding or may be patterned. Furthermore, the coating can have a uniform or varying thickness to increase or optimize its shielding effect. The shielding can be helpful in virtually any type of noninvasive sensor that employs spectroscopy.

[0070] In an embodiment, the sensor can also include a heat sink. In an embodiment, the heat sink can include a shape that is functional in its ability to dissipate excess heat and aesthetically pleasing to the wearer. For example, the heat sink can be configured in a shape that maximizes surface area to allow for greater dissipation of heat. In an embodiment, the heat sink includes a metalicized plastic, such as plastic including carbon and aluminum to allow for improved thermal conductivity and diffusivity. In an embodiment, the heat sink can advantageously be inexpensively molded into desired shapes and configurations for aesthetic and functional purposes. For example, the shape of the heat sink can be a generally curved surface and include one or more fins, undulations, grooves or channels, or combs.

[0071] The sensor can include photocommunicative components, such as an emitter, a detector, and other components. The emitter can include a plurality of sets of optical sources that, in an embodiment, are arranged together as a point source. The various optical sources can emit a sequence of optical radiation pulses at different wavelengths towards a measurement site, such as a patient's finger. Detectors can then detect optical radiation from the measurement site. The optical sources and optical radiation detectors can operate at any appropriate wavelength, including, as discussed herein, infrared, near infrared, visible light, and ultraviolet. In addition, the optical sources and optical radiation detectors can operate at any appropriate wavelength, and such modifications to the embodiments desirable to operate at any such wavelength will be apparent to those skilled in the art.

[0072] In certain embodiments, multiple detectors are employed and arranged in a spatial geometry. This spatial geometry provides a diversity of path lengths among at least some of the detectors and allows for multiple bulk and pulsatile measurements that are robust. Each of the detectors can provide a respective output stream based on the detected optical radiation, or a sum of output streams can be provided from multiple detectors. In some embodiments, the sensor can also include other components, such as one or more heat sinks and one or more thermistors.

[0073] The spatial configuration of the detectors provides a geometry having a diversity of path lengths among the detectors. For example, a detector in the sensor may comprise multiple detectors that are arranged to have a sufficient difference in mean path length to allow for noise cancellation and noise reduction. In addition, walls may be used to separate individual photodetectors and prevent mixing of detected optical radiation between the different locations on the measurement site. A window may also be employed to facilitate the passing of optical radiation at various wavelengths for measuring glucose in the tissue.

[0074] In the present disclosure, a sensor may measure various blood constituents or analytes noninvasively using spectroscopy and a recipe of various features. As disclosed herein, the sensor is capable of non-invasively measuring blood analytes, such as, glucose, total hemoglobin, methemoglobin, oxygen content,

and the like. In an embodiment, the spectroscopy used in the sensor can employ visible, infrared and near infrared wavelengths. The sensor may comprise an emitter, a detector, and other components. In some embodiments, the sensor may also comprise other components, such as one or more heat sinks and one or more thermistors.

[0075] In various embodiments, the sensor may also be coupled to one or more companion devices that process and/or display the sensor's output. The companion devices may comprise various components, such as a sensor front-end, a signal processor, a display, a network interface, a storage device or memory, etc.

[0076] A sensor can include photocommunicative components, such as an emitter, a detector, and other components. The emitter is configured as a point optical source that comprises a plurality of LEDs that emit a sequence of pulses of optical radiation across a spectrum of wavelengths. In some embodiments, the plurality of sets of optical sources may each comprise at least one top-emitting LED and at least one super luminescent LED. In some embodiments, the emitter comprises optical sources that transmit optical radiation in the infrared or near-infrared wavelengths suitable for detecting blood analytes like glucose. In order to achieve the desired SNR for detecting analytes like glucose, the emitter may be driven using a progression from low power to higher power. In addition, the emitter may have its duty cycle modified to achieve a desired SNR.

[0077] The emitter may be constructed of materials, such as aluminum nitride and may include a heat sink to assist in heat dissipation. A thermistor may also be employed to account for heating effects on the LEDs. The emitter may further comprise a glass window and a nitrogen environment to improve transmission from the sources and prevent oxidative effects.

[0078] The sensor can be coupled to one or more monitors that process and/or display the sensor's output. The monitors can include various components, such as a sensor front end, a signal processor, a display, etc.

[0079] The sensor can be integrated with a monitor, for example, into a handheld unit including the sensor, a display and user controls. In other embodiments, the sensor can communicate with one or more processing devices.

The communication can be via wire(s), cable(s), flex circuit(s), wireless technologies, or other suitable analog or digital communication methodologies and devices to perform those methodologies. Many of the foregoing arrangements allow the sensor to be attached to the measurement site while the device is attached elsewhere on a patient, such as the patient's arm, or placed at a location near the patient, such as a bed, shelf or table. The sensor or monitor can also provide outputs to a storage device or network interface.

[0080] Reference will now be made to the Figures to discuss embodiments of the present disclosure.

[0081] **FIGURE 1** illustrates an example of a data collection system 100. In certain embodiments, the data collection system 100 noninvasively measure a blood analyte, such as oxygen, carbon monoxide, methemoglobin, total hemoglobin, glucose, proteins, glucose, lipids, a percentage thereof (e.g., saturation) or for measuring many other physiologically relevant patient characteristics. The system 100 can also measure additional blood analytes and/or other physiological parameters useful in determining a state or trend of wellness of a patient.

[0082] The data collection system 100 can be capable of measuring optical radiation from the measurement site. For example, in some embodiments, the data collection system 100 can employ photodiodes defined in terms of area. In an embodiment, the area is from about 1 mm^2 – 5 mm^2 (or higher) that are capable of detecting about 100 nanoamps (nA) or less of current resulting from measured light at full scale. In addition to having its ordinary meaning, the phrase "at full scale" can mean light saturation of a photodiode amplifier (not shown). Of course, as would be understood by a person of skill in the art from the present disclosure, various other sizes and types of photodiodes can be used with the embodiments of the present disclosure.

[0083] The data collection system 100 can measure a range of approximately about 2 nA to about 100 nA full scale. The data collection system 100 can also include sensor front-ends that are capable of processing and amplifying current from the detector(s) at signal-to-noise ratios (SNRs) of about 100 decibels (dB) or more, such as about 120 dB in order to measure various desired

analytes. The data collection system 100 can operate with a lower SNR if less accuracy is desired for an analyte like glucose.

[0084] The data collection system 100 can measure analyte concentrations, including glucose, at least in part by detecting light attenuated by a measurement site 102. The measurement site 102 can be any location on a patient's body, such as a finger, foot, ear lobe, or the like. For convenience, this disclosure is described primarily in the context of a finger measurement site 102. However, the features of the embodiments disclosed herein can be used with other measurement sites 102.

[0085] In the depicted embodiment, the system 100 includes an optional tissue thickness adjuster or tissue shaper 105, which can include one or more protrusions, bumps, lenses, or other suitable tissue-shaping mechanisms. In certain embodiments, the tissue shaper 105 is a flat or substantially flat surface that can be positioned proximate the measurement site 102 and that can apply sufficient pressure to cause the tissue of the measurement site 102 to be flat or substantially flat. In other embodiments, the tissue shaper 105 is a convex or substantially convex surface with respect to the measurement site 102. Many other configurations of the tissue shaper 105 are possible. Advantageously, in certain embodiments, the tissue shaper 105 reduces thickness of the measurement site 102 while preventing or reducing occlusion at the measurement site 102. Reducing thickness of the site can advantageously reduce the amount of attenuation of the light because there is less tissue through which the light must travel. Shaping the tissue in to a convex (or alternatively concave) surface can also provide more surface area from which light can be detected.

[0086] The embodiment of the data collection system 100 shown also includes an optional noise shield 103. In an embodiment, the noise shield 103 can be advantageously adapted to reduce electromagnetic noise while increasing the transmittance of light from the measurement site 102 to one or more detectors 106 (described below). For example, the noise shield 103 can advantageously include a conductive coated glass or metal grid electrically communicating with one or more other shields of the sensor 101 or electrically grounded. In an embodiment where

the noise shield 103 includes conductive coated glass, the coating can advantageously include indium tin oxide. In an embodiment, the indium tin oxide includes a surface resistivity ranging from approximately 30 ohms per square inch to about 500 ohms per square inch. In an embodiment, the resistivity is approximately 30, 200, or 500 ohms per square inch. As would be understood by a person of skill in the art from the present disclosure, other resistivities can also be used which are less than about 30 ohms or more than about 500 ohms. Other conductive materials transparent or substantially transparent to light can be used instead.

[0087] In some embodiments, the measurement site 102 is located somewhere along a non-dominant arm or a non-dominant hand, e.g., a right-handed person's left arm or left hand. In some patients, the non-dominant arm or hand can have less musculature and higher fat content, which can result in less water content in that tissue of the patient. Tissue having less water content can provide less interference with the particular wavelengths that are absorbed in a useful manner by blood analytes like glucose. Accordingly, in some embodiments, the data collection system 100 can be used on a person's non-dominant hand or arm.

[0088] The data collection system 100 can include a sensor 101 (or multiple sensors) that is coupled to a processing device or physiological monitor 109. In an embodiment, the sensor 101 and the monitor 109 are integrated together into a single unit. In another embodiment, the sensor 101 and the monitor 109 are separate from each other and communicate one with another in any suitable manner, such as via a wired or wireless connection. The sensor 101 and monitor 109 can be attachable and detachable from each other for the convenience of the user or caregiver, for ease of storage, sterility issues, or the like. The sensor 101 and the monitor 109 will now be further described.

[0089] In the depicted embodiment shown in **FIGURE 1**, the sensor 101 includes an emitter 104, a tissue shaper 105, a set of detectors 106, and a front-end interface 108. The emitter 104 can serve as the source of optical radiation transmitted towards measurement site 102. As will be described in further detail below, the emitter 104 can include one or more sources of optical radiation, such as LEDs, laser diodes, incandescent bulbs with appropriate frequency-selective filters,

combinations of the same, or the like. In an embodiment, the emitter 104 includes sets of optical sources that are capable of emitting visible and near-infrared optical radiation.

[0090] In some embodiments, the emitter 104 is used as a point optical source, and thus, the one or more optical sources of the emitter 104 can be located within a close distance to each other, such as within about a 2 mm to about 4 mm. The emitters 104 can be arranged in an array, such as is described in U.S. Publication No. 2006/0211924, filed Sept. 21, 2006, titled "Multiple Wavelength Sensor Emitters," the disclosure of which is hereby incorporated by reference in its entirety. In particular, the emitters 104 can be arranged at least in part as described in paragraphs [0061] through [0068] of the aforementioned publication, which paragraphs are hereby incorporated specifically by reference. Other relative spatial relationships can be used to arrange the emitters 104.

[0091] For analytes like glucose, currently available non-invasive techniques often attempt to employ light near the water absorbance minima at or about 1600 nm. Typically, these devices and methods employ a single wavelength or single band of wavelengths at or about 1600 nm. However, to date, these techniques have been unable to adequately consistently measure analytes like glucose based on spectroscopy.

[0092] In contrast, the emitter 104 of the data collection system 100 can emit, in certain embodiments, combinations of optical radiation in various bands of interest. For example, in some embodiments, for analytes like glucose, the emitter 104 can emit optical radiation at three (3) or more wavelengths between about 1600 nm to about 1700 nm. In particular, the emitter 104 can emit optical radiation at or about 1610 nm, about 1640 nm, and about 1665 nm. In some circumstances, the use of three wavelengths within about 1600 nm to about 1700 nm enable sufficient SNRs of about 100 dB, which can result in a measurement accuracy of about 20 mg/dL or better for analytes like glucose.

[0093] In other embodiments, the emitter 104 can use two (2) wavelengths within about 1600 nm to about 1700 nm to advantageously enable SNRs of about 85 dB, which can result in a measurement accuracy of about 25-30 mg/dL or better

for analytes like glucose. Furthermore, in some embodiments, the emitter 104 can emit light at wavelengths above about 1670 nm. Measurements at these wavelengths can be advantageously used to compensate or confirm the contribution of protein, water, and other non-hemoglobin species exhibited in measurements for analytes like glucose conducted between about 1600 nm and about 1700 nm. Of course, other wavelengths and combinations of wavelengths can be used to measure analytes and/or to distinguish other types of tissue, fluids, tissue properties, fluid properties, combinations of the same or the like.

[0094] For example, the emitter 104 can emit optical radiation across other spectra for other analytes. In particular, the emitter 104 can employ light wavelengths to measure various blood analytes or percentages (e.g., saturation) thereof. For example, in one embodiment, the emitter 104 can emit optical radiation in the form of pulses at wavelengths about 905 nm, about 1050 nm, about 1200 nm, about 1300 nm, about 1330 nm, about 1610 nm, about 1640 nm, and about 1665 nm. In another embodiment, the emitter 104 can emit optical radiation ranging from about 860 nm to about 950 nm, about 950 nm to about 1100 nm, about 1100 nm to about 1270 nm, about 1250 nm to about 1350 nm, about 1300 nm to about 1360 nm, and about 1590 nm to about 1700 nm. Of course, the emitter 104 can transmit any of a variety of wavelengths of visible or near-infrared optical radiation.

[0095] Due to the different responses of analytes to the different wavelengths, certain embodiments of the data collection system 100 can advantageously use the measurements at these different wavelengths to improve the accuracy of measurements. For example, the measurements of water from visible and infrared light can be used to compensate for water absorbance that is exhibited in the near-infrared wavelengths.

[0096] As briefly described above, the emitter 104 can include sets of light-emitting diodes (LEDs) as its optical source. The emitter 104 can use one or more top-emitting LEDs. In particular, in some embodiments, the emitter 104 can include top-emitting LEDs emitting light at about 850 nm to 1350 nm.

[0097] The emitter 104 can also use super luminescent LEDs (SLEDs) or side-emitting LEDs. In some embodiments, the emitter 104 can employ SLEDs or

side-emitting LEDs to emit optical radiation at about 1600 nm to about 1800 nm. Emitter 104 can use SLEDs or side-emitting LEDs to transmit near infrared optical radiation because these types of sources can transmit at high power or relatively high power, e.g., about 40 mW to about 100 mW. This higher power capability can be useful to compensate or overcome the greater attenuation of these wavelengths of light in tissue and water. For example, the higher power emission can effectively compensate and/or normalize the absorption signal for light in the mentioned wavelengths to be similar in amplitude and/or effect as other wavelengths that can be detected by one or more photodetectors after absorption. However, the embodiments of the present disclosure do not necessarily require the use of high power optical sources. For example, some embodiments may be configured to measure analytes, such as total hemoglobin (tHb), oxygen saturation (SpO_2), carboxyhemoglobin, methemoglobin, etc., without the use of high power optical sources like side emitting LEDs. Instead, such embodiments may employ other types of optical sources, such as top emitting LEDs. Alternatively, the emitter 104 can use other types of sources of optical radiation, such as a laser diode, to emit near-infrared light into the measurement site 102.

[0098] In addition, in some embodiments, in order to assist in achieving a comparative balance of desired power output between the LEDs, some of the LEDs in the emitter 104 can have a filter or covering that reduces and/or cleans the optical radiation from particular LEDs or groups of LEDs. For example, since some wavelengths of light can penetrate through tissue relatively well, LEDs, such as some or all of the top-emitting LEDs can use a filter or covering, such as a cap or painted dye. This can be useful in allowing the emitter 104 to use LEDs with a higher output and/or to equalize intensity of LEDs.

[0099] The data collection system 100 also includes a driver 111 that drives the emitter 104. The driver 111 can be a circuit or the like that is controlled by the monitor 109. For example, the driver 111 can provide pulses of current to the emitter 104. In an embodiment, the driver 111 drives the emitter 104 in a progressive fashion, such as in an alternating manner. The driver 111 can drive the emitter 104 with a series of pulses of about 1 milliwatt (mW) for some wavelengths

that can penetrate tissue relatively well and from about 40 mW to about 100 mW for other wavelengths that tend to be significantly absorbed in tissue. A wide variety of other driving powers and driving methodologies can be used in various embodiments.

[0100] The driver 111 can be synchronized with other parts of the sensor 101 and can minimize or reduce jitter in the timing of pulses of optical radiation emitted from the emitter 104. In some embodiments, the driver 111 is capable of driving the emitter 104 to emit optical radiation in a pattern that varies by less than about 10 parts-per-million.

[0101] The detectors 106 capture and measure light from the measurement site 102. For example, the detectors 106 can capture and measure light transmitted from the emitter 104 that has been attenuated or reflected from the tissue in the measurement site 102. The detectors 106 can output a detector signal 107 responsive to the light captured or measured. The detectors 106 can be implemented using one or more photodiodes, phototransistors, or the like.

[0102] In addition, the detectors 106 can be arranged with a spatial configuration to provide a variation of path lengths among at least some of the detectors 106. That is, some of the detectors 106 can have the substantially, or from the perspective of the processing algorithm, effectively, the same path length from the emitter 104. However, according to an embodiment, at least some of the detectors 106 can have a different path length from the emitter 104 relative to other of the detectors 106. Variations in path lengths can be helpful in allowing the use of a bulk signal stream from the detectors 106. In some embodiments, the detectors 106 may employ a linear spacing, a logarithmic spacing, or a two or three dimensional matrix of spacing, or any other spacing scheme in order to provide an appropriate variation in path lengths.

[0103] The front end interface 108 provides an interface that adapts the output of the detectors 106, which is responsive to desired physiological parameters. For example, the front end interface 108 can adapt a signal 107 received from one or more of the detectors 106 into a form that can be processed by the monitor 109, for example, by a signal processor 110 in the monitor 109. The

front end interface 108 can have its components assembled in the sensor 101, in the monitor 109, in connecting cabling (if used), combinations of the same, or the like. The location of the front end interface 108 can be chosen based on various factors including space desired for components, desired noise reductions or limits, desired heat reductions or limits, and the like.

[0104] The front end interface 108 can be coupled to the detectors 106 and to the signal processor 110 using a bus, wire, electrical or optical cable, flex circuit, or some other form of signal connection. The front end interface 108 can also be at least partially integrated with various components, such as the detectors 106. For example, the front end interface 108 can include one or more integrated circuits that are on the same circuit board as the detectors 106. Other configurations can also be used.

[0105] The front end interface 108 can be implemented using one or more amplifiers, such as transimpedance amplifiers, that are coupled to one or more analog to digital converters (ADCs) (which can be in the monitor 109), such as a sigma-delta ADC. A transimpedance-based front end interface 108 can employ single-ended circuitry, differential circuitry, and/or a hybrid configuration. A transimpedance-based front end interface 108 can be useful for its sampling rate capability and freedom in modulation/demodulation algorithms. For example, this type of front end interface 108 can advantageously facilitate the sampling of the ADCs being synchronized with the pulses emitted from the emitter 104.

[0106] The ADC or ADCs can provide one or more outputs into multiple channels of digital information for processing by the signal processor 110 of the monitor 109. Each channel can correspond to a signal output from a detector 106.

[0107] In some embodiments, a programmable gain amplifier (PGA) can be used in combination with a transimpedance-based front end interface 108. For example, the output of a transimpedance-based front end interface 108 can be output to a PGA that is coupled with an ADC in the monitor 109. A PGA can be useful in order to provide another level of amplification and control of the stream of signals from the detectors 106. Alternatively, the PGA and ADC components can

be integrated with the transimpedance-based front end interface 108 in the sensor 101.

[0108] In another embodiment, the front end interface 108 can be implemented using switched-capacitor circuits. A switched-capacitor-based front end interface 108 can be useful for, in certain embodiments, its resistor-free design and analog averaging properties. In addition, a switched-capacitor-based front end interface 108 can be useful because it can provide a digital signal to the signal processor 110 in the monitor 109.

[0109] As shown in **FIGURE 1**, the monitor 109 can include the signal processor 110 and a user interface, such as a display 112. The monitor 109 can also include optional outputs alone or in combination with the display 112, such as a storage device 114 and a network interface 116. In an embodiment, the signal processor 110 includes processing logic that determines measurements for desired analytes, such as glucose, based on the signals received from the detectors 106. The signal processor 110 can be implemented using one or more microprocessors or subprocessors (e.g., cores), digital signal processors, application specific integrated circuits (ASICs), field programmable gate arrays (FPGAs), combinations of the same, and the like.

[0110] The signal processor 110 can provide various signals that control the operation of the sensor 101. For example, the signal processor 110 can provide an emitter control signal to the driver 111. This control signal can be useful in order to synchronize, minimize, or reduce jitter in the timing of pulses emitted from the emitter 104. Accordingly, this control signal can be useful in order to cause optical radiation pulses emitted from the emitter 104 to follow a precise timing and consistent pattern. For example, when a transimpedance-based front end interface 108 is used, the control signal from the signal processor 110 can provide synchronization with the ADC in order to avoid aliasing, cross-talk, and the like. As also shown, an optional memory 113 can be included in the front-end interface 108 and/or in the signal processor 110. This memory 113 can serve as a buffer or storage location for the front-end interface 108 and/or the signal processor 110, among other uses.

[0111] The user interface 112 can provide an output, e.g., on a display, for presentation to a user of the data collection system 100. The user interface 112 can be implemented as a touch-screen display, an LCD display, an organic LED display, or the like. In addition, the user interface 112 can be manipulated to allow for measurement on the non-dominant side of patient. For example, the user interface 112 can include a flip screen, a screen that can be moved from one side to another on the monitor 109, or can include an ability to reorient its display indicia responsive to user input or device orientation. In alternative embodiments, the data collection system 100 can be provided without a user interface 112 and can simply provide an output signal to a separate display or system.

[0112] A storage device 114 and a network interface 116 represent other optional output connections that can be included in the monitor 109. The storage device 114 can include any computer-readable medium, such as a memory device, hard disk storage, EEPROM, flash drive, or the like. The various software and/or firmware applications can be stored in the storage device 114, which can be executed by the signal processor 110 or another processor of the monitor 109. The network interface 116 can be a serial bus port (RS-232/RS-485), a Universal Serial Bus (USB) port, an Ethernet port, a wireless interface (e.g., WiFi such as any 802.1x interface, including an internal wireless card), or other suitable communication device(s) that allows the monitor 109 to communicate and share data with other devices. The monitor 109 can also include various other components not shown, such as a microprocessor, graphics processor, or controller to output the user interface 112, to control data communications, to compute data trending, or to perform other operations.

[0113] Although not shown in the depicted embodiment, the data collection system 100 can include various other components or can be configured in different ways. For example, the sensor 101 can have both the emitter 104 and detectors 106 on the same side of the measurement site 102 and use reflectance to measure analytes. The data collection system 100 can also include a sensor that measures the power of light emitted from the emitter 104.

[0114] **FIGURES 2A** through **2D** illustrate example monitoring devices 200 in which the data collection system 100 can be housed. Advantageously, in certain embodiments, some or all of the example monitoring devices 200 shown can have a shape and size that allows a user to operate it with a single hand or attach it, for example, to a patient's body or limb. Although several examples are shown, many other monitoring device configurations can be used to house the data collection system 100. In addition, certain of the features of the monitoring devices 200 shown in FIGURES 2A through 2D can be combined with features of the other monitoring devices 200 shown.

[0115] Referring specifically to **FIGURE 2A**, an example monitoring device 200A is shown, in which a sensor 201a and a monitor 209a are integrated into a single unit. The monitoring device 200A shown is a handheld or portable device that can measure glucose and other analytes in a patient's finger. The sensor 201a includes an emitter shell 204a and a detector shell 206a. The depicted embodiment of the monitoring device 200A also includes various control buttons 208a and a display 210a.

[0116] The sensor 201a can be constructed of white material used for reflective purposes (such as white silicone or plastic), which can increase the usable signal at the detector 106 by forcing light back into the sensor 201a. Pads in the emitter shell 204a and the detector shell 206a can contain separated windows to prevent or reduce mixing of light signals, for example, from distinct quadrants on a patient's finger. In addition, these pads can be made of a relatively soft material, such as a gel or foam, in order to conform to the shape, for example, of a patient's finger. The emitter shell 204a and the detector shell 206a can also include absorbing black or grey material portions to prevent or reduce ambient light from entering into the sensor 201a.

[0117] In some embodiments, some or all portions of the emitter shell 204a and/or detector shell 206a can be detachable and/or disposable. For example, some or all portions of the shells 204a and 206a can be removable pieces. The removability of the shells 204a and 206a can be useful for sanitary purposes or for sizing the sensor 201a to different patients. The monitor 209a can include a

fitting, slot, magnet, or other connecting mechanism to allow the sensor 201c to be removably attached to the monitor 209a.

[0118] The monitoring device 200a also includes optional control buttons 208a and a display 210a that can allow the user to control the operation of the device. For example, a user can operate the control buttons 208a to view one or more measurements of various analytes, such as glucose. In addition, the user can operate the control buttons 208a to view other forms of information, such as graphs, histograms, measurement data, trend measurement data, parameter combination views, wellness indications, and the like. Many parameters, trends, alarms and parameter displays could be output to the display 210a, such as those that are commercially available through a wide variety of noninvasive monitoring devices from Masimo® Corporation of Irvine, California.

[0119] Furthermore, the controls 208a and/or display 210a can provide functionality for the user to manipulate settings of the monitoring device 200a, such as alarm settings, emitter settings, detector settings, and the like. The monitoring device 200a can employ any of a variety of user interface designs, such as frames, menus, touch-screens, and any type of button.

[0120] **FIGURE 2B** illustrates another example of a monitoring device 200B. In the depicted embodiment, the monitoring device 200B includes a finger clip sensor 201b connected to a monitor 209b via a cable 212. In the embodiment shown, the monitor 209b includes a display 210b, control buttons 208b and a power button. Moreover, the monitor 209b can advantageously include electronic processing, signal processing, and data storage devices capable of receiving signal data from said sensor 201b, processing the signal data to determine one or more output measurement values indicative of one or more physiological parameters of a monitored patient, and displaying the measurement values, trends of the measurement values, combinations of measurement values, and the like.

[0121] The cable 212 connecting the sensor 201b and the monitor 209b can be implemented using one or more wires, optical fiber, flex circuits, or the like. In some embodiments, the cable 212 can employ twisted pairs of conductors in order to minimize or reduce cross-talk of data transmitted from the sensor 201b to

the monitor 209b. Various lengths of the cable 212 can be employed to allow for separation between the sensor 201b and the monitor 209b. The cable 212 can be fitted with a connector (male or female) on either end of the cable 212 so that the sensor 201b and the monitor 209b can be connected and disconnected from each other. Alternatively, the sensor 201b and the monitor 209b can be coupled together via a wireless communication link, such as an infrared link, radio frequency channel, or any other wireless communication protocol and channel.

[0122] The monitor 209b can be attached to the patient. For example, the monitor 209b can include a belt clip or straps (see, e.g., FIGURE 2C) that facilitate attachment to a patient's belt, arm, leg, or the like. The monitor 209b can also include a fitting, slot, magnet, LEMO snap-click connector, or other connecting mechanism to allow the cable 212 and sensor 201b to be attached to the monitor 209B.

[0123] The monitor 209b can also include other components, such as a speaker, power button, removable storage or memory (e.g., a flash card slot), an AC power port, and one or more network interfaces, such as a universal serial bus interface or an Ethernet port. For example, the monitor 209b can include a display 210b that can indicate a measurement for glucose, for example, in mg/dL. Other analytes and forms of display can also appear on the monitor 209b.

[0124] In addition, although a single sensor 201b with a single monitor 209b is shown, different combinations of sensors and device pairings can be implemented. For example, multiple sensors can be provided for a plurality of differing patient types or measurement sites or even patient fingers.

[0125] **FIGURE 2C** illustrates yet another example of monitoring device 200C that can house the data collection system 100. Like the monitoring device 200B, the monitoring device 200C includes a finger clip sensor 201c connected to a monitor 209c via a cable 212. The cable 212 can have all of the features described above with respect to FIGURE 2B. The monitor 209c can include all of the features of the monitor 200B described above. For example, the monitor 209c includes buttons 208c and a display 210c. The monitor 209c shown also includes straps 214c that allow the monitor 209c to be attached to a patient's limb or the like.

[0126] **FIGURE 2D** illustrates yet another example of monitoring device 200D that can house the data collection system 100. Like the monitoring devices 200B and 200C, the monitoring device 200D includes a finger clip sensor 201d connected to a monitor 209d via a cable 212. The cable 212 can have all of the features described above with respect to FIGURE 2B. In addition to having some or all of the features described above with respect to FIGURES 2B and 2C, the monitoring device 200D includes an optional universal serial bus (USB) port 216 and an Ethernet port 218. The USB port 216 and the Ethernet port 218 can be used, for example, to transfer information between the monitor 209d and a computer (not shown) via a cable. Software stored on the computer can provide functionality for a user to, for example, view physiological data and trends, adjust settings and download firmware updates to the monitor 209b, and perform a variety of other functions. The USB port 216 and the Ethernet port 218 can be included with the other monitoring devices 200A, 200B, and 200C described above.

[0127] **FIGURES 3A** through **3C** illustrate more detailed examples of embodiments of a sensor 301a. The sensor 301a shown can include all of the features of the sensors 100 and 200 described above.

[0128] Referring to **FIGURE 3A**, the sensor 301a in the depicted embodiment is a clothespin-shaped clip sensor that includes an enclosure 302a for receiving a patient's finger. The enclosure 302a is formed by an upper section or emitter shell 304a, which is pivotably connected with a lower section or detector shell 306a. The emitter shell 304a can be biased with the detector shell 306a to close together around a pivot point 303a and thereby sandwich finger tissue between the emitter and detector shells 304a, 306a.

[0129] In an embodiment, the pivot point 303a advantageously includes a pivot capable of adjusting the relationship between the emitter and detector shells 304a, 306a to effectively level the sections when applied to a tissue site. In another embodiment, the sensor 301a includes some or all features of the finger clip described in U.S. Publication No. 2006/0211924, incorporated above, such as a spring that causes finger clip forces to be distributed along the finger. Paragraphs

[0096] through [0105], which describe this feature, are hereby specifically incorporated by reference.

[0130] The emitter shell 304a can position and house various emitter components of the sensor 301a. It can be constructed of reflective material (e.g., white silicone or plastic) and/or can be metallic or include metalicized plastic (e.g., including carbon and aluminum) to possibly serve as a heat sink. The emitter shell 304a can also include absorbing opaque material, such as, for example, black or grey colored material, at various areas, such as on one or more flaps 307a, to reduce ambient light entering the sensor 301a.

[0131] The detector shell 306a can position and house one or more detector portions of the sensor 301a. The detector shell 306a can be constructed of reflective material, such as white silicone or plastic. As noted, such materials can increase the usable signal at a detector by forcing light back into the tissue and measurement site (see FIGURE 1). The detector shell 306a can also include absorbing opaque material at various areas, such as lower area 308a, to reduce ambient light entering the sensor 301a.

[0132] Referring to **FIGURES 3B** and **3C**, an example of finger bed 310 is shown in the sensor 301b. The finger bed 310 includes a generally curved surface shaped generally to receive tissue, such as a human digit. The finger bed 310 includes one or more ridges or channels 314. Each of the ridges 314 has a generally convex shape that can facilitate increasing traction or gripping of the patient's finger to the finger bed. Advantageously, the ridges 314 can improve the accuracy of spectroscopic analysis in certain embodiments by reducing noise that can result from a measurement site moving or shaking loose inside of the sensor 301a. The ridges 314 can be made from reflective or opaque materials in some embodiments to further increase SNR. In other implementations, other surface shapes can be used, such as, for example, generally flat, concave, or convex finger beds 310.

[0133] Finger bed 310 can also include an embodiment of a tissue thickness adjuster or protrusion 305. The protrusion 305 includes a measurement site contact area 370 (see FIGURE 3C) that can contact body tissue of a

measurement site. The protrusion 305 can be removed from or integrated with the finger bed 310. Interchangeable, different shaped protrusions 305 can also be provided, which can correspond to different finger shapes, characteristics, opacity, sizes, or the like.

[0134] Referring specifically to **FIGURE 3C**, the contact area 370 of the protrusion 305 can include openings or windows 320, 321, 322, and 323. When light from a measurement site passes through the windows 320, 321, 322, and 323, the light can reach one or more photodetectors (see FIGURE 3E). In an embodiment, the windows 320, 321, 322, and 323 mirror specific detector placements layouts such that light can impinge through the protrusion 305 onto the photodetectors. Any number of windows 320, 321, 322, and 323 can be employed in the protrusion 305 to allow light to pass from the measurement site to the photodetectors.

[0135] The windows 320, 321, 322, and 323 can also include shielding, such as an embedded grid of wiring or a conductive glass coating, to reduce noise from ambient light or other electromagnetic noise. The windows 320, 321, 322, and 323 can be made from materials, such as plastic or glass. In some embodiments, the windows 320, 321, 322, and 323 can be constructed from conductive glass, such as indium tin oxide (ITO) coated glass. Conductive glass can be useful because its shielding is transparent, and thus allows for a larger aperture versus a window with an embedded grid of wiring. In addition, in certain embodiments, the conductive glass does not need openings in its shielding (since it is transparent), which enhances its shielding performance. For example, some embodiments that employ the conductive glass can attain up to an about 40% to about 50% greater signal than non-conductive glass with a shielding grid. In addition, in some embodiments, conductive glass can be useful for shielding noise from a greater variety of directions than non-conductive glass with a shielding grid.

[0136] Turning to **FIGURE 3B**, the sensor 301a can also include a shielding 315a, such as a metal cage, box, metal sheet, perforated metal sheet, a metal layer on a non-metal material, or the like. The shielding 315a is provided in the depicted embodiment below or embedded within the protrusion 305 to reduce

noise. The shielding 315a can be constructed from a conductive material, such as copper. The shielding 315a can include one or more openings or windows (not shown). The windows can be made from glass or plastic to thereby allow light that has passed through the windows 320, 321, 322, and 323 on an external surface of the protrusion 305 (see FIGURE 3C) to pass through to one or more photodetectors that can be enclosed or provided below (see FIGURE 3E).

[0137] In some embodiments, the shielding cage for shielding 315a can be constructed in a single manufactured component with or without the use of conductive glass. This form of construction may be useful in order to reduce costs of manufacture as well as assist in quality control of the components. Furthermore, the shielding cage can also be used to house various other components, such as sigma delta components for various embodiments of front end interfaces 108.

[0138] In an embodiment, the photodetectors can be positioned within or directly beneath the protrusion 305 (see FIGURE 3E). In such cases, the mean optical path length from the emitters to the detectors can be reduced and the accuracy of blood analyte measurement can increase. For example, in one embodiment, a convex bump of about 1 mm to about 3 mm in height and about 10 mm^2 to about 60 mm^2 was found to help signal strength by about an order of magnitude versus other shapes. Of course other dimensions and sizes can be employed in other embodiments. Depending on the properties desired, the length, width, and height of the protrusion 305 can be selected. In making such determinations, consideration can be made of protrusion's 305 effect on blood flow at the measurement site and mean path length for optical radiation passing through openings 320, 321, 322, and 323. Patient comfort can also be considered in determining the size and shape of the protrusion.

[0139] In an embodiment, the protrusion 305 can include a pliant material, including soft plastic or rubber, which can somewhat conform to the shape of a measurement site. Pliant materials can improve patient comfort and tactility by conforming the measurement site contact area 370 to the measurement site. Additionally, pliant materials can minimize or reduce noise, such as ambient light.

Alternatively, the protrusion 305 can be made from a rigid material, such as hard plastic or metal.

[0140] Rigid materials can improve measurement accuracy of a blood analyte by conforming the measurement site to the contact area 370. The contact area 370 can be an ideal shape for improving accuracy or reducing noise. Selecting a material for the protrusion 305 can include consideration of materials that do not significantly alter blood flow at the measurement site. The protrusion 305 and the contact area 370 can include a combination of materials with various characteristics.

[0141] The contact area 370 serves as a contact surface for the measurement site. For example, in some embodiments, the contact area 370 can be shaped for contact with a patient's finger. Accordingly, the contact area 370 can be sized and shaped for different sizes of fingers. The contact area 370 can be constructed of different materials for reflective purposes as well as for the comfort of the patient. For example, the contact area 370 can be constructed from materials having various hardness and textures, such as plastic, gel, foam, and the like.

[0142] The formulas and analysis that follow with respect to **FIGURE 5** provide insight into how selecting these variables can alter transmittance and intensity gain of optical radiation that has been applied to the measurement site. These examples do not limit the scope of this disclosure.

[0143] Referring to **FIGURE 5**, a plot 500 is shown that illustrates examples of effects of embodiments of the protrusion 305 on the SNR at various wavelengths of light. As described above, the protrusion 305 can assist in conforming the tissue and effectively reduce its mean path length. In some instances, this effect by the protrusion 305 can have significant impact on increasing the SNR.

[0144] According to the Beer Lambert law, a transmittance of light (I) can be expressed as follows: $I = I_o * e^{-m*b*c}$, where I_o is the initial power of light being transmitted, m is the path length traveled by the light, and the component "b*c" corresponds to the bulk absorption of the light at a specific wavelength of light. For light at about 1600 nm to about 1700 nm, for example, the bulk absorption component is generally around 0.7 mm^{-1}. Assuming a typical finger thickness of

about 12 mm and a mean path length of 20 mm due to tissue scattering, then $I = I_o * e^{(-20*0.7)}$.

[0145] In an embodiment where the protrusion 305 is a convex bump, the thickness of the finger can be reduced to 10 mm (from 12 mm) for some fingers and the effective light mean path is reduced to about 16.6 mm from 20 mm (see box 510). This results in a new transmittance, $I_1 = I_o * e^{(-16.6*0.7)}$. A curve for a typical finger (having a mean path length of 20 mm) across various wavelengths is shown in the plot 500 of **FIGURE 5**. The plot 500 illustrates potential effects of the protrusion 305 on the transmittance. As illustrated, comparing I and I_1 results in an intensity gain of $e^{(-16.6*0.7)}/e^{(-20*0.7)}$, which is about a 10 times increase for light in the about 1600 nm to about 1700 nm range. Such an increase can affect the SNR at which the sensor can operate. The foregoing gains can be due at least in part to the about 1600 nm to about 1700 nm range having high values in bulk absorptions (water, protein, and the like), e.g., about 0.7 mm^{-1}. The plot 500 also shows improvements in the visible/near-infrared range (about 600 nm to about 1300 nm).

[0146] Turning again to **FIGURES 3A** through **3C**, an example heat sink 350a is also shown. The heat sink 350a can be attached to, or protrude from an outer surface of, the sensor 301a, thereby providing increased ability for various sensor components to dissipate excess heat. By being on the outer surface of the sensor 301a in certain embodiments, the heat sink 350a can be exposed to the air and thereby facilitate more efficient cooling. In an embodiment, one or more of the emitters (see FIGURE 1) generate sufficient heat that inclusion of the heat sink 350a can advantageously allows the sensor 301a to remain safely cooled. The heat sink 350a can include one or more materials that help dissipate heat, such as, for example, aluminum, steel, copper, carbon, combinations of the same, or the like. For example, in some embodiments, the emitter shell 304a can include a heat conducting material that is also readily and relatively inexpensively moldable into desired shapes and forms.

[0147] In some embodiments, the heat sink 350a includes metalicized plastic. The metalicized plastic can include aluminum and carbon, for example. The material can allow for improved thermal conductivity and diffusivity, which can

increase commercial viability of the heat sink. In some embodiments, the material selected to construct the heat sink 350a can include a thermally conductive liquid crystalline polymer, such as CoolPoly® D5506, commercially available from Cool Polymers®, Inc. of Warwick, Rhode Island. Such a material can be selected for its electrically non-conductive and dielectric properties so as, for example, to aid in electrical shielding. In an embodiment, the heat sink 350a provides improved heat transfer properties when the sensor 301a is active for short intervals of less than a full day's use. In an embodiment, the heat sink 350a can advantageously provide improved heat transfers in about three (3) to about four (4) minute intervals, for example, although a heat sink 350a can be selected that performs effectively in shorter or longer intervals.

[0148] Moreover, the heat sink 350a can have different shapes and configurations for aesthetic as well as for functional purposes. In an embodiment, the heat sink is configured to maximize heat dissipation, for example, by maximizing surface area. In an embodiment, the heat sink 350a is molded into a generally curved surface and includes one or more fins, undulations, grooves, or channels. The example heat sink 350a shown includes fins 351a (see FIGURE 3A).

[0149] An alternative shape of a sensor 301b and heat sink 350b is shown in **FIGURE 3D**. The sensor 301b can include some or all of the features of the sensor 301a. For example, the sensor 301b includes an enclosure 302b formed by an emitter shell 304b and a detector shell 306b, pivotably connected about a pivot 303a. The emitter shell 304b can also include absorbing opaque material on one or more flaps 307b, and the detector shell 306a can also include absorbing opaque material at various areas, such as lower area 308b.

[0150] However, the shape of the sensor 301b is different in this embodiment. In particular, the heat sink 350b includes comb protrusions 351b. The comb protrusions 351b are exposed to the air in a similar manner to the fins 351a of the heat sink 350a, thereby facilitating efficient cooling of the sensor 301b.

[0151] **FIGURE 3E** illustrates a more detailed example of a detector shell 306b of the sensor 301b. The features described with respect to the detector shell 306b can also be used with the detector shell 306a of the sensor 301a.

[0152] As shown, the detector shell 306b includes detectors 316. The detectors 316 can have a predetermined spacing 340 from each other, or a spatial relationship among one another that results in a spatial configuration. This spatial configuration can purposefully create a variation of path lengths among detectors 316 and the emitter discussed above.

[0153] In the depicted embodiment, the detector shell 316 can hold multiple (e.g., two, three, four, etc.) photodiode arrays that are arranged in a two-dimensional grid pattern. Multiple photodiode arrays can also be useful to detect light piping (e.g., light that bypasses measurement site 102). In the detector shell 316, walls can be provided to separate the individual photodiode arrays to prevent or reduce mixing of light signals from distinct quadrants. In addition, the detector shell 316 can be covered by windows of transparent material, such as glass, plastic, or the like, to allow maximum or increased transmission of power light captured. In various embodiments, the transparent materials used can also be partially transparent or translucent or can otherwise pass some or all of the optical radiation passing through them. As noted, this window can include some shielding in the form of an embedded grid of wiring, or a conductive layer or coating.

[0154] As further illustrated by **FIGURE 3E**, the detectors 316 can have a spatial configuration of a grid. However, the detectors 316 can be arranged in other configurations that vary the path length. For example, the detectors 316 can be arranged in a linear array, a logarithmic array, a two-dimensional array, a zig-zag pattern, or the like. Furthermore, any number of the detectors 316 can be employed in certain embodiments.

[0155] **FIGURE 3F** illustrates another embodiment of a sensor 301f. The sensor 301f can include some or all of the features of the sensor 301a of FIGURE 3A described above. For example, the sensor 301f includes an enclosure 302f formed by an upper section or emitter shell 304f, which is pivotably connected with a lower section or detector shell 306f around a pivot point 303f. The emitter shell 304f can also include absorbing opaque material on various areas, such as on one or more flaps 307f, to reduce ambient light entering the sensor 301f. The detector shell 306f can also include absorbing opaque material at various areas, such as a

lower area 308f. The sensor 301f also includes a heat sink 350f, which includes fins 351f.

[0156] In addition to these features, the sensor 301f includes a flex circuit cover 360, which can be made of plastic or another suitable material. The flex circuit cover 360 can cover and thereby protect a flex circuit (not shown) that extends from the emitter shell 304f to the detector shell 306f. An example of such a flex circuit is illustrated in U.S. Publication No. 2006/0211924, incorporated above (see FIGURE 46 and associated description, which is hereby specifically incorporated by reference). The flex circuit cover 360 is shown in more detail below in FIGURE 17.

[0157] In addition, sensors 301a-f has extra length – extends to second joint on finger - Easier to place, harder to move due to cable, better for light piping

[0158] **FIGURES 4A** through **4C** illustrate example arrangements of a protrusion 405, which is an embodiment of the protrusion 305 described above. In an embodiment, the protrusion 405 can include a measurement site contact area 470. The measurement site contact area 470 can include a surface that molds body tissue of a measurement site, such as a finger, into a flat or relatively flat surface.

[0159] The protrusion 405 can have dimensions that are suitable for a measurement site such as a patient's finger. As shown, the protrusion 405 can have a length 400, a width 410, and a height 430. The length 400 can be from about 9 to about 11 millimeters, e.g., about 10 millimeters. The width 410 can be from about 7 to about 9 millimeters, e.g., about 8 millimeters. The height 430 can be from about 0.5 millimeters to about 3 millimeters, e.g., about 2 millimeters. In an embodiment, the dimensions 400, 410, and 430 can be selected such that the measurement site contact area 470 includes an area of about 80 square millimeters, although larger and smaller areas can be used for different sized tissue for an adult, an adolescent, or infant, or for other considerations.

[0160] The measurement site contact area 470 can also include differently shaped surfaces that conform the measurement site into different shapes. For example, the measurement site contact area 470 can be generally curved and/or convex with respect to the measurement site. The measurement site contact area

470 can be other shapes that reduce or even minimize air between the protrusion 405 and or the measurement site. Additionally, the surface pattern of the measurement site contact area 470 can vary from smooth to bumpy, e.g., to provide varying levels of grip.

[0161] In **FIGURES 4A** and **4C**, openings or windows 420, 421, 422, and 423 can include a wide variety of shapes and sizes, including for example, generally square, circular, triangular, or combinations thereof. The windows 420, 421, 422, and 423 can be of non-uniform shapes and sizes. As shown, the windows 420, 421, 422, and 423 can be evenly spaced out in a grid like arrangement. Other arrangements or patterns of arranging the windows 420, 421, 422, and 423 are possible. For example, the windows 420, 421, 422, and 423 can be placed in a triangular, circular, or linear arrangement. In some embodiments, the windows 420, 421, 422, and 423 can be placed at different heights with respect to the finger bed 310 of FIGURE 3. The windows 420, 421, 422, and 423 can also mimic or approximately mimic a configuration of, or even house, a plurality of detectors.

[0162] **FIGURES 6A** through **6D** illustrate another embodiment of a protrusion 605 that can be used as the tissue shaper 105 described above or in place of the protrusions 305, 405 described above. The depicted protrusion 605 is a partially cylindrical lens having a partial cylinder 608 and an extension 610. The partial cylinder 608 can be a half cylinder in some embodiments; however, a smaller or greater portion than half of a cylinder can be used. Advantageously, in certain embodiments, the partially cylindrical protrusion 605 focuses light onto a smaller area, such that fewer detectors can be used to detect the light attenuated by a measurement site.

[0163] **FIGURE 6A** illustrates a perspective view of the partially cylindrical protrusion 605. **FIGURE 6B** illustrates a front elevation view of the partially cylindrical protrusion 605. **FIGURE 6C** illustrates a side view of the partially cylindrical protrusion 605. **FIGURE 6D** illustrates a top view of the partially cylindrical protrusion 605.

[0164] Advantageously, in certain embodiments, placing the partially cylindrical protrusion 605 over the photodiodes in any of the sensors described

above adds multiple benefits to any of the sensors described above. In one embodiment, the partially cylindrical protrusion 605 penetrates into the tissue and reduces the path length of the light traveling in the tissue, similar to the protrusions described above.

[0165] The partially cylindrical protrusion 605 can also collect light from a large surface and focus down the light to a smaller area. As a result, in certain embodiments, signal strength per area of the photodiode can be increased. The partially cylindrical protrusion 605 can therefore facilitate a lower cost sensor because, in certain embodiments, less photodiode area can be used to obtain the same signal strength. Less photodiode area can be realized by using smaller photodiodes or fewer photodiodes (see, e.g., FIGURE 14). If fewer or smaller photodiodes are used, the partially cylindrical protrusion 605 can also facilitate an improved SNR of the sensor because fewer or smaller photodiodes can have less dark current.

[0166] The dimensions of the partially cylindrical protrusion 605 can vary based on, for instance, a number of photodiodes used with the sensor. Referring to **FIGURE 6C**, the overall height of the partially cylindrical protrusion 605 (measurement "a") in some implementations is about 1 to about 3 mm. A height in this range can allow the partially cylindrical protrusion 605 to penetrate into the pad of the finger or other tissue and reduce the distance that light travels through the tissue. Other heights, however, of the partially cylindrical protrusion 605 can also accomplish this objective. For example, the chosen height of the partially cylindrical protrusion 605 can be selected based on the size of the measurement site, whether the patient is an adult or child, and so on. In an embodiment, the height of the protrusion 605 is chosen to provide as much tissue thickness reduction as possible while reducing or preventing occlusion of blood vessels in the tissue.

[0167] Referring to **FIGURE 6D**, the width of the partially cylindrical protrusion 605 (measurement "b") can be about 3 to about 5 mm. In one embodiment, the width is about 4 mm. In one embodiment, a width in this range provides good penetration of the partially cylindrical protrusion 605 into the tissue to reduce the path length of the light. Other widths, however, of the partially cylindrical

protrusion 605 can also accomplish this objective. For example, the width of the partially cylindrical protrusion 605 can vary based on the size of the measurement site, whether the patient is an adult or child, and so on. In addition, the length of the protrusion 605 could be about 10 mm, or about 8 mm to about 12 mm, or smaller than 8 mm or greater than 12 mm.

[0168] In certain embodiments, the focal length (*f*) for the partially cylindrical protrusion 605 can be expressed as: $f = \frac{R}{n-1}$, where *R* is the radius of curvature of the partial cylinder 608 and *n* is the index of refraction of the material used. In certain embodiments, the radius of curvature can be between about 1.5 mm and about 2 mm. In another embodiment, the partially cylindrical protrusion 605 can include a material, such as nBK7 glass, with an index of refraction of around 1.5 at 1300 nm, which can provide focal lengths of between about 3 mm and about 4 mm.

[0169] A partially cylindrical protrusion 605 having a material with a higher index of refraction such as nSF11 glass (e.g., n=1.75 at 1300 nm) can provide a shorter focal length and possibly a smaller photodiode chip, but can also cause higher reflections due to the index of refraction mismatch with air. Many types of glass or plastic can be used with index of refraction values ranging from, for example, about 1.4 to about 1.9. The index of refraction of the material of the protrusion 605 can be chosen to improve or optimize the light focusing properties of the protrusion 605. A plastic partially cylindrical protrusion 605 could provide the cheapest option in high volumes but can also have some undesired light absorption peaks at wavelengths higher than 1500 nm. Other focal lengths and materials having different indices of refraction can be used for the partially cylindrical protrusion 605.

[0170] Placing a photodiode at a given distance below the partially cylindrical protrusion 605 can facilitate capturing some or all of the light traveling perpendicular to the lens within the active area of the photodiode (see FIGURE 14). Different sizes of the partially cylindrical protrusion 605 can use different sizes of photodiodes. The extension 610 added onto the bottom of the partial cylinder 608 is

used in certain embodiments to increase the height of the partially cylindrical protrusion 605. In an embodiment, the added height is such that the photodiodes are at or are approximately at the focal length of the partially cylindrical protrusion 605. In an embodiment, the added height provides for greater thinning of the measurement site. In an embodiment, the added height assists in deflecting light piped through the sensor. This is because light piped around the sensor passes through the side walls of the added height without being directed toward the detectors. The extension 610 can also further facilitate the protrusion 605 increasing or maximizing the amount of light that is provided to the detectors. In some embodiments, the extension 610 can be omitted.

[0171] **FIGURE 6E** illustrates another view of the sensor 301f of FIGURE 3F, which includes an embodiment of a partially cylindrical protrusion 605b. Like the sensor 301A shown in FIGURES 3B and 3C, the sensor 301f includes a finger bed 310f. The finger bed 310f includes a generally curved surface shaped generally to receive tissue, such as a human digit. The finger bed 310f also includes the ridges or channels 314 described above with respect to FIGURES 3B and 3C.

[0172] The example of finger bed 310f shown also includes the protrusion 605b, which includes the features of the protrusion 605 described above. In addition, the protrusion 605b also includes chamfered edges 607 on each end to provide a more comfortable surface for a finger to slide across (see also FIGURE 14D). In another embodiment, the protrusion 605b could instead include a single chamfered edge 607 proximal to the ridges 314. In another embodiment, one or both of the chamfered edges 607 could be rounded.

[0173] The protrusion 605b also includes a measurement site contact area 670 that can contact body tissue of a measurement site. The protrusion 605b can be removed from or integrated with the finger bed 310f. Interchangeable, differently shaped protrusions 605b can also be provided, which can correspond to different finger shapes, characteristics, opacity, sizes, or the like.

[0174] **FIGURES 7A** and **7B** illustrate block diagrams of sensors 701 that include example arrangements of conductive glass or conductive coated glass for shielding. Advantageously, in certain embodiments, the shielding can provide

increased SNR. The features of the sensors 701 can be implemented with any of the sensors 101, 201, 301 described above. Although not shown, the partially cylindrical protrusion 605 of FIGURE 6 can also be used with the sensors 701 in certain embodiments.

[0175] For example, referring specifically to **FIGURE 7A**, the sensor 701a includes an emitter housing 704a and a detector housing 706. The emitter housing 704a includes LEDs 104. The detector housing 706a includes a tissue bed 710a with an opening or window 703a, the conductive glass 730a, and one or more photodiodes for detectors 106 provided on a submount 707a.

[0176] During operation, a finger 102 can be placed on the tissue bed 710a and optical radiation can be emitted from the LEDs 104. Light can then be attenuated as it passes through or is reflected from the tissue of the finger 102. The attenuated light can then pass through the opening 703a in the tissue bed 710a. Based on the received light, the detectors 106 can provide a detector signal 107, for example, to the front end interface 108 (see FIGURE 1).

[0177] In the depicted embodiment, the conductive glass 730 is provided in the opening 703. The conductive glass 730 can thus not only permit light from the finger to pass to the detectors 106, but it can also supplement the shielding of the detectors 106 from noise. The conductive glass 730 can include a stack or set of layers. In **FIGURE 7A**, the conductive glass 730a is shown having a glass layer 731 proximate the finger 102 and a conductive layer 733 electrically coupled to the shielding 790a.

[0178] In an embodiment, the conductive glass 730a can be coated with a conductive, transparent or partially transparent material, such as a thin film of indium tin oxide (ITO). To supplement electrical shielding effects of a shielding enclosure 790a, the conductive glass 730a can be electrically coupled to the shielding enclosure 790a. The conductive glass 730a can be electrically coupled to the shielding 704a based on direct contact or via other connection devices, such as a wire or another component.

[0179] The shielding enclosure 790a can be provided to encompass the detectors 106 to reduce or prevent noise. For example, the shielding enclosure

790a can be constructed from a conductive material, such as copper, in the form of a metal cage. The shielding or enclosure a can include an opaque material to not only reduce electrical noise, but also ambient optical noise.

[0180] In some embodiments, the shielding enclosure 790a can be constructed in a single manufactured component with or without the use of conductive glass. This form of construction may be useful in order to reduce costs of manufacture as well as assist in quality control of the components. Furthermore, the shielding enclosure 790a can also be used to house various other components, such as sigma delta components for various embodiments of front end interfaces 108.

[0181] Referring to **FIGURE 7B**, another block diagram of an example sensor 701b is shown. A tissue bed 710b of the sensor 701b includes a protrusion 705b, which is in the form of a convex bump. The protrusion 705b can include all of the features of the protrusions or tissue shaping materials described above. For example, the protrusion 705b includes a contact area 370 that comes in contact with the finger 102 and which can include one or more openings 703b. One or more components of conductive glass 730b can be provided in the openings 703. For example, in an embodiment, each of the openings 703 can include a separate window of the conductive glass 730b. In an embodiment, a single piece of the conductive glass 730b can used for some or all of the openings 703b. The conductive glass 730b is smaller than the conductive glass 730a in this particular embodiment.

[0182] A shielding enclosure 790b is also provided, which can have all the features of the shielding enclosure 790a. The shielding enclosure 790b is smaller than the shielding enclosure 790a; however, a variety of sizes can be selected for the shielding enclosures 790.

[0183] In some embodiments, the shielding enclosure 790b can be constructed in a single manufactured component with or without the use of conductive glass. This form of construction may be useful in order to reduce costs of manufacture as well as assist in quality control of the components. Furthermore, the shielding enclosure 790b can also be used to house various other components,

such as sigma delta components for various embodiments of front end interfaces 108.

[0184] **FIGURES 8A** through **8D** illustrate a perspective view, side views, and a bottom elevation view of the conductive glass described above with respect to the sensors 701a, 701b. As shown in the perspective view of **FIGURE 8A** and side view of **FIGURE 8B**, the conductive glass 730 includes the electrically conductive material 733 described above as a coating on the glass layer 731 described above to form a stack. In an embodiment where the electrically conductive material 733 includes indium tin oxide, surface resistivity of the electrically conductive material 733 can range approximately from 30 ohms per square inch to 500 ohms per square inch, or approximately 30, 200, or 500 ohms per square inch. As would be understood by a person of skill in the art from the present disclosure, other resistivities can also be used which are less than 30 ohms or more than 500 ohms. Other transparent, electrically conductive materials can be used as the material 733.

[0185] Although the conductive material 733 is shown spread over the surface of the glass layer 731, the conductive material 733 can be patterned or provided on selected portions of the glass layer 731. Furthermore, the conductive material 733 can have uniform or varying thickness depending on a desired transmission of light, a desired shielding effect, and other considerations.

[0186] In **FIGURE 8C**, a side view of a conductive glass 830a is shown to illustrate an embodiment where the electrically conductive material 733 is provided as an internal layer between two glass layers 731, 835. Various combinations of integrating electrically conductive material 733 with glass are possible. For example, the electrically conductive material 733 can be a layer within a stack of layers. This stack of layers can include one or more layers of glass 731, 835, as well as one or more layers of conductive material 733. The stack can include other layers of materials to achieve desired characteristics.

[0187] In **FIGURE 8D**, a bottom perspective view is shown to illustrate an embodiment where a conductive glass 830b can include conductive material 837 that occupies or covers a portion of a glass layer 839. This embodiment can be useful, for example, to create individual, shielded windows for detectors 106, such

as those shown in FIGURE 3C. The conductive material 837 can be patterned to include an area 838 to allow light to pass to detectors 106 and one or more strips 841 to couple to the shielding 704 of FIGURE 7.

[0188] Other configurations and patterns for the conductive material can be used in certain embodiments, such as, for example, a conductive coating lining periphery edges, a conductive coating outlaid in a pattern including a grid or other pattern, a speckled conductive coating, coating outlaid in lines in either direction or diagonally, varied thicknesses from the center out or from the periphery in, or other suitable patterns or coatings that balance the shielding properties with transparency considerations.

[0189] **FIGURE 9** depicts an example graph 900 that illustrates comparative results obtained by an example sensor having components similar to those disclosed above with respect to FIGURES 7 and 8. The graph 900 depicts the results of the percentage of transmission of varying wavelengths of light for different types of windows used in the sensors described above.

[0190] A line 915 on the graph 900 illustrates example light transmission of a window made from plain glass. As shown, the light transmission percentage of varying wavelengths of light is approximately 90% for a window made from plain glass. A line 920 on the graph 900 demonstrates an example light transmission percentage for an embodiment in which a window is made from glass having an ITO coating with a surface resistivity of 500 ohms per square inch. A line 925 on the graph 900 shows an example light transmission for an embodiment in which a window is made from glass that includes a coating of ITO oxide with a surface resistivity of 200 ohms per square inch. A line 930 on the graph 900 shows an example light transmission for an embodiment in which a window is made from glass that includes a coating of ITO oxide with a surface resistivity of 30 ohms per square inch.

[0191] The light transmission percentage for a window with currently available embedded wiring can have a light transmission percentage of approximately 70%. This lower percentage of light transmission can be due to the opacity of the wiring employed in a currently available window with wiring.

Accordingly, certain embodiments of glass coatings described herein can employ, for example, ITO coatings with different surface resistivity depending on the desired light transmission, wavelengths of light used for measurement, desired shielding effect, and other criteria.

[0192] **FIGURES 10A** through **10B** illustrate comparative noise floors of example implementations of the sensors described above. Noise can include optical noise from ambient light and electro-magnetic noise, for example, from surrounding electrical equipment. In **FIGURE 10A**, a graph 1000 depicts possible noise floors for different frequencies of noise for an embodiment in which one of the sensors described above included separate windows for four (4) detectors 106. One or more of the windows included an embedded grid of wiring as a noise shield. Symbols 1030 - 1033 illustrate the noise floor performance for this embodiment. As can be seen, the noise floor performance can vary for each of the openings and based on the frequency of the noise.

[0193] In **FIGURE 10B**, a graph 1050 depicts a noise floor for frequencies of noise 1070 for an embodiment in which the sensor included separate openings for four (4) detectors 106 and one or more windows that include an ITO coating. In this embodiment, a surface resistivity of the ITO used was about 500 ohms per square inch. Symbols 1080 - 1083 illustrate the noise floor performance for this embodiment. As can be seen, the noise floor performance for this embodiment can vary less for each of the openings and provide lower noise floors in comparison to the embodiment of **FIGURE 10A**.

[0194] **FIGURE 11A** illustrates an example structure for configuring the set of optical sources of the emitters described above. As shown, an emitter 104 can include a driver 1105, a thermistor 1120, a set of top-emitting LEDs 1102 for emitting red and/or infrared light, a set of side-emitting LEDs 1104 for emitting near infrared light, and a submount 1106.

[0195] The thermistor 1120 can be provided to compensate for temperature variations. For example, the thermistor 1120 can be provided to allow for wavelength centroid and power drift of LEDs 1102 and 1104 due to heating. In addition, other thermistors ~~(not shown)~~ can be employed, for example, to measure a

temperature of a measurement site. The temperature can be displayed on a display device and used by a caregiver. Such a temperature can also be helpful in correcting for wavelength drift due to changes in water absorption, which can be temperature dependent, thereby providing more accurate data useful in detecting blood analytes like glucose. In addition, using a thermistor or other type of temperature sensitive device may be useful for detecting extreme temperatures at the measurement site that are too hot or too cold. The presence of low perfusion may also be detected, for example, when the finger of a patient has become too cold. Moreover, shifts in temperature at the measurement site can alter the absorption spectrum of water and other tissue in the measurement cite. A thermistor's temperature reading can be used to adjust for the variations in absorption spectrum changes in the measurement site.

[0196] The driver 1105 can provide pulses of current to the emitter 1104. In an embodiment, the driver 1105 drives the emitter 1104 in a progressive fashion, for example, in an alternating manner based on a control signal from, for example, a processor (e.g., the processor 110). For example, the driver 1105 can drive the emitter 1104 with a series of pulses to about 1 milliwatt (mW) for visible light to light at about 1300 nm and from about 40 mW to about 100 mW for light at about 1600 nm to about 1700 nm. However, a wide number of driving powers and driving methodologies can be used. The driver 1105 can be synchronized with other parts of the sensor and can minimize or reduce any jitter in the timing of pulses of optical radiation emitted from the emitter 1104. In some embodiments, the driver 1105 is capable of driving the emitter 1104 to emit an optical radiation in a pattern that varies by less than about 10 parts-per-million; however other amounts of variation can be used.

[0197] The submount 1106 provides a support structure in certain embodiments for aligning the top-emitting LEDs 1102 and the side-emitting LEDs 1104 so that their optical radiation is transmitted generally towards the measurement site. In some embodiments, the submount 1106 is also constructed of aluminum nitride (AlN) or beryllium oxide (BEO) for heat dissipation, although

other materials or combinations of materials suitable for the submount 1106 can be used.

[0198] **FIGURE 11B** illustrates a configuration of emitting optical radiation into a measurement site for measuring a blood constituent or analyte like glucose. In some embodiments, emitter 104 may be driven in a progressive fashion to minimize noise and increase SNR of sensor 101. For example, emitter 104 may be driven based on a progression of power/current delivered to LEDs 1102 and 1104.

[0199] In some embodiments, emitter 104 may be configured to emit pulses centered about 905 nm, about 1050 nm, about 1200 nm, about 1300 nm, about 1330 nm, about 1610 nm, about 1640 nm, and about 1665 nm. In another embodiment, the emitter 104 may emit optical radiation ranging from about 860 nm to about 950 nm, about 950 nm to about 1100 nm, about 1100 nm to about 1270 nm, about 1250 nm to about 1350 nm, about 1300 nm to about 1360 nm, and about 1590 nm to about 1700 nm. Of course, emitter 104 may be configured to transmit any of a variety of wavelengths of visible, or near-infrared optical radiation.

[0200] For purposes of illustration, **FIGURE 11B** shows a sequence of pulses of light at wavelengths of around 905 nm, around 1200 nm, around 1300 nm, and around 1330 nm from top emitting LEDs 1102. **FIGURE 11B** also shows that emitter 104 may then emit pulses centered at around 1630 nm, around 1660 nm, and around 1615 nm from side emitting LEDs 1104. Emitter 104 may be progressively driven at higher power/current. This progression may allow driver circuit 105 to stabilize in its operations, and thus, provide a more stable current/power to LEDs 1102 and 1104.

[0201] For example, as shown in **FIGURE 11B**, the sequence of optical radiation pulses are shown having a logarithmic-like progression in power/current. In some embodiments, the timing of these pulses is based on a cycle of about 400 slots running at 48 kHz (e.g. each time slot may be approximately 0.02 ms or 20 microseconds). An artisan will recognize that term “slots” includes its ordinary meaning, which includes a time period that may also be expressed in terms of a frequency. In the example shown, pulses from top emitting LEDs 1102 may have a pulse width of about 40 time slots (e.g., about 0.8 ms) and an off period of about 4

time slots in between. In addition, pulses from side emitting LEDs 1104 (e.g., or a laser diode) may have a pulse width of about 60 time slots (e.g., about 1.25 ms) and a similar off period of about 4 time slots. A pause of about 70 time slots (e.g. 1.5 ms) may also be provided in order to allow driver circuit 1105 to stabilize after operating at higher current/power.

[0202] As shown in **FIGURE 11B**, top emitting LEDs 1102 may be initially driven with a power to approximately 1 mW at a current of about 20-100 mA. Power in these LEDs may also be modulated by using a filter or covering of black dye to reduce power output of LEDs. In this example, top emitting LEDs 1102 may be driven at approximately 0.02 to 0.08 mW. The sequence of the wavelengths may be based on the current requirements of top emitting LEDs 502 for that particular wavelength. Of course, in other embodiments, different wavelengths and sequences of wavelengths may be output from emitter 104.

[0203] Subsequently, side emitting LEDs 1104 may be driven at higher powers, such as about 40-100 mW and higher currents of about 600-800 mA. This higher power may be employed in order to compensate for the higher opacity of tissue and water in measurement site 102 to these wavelengths. For example, as shown, pulses at about 1630 nm, about 1660 nm, and about 1615 nm may be output with progressively higher power, such as at about 40 mW, about 50 mW, and about 60 mW, respectively. In this embodiment, the order of wavelengths may be based on the optical characteristics of that wavelength in tissue as well as the current needed to drive side emitting LEDs 1104. For example, in this embodiment, the optical pulse at about 1615 nm is driven at the highest power due to its sensitivity in detecting analytes like glucose and the ability of light at this wavelength to penetrate tissue. Of course, different wavelengths and sequences of wavelengths may be output from emitter 104.

[0204] As noted, this progression may be useful in some embodiments because it allows the circuitry of driver circuit 1105 to stabilize its power delivery to LEDs 1102 and 1104. Driver circuit 1105 may be allowed to stabilize based on the duty cycle of the pulses or, for example, by configuring a variable waiting period to

allow for stabilization of driver circuit 1105. Of course, other variations in power/current and wavelength may also be employed in the present disclosure.

[0205] Modulation in the duty cycle of the individual pulses may also be useful because duty cycle can affect the signal noise ratio of the system 100. That is, as the duty cycle is increased so may the signal to noise ratio.

[0206] Furthermore, as noted above, driver circuit 1105 may monitor temperatures of the LEDs 1102 and 1104 using the thermistor 1120 and adjust the output of LEDs 1102 and 1104 accordingly. Such a temperature may be to help sensor 101 correct for wavelength drift due to changes in water absorption, which can be temperature dependent.

[0207] **FIGURE 11C** illustrates another exemplary emitter that may be employed in the sensor according to an embodiment of the disclosure. As shown, the emitter 104 can include components mounted on a substrate 1108 and on submount 1106. In particular, top-emitting LEDs 1102 for emitting red and/or infrared light may be mounted on substrate 1108. Side emitting LEDS 1104 may be mounted on submount 1106. As noted, side-emitting LEDs 1104 may be included in emitter 104 for emitting near infrared light.

[0208] As also shown, the sensor of **FIGURE 11C** may include a thermistor 1120. As noted, the thermistor 1120 can be provided to compensate for temperature variations. The thermistor 1120 can be provided to allow for wavelength centroid and power drift of LEDs 1102 and 1104 due to heating. In addition, other thermistors (not shown) can be employed, for example, to measure a temperature of a measurement site. Such a temperature can be helpful in correcting for wavelength drift due to changes in water absorption, which can be temperature dependent, thereby providing more accurate data useful in detecting blood analytes like glucose.

[0209] In some embodiments, the emitter 104 may be implemented without the use of side emitting LEDs. For example, certain blood constituents, such as total hemoglobin, can be measured by embodiments of the disclosure without the use of side emitting LEDs. **FIGURE 11D** illustrates another exemplary emitter that may be employed in the sensor according to an embodiment of the

disclosure. In particular, an emitter 104 that is configured for a blood constituent, such as total hemoglobin, is shown. The emitter 104 can include components mounted on a substrate 1108. In particular, top-emitting LEDs 1102 for emitting red and/or infrared light may be mounted on substrate 1108.

[0210] As also shown, the emitter of **FIGURE 11D** may include a thermistor 1120. The thermistor 1120 can be provided to compensate for temperature variations. The thermistor 1120 can be provided to allow for wavelength centroid and power drift of LEDs 1102 due to heating.

[0211] **FIGURE 12A** illustrates a detector submount 1200 having photodiode detectors that are arranged in a grid pattern on the detector submount 1200 to capture light at different quadrants from a measurement site. One detector submount 1200 can be placed under each window of the sensors described above, or multiple windows can be placed over a single detector submount 1200. The detector submount 1200 can also be used with the partially cylindrical protrusion 605 described above with respect to FIGURE 6.

[0212] The detectors include photodiode detectors 1-4 that are arranged in a grid pattern on the submount 1200 to capture light at different quadrants from the measurement site. As noted, other patterns of photodiodes, such as a linear row, or logarithmic row, can also be employed in certain embodiments.

[0213] As shown, the detectors 1-4 may have a predetermined spacing from each other, or spatial relationship among one another that result in a spatial configuration. This spatial configuration can be configured to purposefully create a variation of path lengths among detectors 106 and the point light source discussed above.

[0214] Detectors may hold multiple (e.g., two, three, four, etc.) photodiode arrays that are arranged in a two-dimensional grid pattern. Multiple photodiode arrays may also be useful to detect light piping (i.e., light that bypasses measurement site 102). As shown, walls may separate the individual photodiode arrays to prevent mixing of light signals from distinct quadrants. In addition, as noted, the detectors may be covered by windows of transparent material, such as glass, plastic, etc., to allow maximum transmission of power light captured. As

noted, this window may comprise some shielding in the form of an embedded grid of wiring, or a conductive layer or coating.

[0215] **FIGURES 12B through 12D** illustrate a simplified view of exemplary arrangements and spatial configurations of photodiodes for detectors 106. As shown, detectors 106 may comprise photodiode detectors 1-4 that are arranged in a grid pattern on detector submount 1200 to capture light at different quadrants from measurement site 102.

[0216] As noted, other patterns of photodiodes may also be employed in embodiments of the present disclosure, including, for example, stacked or other configurations recognizable to an artisan from the disclosure herein. For example, detectors 106 may be arranged in a linear array, a logarithmic array, a two-dimensional array, and the like. Furthermore, an artisan will recognize from the disclosure herein that any number of detectors 106 may be employed by embodiments of the present disclosure.

[0217] For example, as shown in **FIGURE 12B**, detectors 106 may comprise photodiode detectors 1-4 that are arranged in a substantially linear configuration on submount 1200. In this embodiment shown, photodiode detectors 1-4 are substantially equally spaced apart (e.g., where the distance D is substantially the same between detectors 1-4).

[0218] In **FIGURE 12C**, photodiode detectors 1-4 may be arranged in a substantially linear configuration on submount 1200, but may employ a substantially progressive, substantially logarithmic, or substantially semi-logarithmic spacing (e.g., where distances D1 > D2 > D3). This arrangement or pattern may be useful for use on a patient's finger and where the thickness of the finger gradually increases.

[0219] In **FIGURE 12D**, a different substantially grid pattern on submount 1200 of photodiode detectors 1-4 is shown. As noted, other patterns of detectors may also be employed in embodiments of the present invention.

[0220] **FIGURES 12E through 12H** illustrate several embodiments of photodiodes that may be used in detectors 106. As shown in these figures, a photodiode 1202 of detector 106 may comprise a plurality of active areas 1204,

These active areas 204 may be coupled together via a common cathode 1206 or anode 1208 in order to provide a larger effective detection area.

[0221] In particular, as shown in **FIGURE 12E**, photodiode 1202 may comprise two (2) active areas 1204a and 1204b. In **FIGURE 12F**, photodiode 1202 may comprise four (4) active areas 1204c-f. In **FIGURE 12G**, photodiode 1202 may comprise three (3) active areas 1204g-i. In **FIGURE 12H**, photodiode 1202 may comprise nine (9) active areas 1204j-r. The use of smaller active areas may be useful because smaller active areas can be easier to fabricate and can be fabricated with higher purity. However, one skilled in the art will recognize that various sizes of active areas may be employed in the photodiode 1202.

[0222] **FIGURE 13** illustrates an example multi-stream process 1300. The multi-stream process 1300 can be implemented by the data collection system 100 and/or by any of the sensors described above. As shown, a control signal from a signal processor 1310 controls a driver 1305. In response, an emitter 1304 generates a pulse sequence 1303 from its emitter (e.g., its LEDs) into a measurement site or sites 1302. As described above, in some embodiments, the pulse sequence 1303 is controlled to have a variation of about 10 parts per million or less. Of course, depending on the analyte desired, the tolerated variation in the pulse sequence 1303 can be greater (or smaller).

[0223] In response to the pulse sequence 1300, detectors 1 to n (n being an integer) in a detector 1306 capture optical radiation from the measurement site 1302 and provide respective streams of output signals. Each signal from one of detectors 1-n can be considered a stream having respective time slots corresponding to the optical pulses from emitter sets 1-n in the emitter 1304. Although n emitters and n detectors are shown, the number of emitters and detectors need not be the same in certain implementations.

[0224] A front end interface 1308 can accept these multiple streams from detectors 1-n and deliver one or more signals or composite signal(s) back to the signal processor 1310. A stream from the detectors 1-n can thus include measured light intensities corresponding to the light pulses emitted from the emitter 1304.

[0225] The signal processor 1310 can then perform various calculations to measure the amount of glucose and other analytes based on these multiple streams of signals. In order to help explain how the signal processor 1310 can measure analytes like glucose, a primer on the spectroscopy employed in these embodiments will now be provided.

[0226] Spectroscopy is premised upon the Beer-Lambert law. According to this law, the properties of a material, e.g., glucose present in a measurement site, can be deterministically calculated from the absorption of light traveling through the material. Specifically, there is a logarithmic relation between the transmission of light through a material and the concentration of a substance and also between the transmission and the length of the path traveled by the light. As noted, this relation is known as the Beer-Lambert law.

[0227] The Beer-Lambert law is usually written as:

[0228] Absorbance $A = m*b*c$, where:

[0229] m is the wavelength-dependent molar absorptivity coefficient (usually expressed in units of M^{-1} cm^{-1});

[0230] b is the mean path length; and

[0231] c is the analyte concentration (e.g., the desired parameter).

[0232] In spectroscopy, instruments attempt to obtain the analyte concentration (c) by relating absorbance (A) to transmittance (T). Transmittance is a proportional value defined as:

[0233] $T = I / I_o$, where:

[0234] I is the light intensity measured by the instrument from the measurement site; and

[0235] I_o is the initial light intensity from the emitter.

[0236] Absorbance (A) can be equated to the transmittance (T) by the equation:

[0237] $A = - \log T$

[0238] Therefore, substituting equations from above:

[0239] $A = - \log (I / I_o)$

[0240] In view of this relationship, spectroscopy thus relies on a proportional-based calculation of $-\log(I / I_o)$ and solving for analyte concentration (c).

[0241] Typically, in order to simplify the calculations, spectroscopy will use detectors that are at the same location in order to keep the path length (b) a fixed, known constant. In addition, spectroscopy will employ various mechanisms to definitively know the transmission power (I_o), such as a photodiode located at the light source. This architecture can be viewed as a single channel or single stream sensor, because the detectors are at a single location.

[0242] However, this scheme can encounter several difficulties in measuring analytes, such as glucose. This can be due to the high overlap of absorption of light by water at the wavelengths relevant to glucose as well as other factors, such as high self-noise of the components.

[0243] Embodiments of the present disclosure can employ a different approach that in part allows for the measurement of analytes like glucose. Some embodiments can employ a bulk, non-pulsatile measurement in order to confirm or validate a pulsatile measurement. In addition, both the non-pulsatile and pulsatile measurements can employ, among other things, the multi-stream operation described above in order to attain sufficient SNR. In particular, a single light source having multiple emitters can be used to transmit light to multiple detectors having a spatial configuration.

[0244] A single light source having multiple emitters can allow for a range of wavelengths of light to be used. For example, visible, infrared, and near infrared wavelengths can be employed. Varying powers of light intensity for different wavelengths can also be employed.

[0245] Secondly, the use of multiple-detectors in a spatial configuration allow for a bulk measurement to confirm or validate that the sensor is positioned correctly. This is because the multiple locations of the spatial configuration can provide, for example, topology information that indicates where the sensor has been positioned. Currently available sensors do not provide such information. For example, if the bulk measurement is within a predetermined range of values, then this can indicate that the sensor is positioned correctly in order to perform pulsatile

measurements for analytes like glucose. If the bulk measurement is outside of a certain range or is an unexpected value, then this can indicate that the sensor should be adjusted, or that the pulsatile measurements can be processed differently to compensate, such as using a different calibration curve or adjusting a calibration curve. This feature and others allow the embodiments to achieve noise cancellation and noise reduction, which can be several times greater in magnitude that what is achievable by currently available technology.

[0246] In order to help illustrate aspects of the multi-stream measurement approach, the following example derivation is provided. Transmittance (T) can be expressed as:

[0247] $T = e^{-m*b*c}$

[0248] In terms of light intensity, this equation can also be rewritten as:

[0249] $I / I_o = e^{-m*b*c}$

[0250] Or, at a detector, the measured light (I) can be expressed as:

[0251] $I = I_o * e^{-m*b*c}$

[0252] As noted, in the present disclosure, multiple detectors (1 to n) can be employed, which results in $I_1 \ldots I_n$ streams of measurements. Assuming each of these detectors have their own path lengths, $b_1 \ldots b_n$, from the light source, the measured light intensities can be expressed as:

[0253] $I_n = I_o * e^{-m*b_n*c}$

[0254] The measured light intensities at any two different detectors can be referenced to each other. For example:

[0255] $I_1/I_n = (I_o * e^{-mb_1c})/(I_o * e^{-mb_nc})$

[0256] As can be seen, the terms, I_o, cancel out and, based on exponent algebra, the equation can be rewritten as:

[0257] $I_1/I_n = e^{-m(b_1-b_n)c}$

[0258] From this equation, the analyte concentration (c) can now be derived from bulk signals $I_1 \ldots I_n$ and knowing the respective mean path lengths b_1 and b_n. This scheme also allows for the cancelling out of I_o, and thus, noise generated by the emitter 1304 can be cancelled out or reduced. In addition, since

the scheme employs a mean path length difference, any changes in mean path length and topological variations from patient to patient are easily accounted. Furthermore, this bulk-measurement scheme can be extended across multiple wavelengths. This flexibility and other features allow embodiments of the present disclosure to measure blood analytes like glucose.

[0259] For example, as noted, the non-pulsatile, bulk measurements can be combined with pulsatile measurements to more accurately measure analytes like glucose. In particular, the non-pulsatile, bulk measurement can be used to confirm or validate the amount of glucose, protein, etc. in the pulsatile measurements taken at the tissue at the measurement site(s) 1302. The pulsatile measurements can be used to measure the amount of glucose, hemoglobin, or the like that is present in the blood. Accordingly, these different measurements can be combined to thus determine analytes like blood glucose.

[0260] **FIGURE 14A** illustrates an embodiment of a detector submount 1400a positioned beneath the partially cylindrical protrusion 605 of FIGURE 6 (or alternatively, the protrusion 605b). The detector submount 1400a includes two rows 1408a of detectors 1410a. The partially cylindrical protrusion 605 can facilitate reducing the number and/or size of detectors used in a sensor because the protrusion 605 can act as a lens that focuses light onto a smaller area.

[0261] To illustrate, in some sensors that do not include the partially cylindrical protrusion 605, sixteen detectors can be used, including four rows of four detectors each. Multiple rows of detectors can be used to measure certain analytes, such as glucose or total hemoglobin, among others. Multiple rows of detectors can also be used to detect light piping (e.g., light that bypasses the measurement site). However, using more detectors in a sensor can add cost, complexity, and noise to the sensor.

[0262] Applying the partially cylindrical protrusion 605 to such a sensor, however, could reduce the number of detectors or rows of detectors used while still receiving the substantially same amount of light, due to the focusing properties of the protrusion 605 (see FIGURE 14B). This is the example situation illustrated in **FIGURE 14**—two rows 1408a of detectors 1410a are used instead of four.

Advantageously, in certain embodiments, the resulting sensor can be more cost effective, have less complexity, and have an improved SNR, due to fewer and/or smaller photodiodes.

[0263] In other embodiments, using the partially cylindrical protrusion 605 can allow the number of detector rows to be reduced to one or three rows of four detectors. The number of detectors in each row can also be reduced. Alternatively, the number of rows might not be reduced but the size of the detectors can be reduced. Many other configurations of detector rows and sizes can also be provided.

[0264] **FIGURE 14B** depicts a front elevation view of the partially cylindrical protrusion 605 (or alternatively, the protrusion 605b) that illustrates how light from emitters (not shown) can be focused by the protrusion 605 onto detectors. The protrusion 605 is placed above a detector submount 1400b having one or more detectors 1410b disposed thereon. The submount 1400b can include any number of rows of detectors 1410, although one row is shown.

[0265] Light, represented by rays 1420, is emitted from the emitters onto the protrusion 605. These light rays 1420 can be attenuated by body tissue (not shown). When the light rays 1420 enter the protrusion 605, the protrusion 605 acts as a lens to refract the rays into rays 1422. This refraction is caused in certain embodiments by the partially cylindrical shape of the protrusion 605. The refraction causes the rays 1422 to be focused or substantially focused on the one or more detectors 1410b. Since the light is focused on a smaller area, a sensor including the protrusion 605 can include fewer detectors to capture the same amount of light compared with other sensors.

[0266] **FIGURE 14C** illustrates another embodiment of a detector submount 1400c, which can be disposed under the protrusion 605b (or alternatively, the protrusion 605). The detector submount 1400c includes a single row 1408c of detectors 1410c. The detectors are electrically connected to conductors 1412c, which can be gold, silver, copper, or any other suitable conductive material.

[0267] The detector submount 1400c is shown positioned under the protrusion 605b in a detector subassembly 1450 illustrated in **FIGURE 14D**. A top-

down view of the detector subassembly 1450 is also shown in **FIGURE 14E**. In the detector subassembly 1450, a cylindrical housing 1430 is disposed on the submount 1400c. The cylindrical housing 1430 includes a transparent cover 1432, upon which the protrusion 605b is disposed. Thus, as shown in **FIGURE 14D**, a gap 1434 exists between the detectors 1410c and the protrusion 605b. The height of this gap 1434 can be chosen to increase or maximize the amount of light that impinges on the detectors 1410c.

[0268] The cylindrical housing 1430 can be made of metal, plastic, or another suitable material. The transparent cover 1432 can be fabricated from glass or plastic, among other materials. The cylindrical housing 1430 can be attached to the submount 1400c at the same time or substantially the same time as the detectors 1410c to reduce manufacturing costs. A shape other than a cylinder can be selected for the housing 1430 in various embodiments.

[0269] In certain embodiments, the cylindrical housing 1430 (and transparent cover 1432) forms an airtight or substantially airtight or hermetic seal with the submount 1400c. As a result, the cylindrical housing 1430 can protect the detectors 1410c and conductors 1412c from fluids and vapors that can cause corrosion. Advantageously, in certain embodiments, the cylindrical housing 1430 can protect the detectors 1410c and conductors 1412c more effectively than currently-available resin epoxies, which are sometimes applied to solder joints between conductors and detectors.

[0270] In embodiments where the cylindrical housing 1430 is at least partially made of metal, the cylindrical housing 1430 can provide noise shielding for the detectors 1410c. For example, the cylindrical housing 1430 can be soldered to a ground connection or ground plane on the submount 1400c, which allows the cylindrical housing 1430 to reduce noise. In another embodiment, the transparent cover 1432 can include a conductive material or conductive layer, such as conductive glass or plastic. The transparent cover 1432 can include any of the features of the noise shields 790 described above.

[0271] The protrusion 605b includes the chamfered edges 607 described above with respect to FIGURE 6E. These chamfered edges 607 can allow a patient

to more comfortably slide a finger over the protrusion 605b when inserting the finger into the sensor 301f.

[0272] **FIGURE 14F** illustrates a portion of the detector shell 306f, which includes the detectors 1410c on the substrate 1400c. The substrate 1400c is enclosed by a shielding enclosure 1490, which can include the features of the shielding enclosures 790a, 790b described above (see also FIGURE 17). The shielding enclosure 1490 can be made of metal. The shielding enclosure 1490 includes a window 1492a above the detectors 1410c, which allows light to be transmitted onto the detectors 1410c.

[0273] A noise shield 1403 is disposed above the shielding enclosure 1490. The noise shield 1403, in the depicted embodiment, includes a window 1492a corresponding to the window 1492a. Each of the windows 1492a, 1492b can include glass, plastic, or can be an opening without glass or plastic. In some embodiments, the windows 1492a, 1492b may be selected to have different sizes or shapes from each other.

[0274] The noise shield 1403 can include any of the features of the conductive glass described above. In the depicted embodiment, the noise shield 1403 extends about three-quarters of the length of the detector shell 306f. In other embodiments, the noise shield 1403 could be smaller or larger. The noise shield 1403 could, for instance, merely cover the detectors 1410c, the submount 1400c, or a portion thereof. The noise shield 1403 also includes a stop 1413 for positioning a measurement site within the sensor 301f. Advantageously, in certain embodiments, the noise shield 1403 can reduce noise caused by light piping.

[0275] A thermistor 1470 is also shown. The thermistor 1470 is attached to the submount 1400c and protrudes above the noise shield 1403. As described above, the thermistor 1470 can be employed to measure a temperature of a measurement site. Such a temperature can be helpful in correcting for wavelength drift due to changes in water absorption, which can be temperature dependent, thereby providing more accurate data useful in detecting blood analytes like glucose.

[0276] In the depicted embodiment, the detectors 1410c are not enclosed in the cylindrical housing 1430. In an alternative embodiment, the cylindrical housing 1430 encloses the detectors 1410c and is disposed under the noise shield 1403. In another embodiment, the cylindrical housing 1430 encloses the detectors 1410c and the noise shield 1403 is not used. If both the cylindrical housing 1403 and the noise shield 1403 are used, either or both can have noise shielding features.

[0277] **FIGURE 14G** illustrates the detector shell 306f of FIGURE 14F, with the finger bed 310f disposed thereon. **FIGURE 14H** illustrates the detector shell 306f of FIGURE 14G, with the protrusion 605b disposed in the finger bed 310f.

[0278] **FIGURE 14I** illustrates a cutaway view of the sensor 301f. Not all features of the sensor 301f are shown, such as the protrusion 605b. Features shown include the emitter and detector shells 304f, 306f, the flaps 307f, the heat sink 350f and fins 351f, the finger bed 310f, and the noise shield 1403.

[0279] In addition to these features, emitters 1404 are depicted in the emitter shell 304f. The emitters 1404 are disposed on a submount 1401, which is connected to a circuit board 1419. The emitters 1404 are also enclosed within a cylindrical housing 1480. The cylindrical housing 1480 can include all of the features of the cylindrical housing 1430 described above. For example, the cylindrical housing 1480 can be made of metal, can be connected to a ground plane of the submount 1401 to provide noise shielding, and can include a transparent cover 1482.

[0280] The cylindrical housing 1480 can also protect the emitters 1404 from fluids and vapors that can cause corrosion. Moreover, the cylindrical housing 1480 can provide a gap between the emitters 1404 and the measurement site (not shown), which can allow light from the emitters 1404 to even out or average out before reaching the measurement site.

[0281] The heat sink 350f, in addition to including the fins 351f, includes a protuberance 352f that extends down from the fins 351f and contacts the submount 1401. The protuberance 352f can be connected to the submount 1401, for

example, with thermal paste or the like. The protuberance 352f can sink heat from the emitters 1404 and dissipate the heat via the fins 351f.

[0282] **FIGURES 15A** and **15B** illustrate embodiments of sensor portions 1500A, 1500B that include alternative heat sink features to those described above. These features can be incorporated into any of the sensors described above. For example, any of the sensors above can be modified to use the heat sink features described below instead of or in addition to the heat sink features of the sensors described above.

[0283] The sensor portions 1500A, 1500B shown include LED emitters 1504; however, for ease of illustration, the detectors have been omitted. The sensor portions 1500A, 1500B shown can be included, for example, in any of the emitter shells described above.

[0284] The LEDs 1504 of the sensor portions 1500A, 1500B are connected to a substrate or submount 1502. The submount 1502 can be used in place of any of the submounts described above. The submount 1502 can be a non-electrically conducting material made of any of a variety of materials, such as ceramic, glass, or the like. A cable 1512 is attached to the submount 1502 and includes electrical wiring 1514, such as twisted wires and the like, for communicating with the LEDs 1504. The cable 1512 can correspond to the cables 212 described above.

[0285] Although not shown, the cable 1512 can also include electrical connections to a detector. Only a portion of the cable 1512 is shown for clarity. The depicted embodiment of the cable 1512 includes an outer jacket 1510 and a conductive shield 1506 disposed within the outer jacket 1510. The conductive shield 1506 can be a ground shield or the like that is made of a metal such as braided copper or aluminum. The conductive shield 1506 or a portion of the conductive shield 1506 can be electrically connected to the submount 1502 and can reduce noise in the signal generated by the sensor 1500A, 1500B by reducing RF coupling with the wires 1514. In alternative embodiments, the cable 1512 does not have a conductive shield. For example, the cable 1512 could be a twisted pair cable or the like, with one wire of the twisted pair used as a heat sink.

[0286] Referring specifically to **FIGURE 15A**, in certain embodiments, the conductive shield 1506 can act as a heat sink for the LEDs 1504 by absorbing thermal energy from the LEDs 1504 and/or the submount 1502. An optional heat insulator 1520 in communication with the submount 1502 can also assist with directing heat toward the conductive shield 1506. The heat insulator 1520 can be made of plastic or another suitable material. Advantageously, using the conductive shield 1506 in the cable 1512 as a heat sink can, in certain embodiments, reduce cost for the sensor.

[0287] Referring to **FIGURE 15B**, the conductive shield 1506 can be attached to both the submount 1502 and to a heat sink layer 1530 sandwiched between the submount 1502 and the optional insulator 1520. Together, the heat sink layer 1530 and the conductive shield 1506 in the cable 1512 can absorb at least part of the thermal energy from the LEDs and/or the submount 1502.

[0288] **FIGURES 15C** and **15D** illustrate implementations of a sensor portion 1500C that includes the heat sink features of the sensor portion 1500A described above with respect to FIGURE 15A. The sensor portion 1500C includes the features of the sensor portion 1500A, except that the optional insulator 1520 is not shown. **FIGURE 15D** is a side cutaway view of the sensor portion 1500C that shows the emitters 1504.

[0289] The cable 1512 includes the outer jacket 1510 and the conductive shield 1506. The conductive shield 1506 is soldered to the submount 1502, and the solder joint 1561 is shown. In some embodiments, a larger solder joint 1561 can assist with removing heat more rapidly from the emitters 1504. Various connections 1563 between the submount 1502 and a circuit board 1519 are shown. In addition, a cylindrical housing 1580, corresponding to the cylindrical housing 1480 of FIGURE 14I, is shown protruding through the circuit board 1519. The emitters 1504 are enclosed in the cylindrical housing 1580.

[0290] **FIGURES 15E** and **15F** illustrate implementations of a sensor portion 1500E that includes the heat sink features of the sensor portion 1500B described above with respect to FIGURE 15B. The sensor portion 1500E includes the heat sink layer 1530. The heat sink layer 1530 can be a metal plate, such as a

copper plate or the like. The optional insulator 1520 is not shown. **FIGURE 15F** is a side cutaway view of the sensor portion 1500E that shows the emitters 1504.

[0291] In the depicted embodiment, the conductive shield 1506 of the cable 1512 is soldered to the heat sink layer 1530 instead of the submount 1502. The solder joint 1565 is shown. In some embodiments, a larger solder joint 1565 can assist with removing heat more rapidly from the emitters 1504. Various connections 1563 between the submount 1502 and a circuit board 1519 are shown. In addition, the cylindrical housing 1580 is shown protruding through the circuit board 1519. The emitters 1504 are enclosed in the cylindrical housing 1580.

[0292] **FIGURES 15G** and **15H** illustrate embodiments of connector features that can be used with any of the sensors described above with respect to FIGURES 1 through 15F. Referring to **FIGURE 15G**, the circuit board 1519 includes a female connector 1575 that mates with a male connector 1577 connected to a daughter board 1587. The daughter board 1587 includes connections to the electrical wiring 1514 of the cable 1512. The connected boards 1519, 1587 are shown in **FIGURE 15H**. Also shown is a hole 1573 that can receive the cylindrical housing 1580 described above.

[0293] Advantageously, in certain embodiments, using a daughter board 1587 to connect to the circuit board 1519 can enable connections to be made more easily to the circuit board 1519. In addition, using separate boards can be easier to manufacture than a single circuit board 1519 with all connections soldered to the circuit board 1519.

[0294] **FIGURE 15I** illustrates an exemplary architecture for front-end interface 108 as a transimpedance-based front-end. As noted, front-end interfaces 108 provide an interface that adapts the output of detectors 106 into a form that can be handled by signal processor 110. As shown in this figure, sensor 101 and front-end interfaces 108 may be integrated together as a single component, such as an integrated circuit. Of course, one skilled in the art will recognize that sensor 101 and front end interfaces 108 may comprise multiple components or circuits that are coupled together.

[0295] Front-end interfaces 108 may be implemented using transimpedance amplifiers that are coupled to analog to digital converters in a sigma delta converter. In some embodiments, a programmable gain amplifier (PGA) can be used in combination with the transimpedance-based front-ends. For example, the output of a transimpedance-based front-end may be output to a sigma-delta ADC that comprises a PGA. A PGA may be useful in order to provide another level of amplification and control of the stream of signals from detectors 106. The PGA may be an integrated circuit or built from a set of micro-relays. Alternatively, the PGA and ADC components in converter 900 may be integrated with the transimpedance-based front-end in sensor 101.

[0296] Due to the low-noise requirements for measuring blood analytes like glucose and the challenge of using multiple photodiodes in detector 106, the applicants developed a noise model to assist in configuring front-end 108. Conventionally, those skilled in the art have focused on optimizing the impedance of the transimpedance amplifiers to minimize noise.

[0297] However, the following noise model was discovered by the applicants:

$Noise = \sqrt{aR + bR^2}$, where:

[0298] aR is characteristic of the impedance of the transimpedance amplifier; and

[0299] bR^2 is characteristic of the impedance of the photodiodes in detector and the number of photodiodes in detector 106.

[0300] The foregoing noise model was found to be helpful at least in part due to the high SNR required to measure analytes like glucose. However, the foregoing noise model was not previously recognized by artisans at least in part because, in conventional devices, the major contributor to noise was generally believed to originate from the emitter or the LEDs. Therefore, artisans have generally continued to focus on reducing noise at the emitter.

[0301] However, for analytes like glucose, the discovered noise model revealed that one of the major contributors to noise was generated by the photodiodes. In addition, the amount of noise varied based on the number of

photodiodes coupled to a transimpedance amplifier. Accordingly, combinations of various photodiodes from different manufacturers, different impedance values with the transimpedance amplifiers, and different numbers of photodiodes were tested as possible embodiments.

[0302] In some embodiments, different combinations of transimpedance to photodiodes may be used. For example, detectors 1-4 (as shown, e.g., in **FIGURE 12A**) may each comprise four photodiodes. In some embodiments, each detector of four photodiodes may be coupled to one or more transimpedance amplifiers. The configuration of these amplifiers may be set according to the model shown in **FIGURE 15J**.

[0303] Alternatively, each of the photodiodes may be coupled to its own respective transimpedance amplifier. For example, transimpedance amplifiers may be implemented as integrated circuits on the same circuit board as detectors 1-4. In this embodiment, the transimpedance amplifiers may be grouped into an averaging (or summing) circuit, which are known to those skilled in the art, in order to provide an output stream from the detector. The use of a summing amplifier to combine outputs from several transimpedance amplifiers into a single, analog signal may be helpful in improving the SNR relative to what is obtainable from a single transimpedance amplifier. The configuration of the transimpedance amplifiers in this setting may also be set according to the model shown in **FIGURE 15J**.

[0304] As yet another alternative, as noted above with respect to **FIGURES 12E** through **12H**, the photodiodes in detectors 106 may comprise multiple active areas that are grouped together. In some embodiments, each of these active areas may be provided its own respective transimpedance. This form of pairing may allow a transimpedance amplifier to be better matched to the characteristics of its corresponding photodiode or active area of a photodiode.

[0305] As noted, **FIGURE 15J** illustrates an exemplary noise model that may be useful in configuring transimpedance amplifiers. As shown, for a given number of photodiodes and a desired SNR, an optimal impedance value for a transimpedance amplifier could be determined.

[0306] For example, an exemplary "4 PD per stream" sensor 1502 is shown where detector 106 comprises four photodiodes 1502. The photodiodes 1502 are coupled to a single transimpedance amplifier 1504 to produce an output stream 1506. In this example, the transimpedance amplifier comprises 10 MΩ resistors 1508 and 1510. Thus, output stream 1506 is produced from the four photodiodes (PD) 1502. As shown in the graph of **FIGURE 15J**, the model indicates that resistance values of about 10 MΩ may provide an acceptable SNR for analytes like glucose.

[0307] However, as a comparison, an exemplary "1 PD per stream" sensor 1512 is also shown in **FIGURE 15J.** In particular, sensor 1512 may comprise a plurality of detectors 106 that each comprises a single photodiode 1514. In addition, as shown for this example configuration, each of photodiodes 1514 may be coupled to respective transimpedance amplifiers 1516, e.g., 1 PD per stream. Transimpedance amplifiers are shown having 40 MΩ resistors 1518. As also shown in the graph of **FIGURE 15J**, the model illustrates that resistance values of 40 MΩ for resistors 1518 may serve as an alternative to the 4 photodiode per stream architecture of sensor 1502 described above and yet still provide an equivalent SNR.

[0308] Moreover, the discovered noise model also indicates that utilizing a 1 photodiode per stream architecture like that in sensor 1512 may provide enhanced performance because each of transimpedance amplifiers 1516 can be tuned or optimized to its respective photodiodes 1518. In some embodiments, an averaging component 1520 may also be used to help cancel or reduce noise across photodiodes 1518.

[0309] For purposes of illustration, **FIGURE 15K** shows different architectures (e.g., four PD per stream and one PD per stream) for various embodiments of a sensor and how components of the sensor may be laid out on a circuit board or substrate. For example, sensor 1522 may comprise a "4 PD per stream" architecture on a submount 700 in which each detector 106 comprises four (4) photodiodes 1524. As shown for sensor 1522, the output of each set of four

photodiodes 1524 is then aggregated into a single transimpedance amplifier 1526 to produce a signal.

[0310] As another example, a sensor 1528 may comprise a "1 PD per stream" architecture on submount 700 in which each detector 106 comprises four (4) photodiodes 1530. In sensor 1528, each individual photodiode 1530 is coupled to a respective transimpedance amplifier 1532. The output of the amplifiers 1532 may then be aggregated into averaging circuit 1520 to produce a signal.

[0311] As noted previously, one skilled in the art will recognize that the photodiodes and detectors may be arranged in different fashions to optimize the detected light. For example, sensor 1534 illustrates an exemplary "4 PD per stream" sensor in which the detectors 106 comprise photodiodes 1536 arranged in a linear fashion. Likewise, sensor 1538 illustrates an exemplary "1 PD per stream" sensor in which the detectors comprise photodiodes 1540 arranged in a linear fashion.

[0312] Alternatively, sensor 1542 illustrates an exemplary "4 PD per stream" sensor in which the detectors 106 comprise photodiodes 1544 arranged in a two-dimensional pattern, such as a zig-zag pattern. Sensor 1546 illustrates an exemplary "1 PD per stream" sensor in which the detectors comprise photodiodes 1548 also arranged in a zig-zag pattern.

[0313] **FIGURE 15L** illustrates an exemplary architecture for a switched-capacitor-based front-end. As shown, front-end interfaces 108 may be implemented using switched capacitor circuits and any number of front-end interfaces 108 may be implemented. The output of these switched capacitor circuits may then be provided to a digital interface 1000 and signal processor 110. Switched capacitor circuits may be useful in system 100 for their resistor free design and analog averaging properties. In particular, the switched capacitor circuitry provides for analog averaging of the signal that allows for a lower smaller sampling rate (e.g., 2 KHz sampling for analog versus 48 KHz sampling for digital designs) than similar digital designs. In some embodiments, the switched capacitor architecture in front end interfaces 108 may provide a similar or equivalent SNR to other front end designs, such as a sigma delta architecture. In addition, a switched capacitor design in front

end interfaces 108 may require less computational power by signal processor 110 to perform the same amount of decimation to obtain the same SNR.

[0314] **FIGURES 16A** and **16B** illustrate embodiments of disposable optical sensors 1600. In an embodiment, any of the features described above, such as protrusion, shielding, and/or heat sink features, can be incorporated into the disposable sensors 1600 shown. For instance, the sensors 1600 can be used as the sensors 101 in the system 100 described above with respect to FIGURE 1. Moreover, any of the features described above, such as protrusion, shielding, and/or heat sink features, can be implemented in other disposable sensor designs that are not depicted herein.

[0315] The sensors 1600 include an adult/pediatric sensor 1610 for finger placement and a disposable infant/neonate sensor 1602 configured for toe, foot or hand placement. Each sensor 1600 has a tape end 1610 and an opposite connector end 1620 electrically and mechanically interconnected via a flexible coupling 1630. The tape end 1610 attaches an emitter and detector to a tissue site. Although not shown, the tape end 1610 can also include any of the protrusion, shielding, and/or heat sink features described above. The emitter illuminates the tissue site and the detector generates a sensor signal responsive to the light after tissue absorption, such as absorption by pulsatile arterial blood flow within the tissue site.

[0316] The sensor signal is communicated via the flexible coupling 1630 to the connector end 1620. The connector end 1620 can mate with a cable (not shown) that communicates the sensor signal to a monitor (not shown), such as any of the cables or monitors shown above with respect to FIGURES 2A through 2D. Alternatively, the connector end 1620 can mate directly with the monitor.

[0317] **FIGURE 17** illustrates an exploded view of certain of the components of the sensor 301f described above. A heat sink 1751 and a cable 1781 attach to an emitter shell 1704. The emitter shell attaches to a flap housing 1707. The flap housing 1707 includes a receptacle 1709 to receive a cylindrical housing 1480/1580 (not shown) attached to an emitter submount 1702, which is attached to a circuit board 1719.

[0318] A spring 1787 attaches to a detector shell 1706 via pins 1783, 1785, which hold the emitter and detector shells 1704, 1706 together. A support structure 1791 attaches to the detector shell 1706, which provides support for a shielding enclosure 1790. A noise shield 1713 attaches to the shielding enclosure 1790. A detector submount 1700 is disposed inside the shielding enclosure 1790. A finger bed 1710 provides a surface for placement of the patient's finger. Finger bed 1710 may comprise a gripping surface or gripping features, which may assist in placing and stabilizing a patient's finger in the sensor. A partially cylindrical protrusion 1705 may also be disposed in the finger bed 1710. As shown, finger bed 1710 attaches to the noise shield 1703. The noise shield 1703 may be configured to reduce noise, such as from ambient light and electromagnetic noise. For example, the noise shield 1703 may be constructed from materials having an opaque color, such as black or a dark blue, to prevent light piping.

[0319] Noise shield 1703 may also comprise a thermistor 1712. The thermistor 1712 may be helpful in measuring the temperature of a patient's finger. For example, the thermistor 1712 may be useful in detecting when the patient's finger is reaching an unsafe temperature that is too hot or too cold. In addition, the temperature of the patient's finger may be useful in indicating to the sensor the presence of low perfusion as the temperature drops. In addition, the thermistor 1712 may be useful in detecting a shift in the characteristics of the water spectrum in the patient's finger, which can be temperature dependent.

[0320] Moreover, a flex circuit cover 1706 attaches to the pins 1783, 1785. Although not shown, a flex circuit can also be provided that connects the circuit board 1719 with the submount 1700 (or a circuit board to which the submount 1700 is connected). A flex circuit protector 1760 may be provided to provide a barrier or shield to the flex circuit (not shown). In particular, the flex circuit protector 1760 may also prevent any electrostatic discharge to or from the flex circuit. The flex circuit protector 1760 may be constructed from well known materials, such as a plastic or rubber materials.

[0321] **FIGURE 18** shows the results obtained by an exemplary sensor 101 of the present disclosure that was configured for measuring glucose. This

sensor 101 was tested using a pure water ex-vivo sample. In particular, ten samples were prepared that ranged from 0-55 mg/dL. Two samples were used as a training set and eight samples were then used as a test population. As shown, embodiments of the sensor 101 were able to obtain at least a standard deviation of 13 mg/dL in the training set and 11 mg/dL in the test population.

[0322] **FIGURE 19** shows the results obtained by an exemplary sensor 101 of the present disclosure that was configured for measuring glucose. This sensor 101 was tested using a turbid ex-vivo sample. In particular, 25 samples of water/glucose/Lyposin were prepared that ranged from 0-55 mg/dL. Five samples were used as a training set and 20 samples were then used as a test population. As shown, embodiments of sensor 101 were able to obtain at least a standard deviation of 37 mg/dL in the training set and 32 mg/dL in the test population.

[0323] **FIGURES 20** through **22** shows other results that can be obtained by an embodiment of system 100. In **FIGURE 20**, 150 blood samples from two diabetic adult volunteers were collected over a 10-day period. Invasive measurements were taken with a YSI glucometer to serve as a reference measurement. Noninvasive measurements were then taken with an embodiment of system 100 that comprised four LEDs and four independent detector streams. As shown, the system 100 obtained a correlation of about 85% and Arms of about 31 mg/dL.

[0324] In **FIGURE 21**, 34 blood samples were taken from a diabetic adult volunteer collected over a 2-day period. Invasive measurements were also taken with a glucometer for comparison. Noninvasive measurements were then taken with an embodiment of system 100 that comprised four LEDs in emitter 104 and four independent detector streams from detectors 106. As shown, the system 100 was able to attain a correlation of about 90% and Arms of about 22 mg/dL.

[0325] The results shown in **FIGURE 22** relate to total hemoglobin testing with an exemplary sensor 101 of the present disclosure. In particular, 47 blood samples were collected from nine adult volunteers. Invasive measurements were then taken with a CO-oximeter for comparison. Noninvasive measurements were taken with an embodiment of system 100 that comprised four LEDs in emitter 104

and four independent detector channels from detectors 106. Measurements were averaged over 1 minute. As shown, the testing resulted in a correlation of about 93% and Arms of about 0.8 mg/dL.

[0326] Conditional language used herein, such as, among others, "can," "could," "might," "may," “e.g.,” and the like, unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments include, while other embodiments do not include, certain features, elements and/or states. Thus, such conditional language is not generally intended to imply that features, elements and/or states are in any way required for one or more embodiments or that one or more embodiments necessarily include logic for deciding, with or without author input or prompting, whether these features, elements and/or states are included or are to be performed in any particular embodiment.

[0327] While certain embodiments of the inventions disclosed herein have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions disclosed herein. Indeed, the novel methods and systems described herein can be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the methods and systems described herein can be made without departing from the spirit of the inventions disclosed herein. The claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of certain of the inventions disclosed herein.

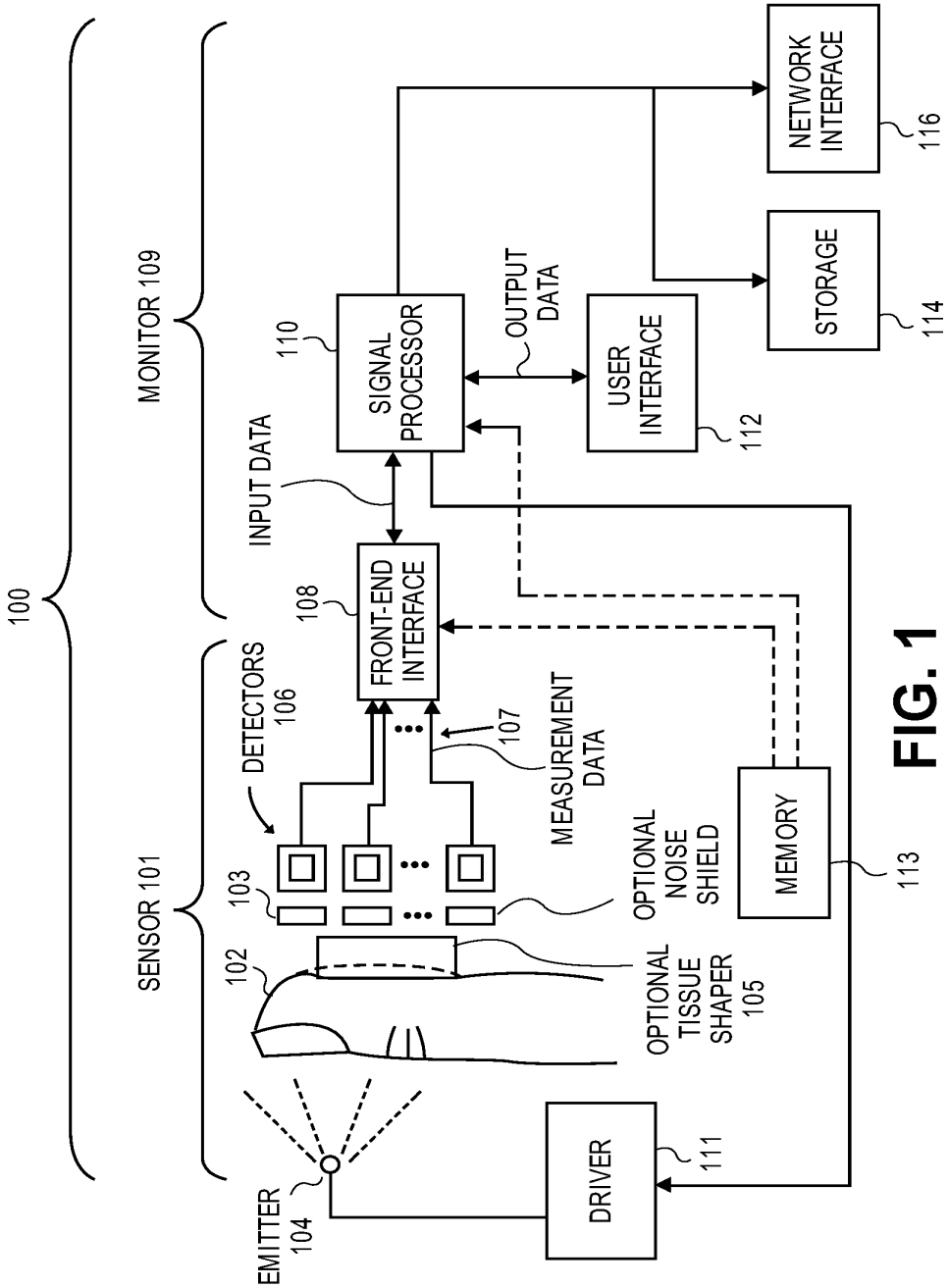

100
MONITOR 109
SENSOR 101
EMITTER
104
DRIVER
111
102
103
DETECTORS
106
OPTIONAL
TISSUE
SHAPER
105
OPTIONAL
NOISE
SHIELD
MEASUREMENT
DATA
107
108
FRONT-END
INTERFACE
INPUT DATA
110
SIGNAL
PROCESSOR
OUTPUT
DATA
USER
INTERFACE
112
MEMORY
113
STORAGE
114
NETWORK
INTERFACE
116

FIG. 1

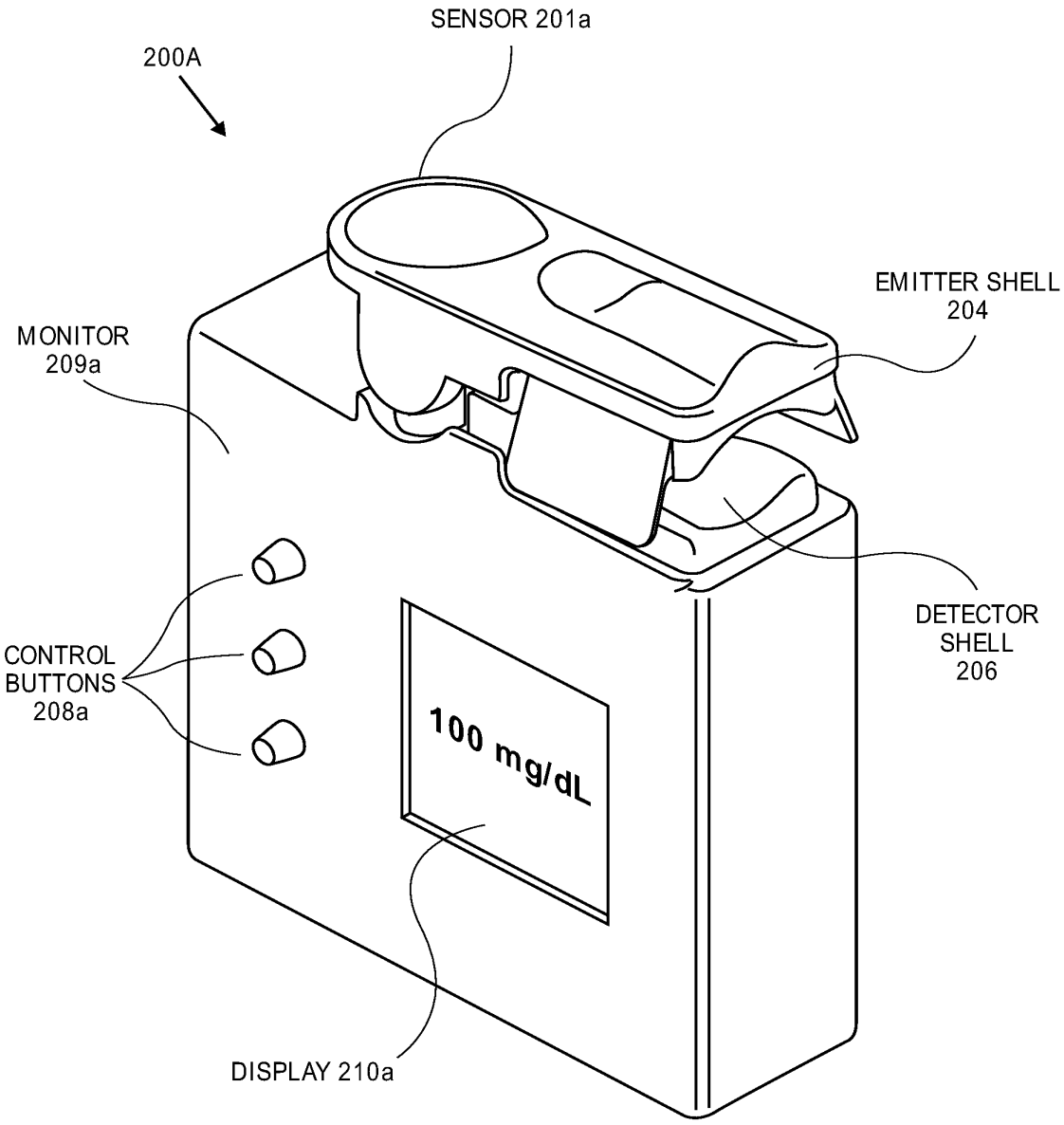

SENSOR 201a
200A
EMITTER SHELL
204
MONITOR
209a
DETECTOR
SHELL
206
CONTROL
BUTTONS
208a
100 mg/dL
DISPLAY 210a

FIG. 2A

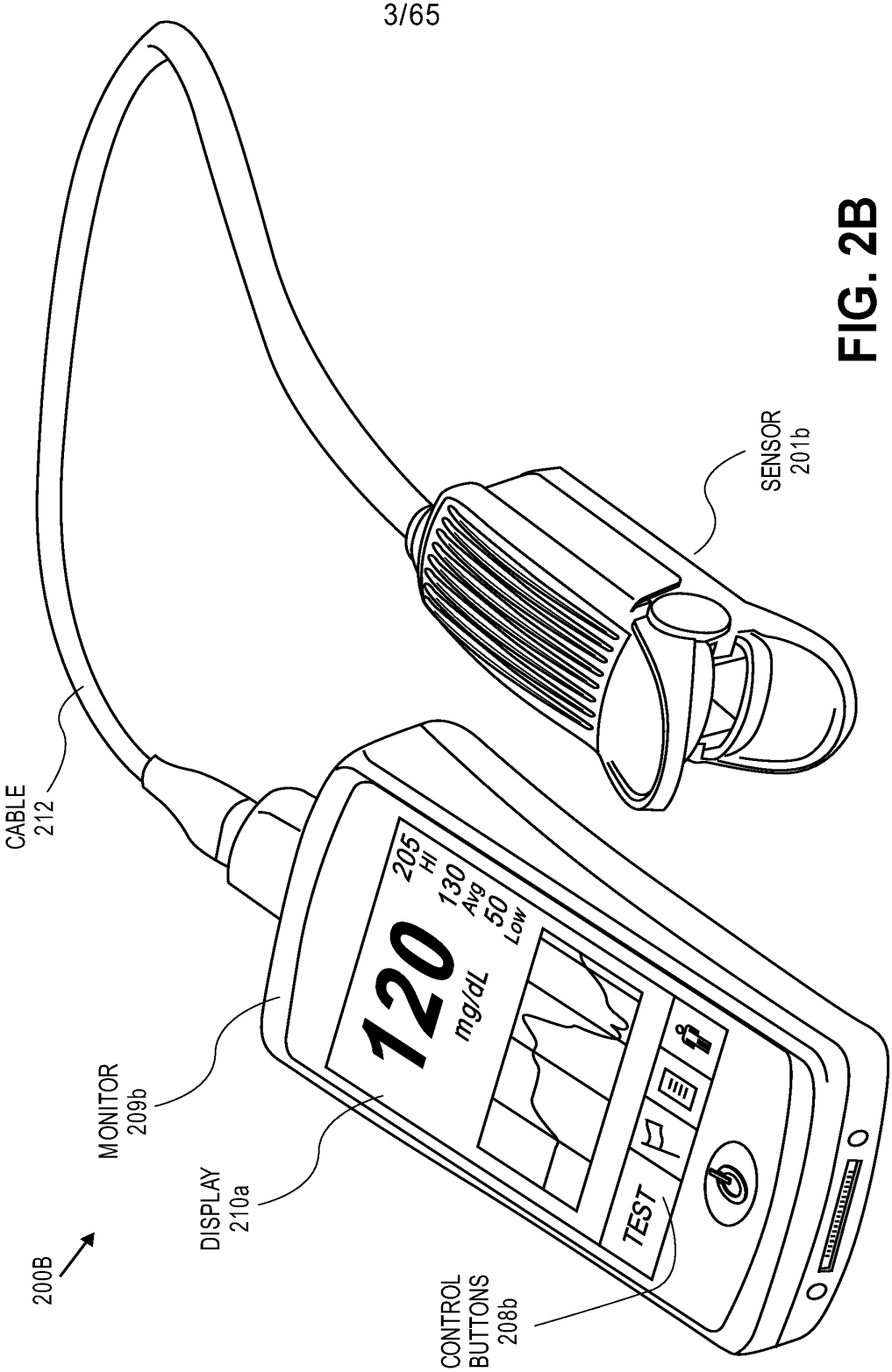

CABLE
212
SENSOR
201b
MONITOR
209b
DISPLAY
210a
CONTROL
BUTTONS
208b
200B
205
HI
130
Avg
50
Low
120
mg/dL
TEST

FIG. 2B

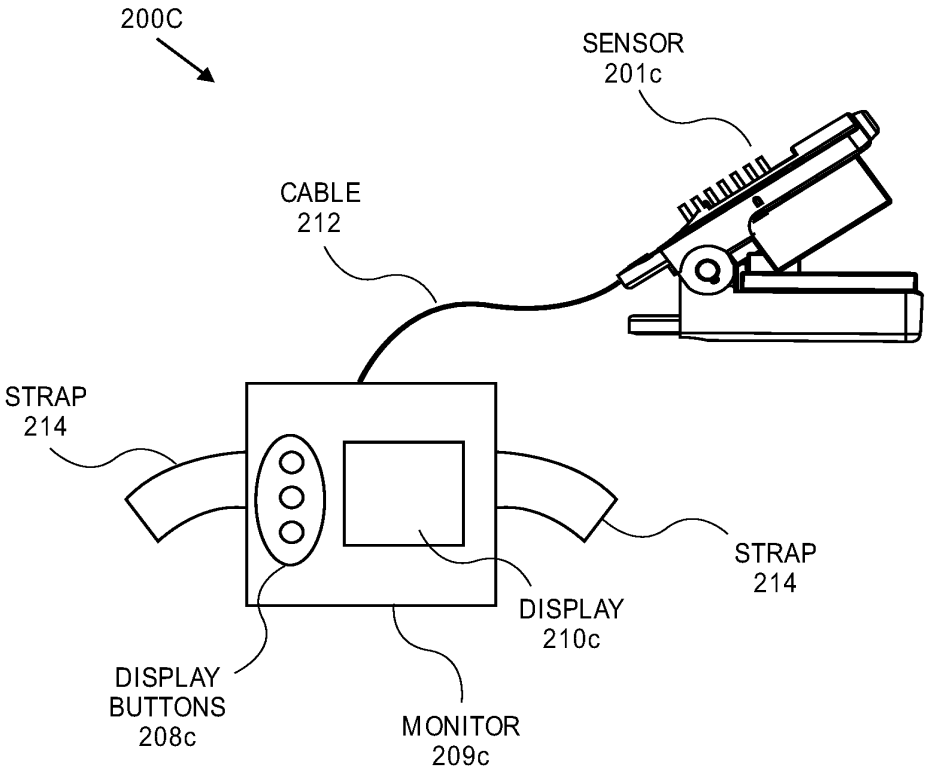

200C
SENSOR
201c
CABLE
212
STRAP
214
STRAP
214
DISPLAY
210c
DISPLAY
BUTTONS
208c
MONITOR
209c

FIG. 2C

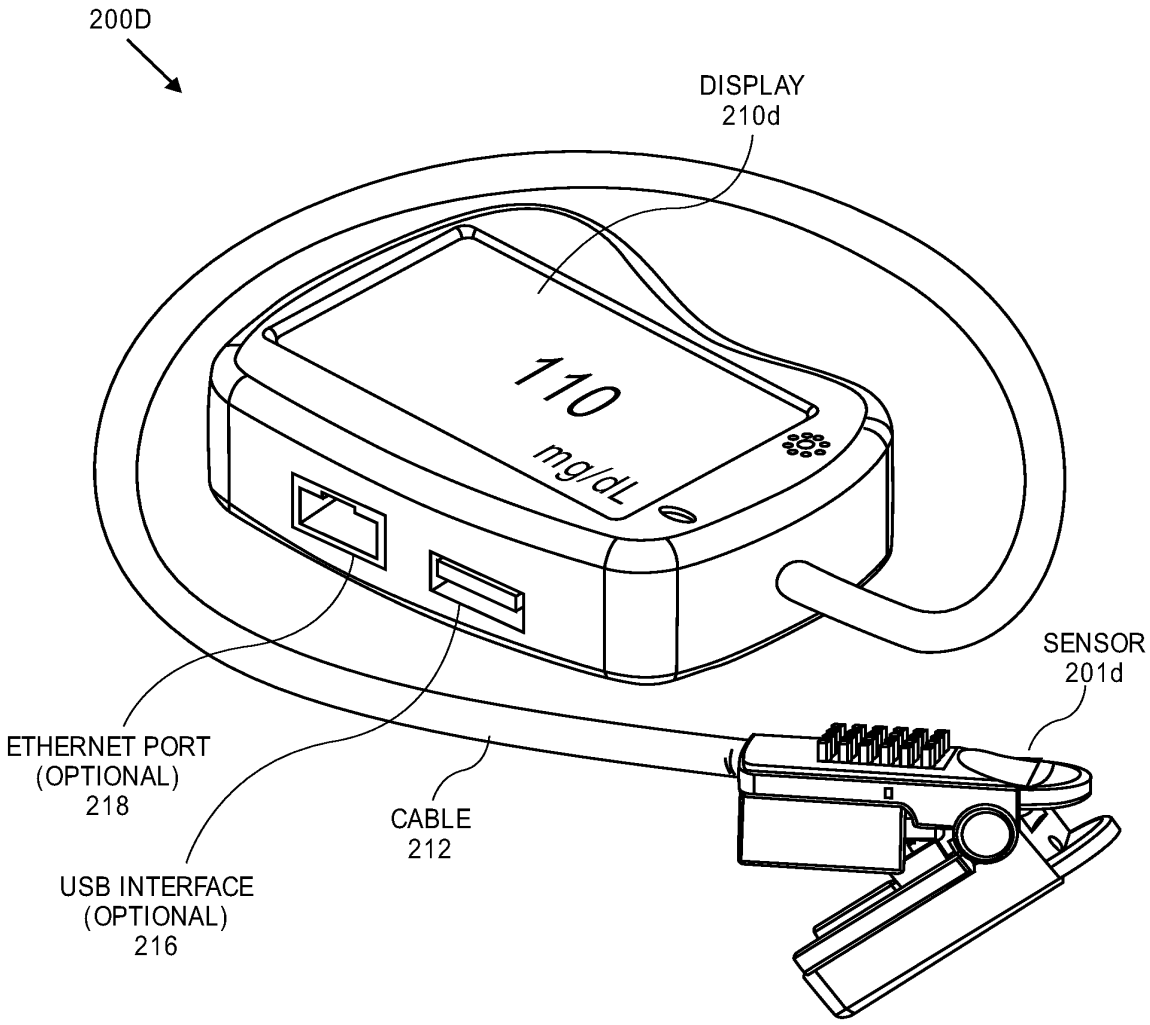

200D
DISPLAY
210d
110
mg/dL
SENSOR
201d
ETHERNET PORT
(OPTIONAL)
218
CABLE
212
USB INTERFACE
(OPTIONAL)
216

FIG. 2D

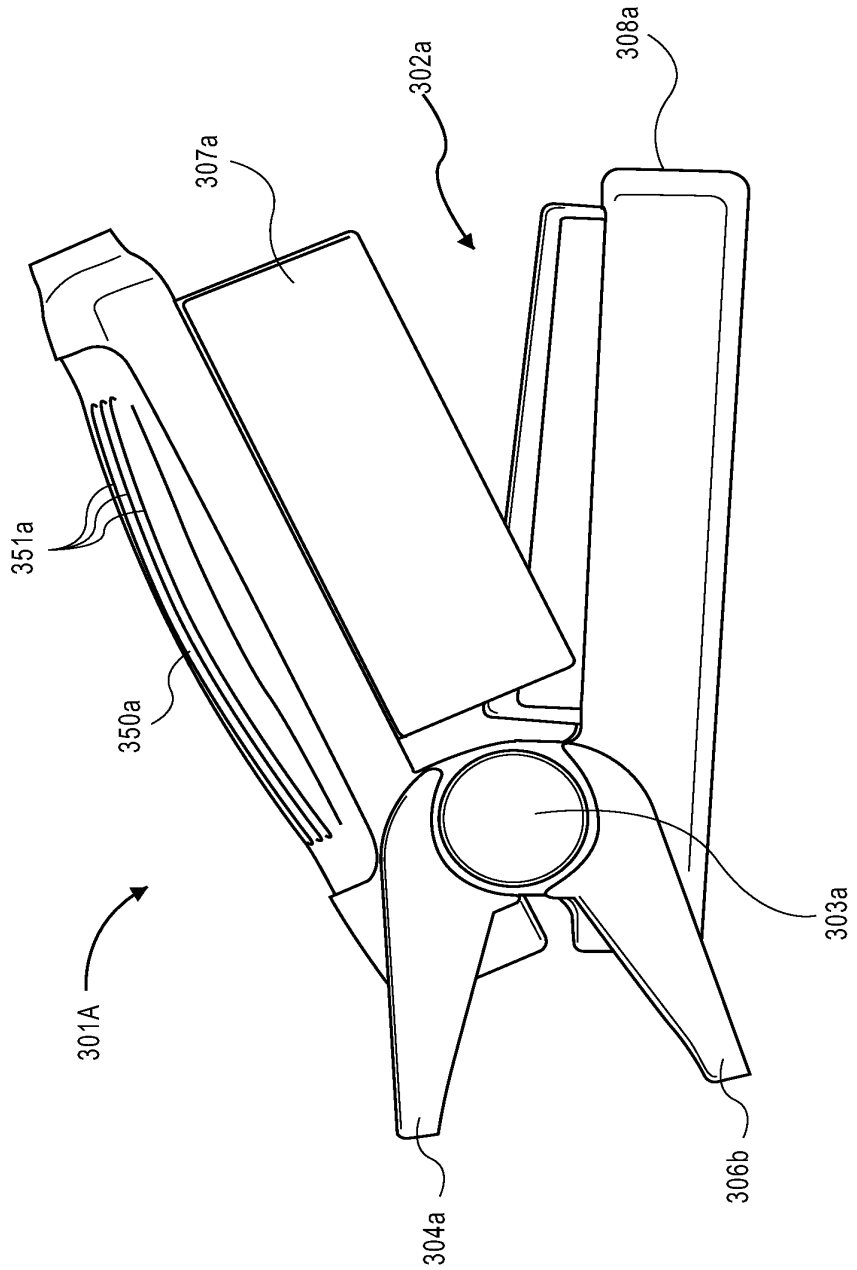


FIG. 3A

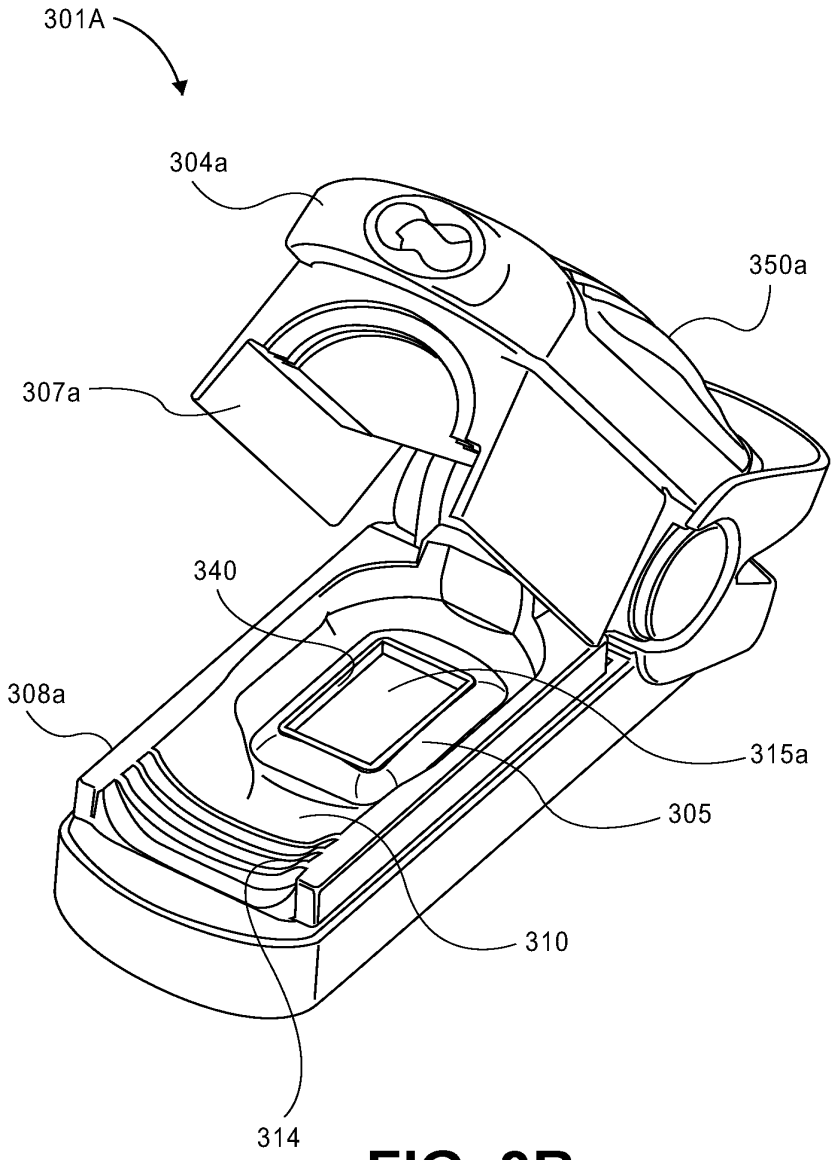


FIG. 3B

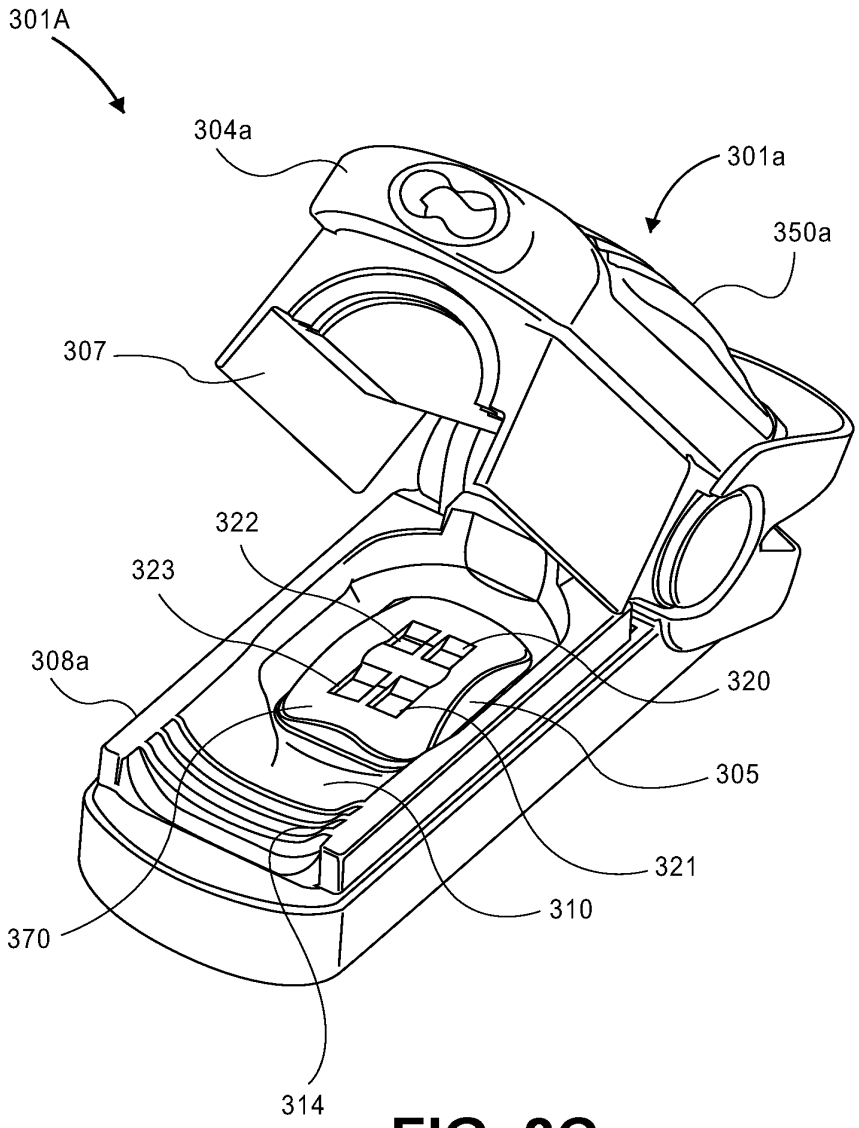


FIG. 3C

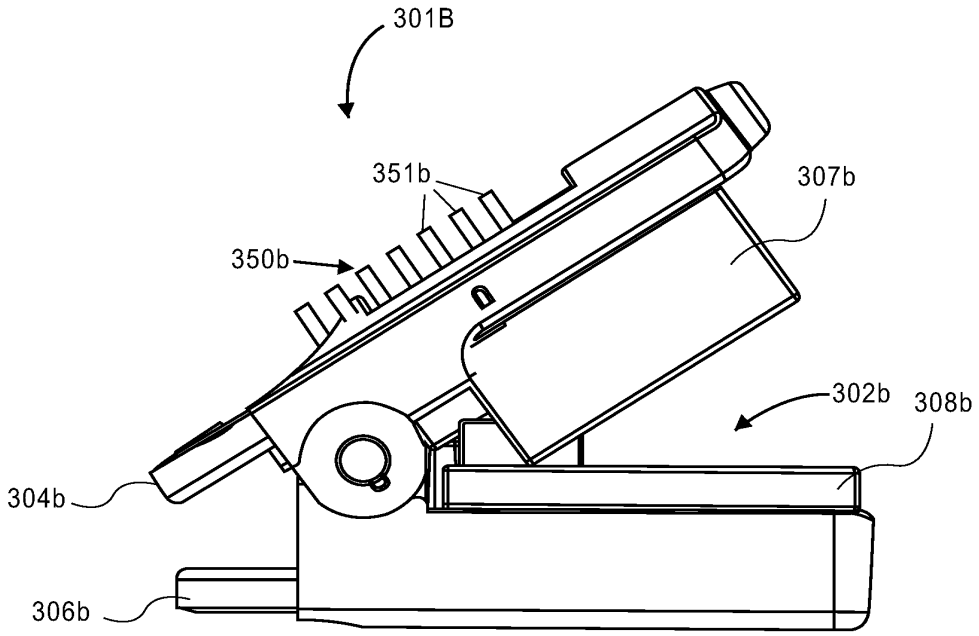


FIG. 3D

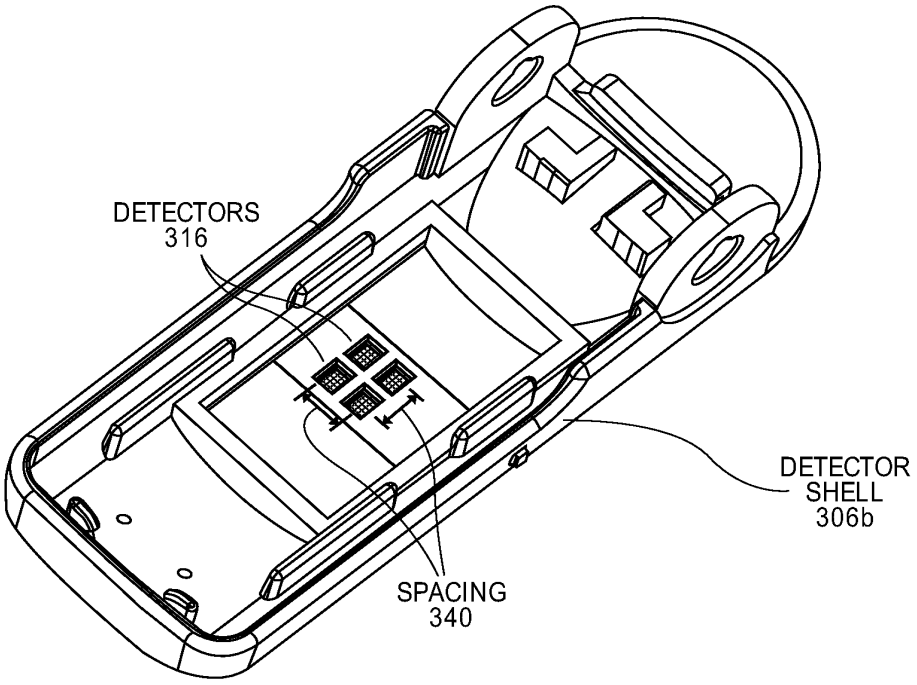


FIG. 3E

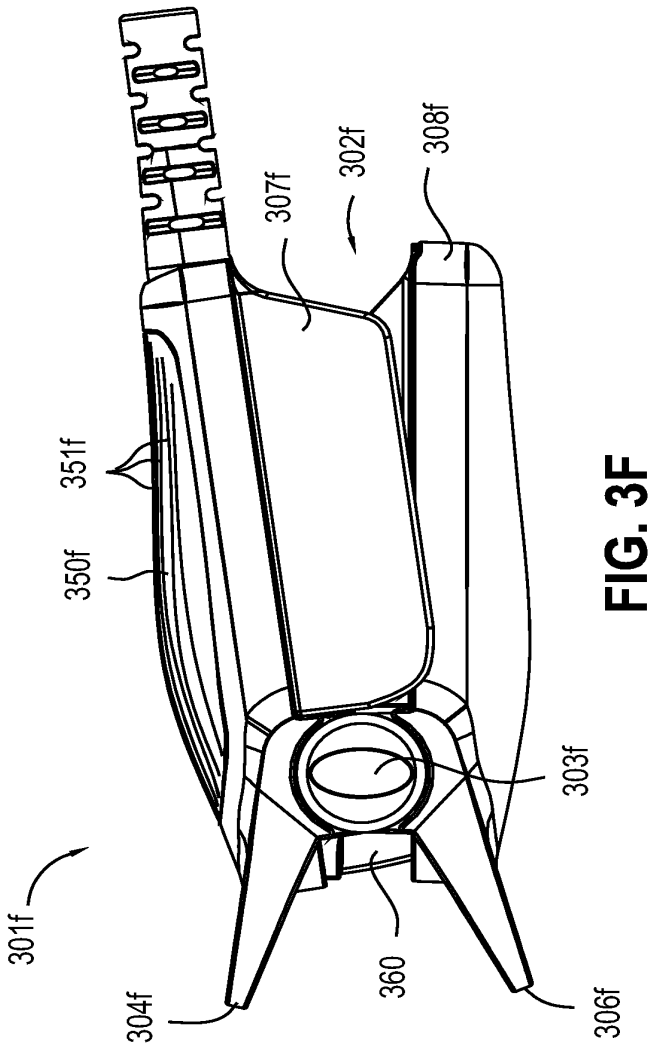


FIG. 3F

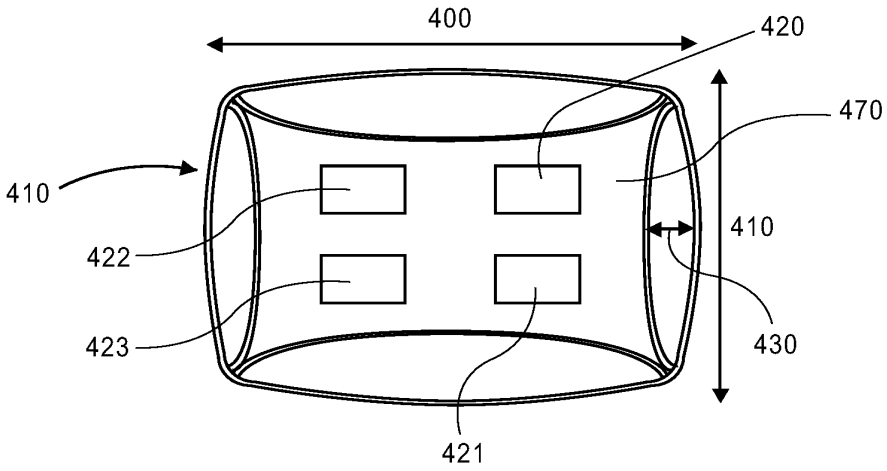


FIG. 4A

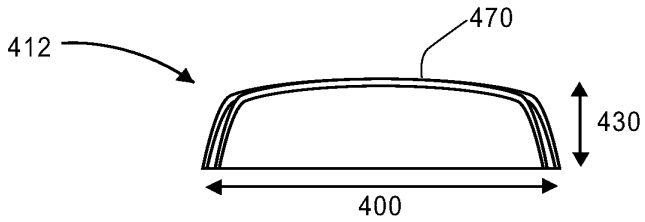


FIG. 4B

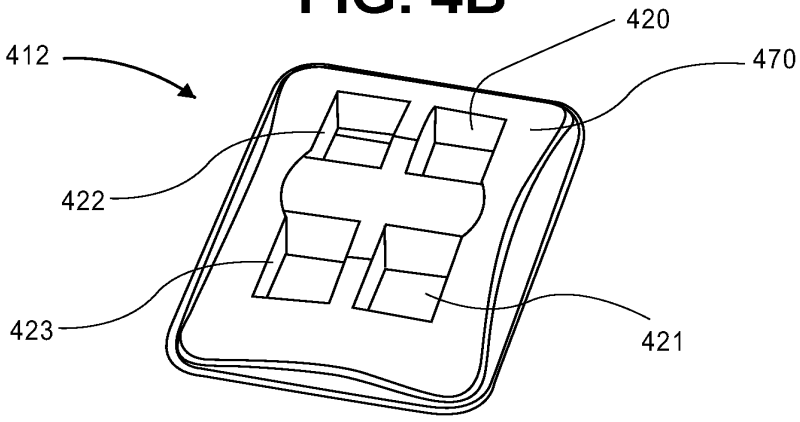


FIG. 4C

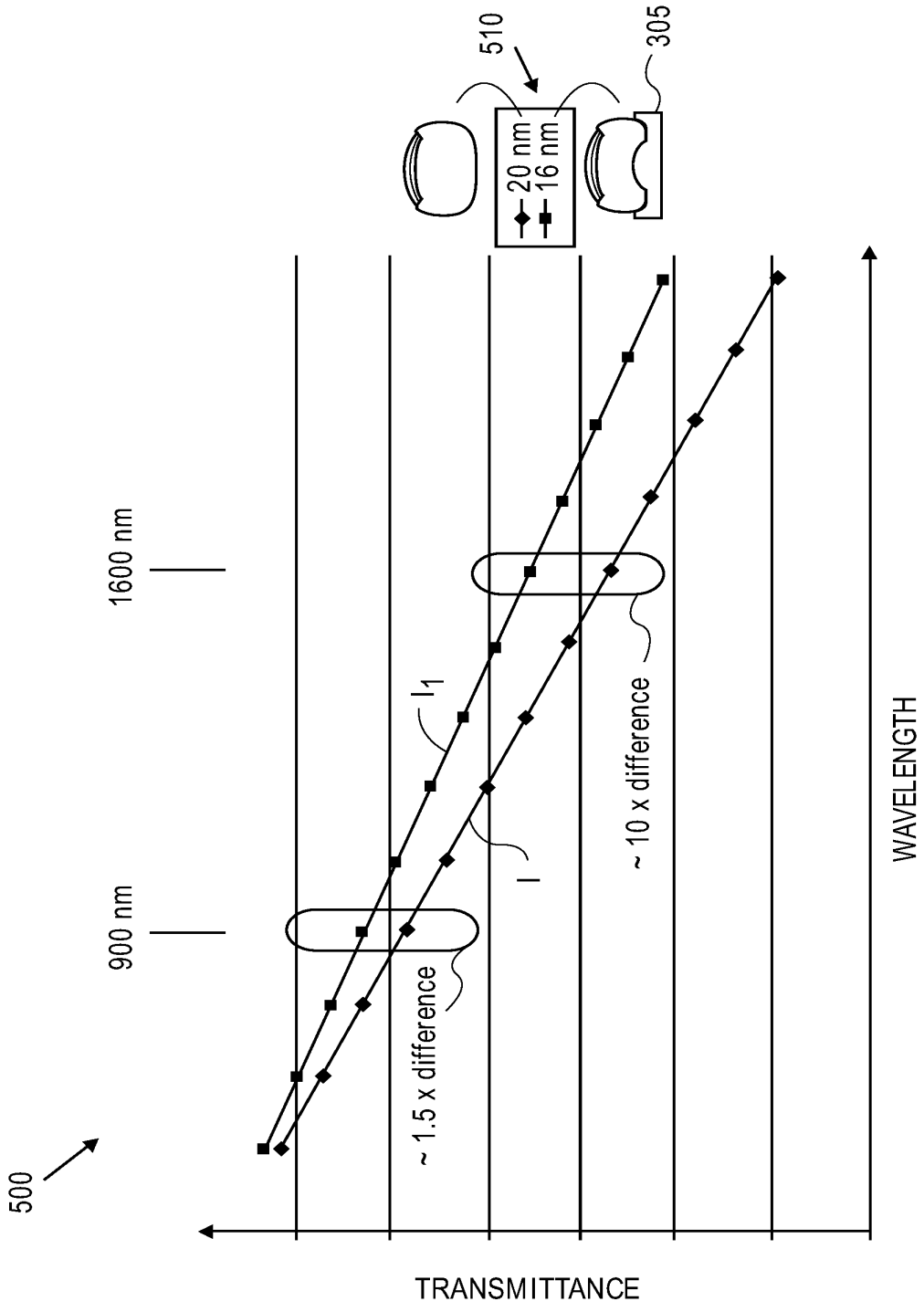

500
510
305
20 nm
16 nm
1600 nm
900 nm
~ 1.5 x difference
~ 10 x difference
I1
I
WAVELENGTH
TRANSMITTANCE

FIG. 5

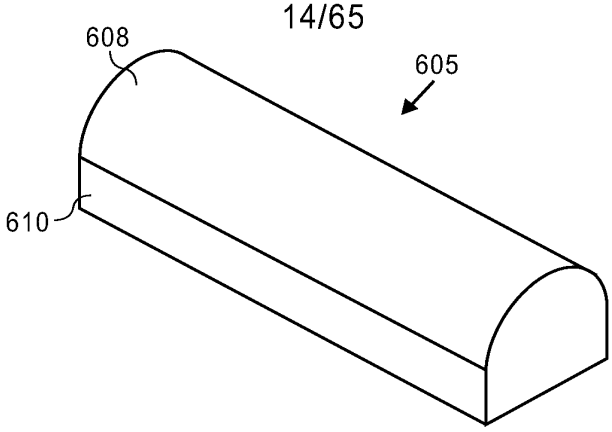


FIG. 6A

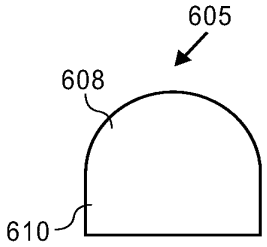


FIG. 6B

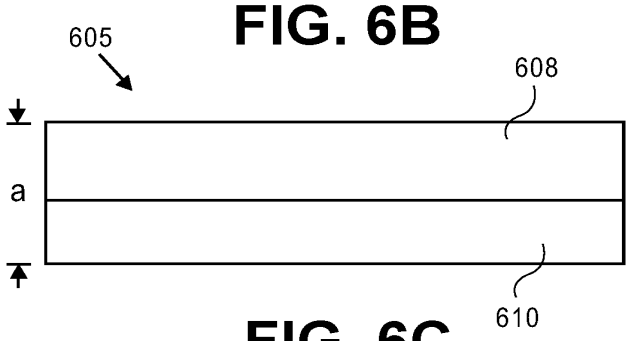


FIG. 6C

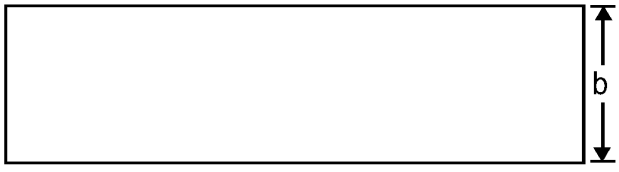


FIG. 6D

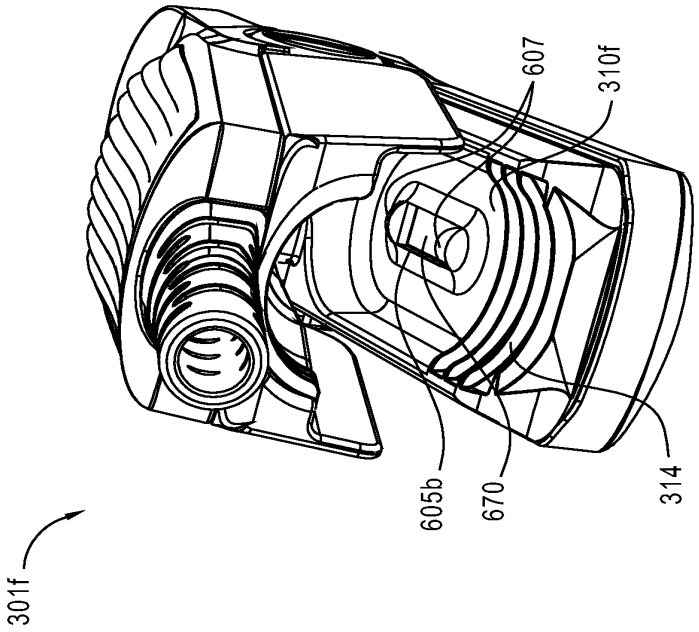


FIG. 6E

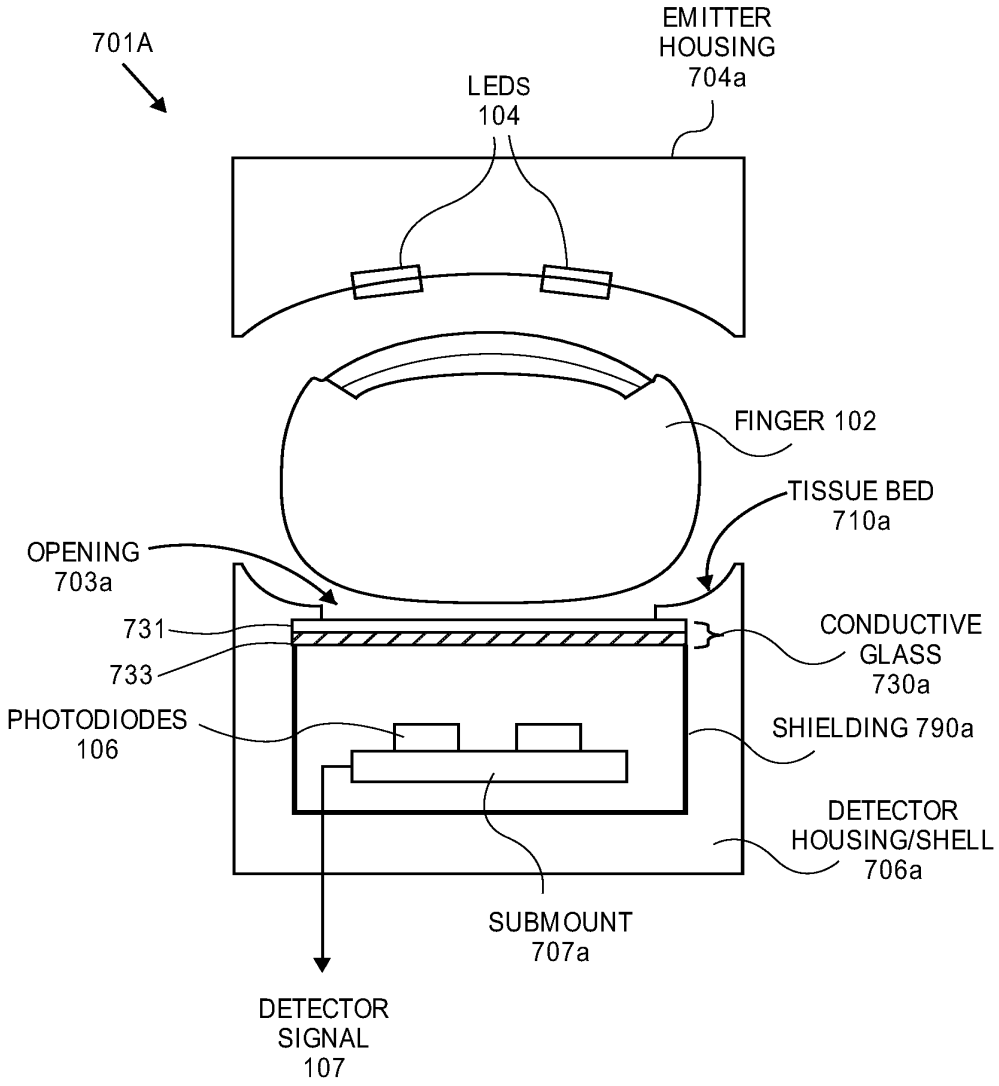

701A
EMITTER HOUSING 704a
LEDS 104
FINGER 102
TISSUE BED 710a
OPENING 703a
731
733
CONDUCTIVE GLASS 730a
PHOTODIODES 106
SHIELDING 790a
DETECTOR HOUSING/SHELL 706a
SUBMOUNT 707a
DETECTOR SIGNAL 107

FIG. 7A

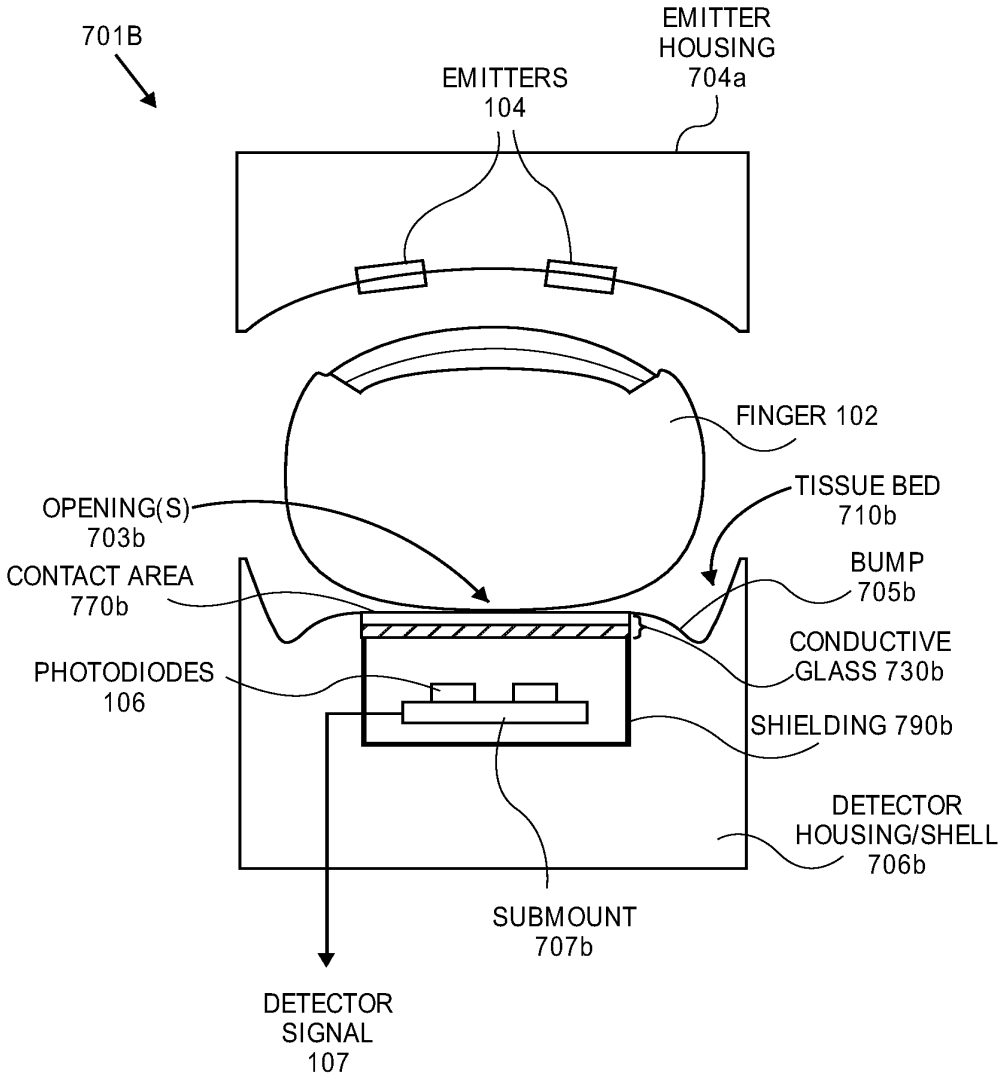

701B
EMITTER HOUSING 704a
EMITTERS 104
FINGER 102
TISSUE BED 710b
OPENING(S) 703b
BUMP 705b
CONTACT AREA 770b
CONDUCTIVE GLASS 730b
PHOTODIODES 106
SHIELDING 790b
DETECTOR HOUSING/SHELL 706b
SUBMOUNT 707b
DETECTOR SIGNAL 107

FIG. 7B

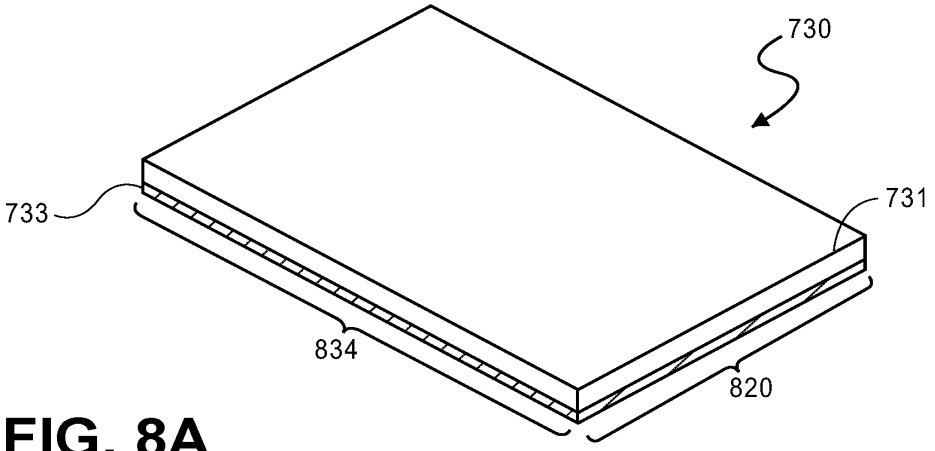


FIG. 8A

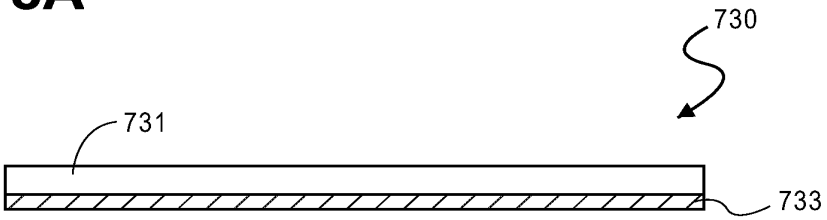


FIG. 8B

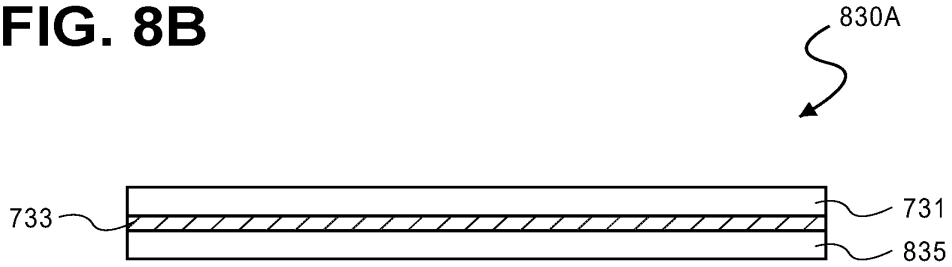


FIG. 8C

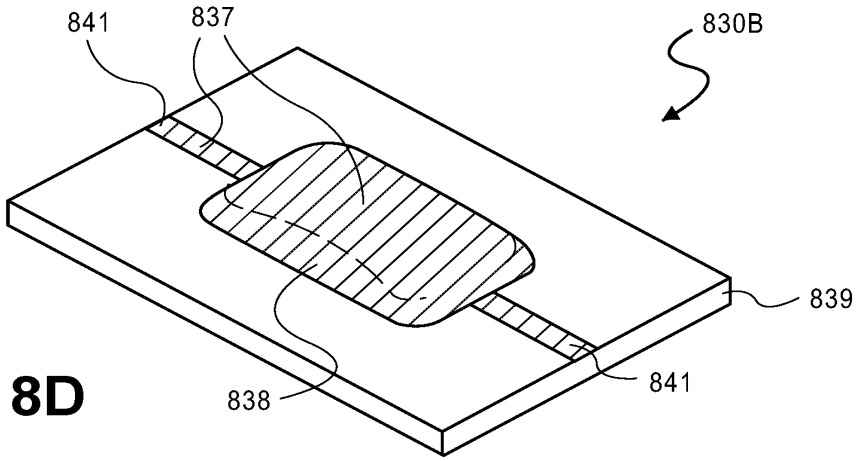


FIG. 8D

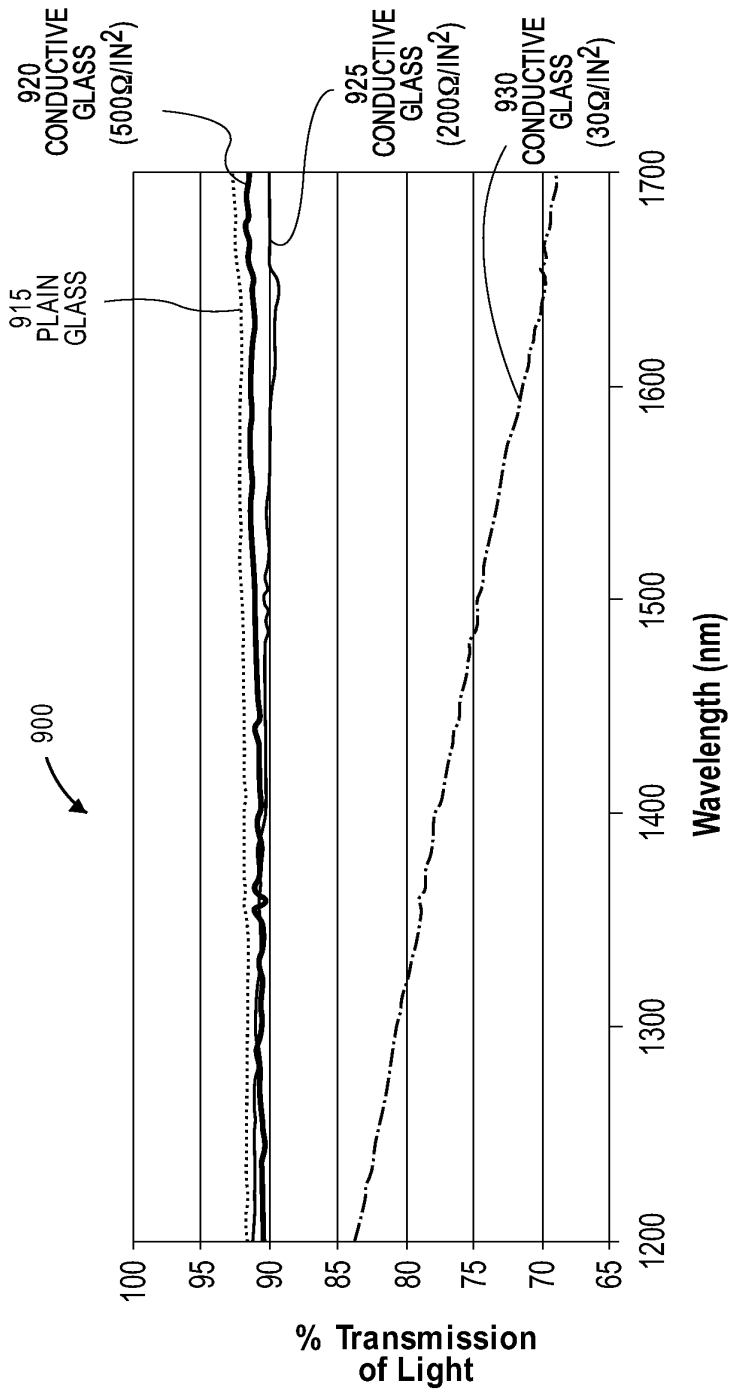

920 CONDUCTIVE GLASS (500Ω/IN2)
925 CONDUCTIVE GLASS (200Ω/IN2)
930 CONDUCTIVE GLASS (30Ω/IN2)
915 PLAIN GLASS
900
100
95
90
85
80
75
70
65
% Transmission of Light
1200
1300
1400
1500
1600
1700
Wavelength (nm)

FIG. 9

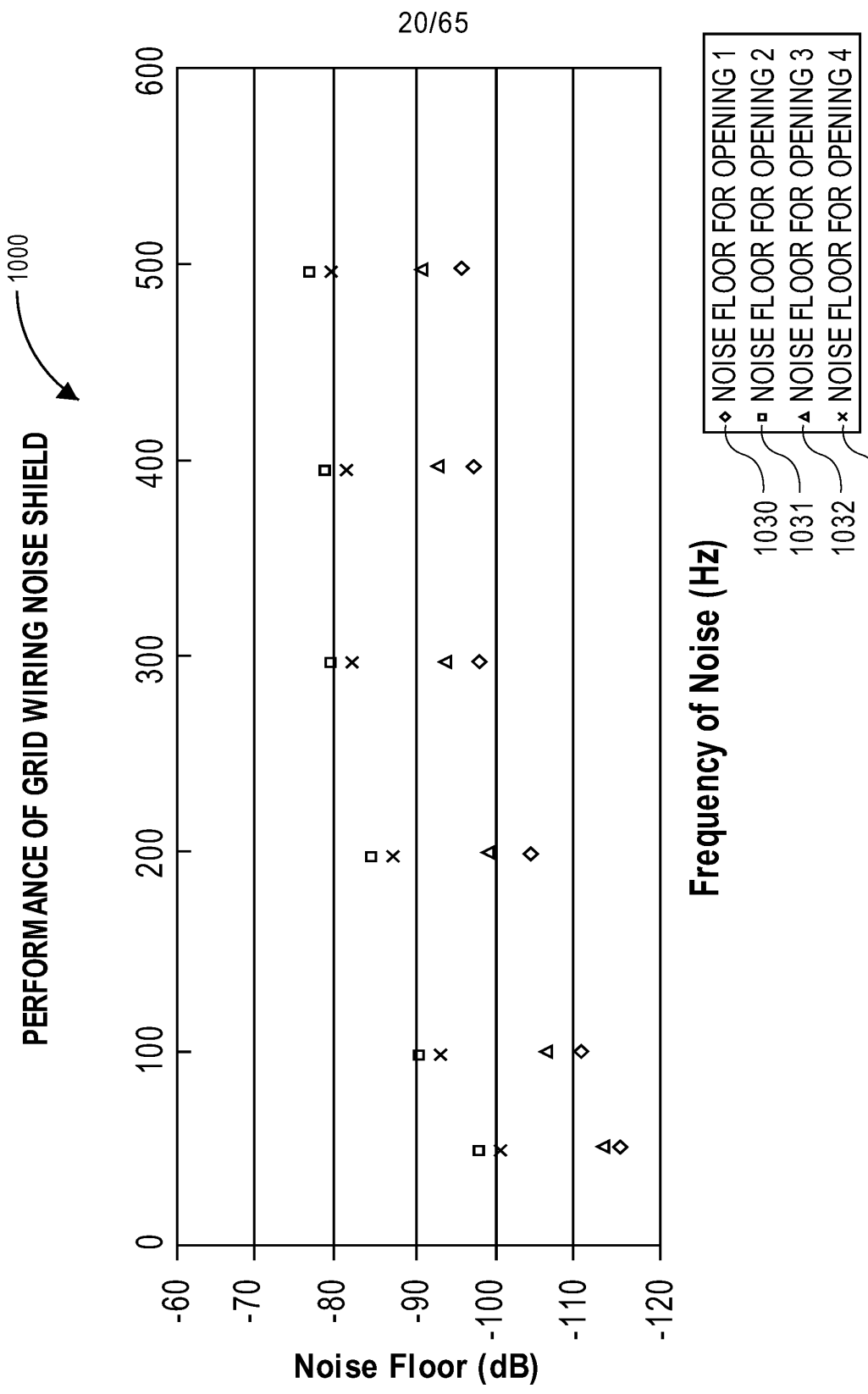

1000
PERFORMANCE OF GRID WIRING NOISE SHIELD
0
100
200
300
400
500
600
-60
-70
-80
-90
-100
-110
-120
Noise Floor (dB)
Frequency of Noise (Hz)
NOISE FLOOR FOR OPENING 1
NOISE FLOOR FOR OPENING 2
NOISE FLOOR FOR OPENING 3
NOISE FLOOR FOR OPENING 4
1030
1031
1032
1033

FIG. 10A

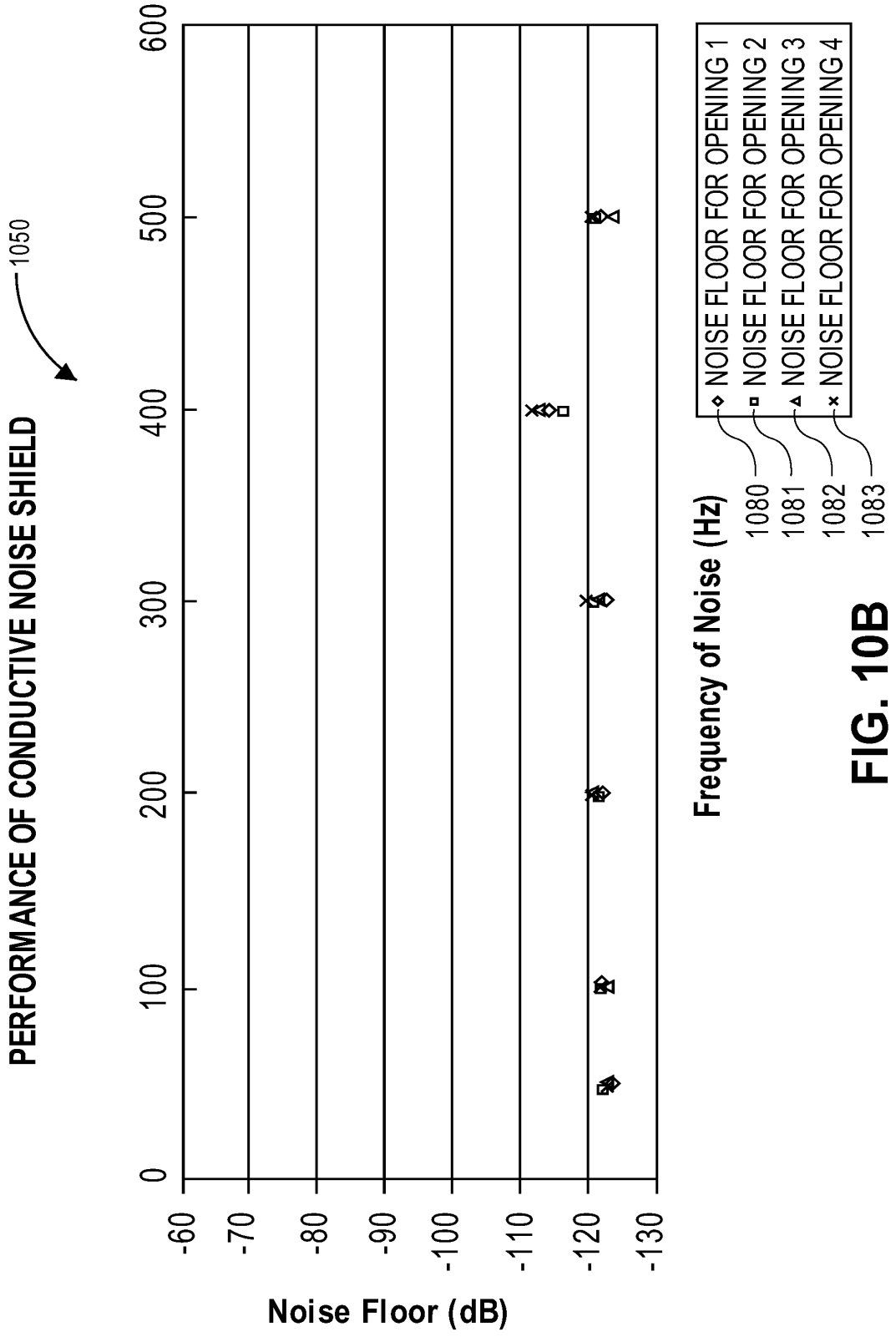

PERFORMANCE OF CONDUCTIVE NOISE SHIELD
1050
Noise Floor (dB)
-60
-70
-80
-90
-100
-110
-120
-130
Frequency of Noise (Hz)
0
100
200
300
400
500
600
NOISE FLOOR FOR OPENING 1
NOISE FLOOR FOR OPENING 2
NOISE FLOOR FOR OPENING 3
NOISE FLOOR FOR OPENING 4
1080
1081
1082
1083

FIG. 10B

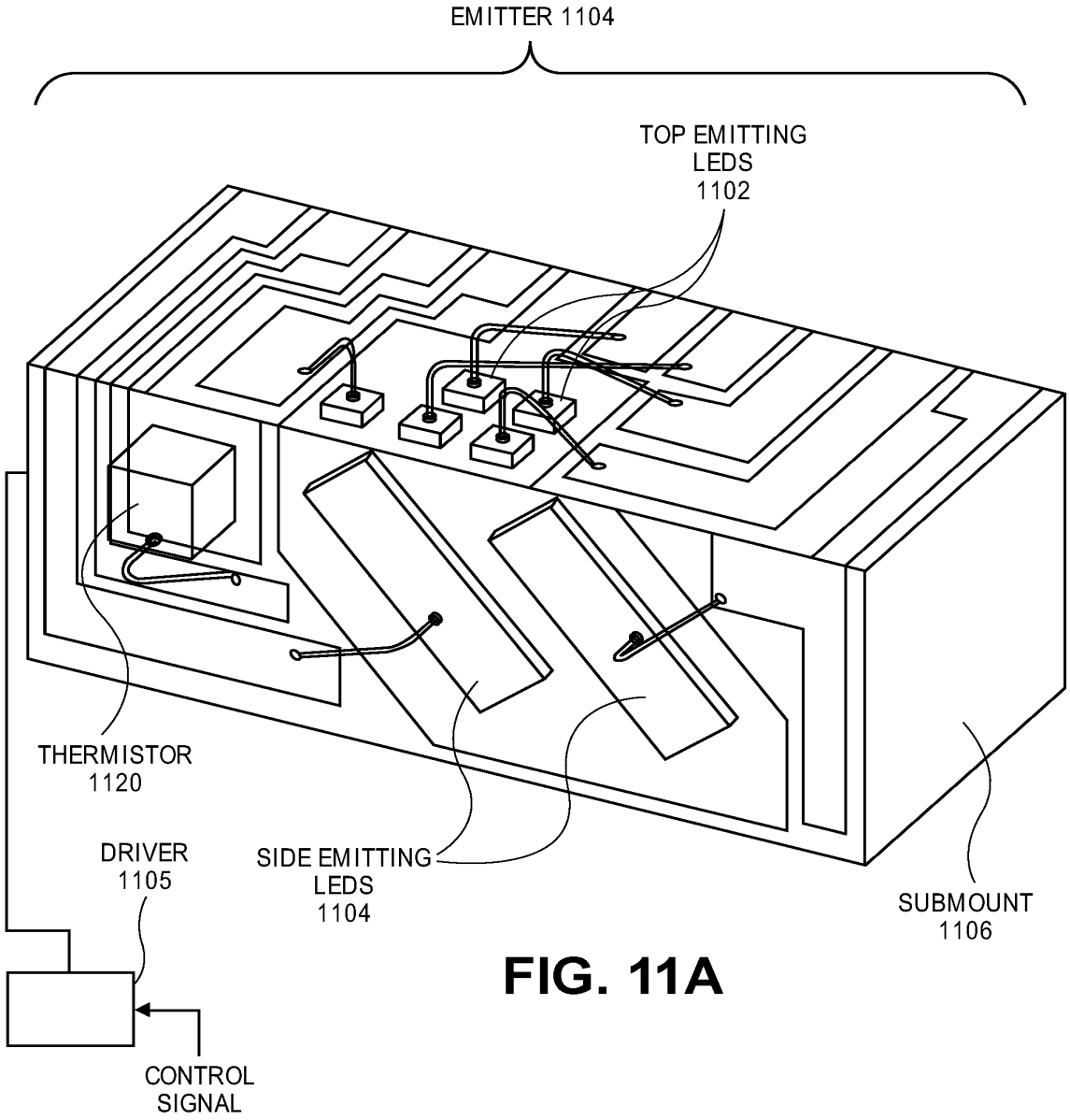

EMITTER 1104
TOP EMITTING LEDS 1102
THERMISTOR 1120
DRIVER 1105
SIDE EMITTING LEDS 1104
SUBMOUNT 1106
CONTROL SIGNAL

FIG. 11A

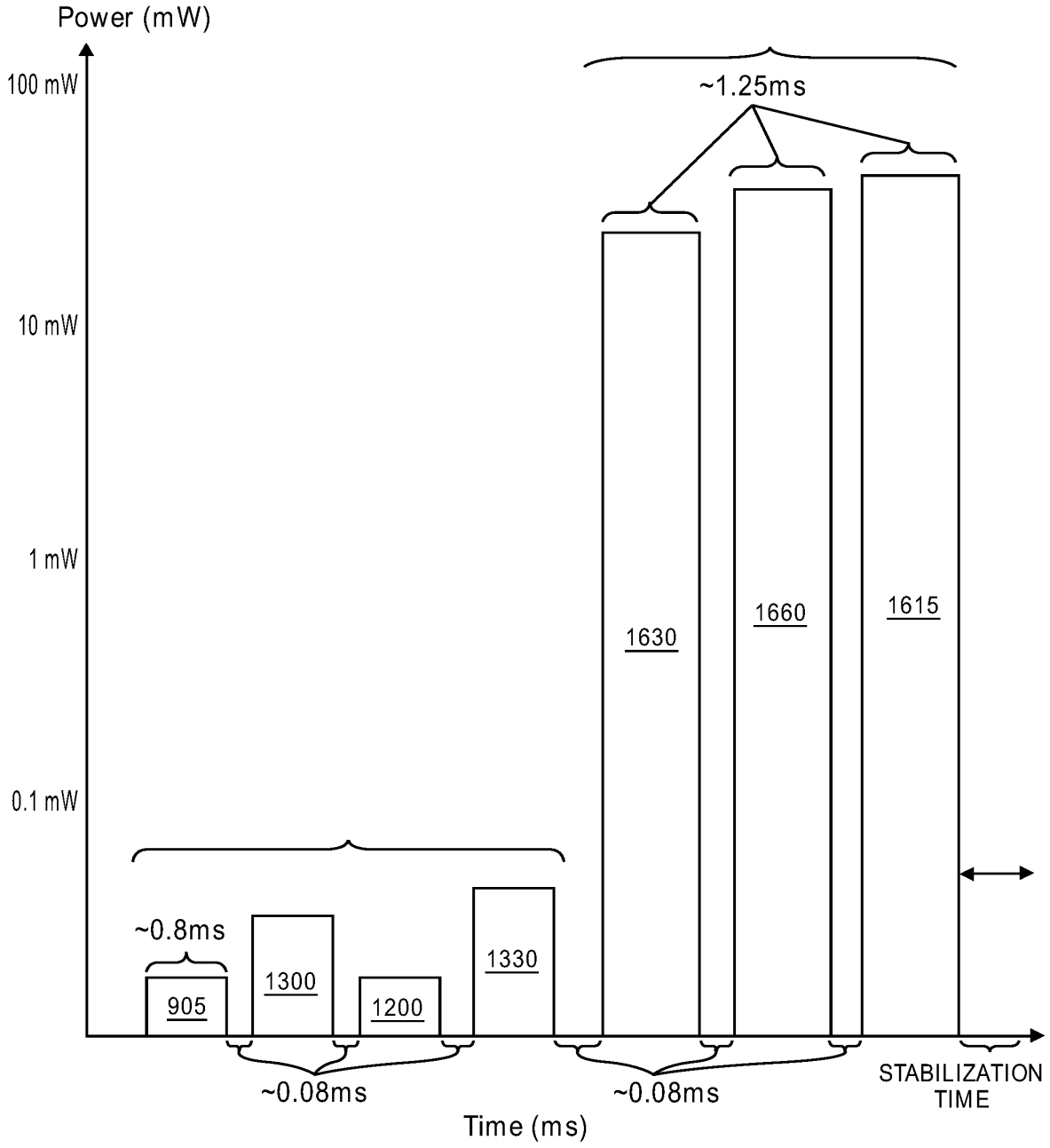

Power (mW)
100 mW
10 mW
1 mW
0.1 mW
~1.25ms
1630
1660
1615
~0.8ms
905
1300
1200
1330
~0.08ms
~0.08ms
STABILIZATION TIME
Time (ms)

FIG. 11B

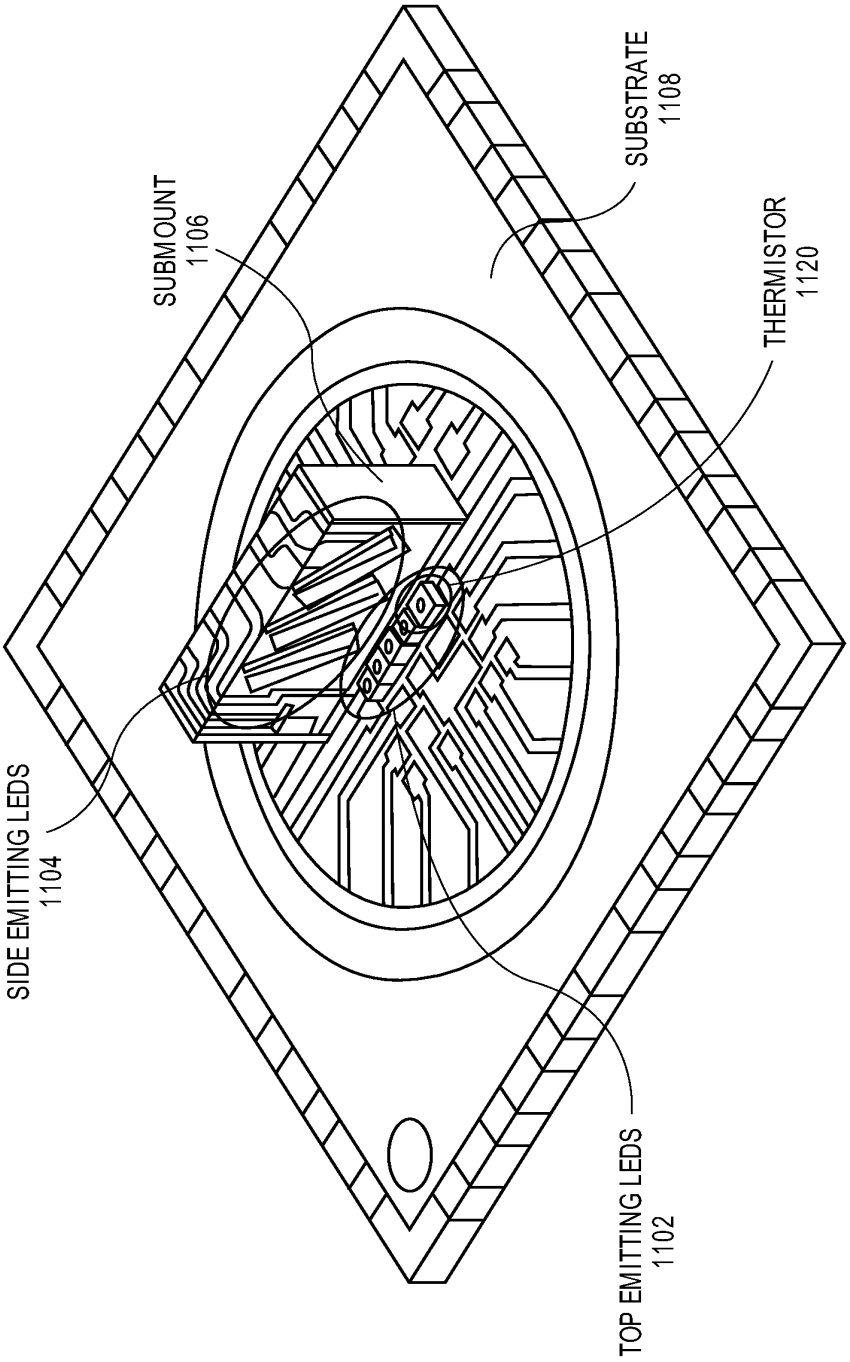

SUBMOUNT
1106
SUBSTRATE
1108
THERMISTOR
1120
SIDE EMITTING LEDS
1104
TOP EMITTING LEDS
1102

FIG. 11C

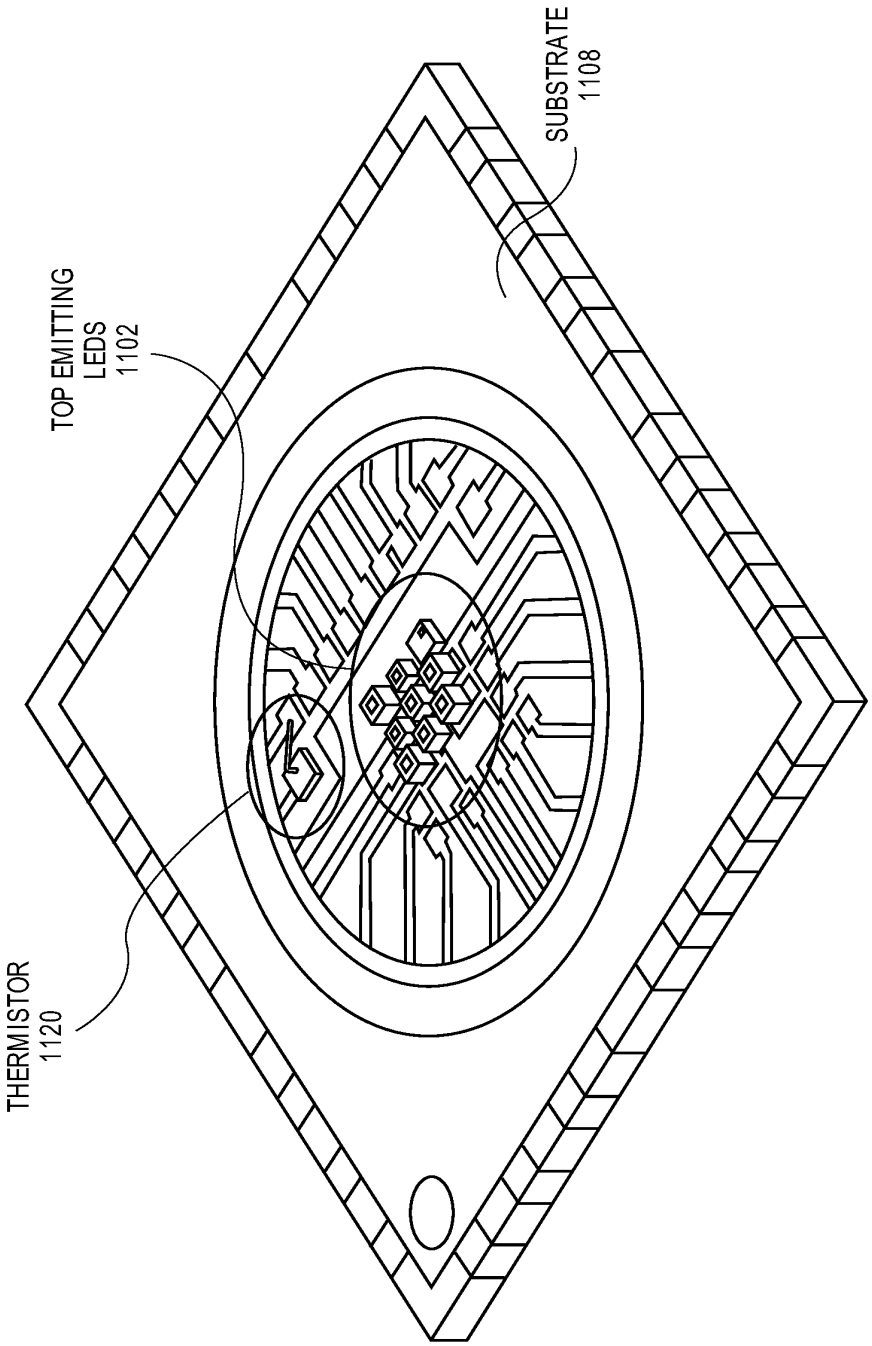


FIG. 11D

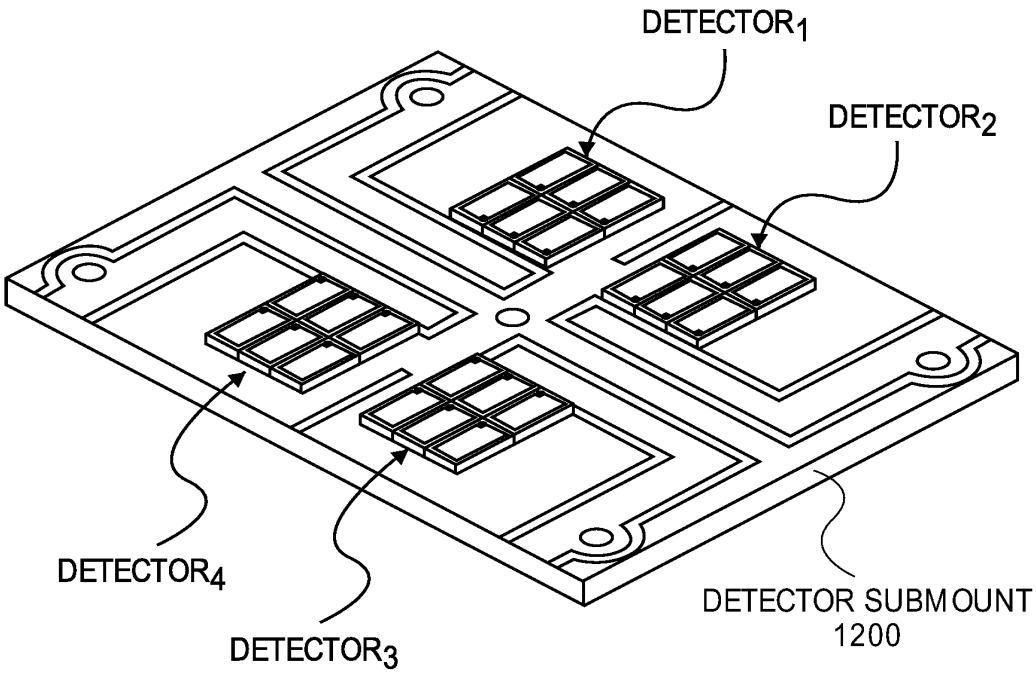

DETECTOR1
DETECTOR2
DETECTOR4
DETECTOR3
DETECTOR SUBMOUNT
1200

FIG. 12A

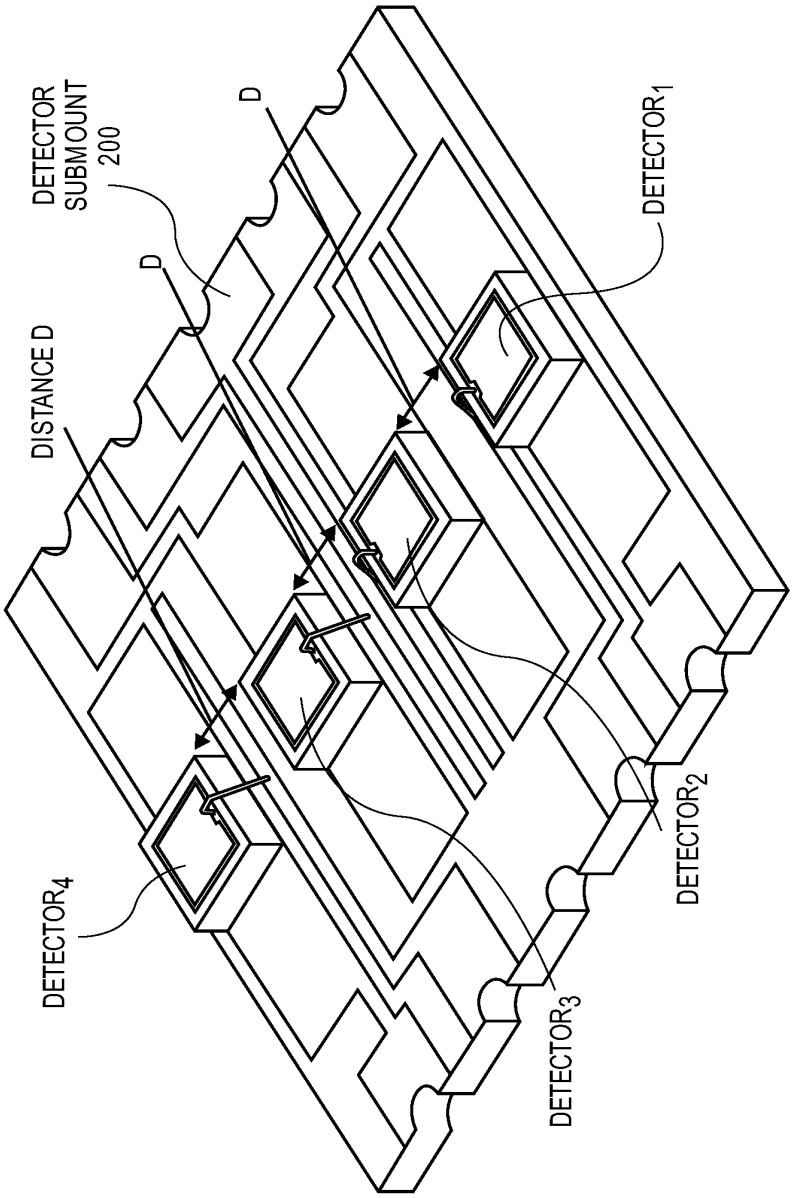

DETECTOR SUBMOUNT 200
D
D
DISTANCE D
DETECTOR$_1$
DETECTOR$_2$
DETECTOR$_3$
DETECTOR$_4$

FIG. 12B

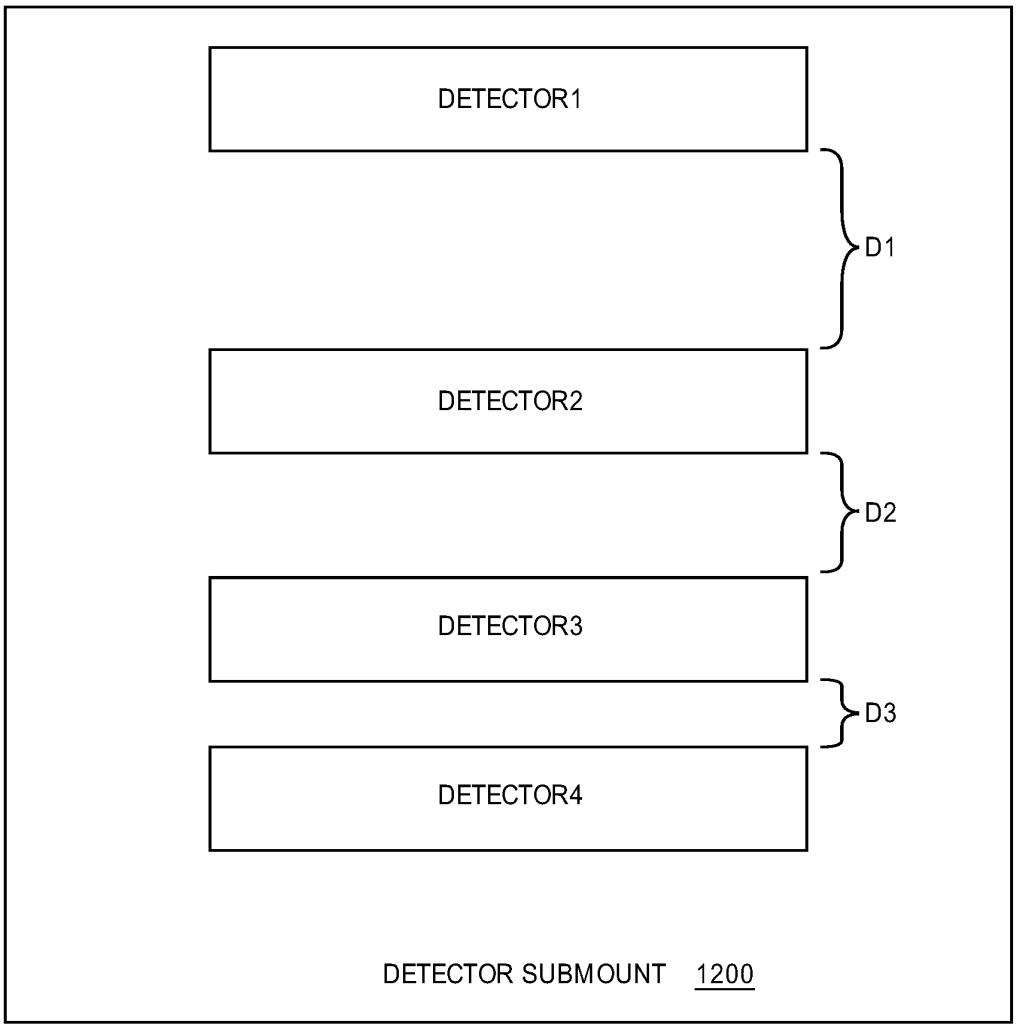

DETECTOR1
D1
DETECTOR2
D2
DETECTOR3
D3
DETECTOR4
DETECTOR SUBMOUNT 1200

FIG. 12C

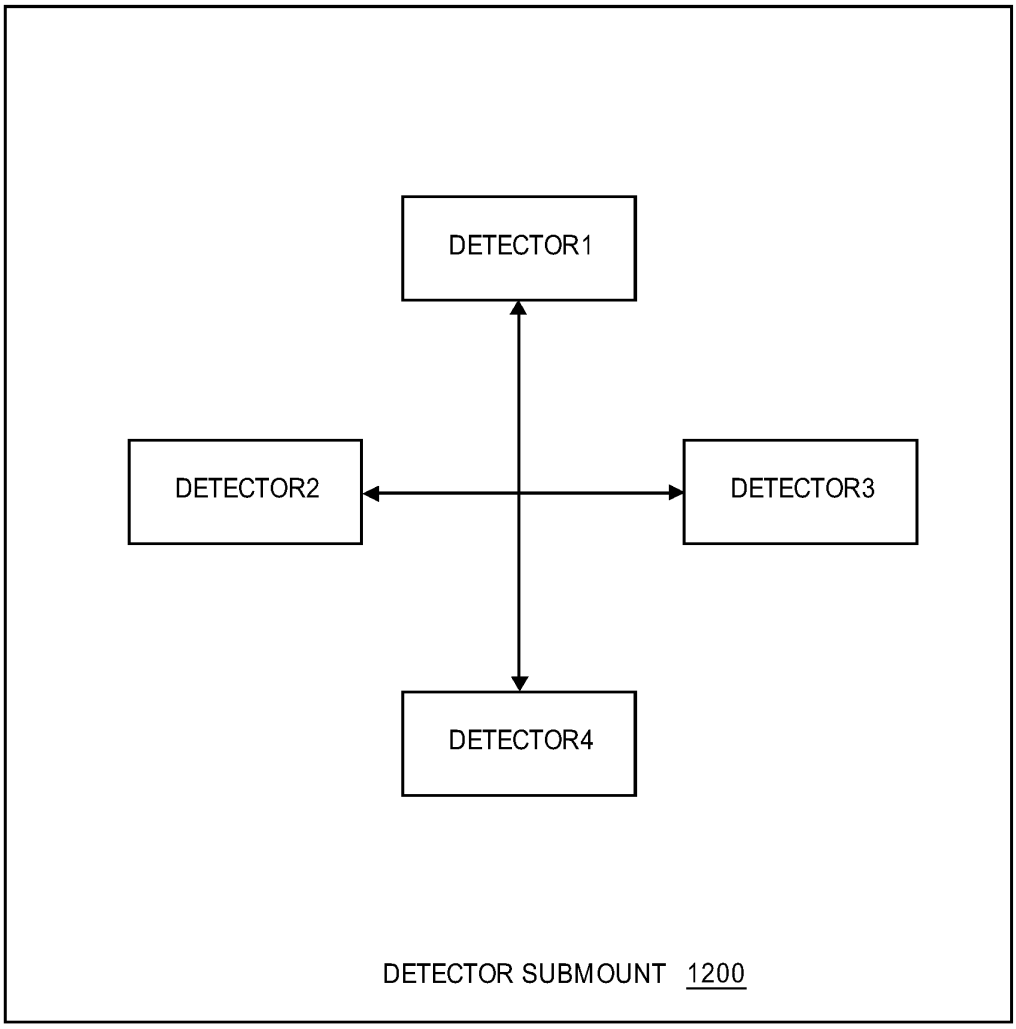

DETECTOR1
DETECTOR2
DETECTOR3
DETECTOR4
DETECTOR SUBMOUNT 1200

FIG. 12D

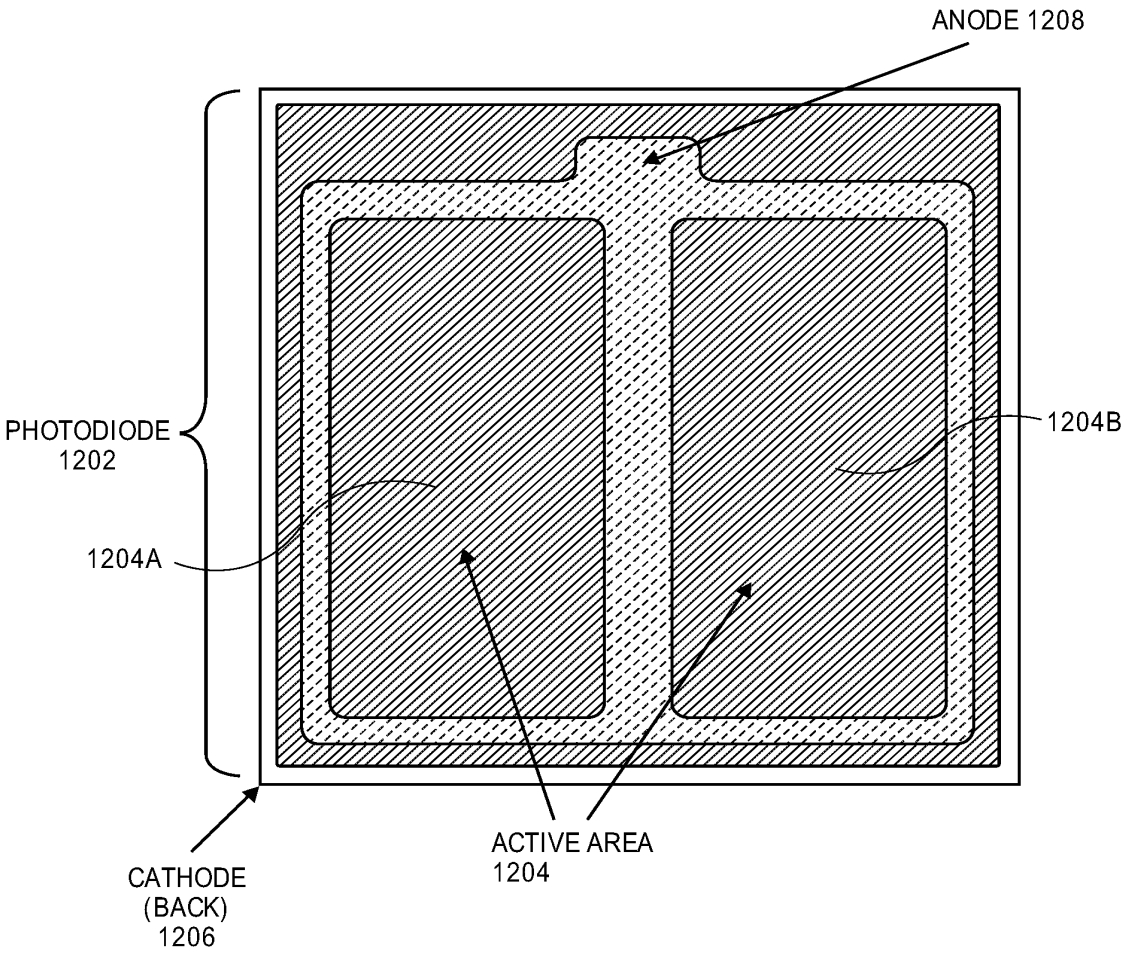

ANODE 1208
PHOTODIODE
1202
1204A
1204B
ACTIVE AREA
1204
CATHODE
(BACK)
1206

FIG. 12E

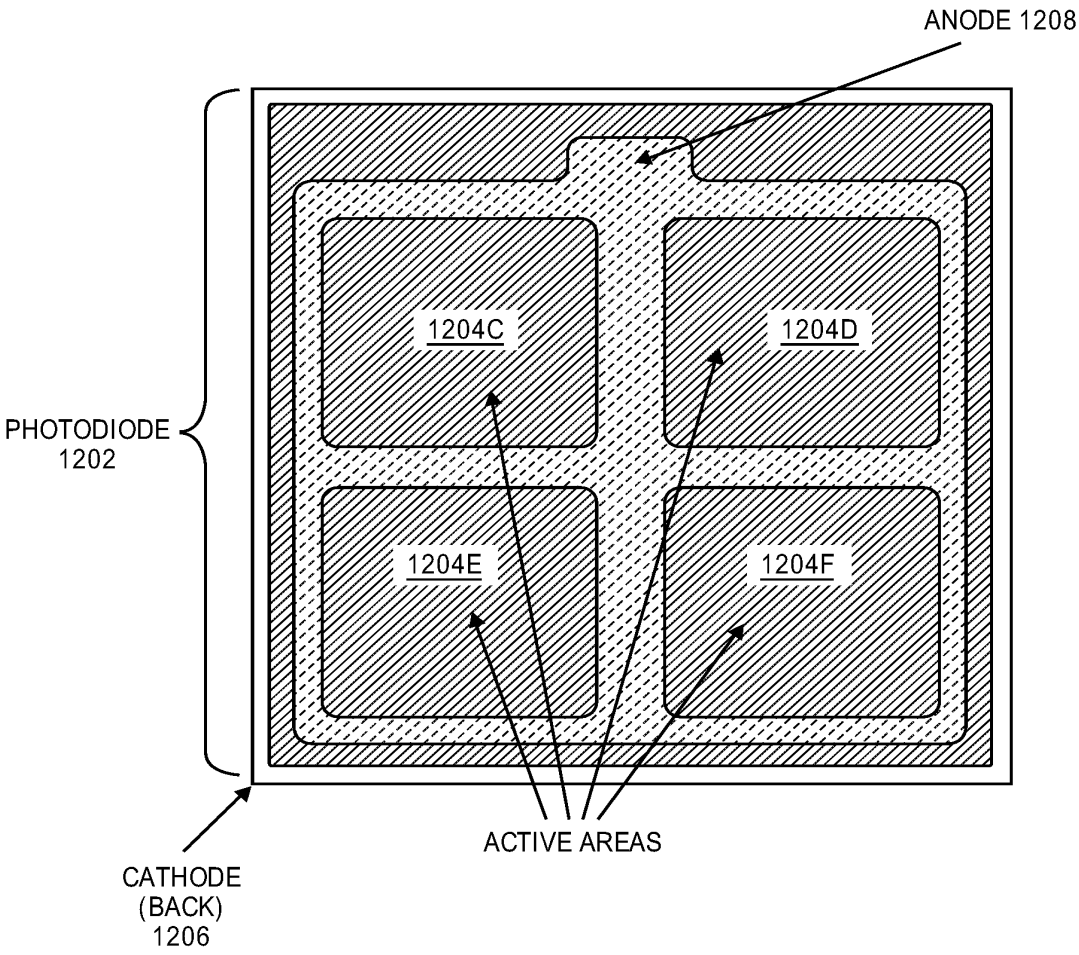

ANODE 1208
1204C
1204D
1204E
1204F
PHOTODIODE
1202
ACTIVE AREAS
CATHODE
(BACK)
1206

FIG. 12F

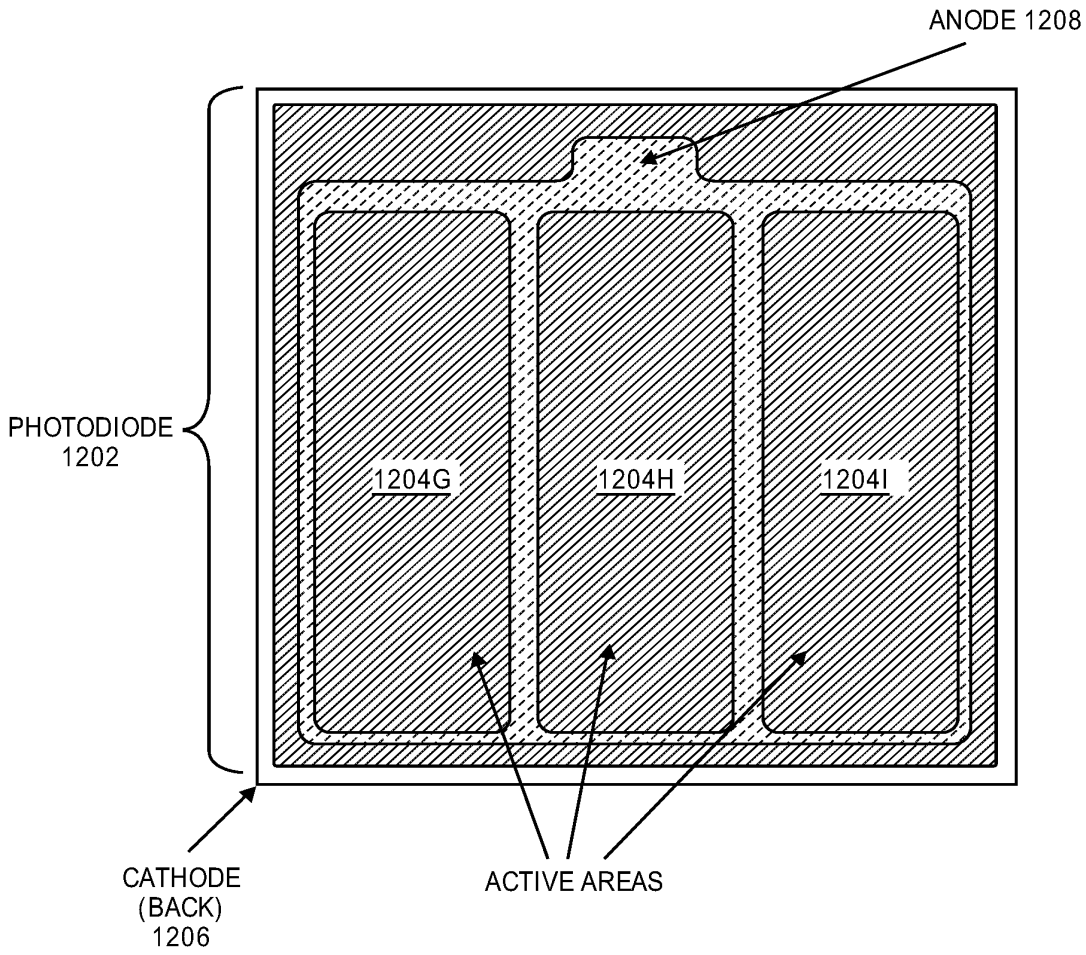

ANODE 1208
PHOTODIODE
1202
1204G
1204H
1204I
CATHODE
(BACK)
1206
ACTIVE AREAS

FIG. 12G

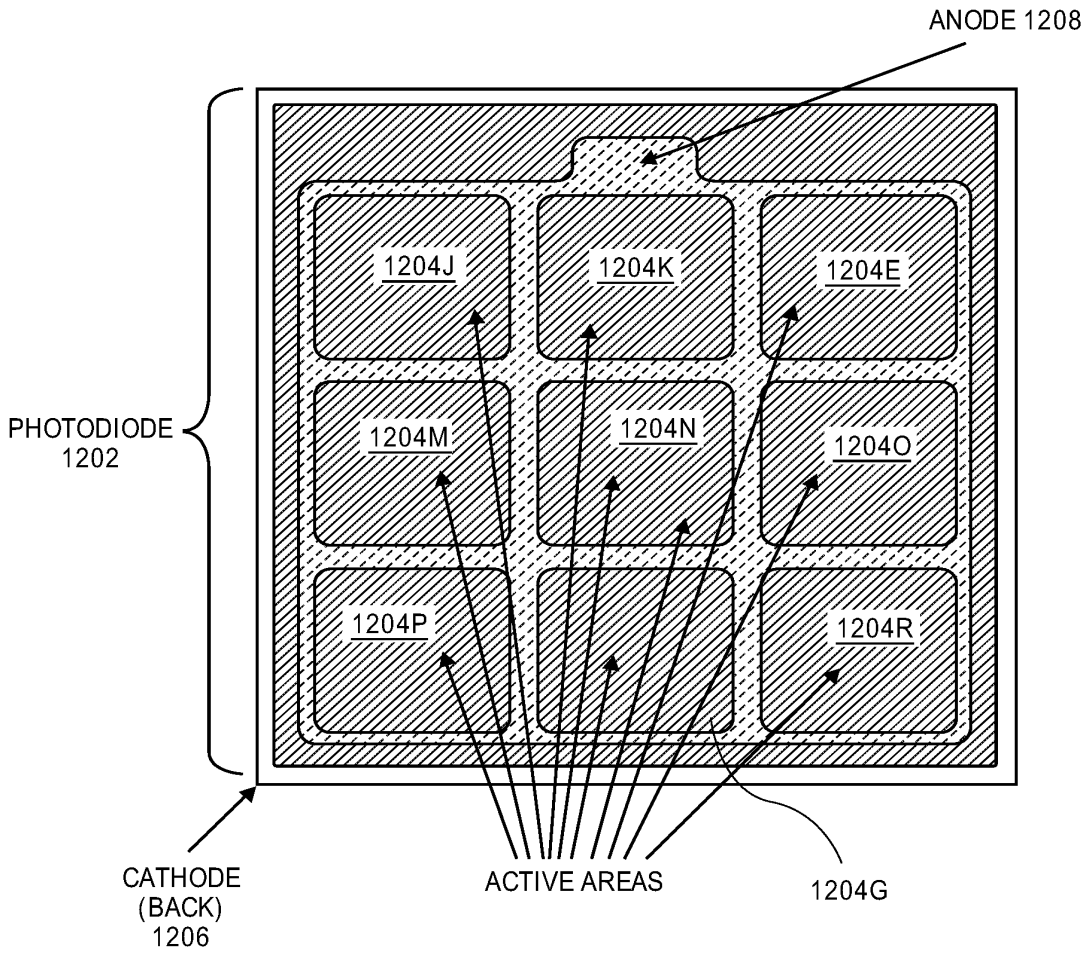

ANODE 1208
1204J
1204K
1204E
1204M
1204N
1204O
1204P
1204R
PHOTODIODE
1202
CATHODE
(BACK)
1206
ACTIVE AREAS
1204G

FIG. 12H

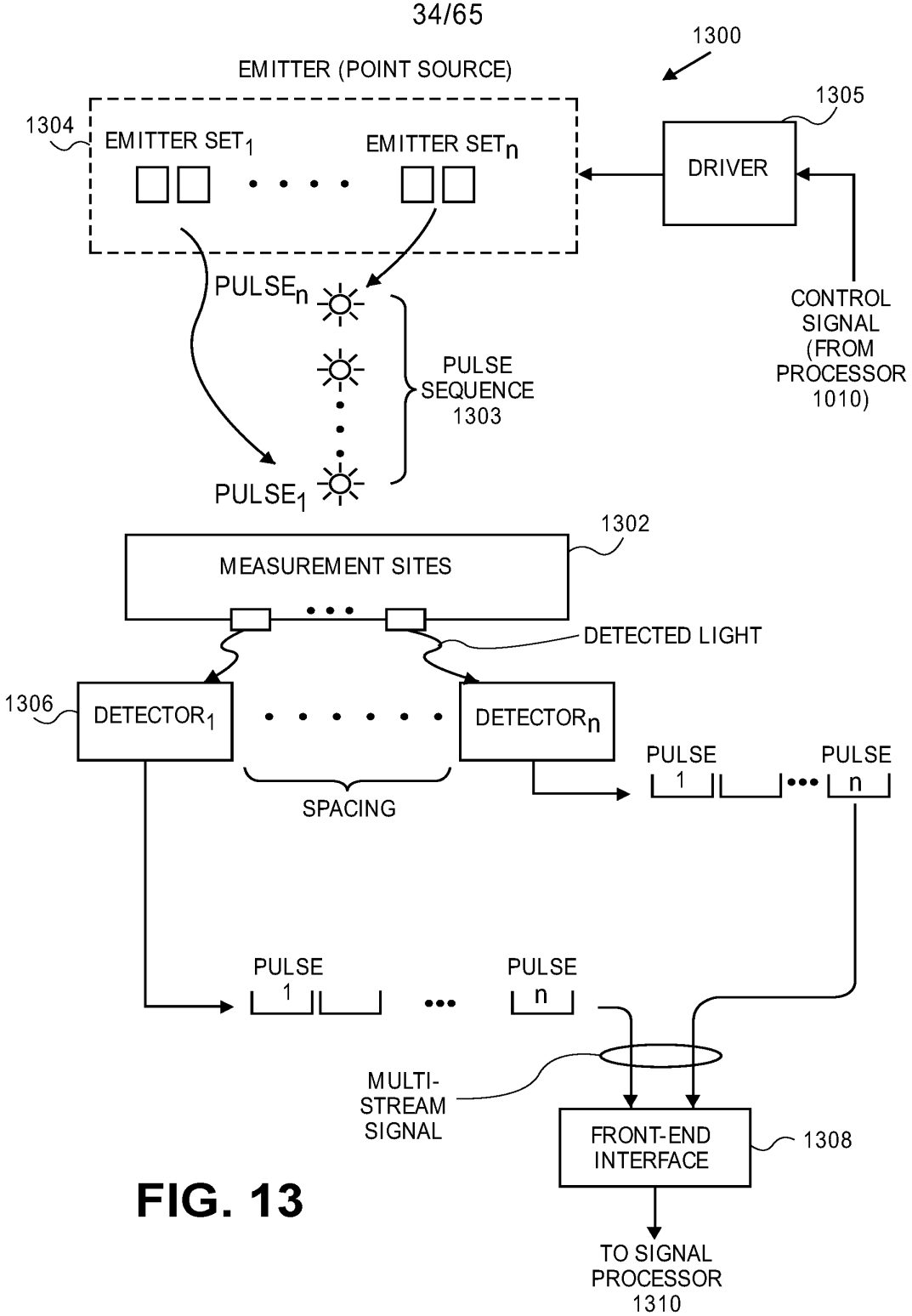

1300
EMITTER (POINT SOURCE)
1305
1304
EMITTER SET1
EMITTER SETn
DRIVER
PULSEn
PULSE SEQUENCE 1303
CONTROL SIGNAL (FROM PROCESSOR 1010)
PULSE1
1302
MEASUREMENT SITES
DETECTED LIGHT
1306
DETECTOR1
DETECTORn
PULSE 1
PULSE n
SPACING
PULSE 1
PULSE n
MULTI-STREAM SIGNAL
FRONT-END INTERFACE
1308
TO SIGNAL PROCESSOR 1310

FIG. 13

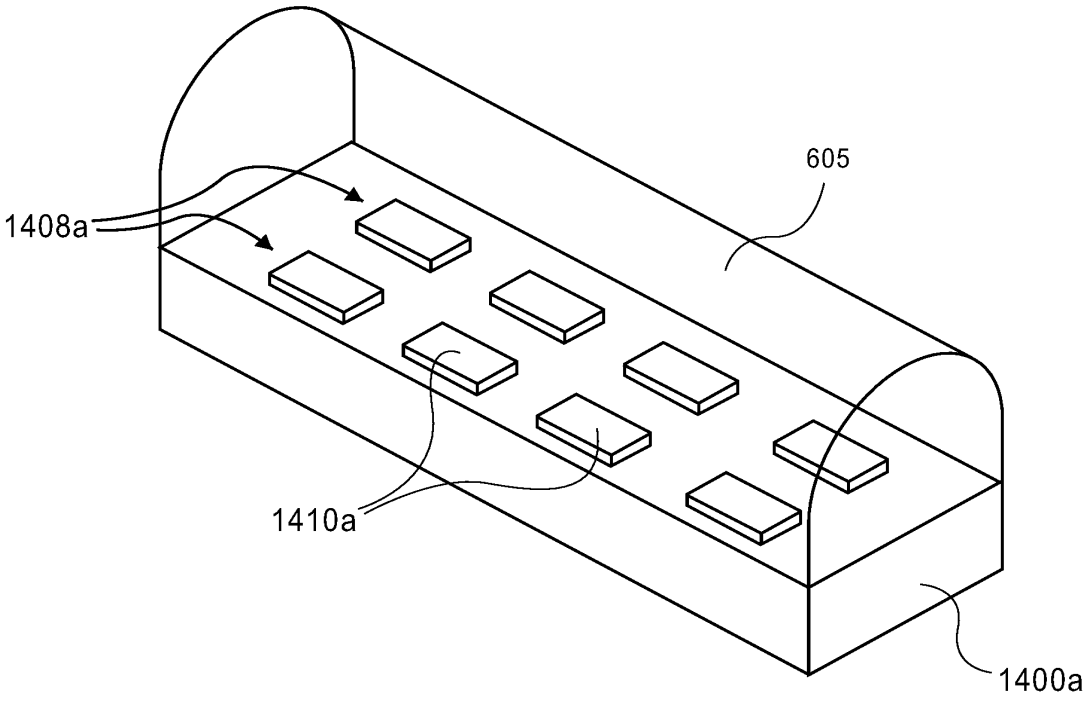


FIG. 14A

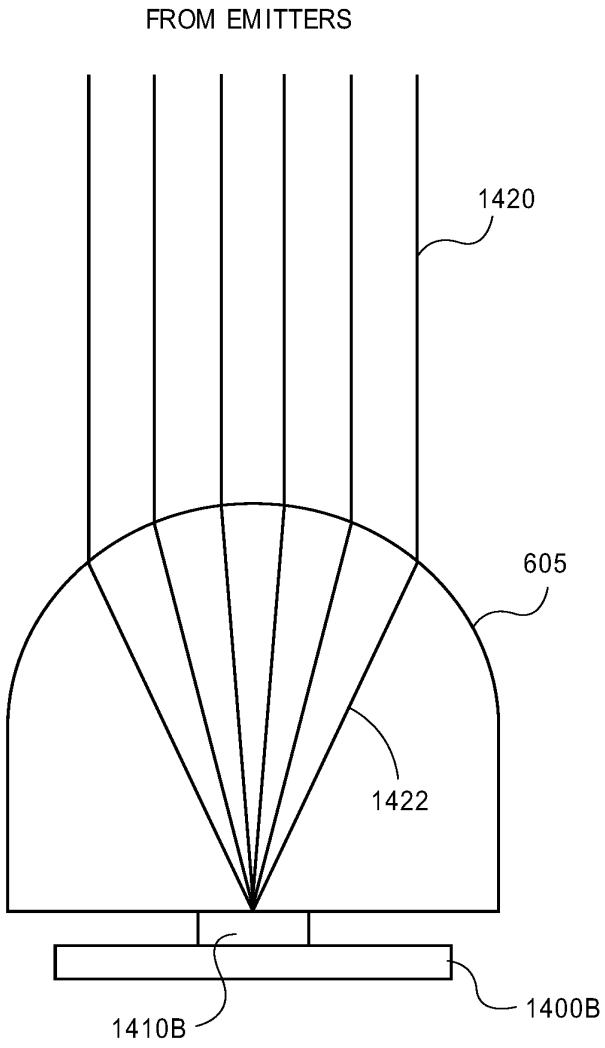


FIG. 14B

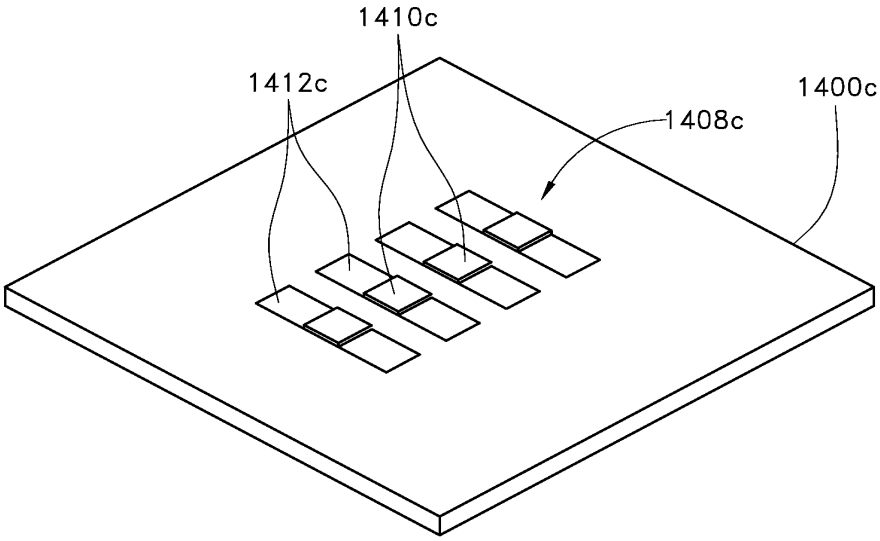


FIG. 14C

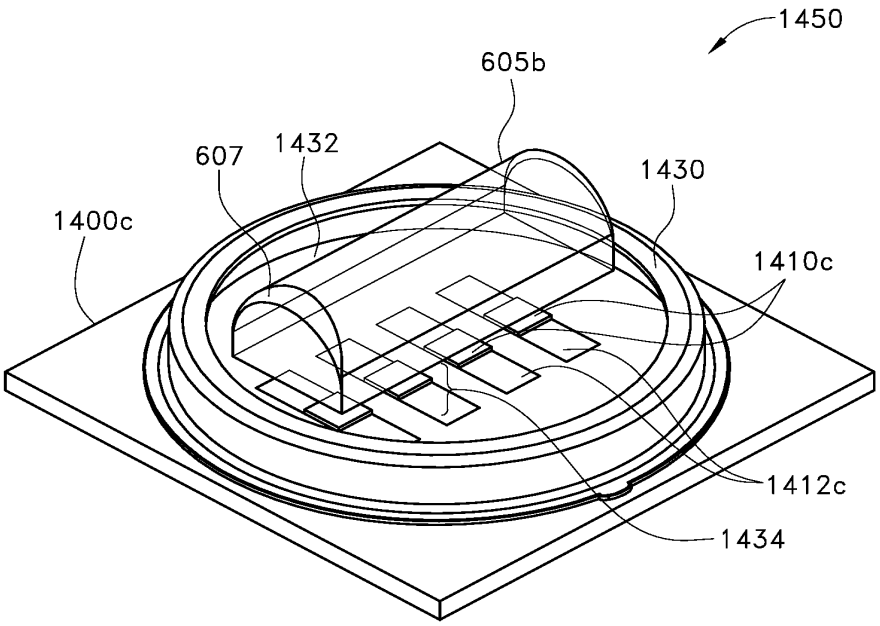


FIG. 14D

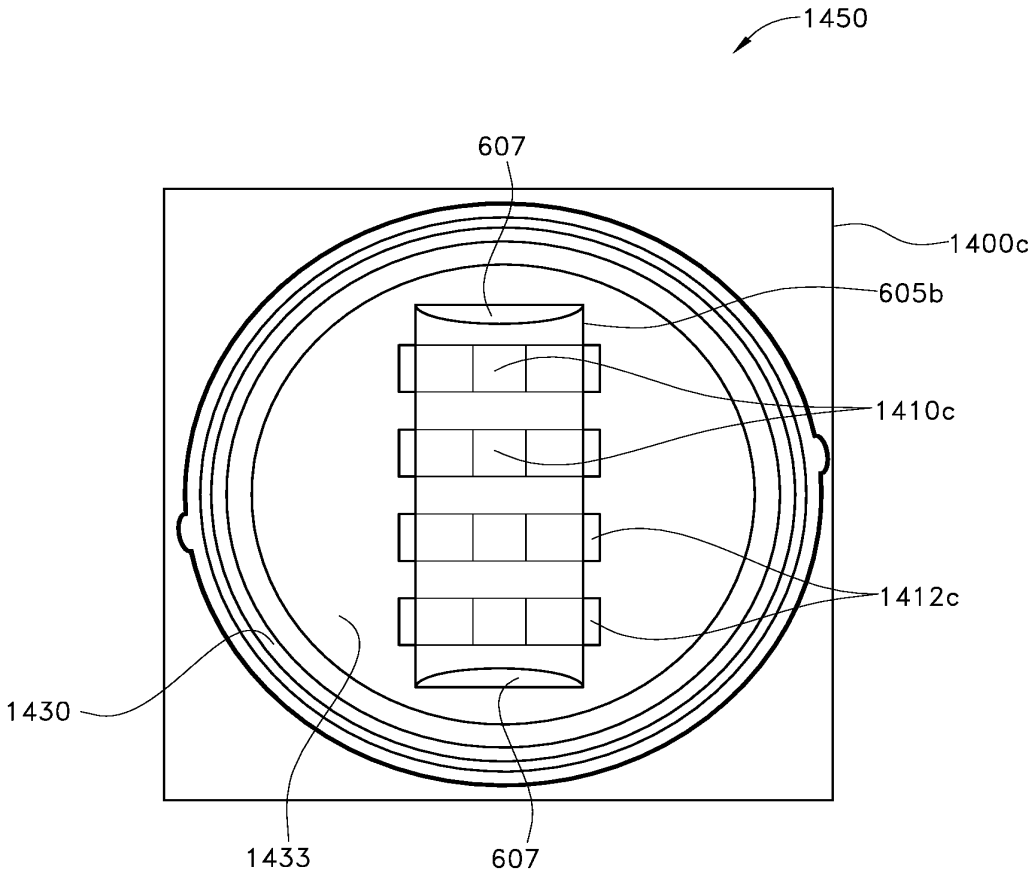


FIG. 14E

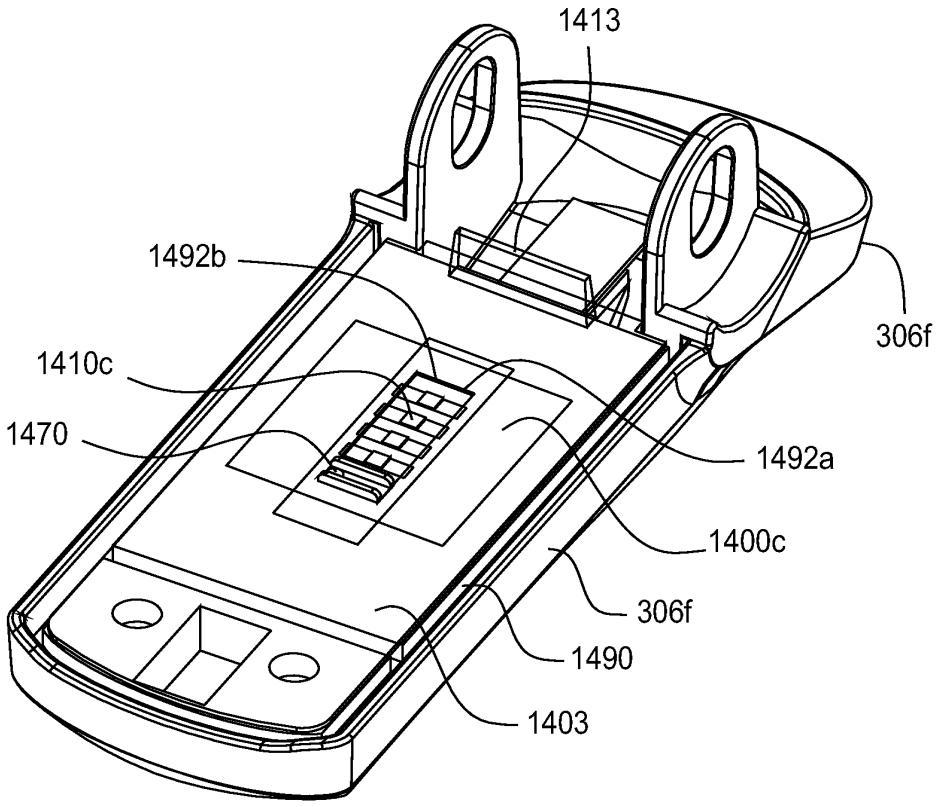


FIG. 14F

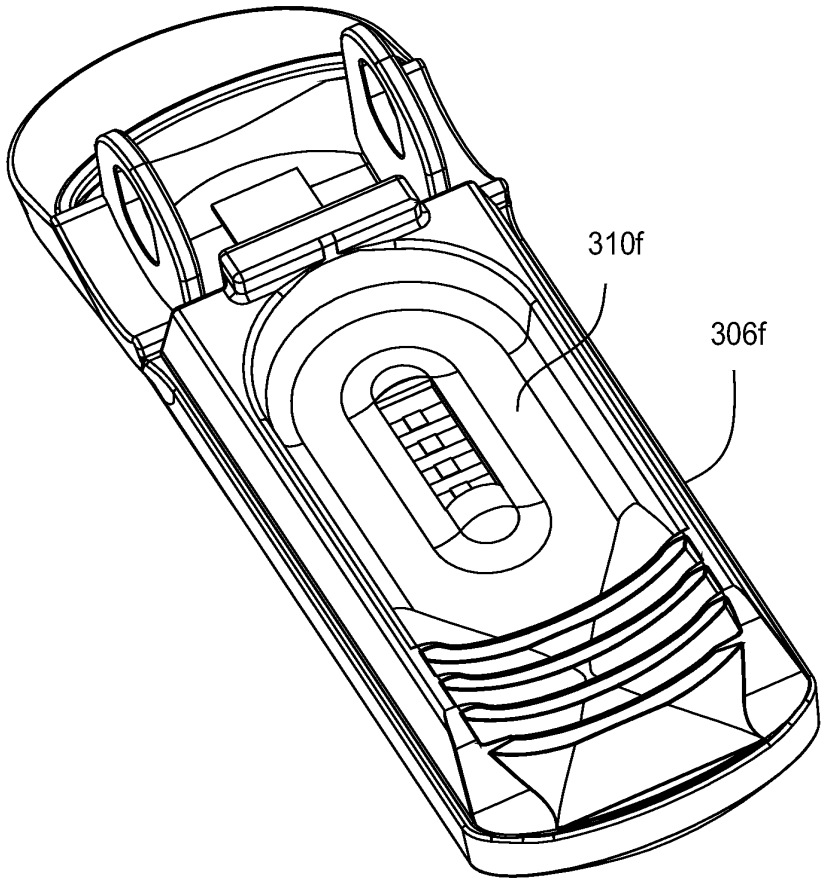


FIG. 14G

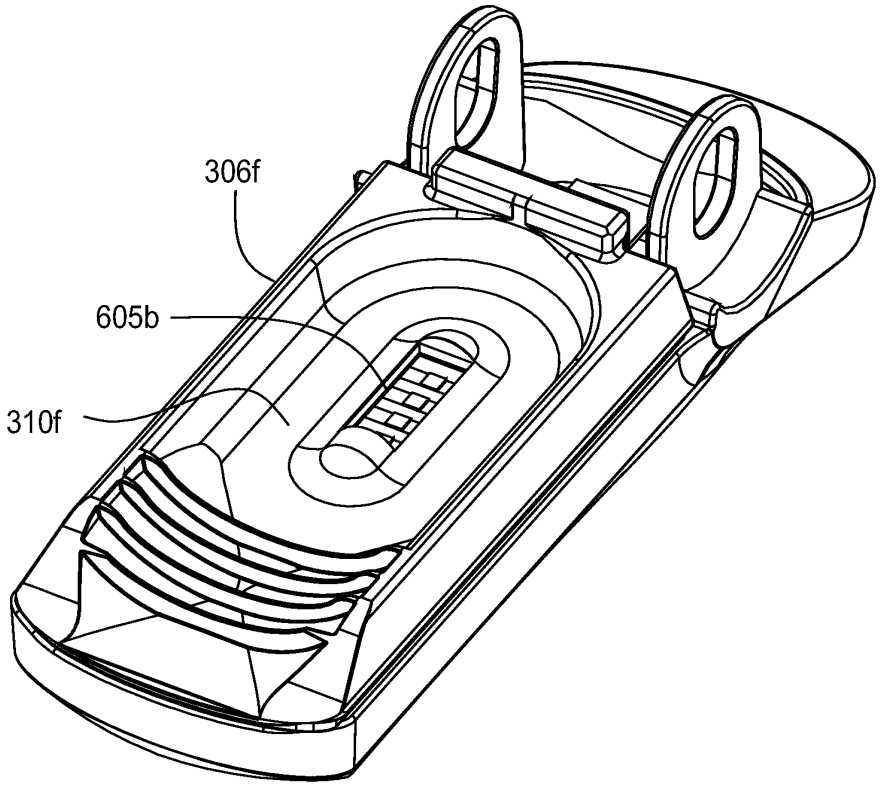


FIG. 14H

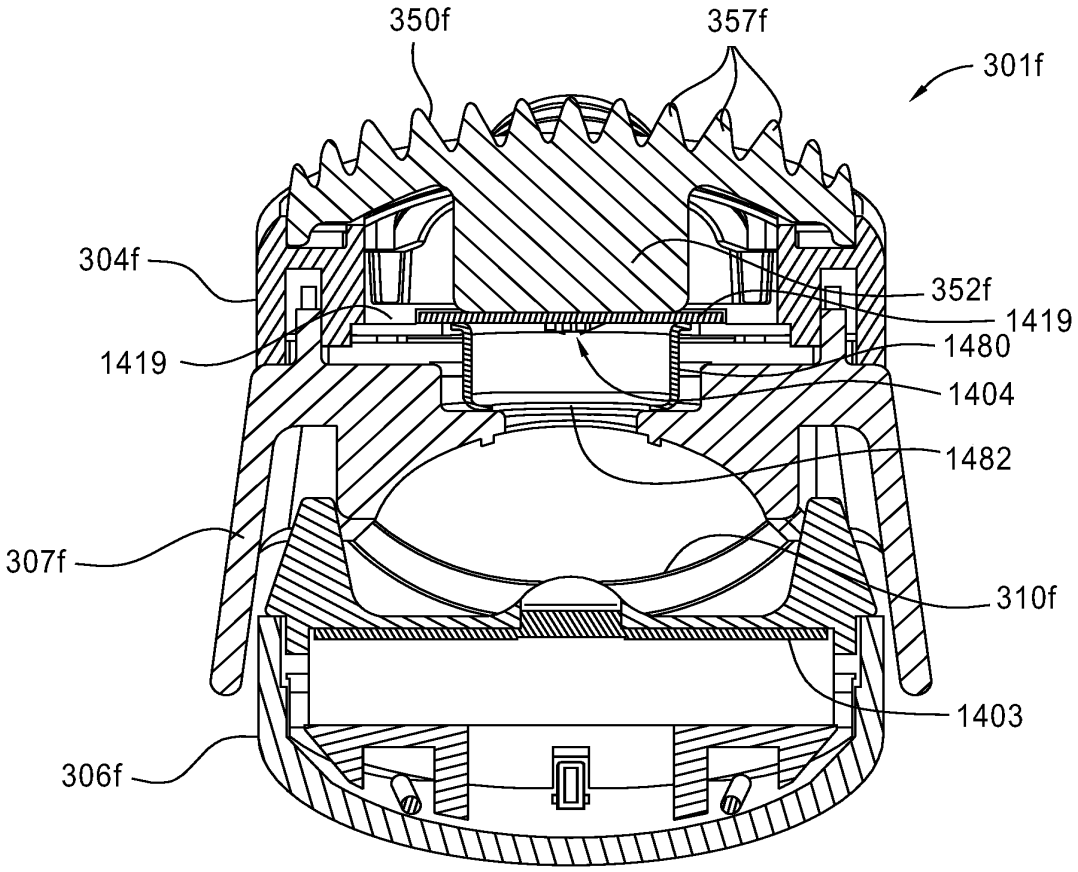

350f
357f
301f
304f
352f
1419
1480
1419
1404
1482
307f
310f
1403
306f

FIG. 14I

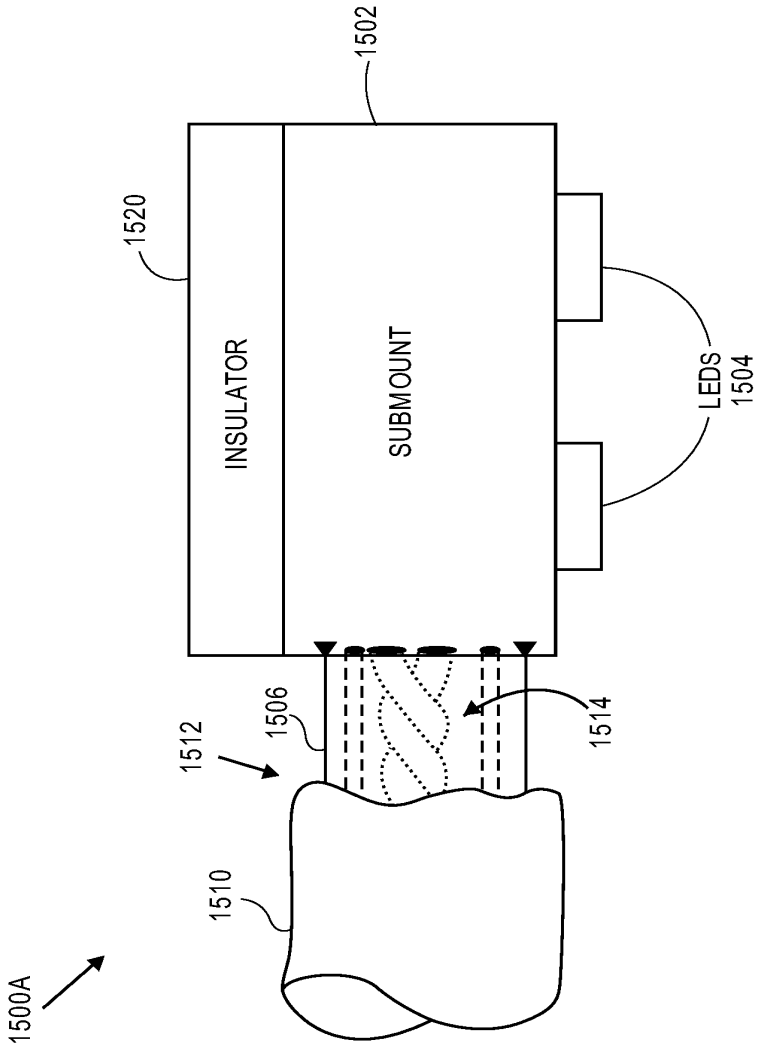

1502
1520
INSULATOR
SUBMOUNT
LEDs
1504
1506
1512
1514
1510
1500A

FIG. 15A

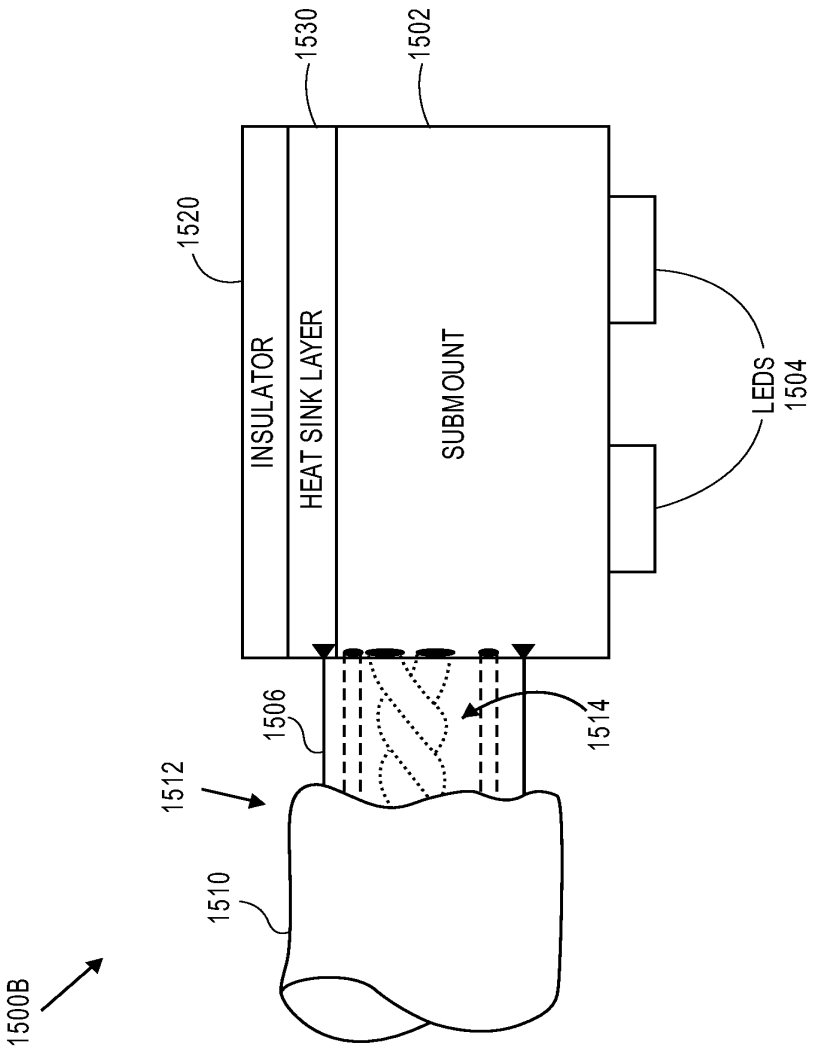

1530
1502
1520
INSULATOR
HEAT SINK LAYER
SUBMOUNT
LEDs
1504
1506
1514
1512
1510
1500B

FIG. 15B

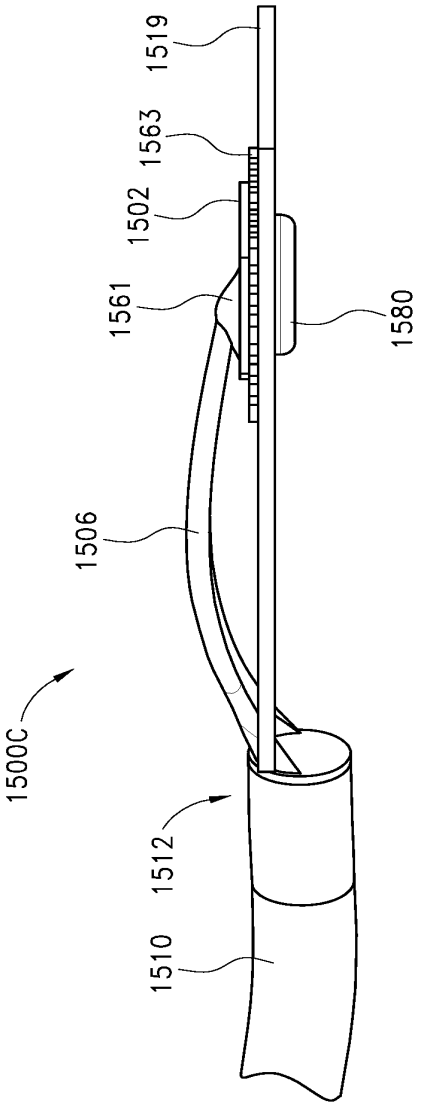


FIG. 15C

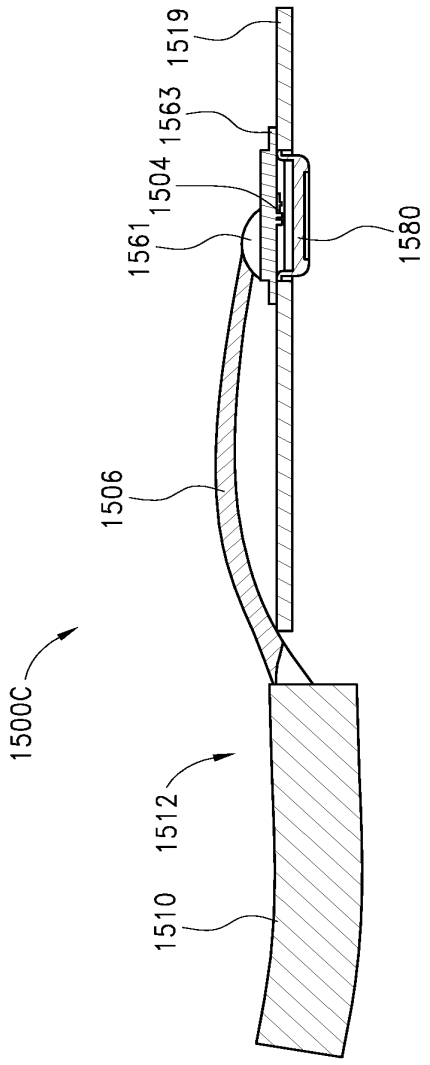


FIG. 15D

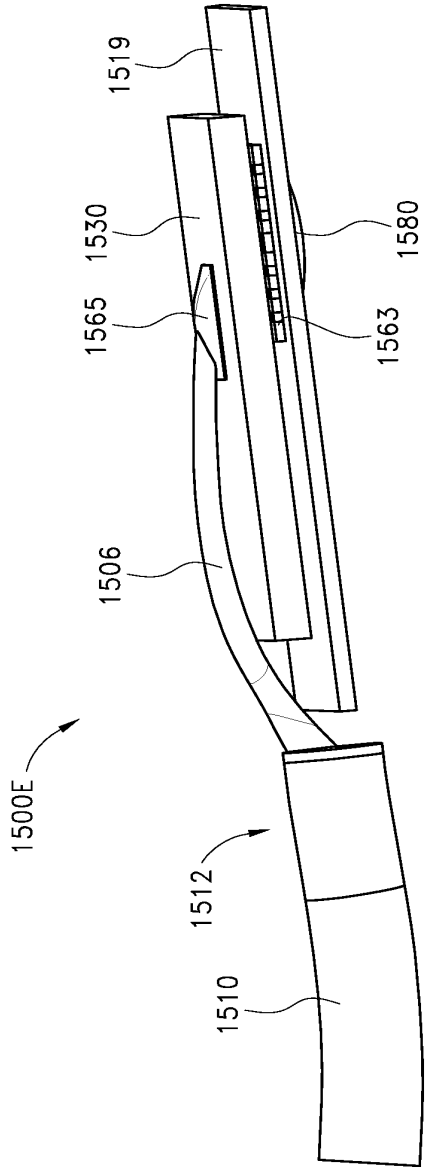


FIG. 15E

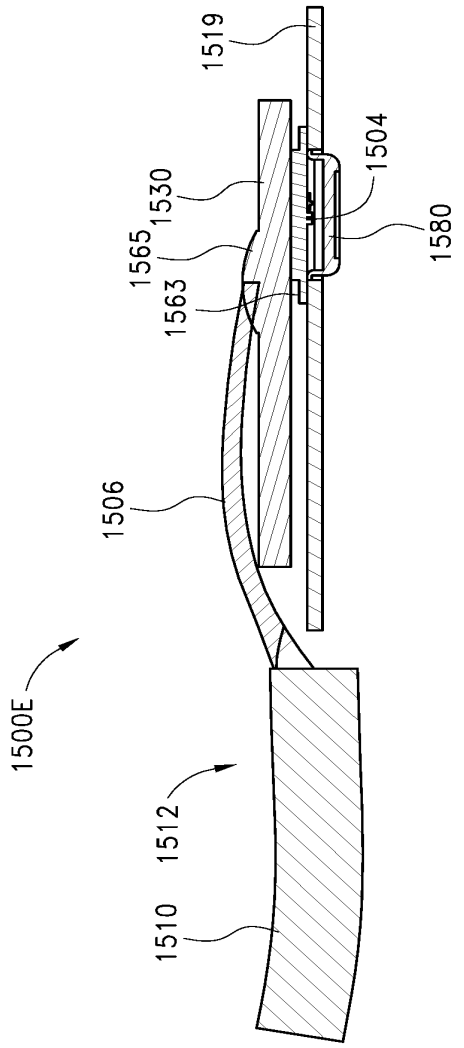


FIG. 15F

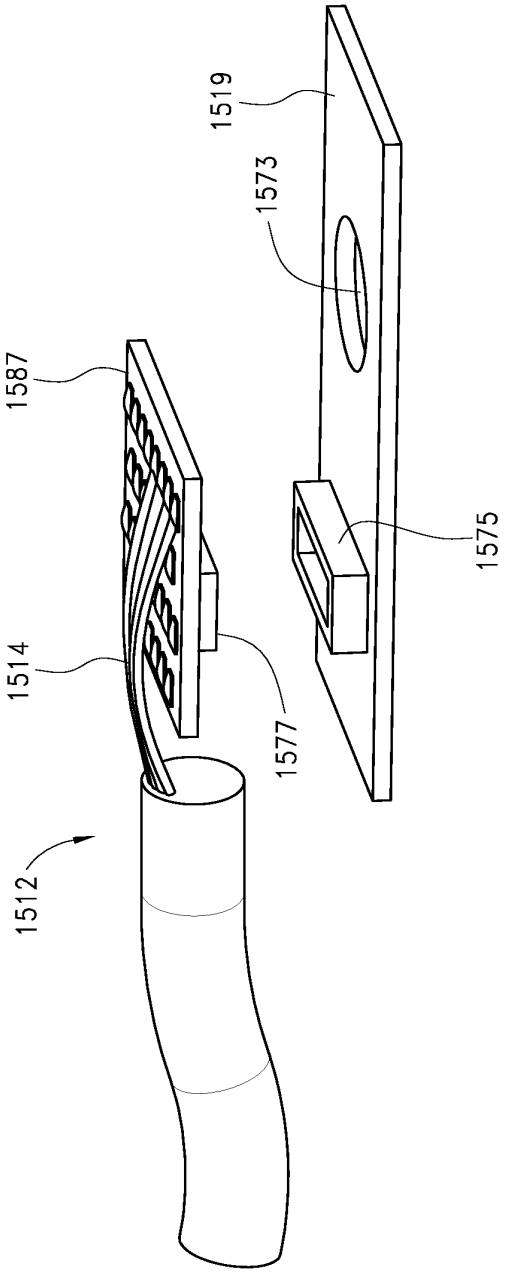


FIG. 15G

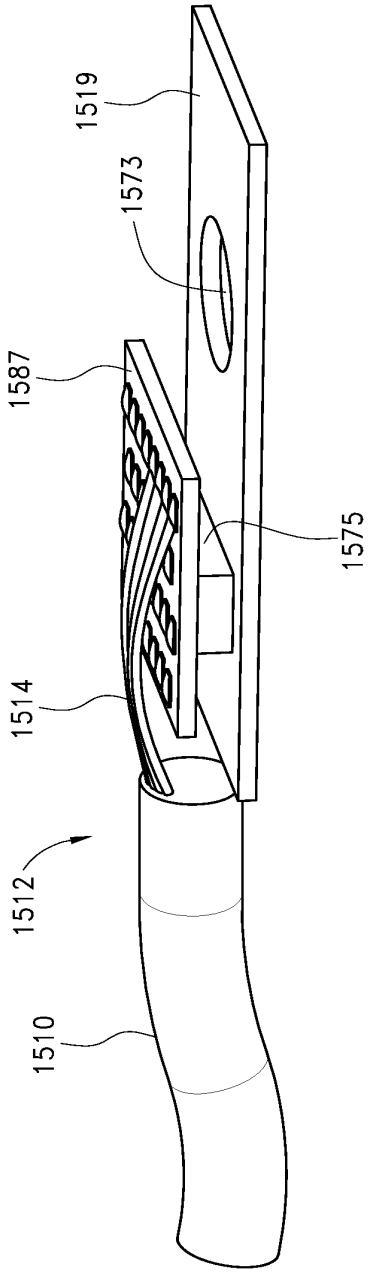


FIG. 15H

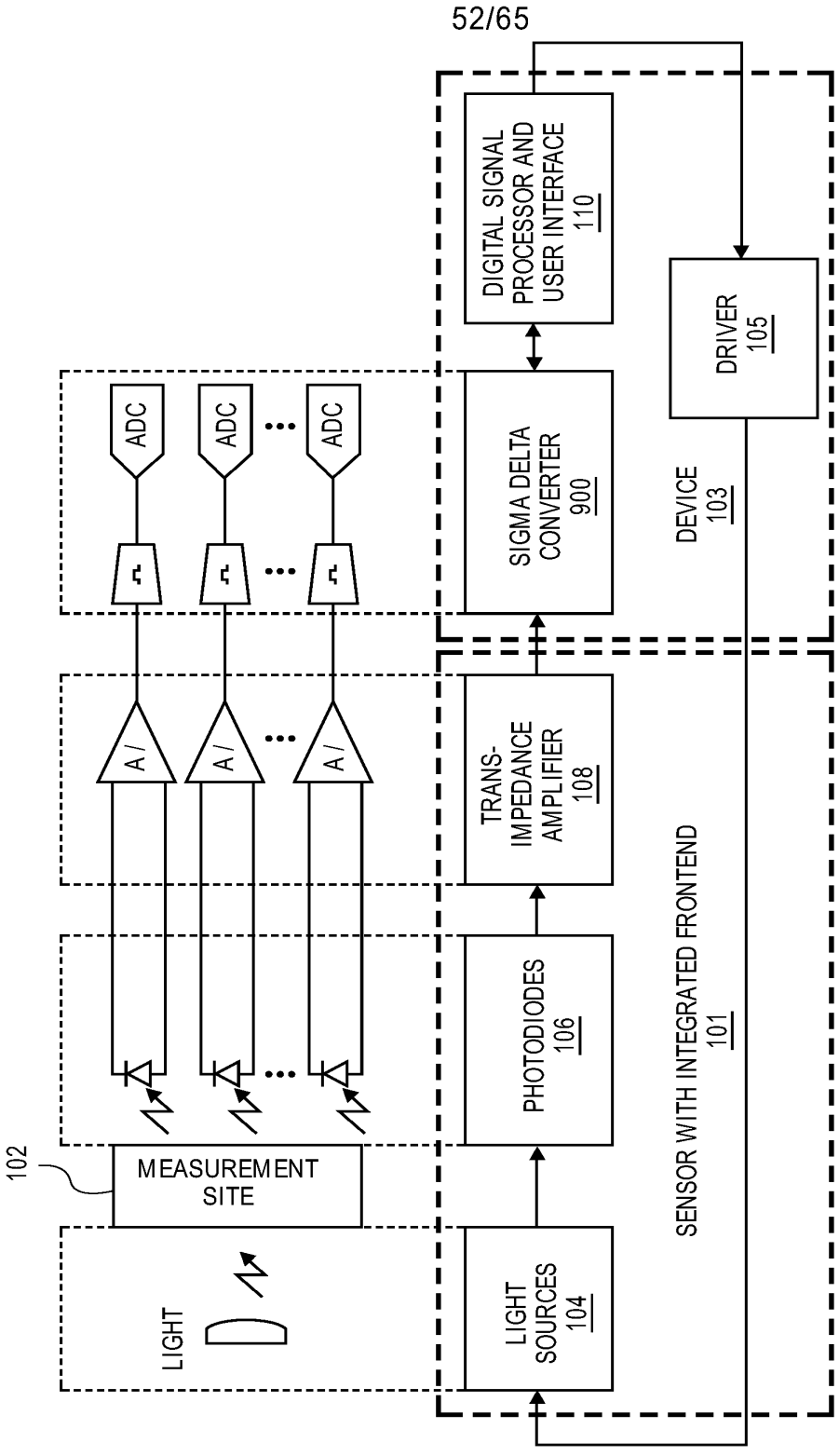

DIGITAL SIGNAL PROCESSOR AND USER INTERFACE 110
DRIVER 105
SIGMA DELTA CONVERTER 900
DEVICE 103
TRANS-IMPEDANCE AMPLIFIER 108
PHOTODIODES 106
LIGHT SOURCES 104
SENSOR WITH INTEGRATED FRONTEND 101
ADC
ADC
ADC
A /
A /
A /
102
MEASUREMENT SITE
LIGHT

FIG. 15I

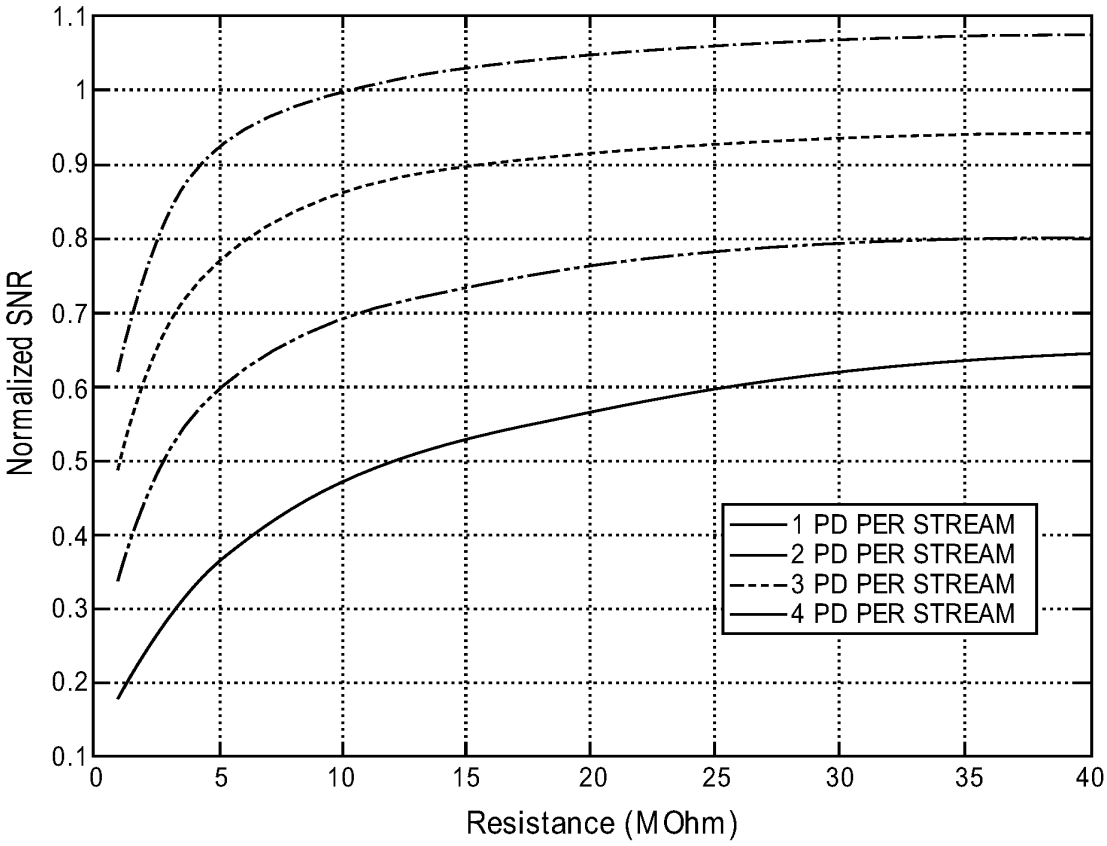

1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
Normalized SNR
0
5
10
15
20
25
30
35
40
Resistance (MOhm)
1 PD PER STREAM
2 PD PER STREAM
3 PD PER STREAM
4 PD PER STREAM

FIG. 15J

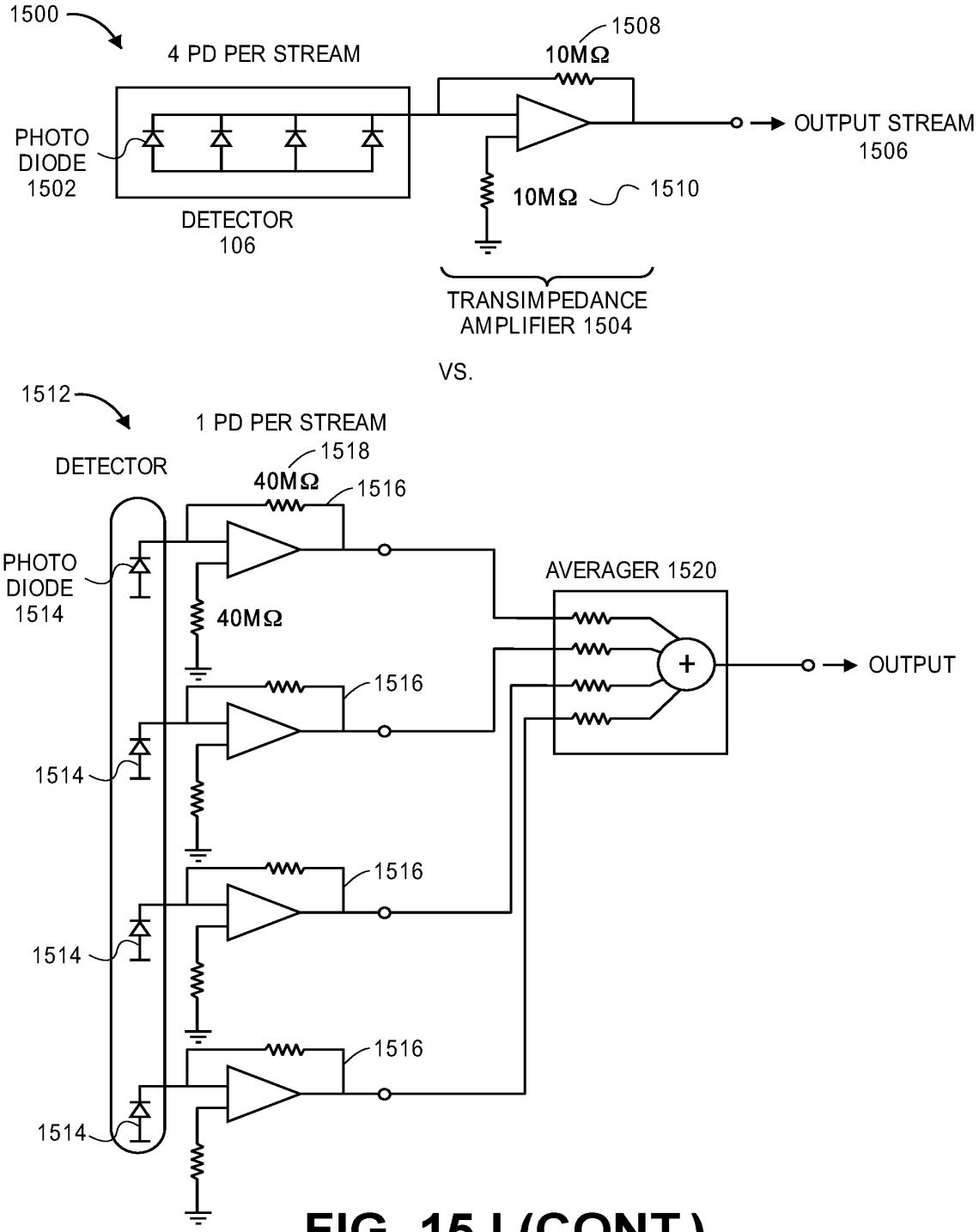
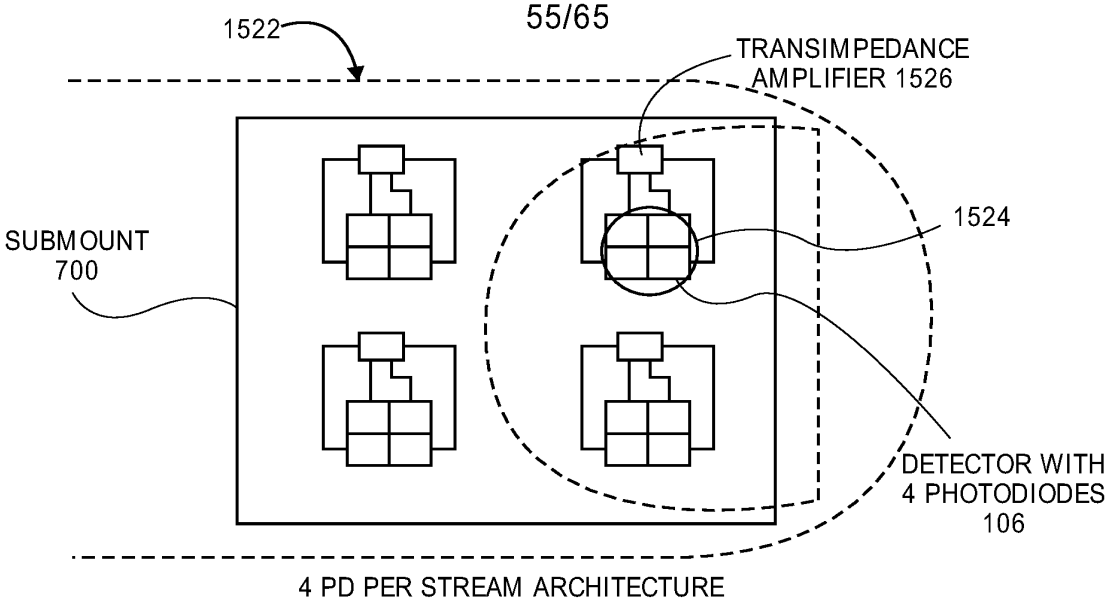

1500
4 PD PER STREAM
1508
10MΩ
PHOTO DIODE 1502
OUTPUT STREAM 1506
10MΩ
1510
DETECTOR 106
TRANSIMPEDANCE AMPLIFIER 1504
VS.
1512
1 PD PER STREAM
DETECTOR
1518
40MΩ
1516
PHOTO DIODE 1514
AVERAGER 1520
40MΩ
OUTPUT
1514
1516
1514
1516
1514
1516

FIG. 15J (CONT.)


1522
TRANSIMPEDANCE AMPLIFIER 1526
1524
SUBMOUNT 700
DETECTOR WITH 4 PHOTODIODES 106
4 PD PER STREAM ARCHITECTURE

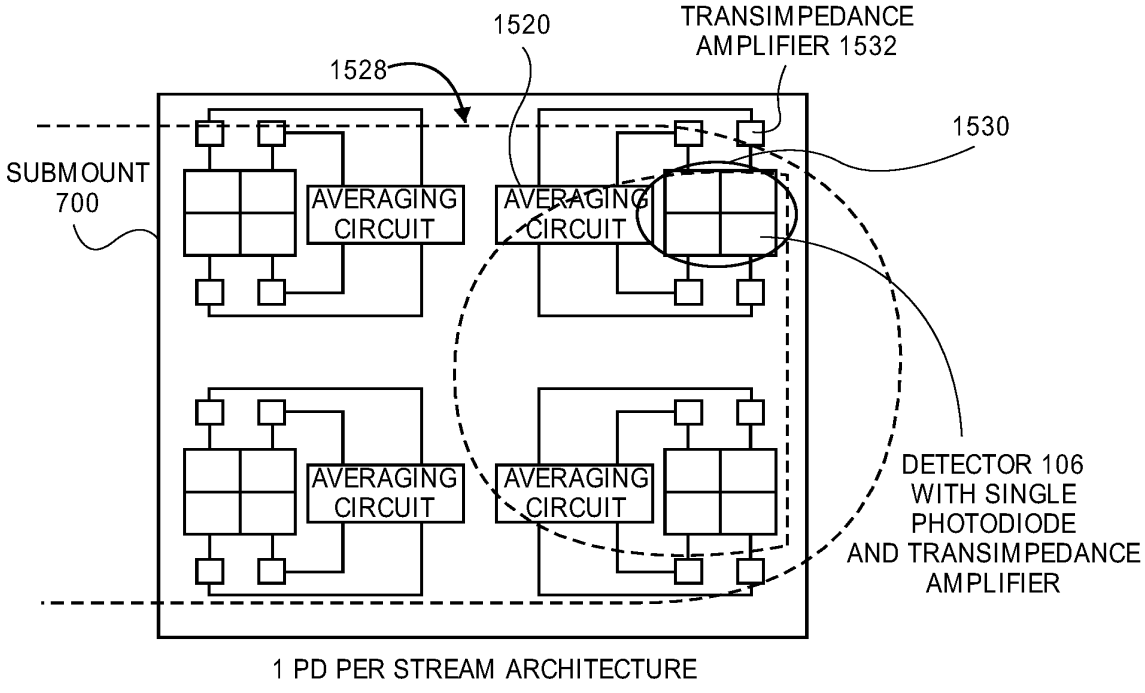

1520
TRANSIMPEDANCE AMPLIFIER 1532
1528
1530
SUBMOUNT 700
AVERAGING CIRCUIT
AVERAGING CIRCUIT
AVERAGING CIRCUIT
AVERAGING CIRCUIT
DETECTOR 106 WITH SINGLE PHOTODIODE AND TRANSIMPEDANCE AMPLIFIER
1 PD PER STREAM ARCHITECTURE

FIG. 15K

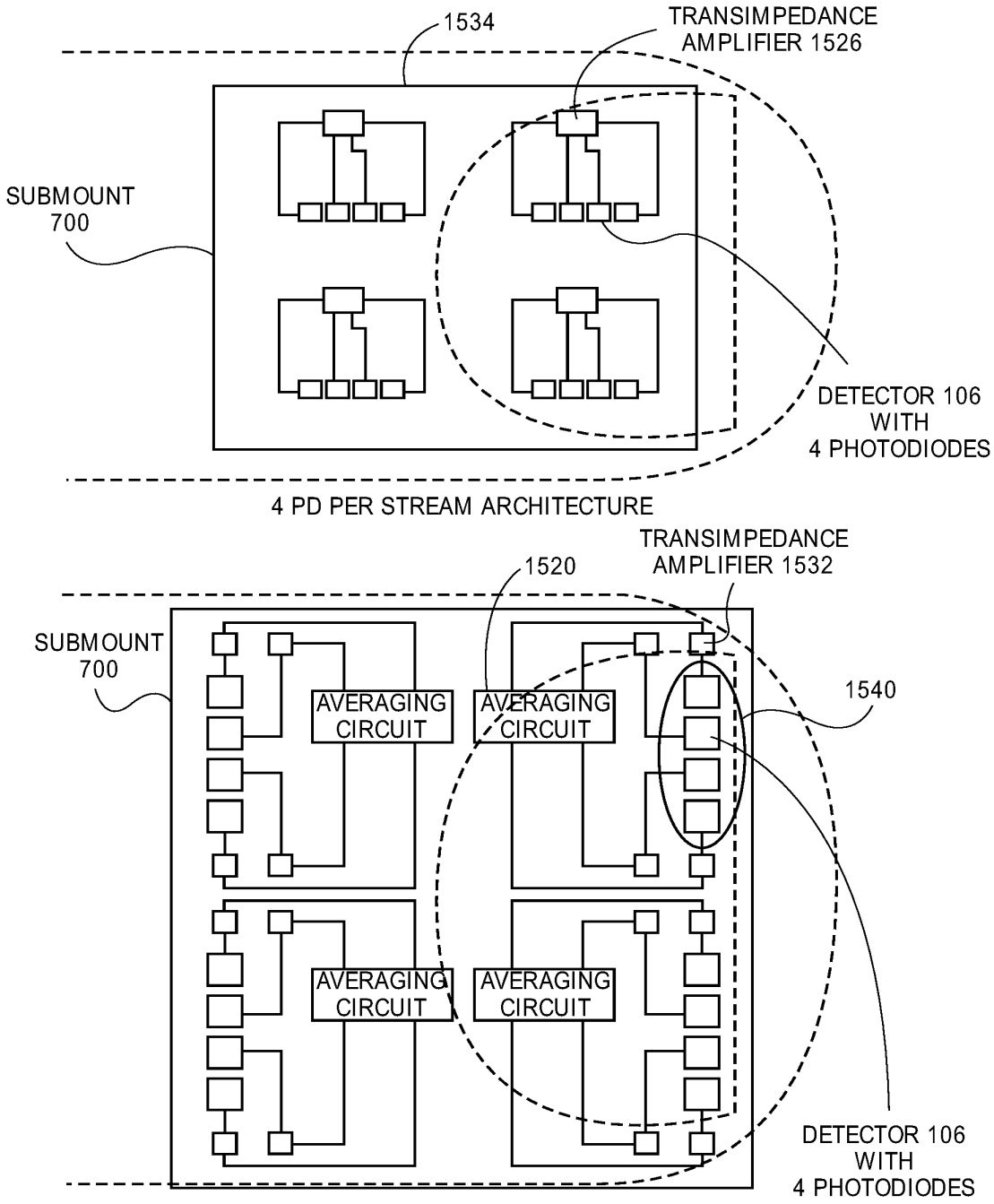

1534
TRANSIMPEDANCE AMPLIFIER 1526
SUBMOUNT 700
DETECTOR 106 WITH 4 PHOTODIODES
4 PD PER STREAM ARCHITECTURE
TRANSIMPEDANCE AMPLIFIER 1532
1520
SUBMOUNT 700
AVERAGING CIRCUIT
AVERAGING CIRCUIT
AVERAGING CIRCUIT
AVERAGING CIRCUIT
1540
DETECTOR 106 WITH 4 PHOTODIODES
1 PD PER STREAM ARCHITECTURE

FIG. 15K (CONT.)

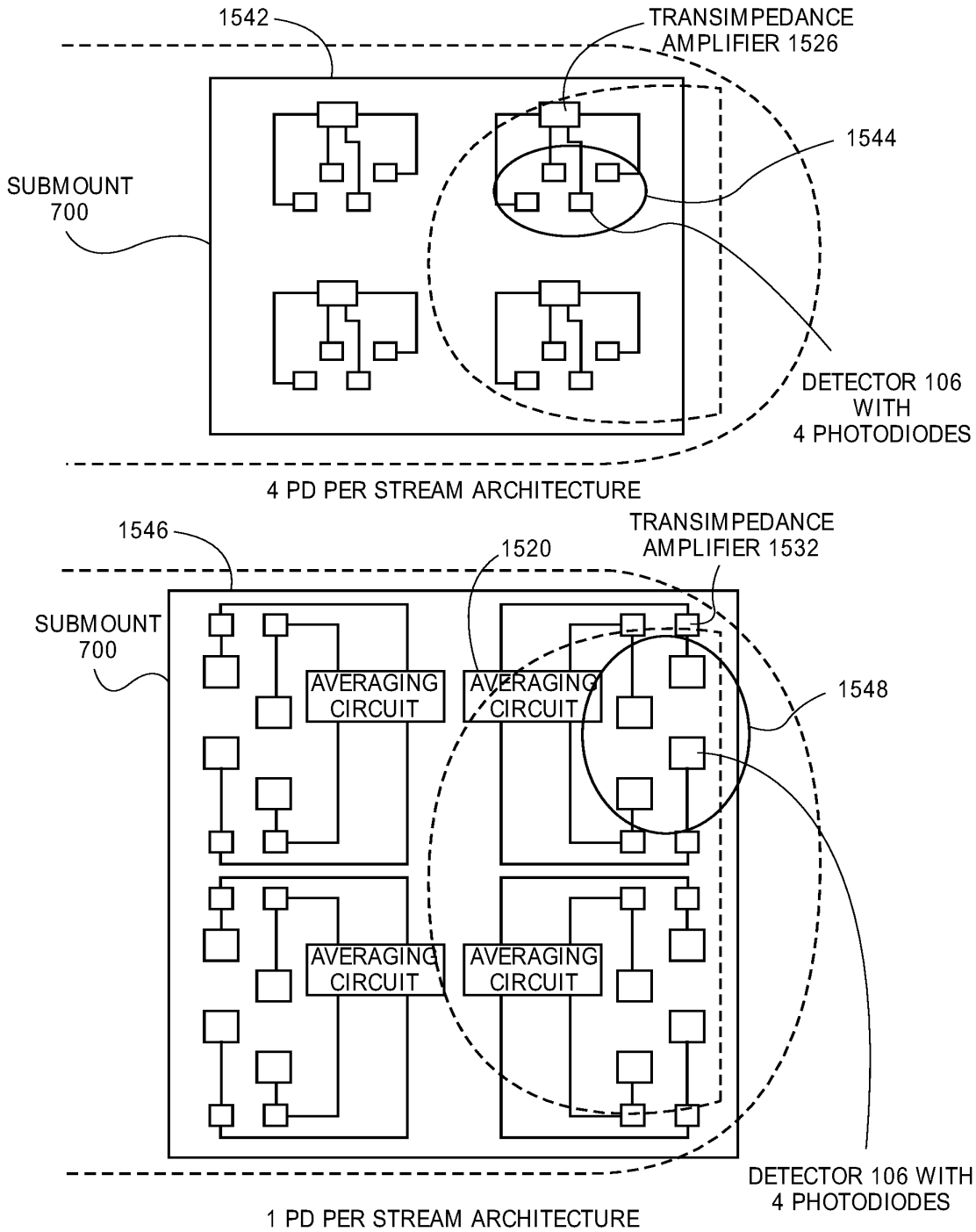

1542
TRANSIMPEDANCE AMPLIFIER 1526
1544
SUBMOUNT 700
DETECTOR 106 WITH 4 PHOTODIODES
4 PD PER STREAM ARCHITECTURE
1546
1520
TRANSIMPEDANCE AMPLIFIER 1532
SUBMOUNT 700
AVERAGING CIRCUIT
AVERAGING CIRCUIT
1548
AVERAGING CIRCUIT
AVERAGING CIRCUIT
DETECTOR 106 WITH 4 PHOTODIODES
1 PD PER STREAM ARCHITECTURE

FIG. 15K (CONT.)

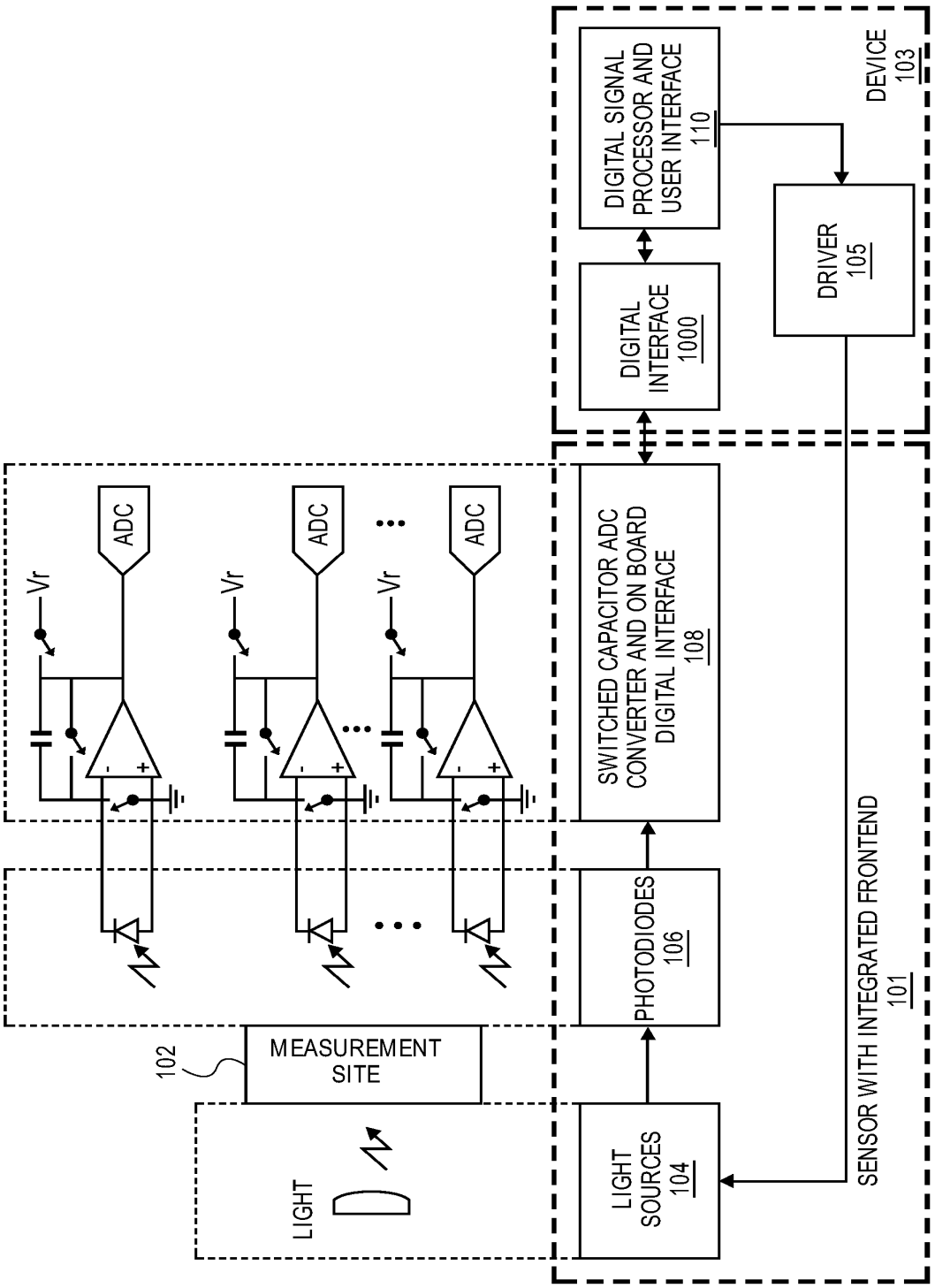

DEVICE
103
DIGITAL SIGNAL PROCESSOR AND USER INTERFACE
110
DRIVER
105
DIGITAL INTERFACE
1000
SWITCHED CAPACITOR ADC CONVERTER AND ON BOARD DIGITAL INTERFACE
108
PHOTODIODES
106
LIGHT SOURCES
104
SENSOR WITH INTEGRATED FRONTEND
101
MEASUREMENT SITE
102
LIGHT
ADC
Vr

FIG. 15L

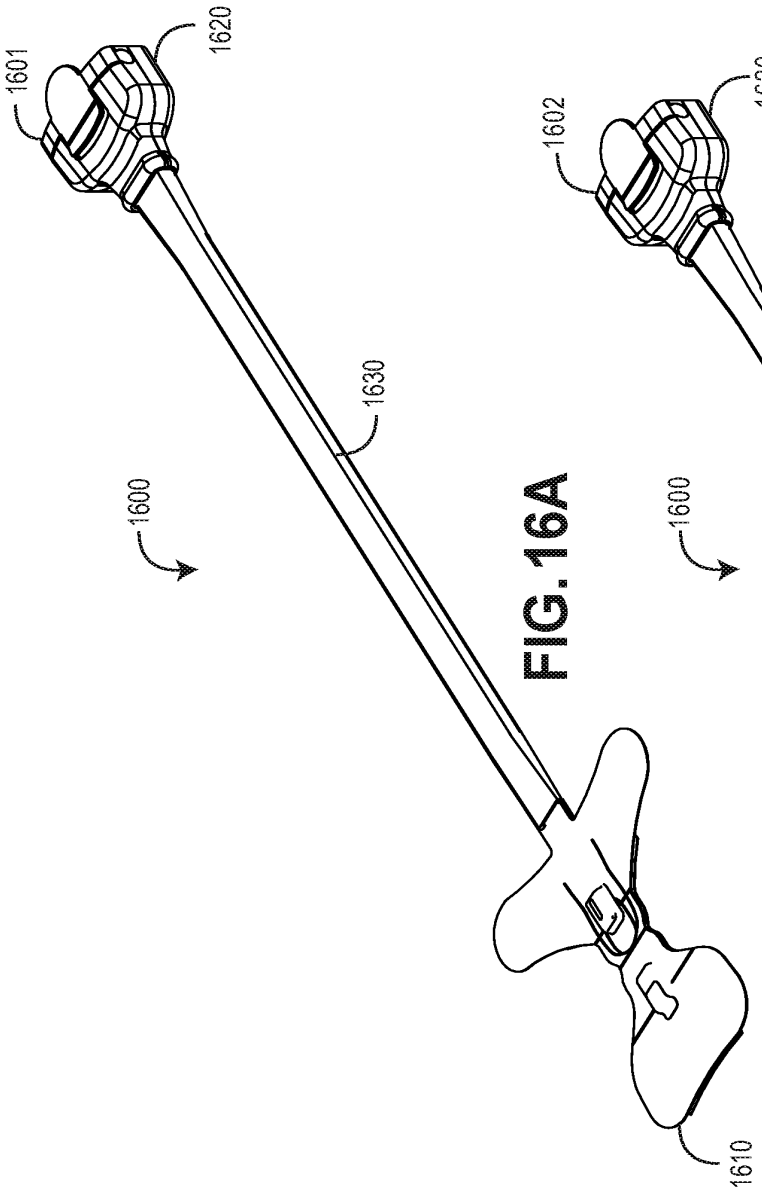


FIG.16A

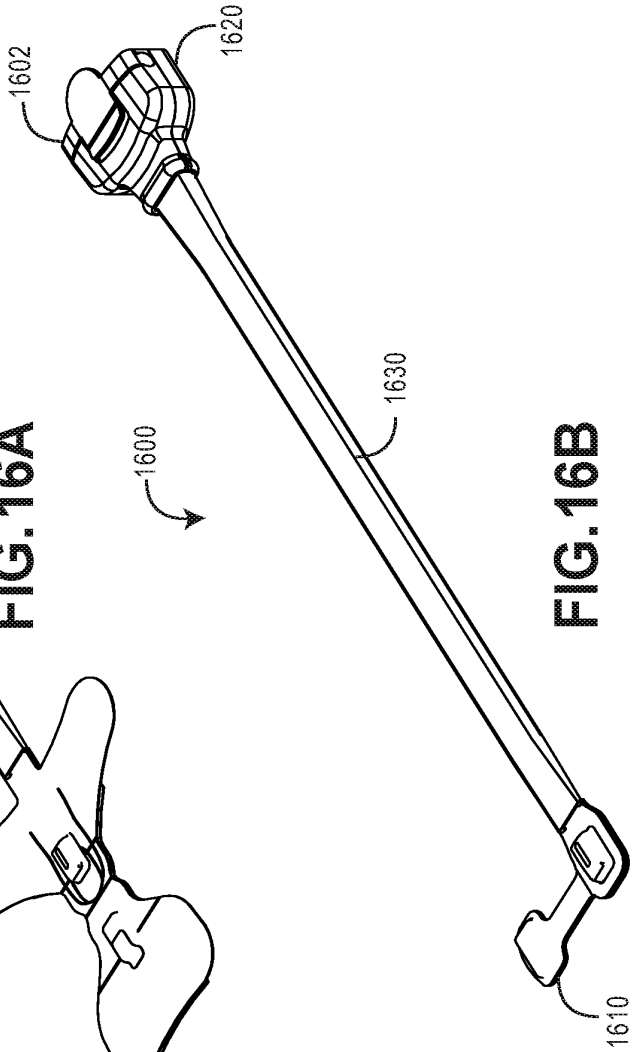


FIG.16B

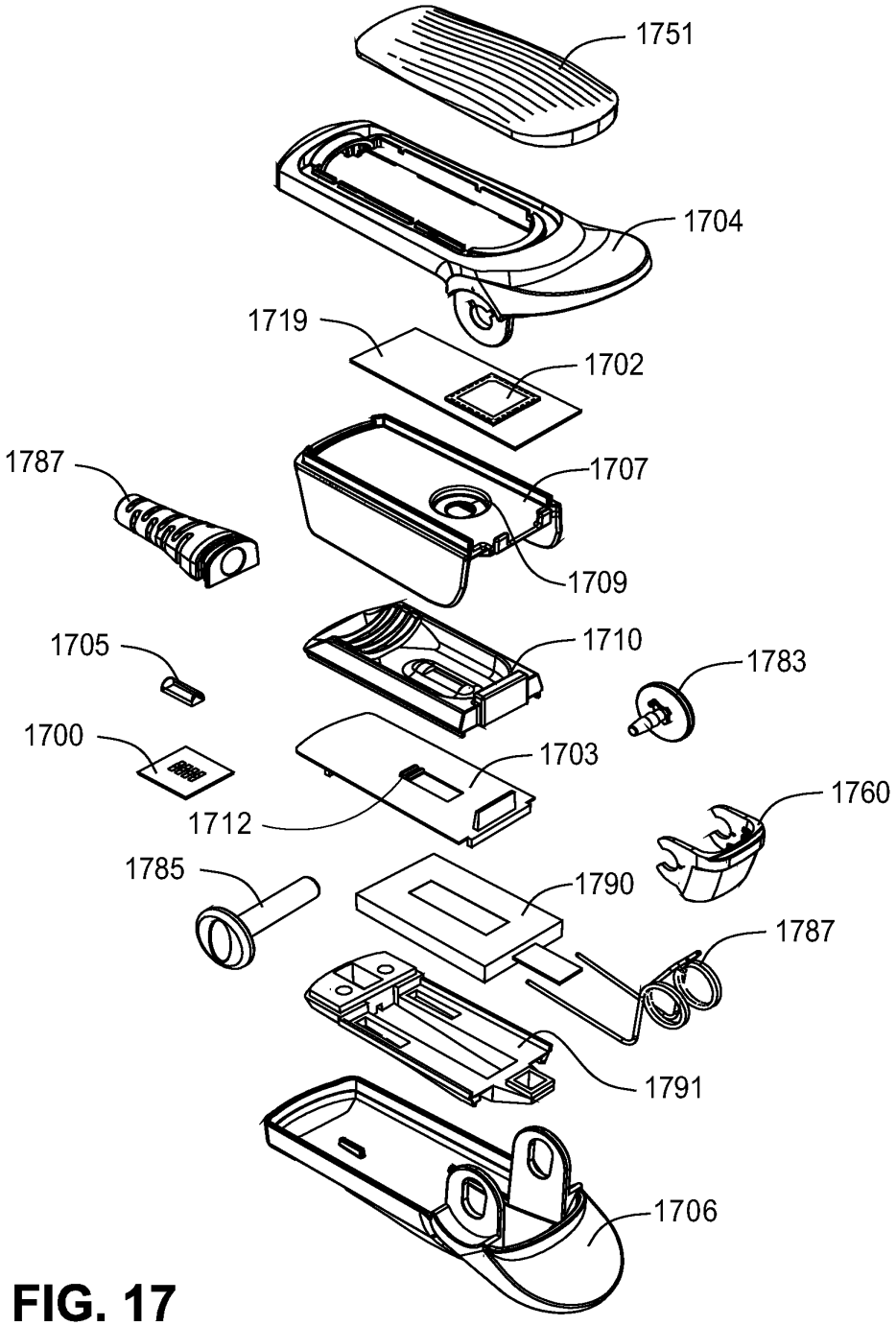

1751
1704
1719
1702
1787
1707
1709
1705
1710
1783
1700
1703
1760
1712
1785
1790
1787
1791
1706

FIG. 17

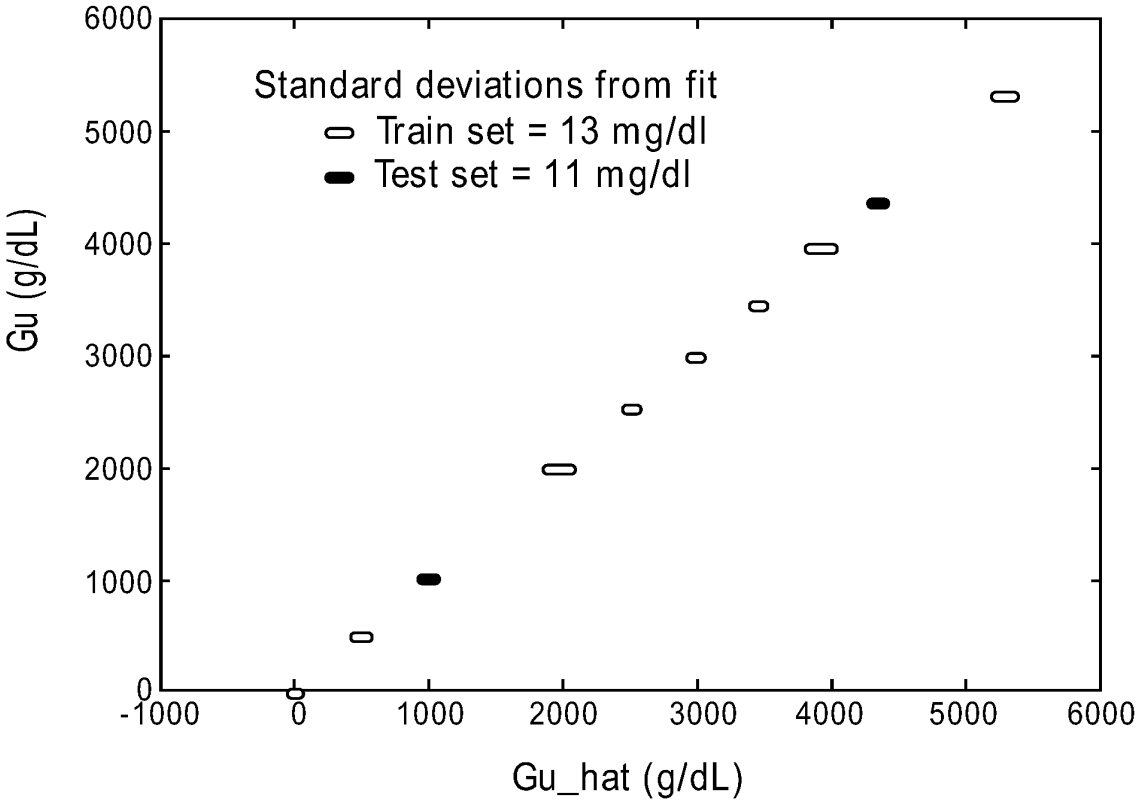

Standard deviations from fit
Train set = 13 mg/dl
Test set = 11 mg/dl
Gu (g/dL)
Gu_hat (g/dL)
6000
5000
4000
3000
2000
1000
0
-1000
0
1000
2000
3000
4000
5000
6000

FIG. 18

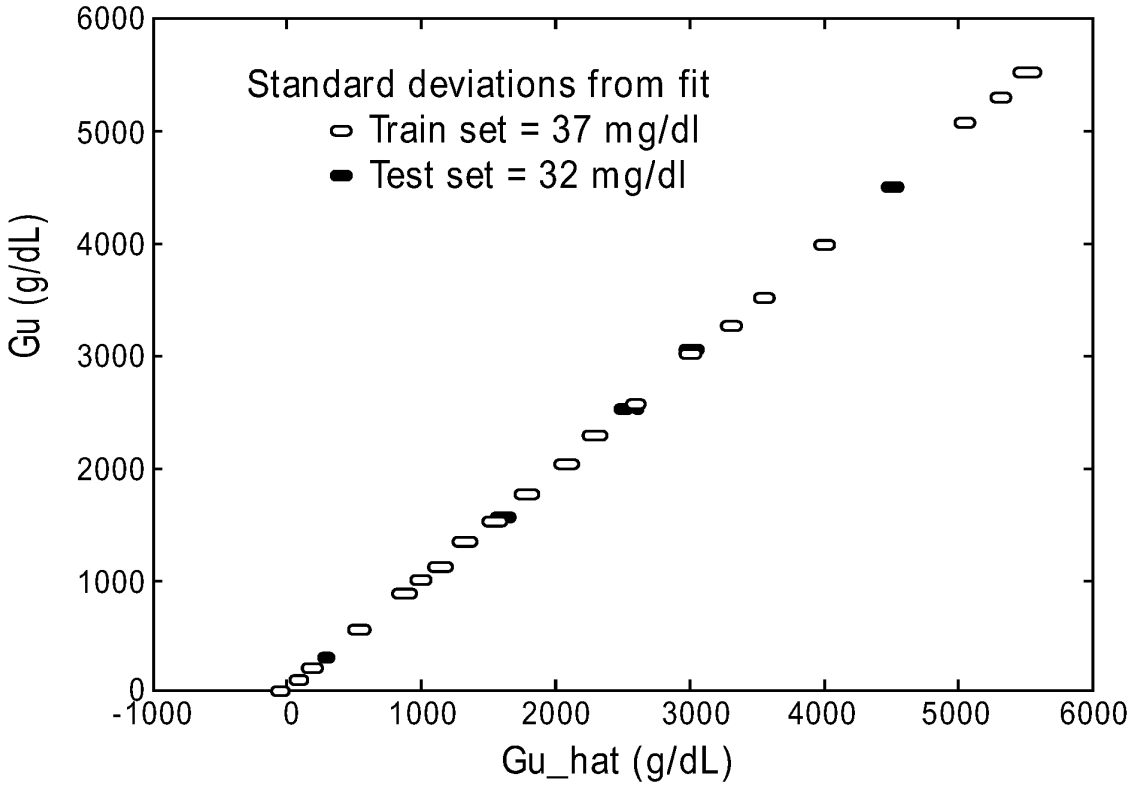

Standard deviations from fit
Train set = 37 mg/dl
Test set = 32 mg/dl
Gu (g/dL)
Gu_hat (g/dL)
6000
5000
4000
3000
2000
1000
0
-1000
0
1000
2000
3000
4000
5000
6000

FIG. 19

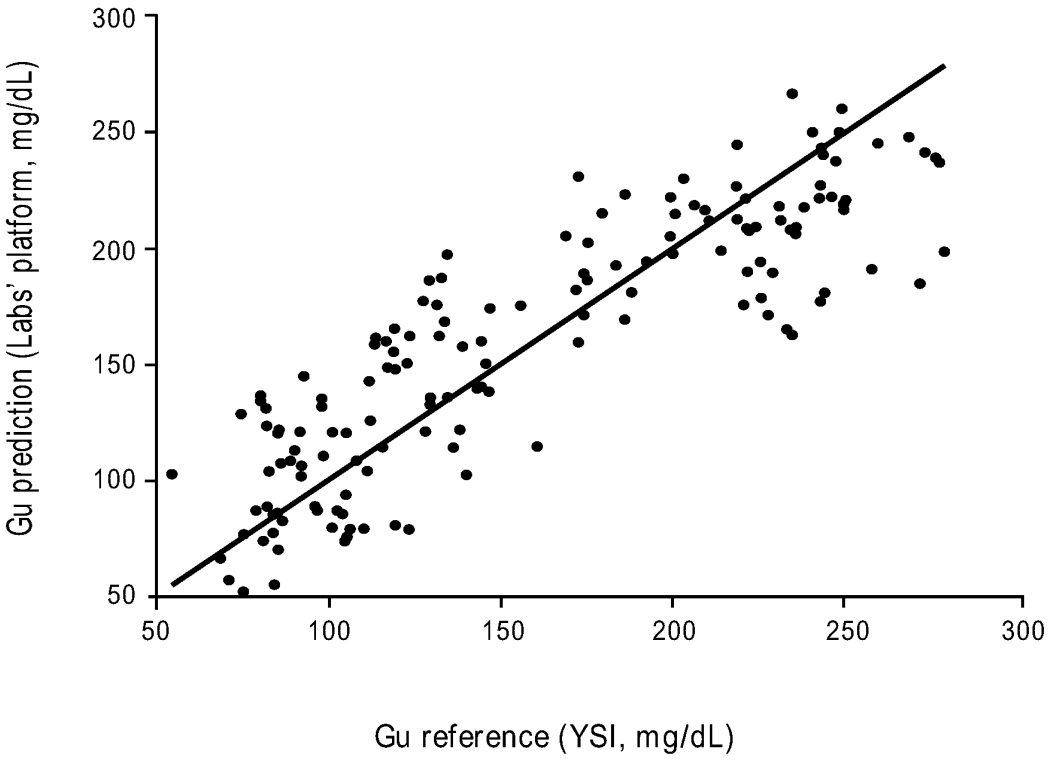

300
250
200
150
100
50
Gu prediction (Labs' platform, mg/dL)
50
100
150
200
250
300
Gu reference (YSI, mg/dL)

FIG. 20

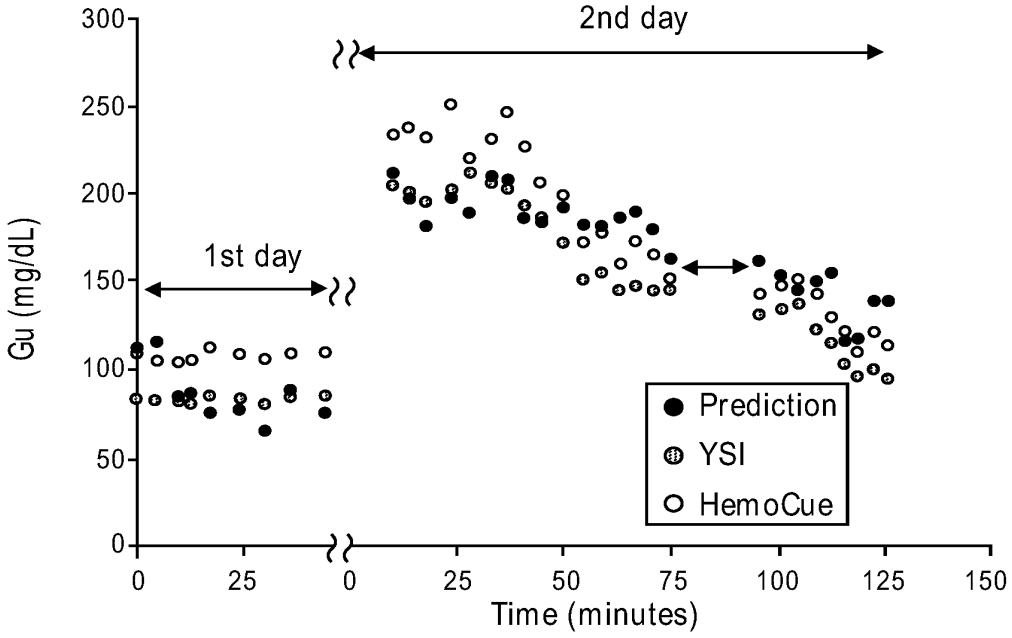

300
250
200
150
100
50
0
Gu (mg/dL)
1st day
2nd day
Prediction
YSI
HemoCue
0
25
0
25
50
75
100
125
150
Time (minutes)

FIG. 21

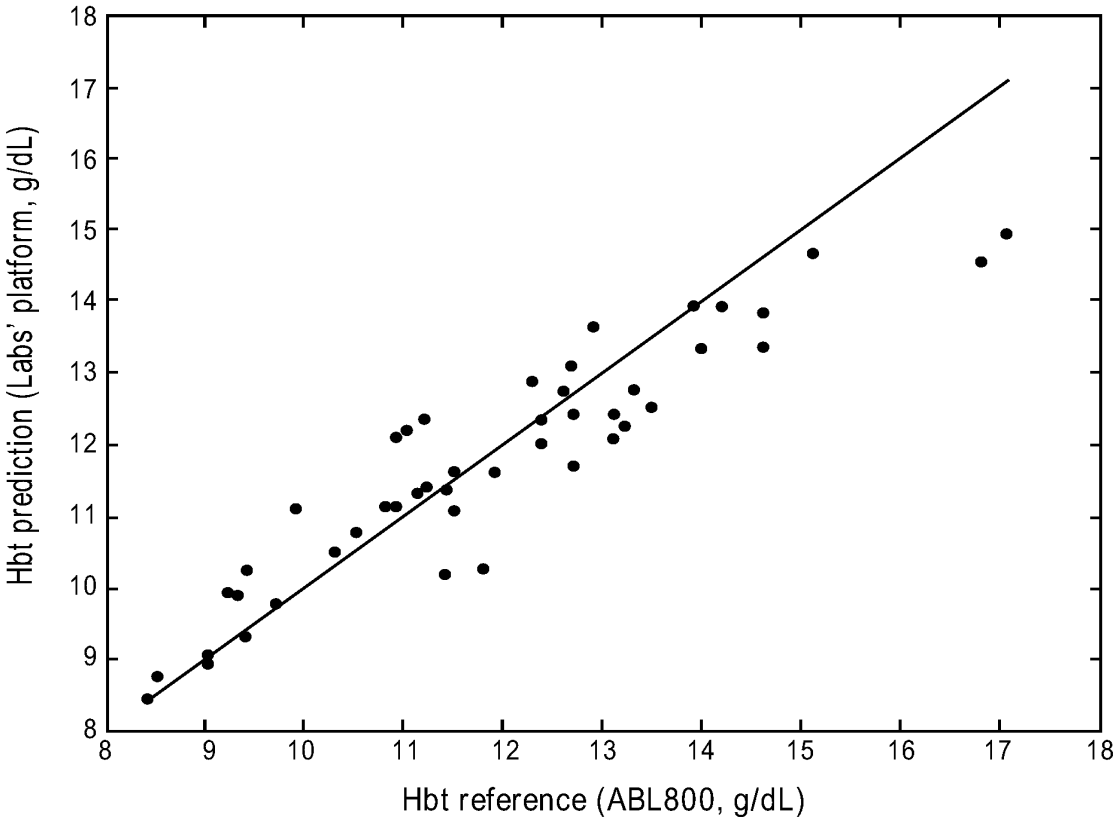

Hbt prediction (Labs' platform, g/dL)
Hbt reference (ABL800, g/dL)
8
9
10
11
12
13
14
15
16
17
18

FIG. 22

PTO/AIA/01 (06-12)
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U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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

Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 14/981290 filed on December 28, 2015.

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

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

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

WARNING:

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

LEGAL NAME OF INVENTOR

Inventor: Jeroen Poeze Date (Optional): 02/27/2017

Signature:

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

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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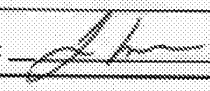
LEGAL NAME OF INVENTOR

Inventor: Sean Merritt Date (Optional): 2/27/2017

Signature: 

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

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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

Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 14/981290 filed on December 28, 2015.

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

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LEGAL NAME OF INVENTOR

Inventor: Cristiano Dalvi Date (Optional): 2.27.17

Signature: 

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

PTO/AIA/01 (06-12)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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

Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

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LEGAL NAME OF INVENTOR

Inventor: Hung Vo Date (Optional): 2/22/17

Signature: [signature]

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

PTO/AIA/01 (06-12)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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

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☒ United States application or PCT international application number 14/981290

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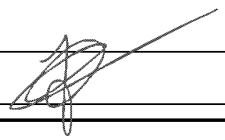
LEGAL NAME OF INVENTOR

Inventor: Johannes Bruinsma Date (Optional): May-8-2017

Signature: 

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

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

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

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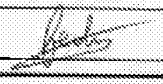
LEGAL NAME OF INVENTOR

Inventor: Ferdyan Lesmana Date (Optional): 2/27/2017

Signature: 

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

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

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

Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 14/981290 filed on December 28, 2015.

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

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

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LEGAL NAME OF INVENTOR

Inventor: Massi Joe E. Kiani Date (Optional): 3-8-17

Signature: [signature]

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

COMBINED DECLARATION & ASSIGNMENT (37 CFR 1.63(e))

Application Data Sheet filed previously or concurrently

Title: MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

Inventors: Greg Olsen

Declaration

This Declaration is directed to U.S. or International Application No. **16/212537**, filed December 6, 2018 and incorporating any amendments made thereto prior to the signature date of this Declaration.

As a named inventor, I declare that:

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 USC 1001 by fine or imprisonment of not more than five (5) years, or both.

I have reviewed and understand the contents of the above-identified application, including the claims, as amended by any amendment.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

Confirmation of Assignment from Inventors

WHEREAS, **above-identified inventors** (individual(s) hereinafter "ASSIGNOR") invented certain new and useful improvements, technology, inventions, developments, ideas, ornamental designs, or discoveries, and hereby assign as the ASSIGNOR may possess or are under an obligation to assign to the below identified Assignee the above-titled application (collectively hereinafter referred to as the "Work") for which an application for Letters Patent in the United States (identified above) has been prepared for filing with the United States Patent and Trademark Office (hereinafter the "Application").

AND WHEREAS, **Cercacor Laboratories, Inc.,** with its principal place of business at 40 Parker, Irvine, CA 92618 (hereinafter the "ASSIGNEE"), desires to acquire the entire right, title, and interest in and to the Application and the Work.

NOW, THEREFORE, for good and valuable consideration of which receipt is hereby acknowledged, ASSIGNOR hereby acknowledges and confirms that ASSIGNOR has sold, assigned, transferred and set over, and by these presents, to the extent not previously assigned, does hereby sell, assign, transfer and set over, unto said ASSIGNEE, its successors, legal representatives and assigns, the entire right, title, and interest throughout the world in the Application and the Work, including all Patent Properties filed or issued upon the Application and the Work; where "Patent Properties" include, but are not limited to:

all provisional applications relating thereto;

all nonprovisional applications claiming priority to aforementioned provisional(s) and/or the present Application, including, all divisions, continuations, continuations-in-part, reissues, and reexaminations thereof;

all Letters Patent of the United States which may be granted thereon and all reissues and extensions thereof; and

all rights of priority under International Conventions and any related Letters Patent which may hereafter be granted or filed in any country or countries foreign to the United States, all extensions, renewals and reissues thereof.

ASSIGNOR hereby acknowledges the ASSIGNEE as the Applicant for all aforementioned Patent Properties, and authorizes and requests the Commissioner of Patents of the United States, and any Official of any country or countries foreign to the United States, whose duty it is to issue patents on applications as aforesaid, to issue all related Letters Patent to the ASSIGNEE, its successors, legal representatives and assigns, in accordance with the terms of this instrument.

AND ASSIGNOR DOES HEREBY sell, assign, transfer, and convey to ASSIGNEE, its successors, legal representatives, and assigns all claims for damages and all remedies arising out of any violation of the rights assigned hereby that may have accrued prior to the date of assignment to ASSIGNEE, or may accrue hereafter, including, but not limited to, the right to sue for, collect, and retain damages for past infringements of said Letters Patent before or after issuance.

AND ASSIGNOR DOES HEREBY covenant and agree that ASSIGNOR will communicate to said ASSIGNEE, its successors, legal representatives and assigns, any facts known to ASSIGNOR respecting the Work, and testify in any legal proceeding, assist in the preparation of any other Patent Property relating to the Application and the Work or any improvements made thereto, sign/execute all lawful papers, authorize the filing of and execute and make all rightful oaths and/or declarations in connection with the Application and the Work including any improvements made thereto, any patent applications filed therefrom, and any continuing application filed from any of the aforementioned applications, and generally do everything possible to aid the ASSIGNEE, its successors, legal representatives and assigns, to obtain and enforce proper patent protection for the Work in all countries.

COMBINED DECLARATION & ASSIGNMENT (37 CFR 1.63(e))

Application Data Sheet filed previously or concurrently

Docket No.: MASCER.002C4 Page 3 of 3

Title: MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

Inventors: Greg Olsen

Legal Name of inventor: Greg Olsen

IN TESTIMONY WHEREOF, I hereunto set my hand and seal this 25 day of JAN, 20 19.

Signature: _____

A NOTARY PUBLIC OR OTHER OFFICER COMPLETING THIS CERTIFICATE VERIFIES ONLY THE IDENTITY OF THE INDIVIDUAL WHO SIGNED THE DOCUMENT TO WHICH THIS CERTIFICATE IS ATTACHED, AND NOT THE TRUTHFULNESS, ACCURACY, OR VALIDITY OF THAT DOCUMENT.

STATE OF CALIFORNIA }
} ss.
COUNTY OF ORANGE }

On 25 JAN 2019, before me, ELISA M. MULET, notary public, personally appeared Greg Olsen who proved to me on the basis of satisfactory evidence to be the person~~(s)~~ whose name~~(s)~~ is/~~are~~ subscribed to the within instrument, and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity~~(ies)~~, and that by his/~~her/their~~ signature~~(s)~~ on the instrument the person~~(s)~~, or the entity upon behalf of which the person~~(s)~~ acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Notary Signature

[SEAL]

ELISA M. MULET
Notary Public - California
Orange County
Commission # 2173718
My Comm. Expires Dec 23, 2020

29717154

Doc code: Oath
Document Description: Oath or declaration filed

MASCER.002C4

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

Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

This statement is directed to:

☐ The attached application,

OR

☒ United States application or PCT international application number 16/212537 filed on December 6, 2018.

LEGAL NAME of inventor to whom this substitute statement applies:

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

Marcelo Lamego

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

City	State	Country
Cupertino	CA	US

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

10292 Orange Avenue

City	State	Zip	Country
Cupertino	CA	95014	US

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

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

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

Relationship to the inventor to whom this substitute statement applies:

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

PTO/SB/AIA02 (07-13)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

SUBSTITUTE STATEMENT

Circumstances permitting execution of this substitute statement:

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

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

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

OR

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

WARNING:

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

PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

Name: Thomas McClenahan | Date (Optional):

Signature:

APPLICANT NAME AND TITLE OF PERSON EXECUTING THIS SUBSTITUTE STATEMENT:

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

Applicant Name: Masimo Corporation

Title of Person Executing This Substitute Statement: Executive Vice President and General Counsel

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

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

City Irvine | State CA | Country US

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

52 Discovery

City Irvine | State CA | Zip 92618 | Country US

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

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor	:	Jeroen Poeze
App. No.	:	16/409515
Filed	:	May 10, 2019
For	:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
Examiner	:	Unassigned
Art Unit	:	2688
Conf. No.	:	8759

PRELIMINARY AMENDMENT

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

Dear Commissioner:

Prior to examination, please amend the application as follows:

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

Remarks begin on page 5 of this paper.

References for Examiner Consideration

Applicant wishes to draw the Examiner's attention to, and encourages the Examiner to review, the following co-owned patents and/or applications and their existing and ongoing prosecution history, including without limitation Office Actions, Amendments, Remarks, and any other potentially relevant documents:

Docket No.	Patent No.	Title	Issued
MASCER.002C1	9,277,880	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	03/08/2016
MASCER.002C3	10,258,265	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	04/16/2019
MASCER.002C4	10,258,266	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	04/16/2019
MASCER.003A	8,630,691	MULTI-STREAM SENSOR FRONT ENDS FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	01/14/2014
MASCER.003D1	8,909,310	MULTI-STREAM SENSOR FRONT ENDS FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	12/09/2014
MASCER.004A	8,203,704	MULTI-STREAM SENSOR FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	06/19/2012
MASCER.004C1	8,570,503	HEAT SINK FOR NONINVASIVE MEDICAL SENSOR	10/29/2013
CERCA.005A	8,515,509	MULTI-STREAM EMITTER FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	08/20/2013
MASCER.006A	8,577,431	NOISE SHIELDING FOR A NONINVASIVE DEVICE	11/05/2013
MASCER.006C1	9,717,425	NOISE SHIELDING FOR A NONINVASIVE DEVICE	08/01/2017
MASCER.007A	8,437,825	CONTOURED PROTRUSION FOR IMPROVING SPECTROSCOPIC MEASUREMENT OF BLOOD CONSTITUENTS	05/07/2013
MASCER.007C1	9,591,975	CONTOURED PROTRUSION FOR IMPROVING SPECTROSCOPIC MEASUREMENT OF BLOOD CONSTITUENTS	03/14/2017
MASCER.008A	8,688,183	EMITTER DRIVER FOR NONINVASIVE PATIENT MONITOR	04/01/2014
MASCER.008C1	9,186,102	EMITTER DRIVER FOR NONINVASIVE PATIENT MONITOR	11/17/2015
MASCER.008C2	9,668,680	EMITTER DRIVER FOR NONINVASIVE PATIENT MONITOR	06/06/2017
MASCER.009DA	D621516	PATIENT MONITORING SENSOR	08/10/2010
MASCER.010DA	D606659	PATIENT MONITOR	12/22/2009

Docket No.	Serial No.	Title	Filed
MASCER.002A	12/534827	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	08/03/2009
MASCER.002C2	14/981290	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	12/28/2015
MASCER.002C5	16/261366	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	01/29/2019
MASCER.002C6	16/261326	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	01/29/2019
MASCER.002C7	16/409304	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	05/10/2019
MASCER.004C3	14/064055	MULTI-STREAM SENSOR FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	10/25/2013
MASCER.006C2	15/660743	NOISE SHIELDING FOR A NONINVASIVE DEVICE	07/26/2017
MASCER.011A	12/497506	HEAT SINK FOR NONINVASIVE MEDICAL SENSOR	07/02/2009

Applicant notes that cited references, office actions, responses and notices of allowance currently exist or will exist with reference to the above-referenced matters. Applicant also understands that the Examiner has access to sophisticated online Patent Office computing systems that provide ready access to the full file histories of these matters including, for example, specifications, drawings, pending claims, cited art, office actions, responses, declarations, and notices of allowance. Rather than submit copies of these file histories, Applicant respectfully requests that the Examiner continue to review these file histories online for past, current, and future information about these matters that may be relevant to examination of the present application. Also, if the Examiner cannot readily access these file histories, Applicant would be pleased to provide any portion of any of the file histories at any time upon specific Examiner request.

No Disclaimers

To the extent that anything in the Information Disclosure Statement or the listed references could be construed as a disclaimer of any subject matter supported by the present application, Applicant hereby rescinds and retracts such disclaimer.

Timing of Disclosure

This Information Disclosure Statement is being filed within three months of the filing date, and no fee is believed to be required.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: May 14, 2019

By: /Scott Cromar/
Scott A. Cromar
Registration No. 65,066
Registered Practitioner
Customer No. 64735
(949) 760-0404

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PTO/SB/08 Equivalent

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	16/409515
	Filing Date	May 10, 2019
	First Named Inventor	Jeroen Poeze
	Art Unit	2688
(Multiple sheets used when necessary)	Examiner	Unassigned
SHEET 1 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	1	3,910,701	10-07-1975	Henderson et al.	
	2	4,114,604	09-19-1978	Shaw et al.	
	3	4,258,719	03-31-1981	Lewyn	
	4	4,267,844	05-19-1981	Yamanishi	
	5	4,438,338	03-20-1984	Stitt	
	6	4,444,471	04-24-1984	Ford et al.	
	7	4,653,498	03-31-1987	New, Jr. et al.	
	8	4,655,225	04-07-1987	Dahne et al.	
	9	4,684,245	08-04-1987	Goldring	
	10	4,709,413	11-24-1987	Forrest	
	11	4,755,676	07-05-1988	Gaalema et al.	
	12	4,781,195	11-01-1988	Martin	
	13	4,805,623	02-21-1989	Jöbsis	
	14	4,880,304	11-14-1989	Jaeb et al.	
	15	4,960,128	10-02-1990	Gordon et al.	
	16	4,964,408	10-23-1990	Hink et al.	
	17	5,028,787	07-02-1991	Rosenthal, et al.	
	18	5,035,243	07-30-1991	Muz, Edwin	
	19	5,041,187	08-20-1991	Hink et al.	
	20	5,043,820	08-27-1991	Wyles et al.	
	21	5,069,213	12-03-1991	Polczynski	
	22	5,069,214	12-03-1991	Samaras et al.	
	23	5,077,476	12-31-1991	Rosenthal	
	24	5,086,229	02-04-1992	Rosenthal et al.	
	25	5,099,842	03-31-1992	Mannheimer et al.	
	26	5,122,925	06-16-1992	Inpyn	
	27	5,131,391	07-21-1992	Sakai et al.	
	28	5,137,023	08-11-1992	Mendelson, et al.	
	29	5,159,929	11-03-1992	McMillen et al.	

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

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SHEET 2 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	30	5,163,438	11-17-1992	Gordon et al.	
	31	5,222,295	06-29-1993	Dorris, Jr.	
	32	5,222,495	06-29-1993	Clarke et al.	
	33	5,222,496	06-29-1993	Clarke et al.	
	34	5,249,576	10-05-1993	Goldberger et al.	
	35	5,250,342	10-05-1993	Lang	
	36	5,278,627	01-11-1994	Aoyagi et al.	
	37	5,297,548	03-29-1994	Pologe, Jonas A.	
	38	5,319,355	06-07-1994	Russek	
	39	5,337,744	08-16-1994	Branigan	
	40	5,337,745	08-16-1994	Benaron	
	41	5,341,805	08-30-1994	Stavridi, et al.	
	42	5,362,966	11-08-1994	Rosenthal et al.	
	43	5,377,676	01-03-1995	Vari, et al.	
	44	5,427,093	06-27-1995	Ogawa et al.	
	45	5,431,170	07-11-1995	Mathews	
	46	5,437,275	08-01-1995	Amundsen et al.	
	47	5,441,054	08-15-1995	Tsuchiya	
	48	5,452,717	09-26-1995	Branigan et al.	
	49	5,456,252	10-10-1995	Vari, et al.	
	50	5,479,934	01-02-1996	Imran	
	51	5,482,034	01-09-1996	Lewis et al.	
	52	5,482,036	01-09-1996	Diab et al.	
	53	5,490,505	02-13-1996	Diab et al.	
	54	5,490,506	02-13-1996	Takatani et al.	
	55	5,494,043	02-27-1996	O'Sullivan et al.	
	56	5,511,546	04-30-1996	Hon	
	57	5,533,511	07-09-1996	Kaspari et al.	
	58	5,534,851	07-09-1996	Russek	

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SHEET 3 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	59	5,551,422	09-03-1996	Simonsen et al.	
	60	5,553,615	09-10-1996	Carim et al.	
	61	5,553,616	09-09-1996	Ham et al.	
	62	5,561,275	10-01-1996	Savage, et al.	
	63	5,562,002	10-08-1996	Lalin	
	64	5,590,649	01-07-1997	Caro et al.	
	65	5,601,079	02-11-1997	Wong et al.	
	66	5,602,924	02-11-1997	Durand et al.	
	67	5,625,458	04-29-1997	Alfano et al.	
	68	5,632,272	05-27-1997	Diab et al.	
	69	5,638,816	06-17-1997	Kiani-Azarbayjany et al.	
	70	5,638,818	06-17-1997	Diab et al.	
	71	5,645,440	07-08-1997	Tobler et al.	
	72	5,676,143	10-14-1997	Simonsen, et al.	
	73	5,685,299	11-11-1997	Diab et al.	
	74	5,743,262	04-28-1998	Lepper, Jr. et al.	
	75	5,750,927	05-12-1998	Baltazar, Osni	
	76	5,752,914	05-19-1998	Delonzor et al.	
	77	5,758,644	06-02-1998	Diab et al.	
	78	5,760,910	06-02-1998	Lepper, Jr. et al.	
	79	5,766,131	06-16-1998	Kondo et al.	
	80	5,769,785	06-23-1998	Diab et al.	
	81	5,782,757	07-21-1998	Diab et al.	
	82	5,785,659	07-28-1998	Caro et al.	
	83	5,791,347	08-11-1998	Flaherty et al.	
	84	5,792,052	08-11-1998	Isaacson et al.	
	85	5,810,734	09-22-1998	Caro et al.	
	86	5,823,950	10-20-1998	Diab et al.	
	87	5,826,885	10-27-1998	Helgeland	

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

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	Filing Date	May 10, 2019
	First Named Inventor	Jeroen Poeze
	Art Unit	2688
(Multiple sheets used when necessary)	Examiner	Unassigned
SHEET 4 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	88	5,830,131	11-03-1998	Caro et al.	
	89	5,833,618	11-10-1998	Caro et al.	
	90	5,851,178	12-22-1998	Aronow	
	91	5,860,919	01-19-1999	Kiani-Azarbayjany et al.	
	92	5,890,929	04-06-1999	Mills et al.	
	93	5,902,235	05-11-1999	Lewis et al.	
	94	5,903,357	05-11-1999	Colak	
	95	5,904,654	05-18-1999	Wohltmann et al.	
	96	5,919,134	07-06-1999	Diab	
	97	5,934,925	08-10-1999	Tobler et al.	
	98	5,940,182	08-17-1999	Lepper, Jr. et al.	
	99	5,957,840	09-28-1999	Terasawa et al.	
	100	5,995,855	11-30-1999	Kiani et al.	
	101	5,997,343	12-07-1999	Mills et al.	
	102	6,002,952	12-14-1999	Diab et al.	
	103	6,011,986	01-04-2000	Diab et al.	
	104	6,027,452	02-22-2000	Flaherty et al.	
	105	6,036,642	03-14-2000	Diab et al.	
	106	6,045,509	04-04-2000	Caro et al.	
	107	6,049,727	04-11-2000	Crothall, Katherine D.	
	108	6,067,462	05-23-2000	Diab et al.	
	109	6,081,735	06-27-2000	Diab et al.	
	110	6,088,607	07-11-2000	Diab et al.	
	111	6,110,522	08-29-2000	Lepper, Jr. et al.	
	112	6,124,597	09-26-2000	Shehada	
	113	6,128,521	10-03-2000	Marro et al.	
	114	6,129,675	10-10-2000	Jay	
	115	6,144,866	11-07-2000	Miesel et al.	
	116	6,144,868	11-07-2000	Parker	

Examiner Signature	Date Considered
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SHEET 5 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	117	6,151,516	11-21-2000	Kiani-Azarbayjany et al.	
	118	6,152,754	11-28-2000	Gerhardt et al.	
	119	6,157,850	12-05-2000	Diab et al.	
	120	6,165,005	12-26-2000	Mills et al.	
	121	6,172,743	01-09-2001	Kley, et al.	
	122	6,181,958	01-30-2001	Steuer et al.	
	123	6,184,521	02-06-2001	Coffin, IV et al.	
	124	6,206,830	03-27-2001	Diab et al.	
	125	6,223,063	04-24-2001	Chaiken et al.	
	126	6,229,856	05-08-2001	Diab et al.	
	127	6,232,609	05-15-2001	Snyder, et al.	
	128	6,236,872	05-22-2001	Diab et al.	
	129	6,241,683	06-05-2001	Macklem, et al.	
	130	6,253,097	06-26-2001	Aronow et al.	
	131	6,256,523	07-03-2001	Diab et al.	
	132	6,263,222	07-17-2001	Diab et al.	
	133	6,278,522	08-21-2001	Lepper, Jr. et al.	
	134	6,278,889	08-21-2001	Robinson	
	135	6,280,213	08-28-2001	Tobler et al.	
	136	6,285,896	09-04-2001	Tobler et al.	
	137	6,301,493	10-09-2001	Marro et al.	
	138	6,317,627	11-13-2001	Ennen et al.	
	139	6,321,100	11-20-2001	Parker	
	140	6,325,761	12-04-2001	Jay	
	141	6,334,065	12-25-2001	Al-Ali et al.	
	142	6,343,223	01-29-2002	Chin et al.	
	143	6,343,224	01-29-2002	Parker	
	144	6,345,194	02-05-2002	Robert Nelson, et al.	
	145	6,349,228	02-19-2002	Kiani et al.	

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

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	Art Unit	2688
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SHEET 6 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
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	146	6,353,750	03-05-2002	Kimura et al.	
	147	6,360,113	03-09-2002	Dettling, Allen	
	148	6,360,114	03-09-2002	Diab et al.	
	149	6,360,115	03-19-2002	Roger Greenwald, et al.	
	150	6,368,283	04-09-2002	Xu, et al.	
	151	6,371,921	04-16-2002	Caro et al.	
	152	6,377,829	04-23-2002	Al-Ali	
	153	6,388,240	05-14-2002	Schulz et al.	
	154	6,397,091	05-28-2002	Diab et al.	
	155	6,430,437	08-06-2002	Marro	
	156	6,430,525	08-06-2002	Weber et al.	
	157	6,463,311	10-08-2002	Diab	
	158	6,470,199	10-22-2002	Kopotic et al.	
	159	6,501,975	12-31-2002	Diab et al.	
	160	6,505,059	01-07-2003	Kollias, et al.	
	161	6,515,273	02-04-2003	Al-Ali	
	162	6,519,487	02-11-2003	Parker	
	163	6,522,521	02-18-2003	Mizuno et al.	
	164	6,525,386	02-25-2003	Mills et al.	
	165	6,526,300	02-25-2003	Kiani et al.	
	166	6,541,756	04-01-2003	Schulz et al.	
	167	6,542,764	04-01-2003	Al-Ali et al.	
	168	6,580,086	06-17-2003	Schulz et al.	
	169	6,584,336	06-24-2003	Ali et al.	
	170	6,595,316	07-22-2003	Cybulski et al.	
	171	6,597,932	07-22-2003	Tian et al.	
	172	6,597,933	07-22-2003	Kiani et al.	
	173	6,606,509	08-12-2003	Schmitt, Joseph M.	
	174	6,606,511	08-12-2003	Ali et al.	

Examiner Signature	Date Considered
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SHEET 7 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	175	6,632,181	10-14-2003	Flaherty et al.	
	176	6,636,759	10-21-2003	Robinson	
	177	6,639,668	10-28-2003	Trepagnier, Pierre	
	178	6,639,867	10-28-2003	Shim	
	179	6,640,116	10-28-2003	Diab	
	180	6,643,530	11-04-2003	Diab et al.	
	181	6,650,917	11-18-2003	Diab et al.	
	182	6,654,624	11-25-2003	Diab et al.	
	183	6,658,276	12-02-2003	Kiani et al.	
	184	6,661,161	12-09-2003	Lanzo et al.	
	185	6,668,185	12-23-2003	Toida	
	186	6,671,531	12-30-2003	Al-Ali et al.	
	187	6,678,543	01-13-2004	Diab et al.	
	188	6,681,133	01-20-2004	Chaiken et al.	
	189	6,684,090	01-27-2004	Ali et al.	
	190	6,684,091	01-27-2004	Parker	
	191	6,697,656	02-24-2004	Al-Ali	
	192	6,697,657	02-24-2004	Shehada, et al.	
	193	6,697,658	02-24-2004	Al-Ali	
	194	6,699,194	03-02-2004	Diab et al.	
	195	6,714,804	03-30-2004	Al-Ali et al.	
	196	6,721,582	04-13-2004	Trepagnier, et al.	
	197	6,721,585	04-13-2004	Parker	
	198	6,725,075	04-20-2004	Al-Ali	
	199	6,728,560	04-27-2004	Kollias, et al.	
	200	6,735,459	05-11-2004	Parker	
	201	6,745,060	06-01-2004	Diab et al.	
	202	6,748,254	06-08-2004	O'Neil et al.	
	203	6,760,607	07-06-2004	Al-Ali	

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U.S. PATENT DOCUMENTS					
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	204	6,770,028	08-03-2004	Ali et al.	
	205	6,771,994	08-03-2004	Kiani et al.	
	206	6,792,300	09-14-2004	Diab et al.	
	207	6,813,511	11-02-2004	Diab et al.	
	208	6,816,010	11-09-2004	Seetharaman et al.	
	209	6,816,241	11-09-2004	Grubisic, et al.	
	210	6,816,741	11-09-2004	Diab	
	211	6,822,564	11-23-2004	Al-Ali	
	212	6,826,419	11-30-2004	Diab et al.	
	213	6,830,711	12-14-2004	Mills et al.	
	214	6,850,787	02-01-2005	Weber et al.	
	215	6,850,788	02-01-2005	Al-Ali	
	216	6,852,083	02-08-2005	Caro et al.	
	217	6,861,639	03-01-2005	Al-Ali	
	218	6,898,452	05-24-2005	Al-Ali et al.	
	219	6,912,413	06-28-2005	Rantala et al.	
	220	6,920,345	07-19-2005	Al-Ali et al.	
	221	6,931,268	08-16-2005	Kiani-Azarbayjany et al.	
	222	6,934,570	08-23-2005	Kiani et al.	
	223	6,939,305	09-06-2005	Flaherty et al.	
	224	6,943,348	09-13-2005	Coffin IV	
	225	6,950,687	09-27-2005	Al-Ali	
	226	6,961,598	11-01-2005	Diab	
	227	6,970,792	11-29-2005	Diab	
	228	6,979,812	12-27-2005	Al-Ali	
	229	6,985,764	01-10-2006	Mason et al.	
	230	6,993,371	01-31-2006	Kiani et al.	
	231	6,995,400	02-07-2006	Mizuyoshi	
	232	6,996,427	02-07-2006	Ali et al.	

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	233	6,999,904	02-14-2006	Weber et al.	
	234	7,003,338	02-21-2006	Weber et al.	
	235	7,003,339	02-21-2006	Diab et al.	
	236	7,015,451	03-21-2006	Dalke et al.	
	237	7,024,233	04-04-2006	Ali et al.	
	238	7,026,619	04-11-2006	Cranford	
	239	7,027,849	04-11-2006	Al-Ali	
	240	7,030,749	04-18-2006	Al-Ali	
	241	7,039,449	05-02-2006	Al-Ali	
	242	7,041,060	05-09-2006	Flaherty et al	
	243	7,044,918	05-16-2006	Diab	
	244	7,047,054	05-16-2006	Benni	
	245	7,067,893	06-27-2006	Mills et al.	
	246	7,092,757	08-15-2006	Larson et al.	
	247	7,096,052	08-22-2006	Mason et al.	
	248	7,096,054	08-22-2006	Abdul-Hafiz et al.	
	249	7,113,815	09-26-2006	O'Neil et al.	
	250	7,132,641	11-07-2006	Schulz et al.	
	251	7,142,901	11-28-2006	Kiani et al.	
	252	7,149,561	12-12-2006	Diab	
	253	7,186,966	03-06-2007	Al-Ali	
	254	7,190,261	03-13-2007	Al-Ali	
	255	7,215,984	05-08-2007	Diab	
	256	7,215,986	05-08-2007	Diab	
	257	7,221,971	05-22-2007	Diab	
	258	7,225,006	05-29-2007	Al-Ali et al.	
	259	7,225,007	05-29-2007	Al-Ali	
	260	7,230,227	06-12-2007	Wilcken et al.	
	261	7,239,905	07-03-2007	Kiani-Azarbayjany et al.	

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	262	7,245,953	07-17-2007	Parker	
	263	7,254,429	08-07-2007	Schurman et al.	
	264	7,254,431	08-07-2007	Al-Ali	
	265	7,254,433	08-07-2007	Diab et al.	
	266	7,254,434	08-07-2007	Schulz et al.	
	267	7,272,425	09-18-2007	Al-Ali	
	268	7,274,955	09-25-2007	Kiani et al.	
	269	7,280,858	10-09-2007	Al-Ali et al.	
	270	7,289,835	10-30-2007	Mansfield et al.	
	271	7,292,883	11-06-2007	De Felice et al.	
	272	7,295,866	11-13-2007	Al-Ali	
	273	7,328,053	02-05-2008	Diab et al.	
	274	7,332,784	02-19-2008	Mills, et al.	
	275	7,340,287	03-04-2008	Mason et al.	
	276	7,341,559	03-11-2008	Schulz et al.	
	277	7,343,186	03-11-2008	Lamego et al.	
	278	7,355,512	04-08-2008	Al-Ali	
	279	7,356,365	04-08-2008	Schurman	
	280	7,365,923	04-29-2008	Hargis et al.	
	281	7,371,981	05-13-2008	Abdul-Hafiz	
	282	7,373,193	05-13-2008	Al-Ali et al.	
	283	7,373,194	05-13-2008	Weber et al.	
	284	7,376,453	05-20-2008	Diab et al.	
	285	7,377,794	05-27-2008	Al Ali et al.	
	286	7,377,899	05-27-2008	Weber et al.	
	287	7,383,070	06-03-2008	Diab et al.	
	288	7,395,189	07-01-2008	Qing et al.	
	289	7,415,297	08-19-2008	Al-Ali et al.	
	290	7,428,432	09-23-2008	Ali et al.	

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	291	7,438,683	10-21-2008	Al-Ali et al.	
	292	7,440,787	10-21-2008	Diab	
	293	7,454,240	11-18-2008	Diab et al.	
	294	7,467,002	12-16-2008	Weber et al.	
	295	7,469,157	12-23-2008	Diab et al.	
	296	7,471,969	12-30-2008	Diab et al.	
	297	7,471,971	12-30-2008	Diab et al.	
	298	7,483,729	01-27-2009	Al-Ali et al.	
	299	7,483,730	01-27-2009	Diab et al.	
	300	7,489,958	02-10-2009	Diab et al.	
	301	7,496,391	02-24-2009	Diab et al.	
	302	7,496,393	02-24-2009	Diab et al.	
	303	7,499,741	03-03-2009	Diab et al.	
	304	7,499,835	03-03-2009	Weber et al.	
	305	7,500,950	03-10-2009	Al-Ali et al.	
	306	7,509,153	03-24-2009	Blank et al.	
	307	7,509,154	03-24-2009	Diab et al.	
	308	7,509,494	03-24-2009	Al-Ali	
	309	7,510,849	03-31-2009	Schurman et al.	
	310	7,519,327	04-14-2009	White	
	311	7,526,328	04-28-2009	Diab et al.	
	312	7,530,942	05-12-2009	Diab	
	313	7,530,949	05-12-2009	Al Ali et al.	
	314	7,530,955	05-12-2009	Diab et al.	
	315	7,563,110	07-21-2009	Al-Ali et al.	
	316	7,596,398	09-29-2009	Al-Ali et al.	
	317	7,601,123	10-13-2009	Tweed, et al.	
	318	7,606,606	10-20-2009	Laakkonen	
	319	7,618,375	11-17-2009	Flaherty	

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Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	320	7,647,083	01-12-2010	Al-Ali et al.	
	321	7,657,294	02-02-2010	Eghbal et al.	
	322	7,657,295	02-02-2010	Coakley et al.	
	323	7,657,296	02-02-2010	Raridan et al.	
	324	7,726,209	06-01-2010	Ruotoistenmäki	
	325	7,729,733	06-01-2010	Al-Ali et al.	
	326	7,734,320	06-08-2010	Al-Ali	
	327	7,761,127	07-20-2010	Al-Ali et al.	
	328	7,761,128	07-20-2010	Al-Ali et al.	
	329	7,764,982	07-27-2010	Dalke et al.	
	330	7,791,155	09-07-2010	Diab	
	331	7,801,581	09-21-2010	Diab	
	332	7,809,418	10-05-2010	Xu	
	333	7,822,452	10-26-2010	Schurman et al.	
	334	7,844,313	11-30-2010	Kiani et al.	
	335	7,844,314	11-30-2010	Al-Ali	
	336	7,844,315	11-30-2010	Al-Ali	
	337	7,862,523	01-04-2011	Ruotoistenmaki	
	338	7,865,222	01-04-2011	Weber et al.	
	339	7,873,497	01-18-2011	Weber et al.	
	340	7,880,606	02-01-2011	Al-Ali	
	341	7,880,626	02-01-2011	Al-Ali et al.	
	342	7,891,355	02-22-2011	Al-Ali et al.	
	343	7,894,868	02-22-2011	Al-Ali et al.	
	344	7,899,506	03-01-2011	Xu et al.	
	345	7,899,507	03-01-2011	Al-Ali et al.	
	346	7,899,518	03-01-2011	Trepagnier et al.	
	347	7,904,132	03-08-2011	Weber et al.	
	348	7,909,772	03-22-2011	Popov et al.	

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	349	7,910,875	03-22-2011	Al-Ali	
	350	7,919,713	04-05-2011	Al-Ali et al.	
	351	7,937,128	05-03-2011	Al-Ali	
	352	7,937,129	05-03-2011	Mason et al.	
	353	7,937,130	05-03-2011	Diab et al.	
	354	7,941,199	05-10-2011	Kiani	
	355	7,951,086	05-31-2011	Flaherty et al.	
	356	7,957,780	06-07-2011	Lamego et al.	
	357	7,962,188	06-14-2011	Kiani et al.	
	358	7,962,190	06-14-2011	Diab et al.	
	359	7,976,472	07-12-2011	Kiani	
	360	7,988,637	08-02-2011	Diab	
	361	7,990,382	08-02-2011	Kiani	
	362	7,991,446	08-02-2011	Ali et al.	
	363	8,000,761	08-16-2011	Al-Ali	
	364	8,008,088	08-08-2011	Bellott et al.	
	365	8,019,400	09-13-2011	Diab et al.	
	366	8,028,701	10-04-2011	Al-Ali et al.	
	367	8,029,765	10-04-2011	Bellott et al.	
	368	8,036,728	10-11-2011	Diab et al.	
	369	8,044,998	10-25-2011	Heenan	
	370	8,046,040	10-25-2011	Ali et al.	
	371	8,046,041	10-25-2011	Diab et al.	
	372	8,046,042	10-25-2011	Diab et al.	
	373	8,048,040	11-01-2011	Kiani	
	374	8,050,728	11-01-2011	Al-Ali et al.	
	375	8,118,620	02-21-2012	Al-Ali et al.	
	376	8,126,528	02-28-2012	Diab et al.	
	377	8,126,531	02-28-2012	Crowley	

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	378	8,128,572	03-06-2012	Diab et al.	
	379	8,130,105	03-06-2012	Al-Ali et al.	
	380	8,145,287	03-27-2012	Diab et al.	
	381	8,150,487	04-03-2012	Diab et al.	
	382	8,175,672	05-08-2012	Parker	
	383	8,180,420	05-15-2012	Diab et al.	
	384	8,182,443	05-22-2012	Kiani	
	385	8,185,180	05-22-2012	Diab et al.	
	386	8,190,223	05-29-2012	Al-Ali et al.	
	387	8,190,227	05-29-2012	Diab et al.	
	388	8,203,438	06-19-2012	Kiani et al.	
	389	8,203,704	06-19-2012	Merritt et al.	
	390	8,219,170	07-10-2012	Hausmann et al.	
	391	8,224,411	07-17-2012	Al-Ali et al.	
	392	8,228,181	07-24-2012	Al-Ali	
	393	8,229,532	07-24-2012	Davis	
	394	8,229,533	07-24-2012	Diab et al.	
	395	8,233,955	07-31-2012	Al-Ali et al.	
	396	8,244,325	08-14-2012	Al-Ali et al.	
	397	8,255,026	08-28-2012	Al-Ali	
	398	8,255,027	08-28-2012	Al-Ali et al.	
	399	8,255,028	08-28-2012	Al-Ali et al.	
	400	8,260,577	09-04-2012	Weber et al.	
	401	8,265,723	09-11-2012	McHale et al.	
	402	8,274,360	09-25-2012	Sampath et al.	
	403	8,289,130	10-16-2012	Nakajima et al.	
	404	8,301,217	10-30-2012	Al-Ali et al.	
	405	8,306,596	11-06-2012	Schurman et al.	
	406	8,310,336	11-13-2012	Muhsin et al.	

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	407	8,315,683	11-20-2012	Al-Ali et al.	
	408	8,332,006	12-11-2012	Naganuma et al.	
	409	8,337,403	12-25-2012	Al-Ali et al.	
	410	8,346,330	01-01-2013	Lamego	
	411	8,353,842	01-15-2013	Al-Ali et al.	
	412	8,355,766	01-15-2013	MacNeish, III et al.	
	413	8,359,080	01-22-2013	Diab et al.	
	414	8,364,223	01-29-2013	Al-Ali et al.	
	415	8,364,226	01-29-2013	Diab et al.	
	416	8,364,389	01-29-2013	Dorogusker et al.	
	417	8,374,665	02-12-2013	Lamego	
	418	8,380,272	02-19-2013	Barrett et al.	
	419	8,385,995	02-26-2013	Al-ali et al.	
	420	8,385,996	02-26-2013	Smith et al.	
	421	8,388,353	03-05-2013	Kiani et al.	
	422	8,399,822	03-19-2013	Al-Ali	
	423	8,401,602	03-19-2013	Kiani	
	424	8,405,608	03-26-2013	Al-Ali et al.	
	425	8,414,499	04-09-2013	Al-Ali et al.	
	426	8,418,524	04-16-2013	Al-Ali	
	427	8,421,022	04-16-2013	Rozenfeld	
	428	8,423,106	04-16-2013	Lamego et al.	
	429	8,428,674	04-23-2013	Duffy et al.	
	430	8,428,967	04-23-2013	Olsen et al.	
	431	8,430,817	04-30-2013	Al-Ali et al.	
	432	8,437,825	05-07-2013	Dalvi et al.	
	433	8,455,290	06-04-2013	Siskavich	
	434	8,457,703	06-04-2013	Al-Ali	
	435	8,457,707	06-04-2013	Kiani	

Examiner Signature	Date Considered
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PTO/SB/08 Equivalent

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	First Named Inventor	Jeroen Poeze
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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	436	8,463,349	06-11-2013	Diab et al.	
	437	8,466,286	06-18-2013	Bellot et al.	
	438	8,471,713	06-25-2013	Poeze et al.	
	439	8,473,020	06-25-2013	Kiani et al.	
	440	8,483,787	07-09-2013	Al-Ali et al.	
	441	8,489,364	07-16-2013	Weber et al.	
	442	8,498,684	07-30-2013	Weber et al.	
	443	8,504,128	08-06-2013	Blank et al.	
	444	8,509,867	08-13-2013	Workman et al.	
	445	8,515,509	08-20-2013	Bruinsma et al.	
	446	8,523,781	09-03-2013	Al-Ali	
	447	8,529,301	09-10-2013	Al-Ali et al.	
	448	8,532,727	09-10-2013	Ali et al.	
	449	8,532,728	09-10-2013	Diab et al.	
	450	8,547,209	10-01-2013	Kiani et al.	
	451	8,548,548	10-01-2013	Al-Ali	
	452	8,548,549	10-01-2013	Schurman et al.	
	453	8,548,550	10-01-2013	Al-Ali et al.	
	454	8,560,032	10-15-2013	Al-Ali et al.	
	455	8,560,034	10-15-2013	Diab et al.	
	456	8,570,167	10-29-2013	Al-Ali	
	457	8,570,503	10-29-2013	Hung Vo	
	458	8,571,617	10-29-2013	Reichgott et al.	
	459	8,571,618	10-29-2013	Lamego et al.	
	460	8,571,619	10-29-2013	Al-Ali et al.	
	461	8,577,431	11-05-2013	Lamego et al.	
	462	8,581,732	11-12-2013	Al-Ali et al.	
	463	8,584,345	11-19-2013	Al-Ali et al.	
	464	8,588,880	11-19-2013	Abdul-Hafiz et al.	

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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	465	8,600,467	12-03-2013	Al-Ali et al.	
	466	8,602,971	12-10-2013	Farr	
	467	8,606,342	12-10-2013	Diab	
	468	8,615,290	12-24-2013	Lin et al.	
	469	8,626,255	01-07-2014	Al-Ali et al.	
	470	8,630,691	01-14-2014	Lamego et al.	
	471	8,634,889	01-21-2014	Al-Ali et al.	
	472	8,641,631	02-04-2014	Sierra et al.	
	473	8,652,060	02-18-2014	Al-Ali	
	474	8,655,004	02-18-2014	Prest et al.	
	475	8,663,107	03-04-2014	Kiani	
	476	8,666,468	03-04-2014	Al-Ali	
	477	8,667,967	03-11-2014	Al-Ali et al.	
	478	8,670,811	03-11-2014	O'Reilly	
	479	8,670,814	03-11-2014	Diab et al.	
	480	8,676,286	03-18-2014	Weber et al.	
	481	8,682,407	03-25-2014	Al-Ali	
	482	8,688,183	04-01-2014	Bruinsma et al.	
	483	8,690,799	04-08-2014	Telfort et al.	
	484	8,700,111	04-15-2014	LeBoeuf et al.	
	485	8,700,112	04-15-2014	Kiani	
	486	8,702,627	04-22-2014	Telfort et al.	
	487	8,706,179	04-22-2014	Parker	
	488	8,712,494	04-29-2014	MacNeish, III et al.	
	489	8,715,206	05-06-2014	Telfort et al.	
	490	8,718,735	05-06-2014	Lamego et al.	
	491	8,718,737	05-06-2014	Diab et al.	
	492	8,718,738	05-06-2014	Blank et al.	
	493	8,720,249	05-13-2014	Al-Ali	

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Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	494	8,721,541	05-13-2014	Al-Ali et al.	
	495	8,721,542	05-13-2014	Al-Ali et al.	
	496	8,723,677	05-13-2014	Kiani	
	497	8,740,792	06-03-2014	Kiani et al.	
	498	8,754,776	06-17-2014	Poeze et al.	
	499	8,755,535	06-17-2014	Telfort et al.	
	500	8,755,856	06-17-2014	Diab et al.	
	501	8,755,872	06-17-2014	Marinow	
	502	8,760,517	06-24-2014	Sarwar et al.	
	503	8,761,850	06-24-2014	Lamego	
	504	8,764,671	07-01-2014	Kiani	
	505	8,768,423	07-01-2014	Shakespeare et al.	
	506	8,771,204	07-08-2014	Telfort et al.	
	507	8,777,634	07-15-2014	Kiani et al.	
	508	8,781,543	07-15-2014	Diab et al.	
	509	8,781,544	07-15-2014	Al-Ali et al.	
	510	8,781,549	07-15-2014	Al-Ali et al.	
	511	8,788,003	07-22-2014	Schurman et al.	
	512	8,790,268	07-29-2014	Al-Ali	
	513	8,801,613	08-12-2014	Al-Ali et al.	
	514	8,821,397	09-02-2014	Al-Ali et al.	
	515	8,821,415	09-02-2014	Al-Ali et al.	
	516	8,830,449	09-09-2014	Lamego et al.	
	517	8,831,700	09-09-2014	Schurman et al.	
	518	8,840,549	09-23-2014	Al-Ali et al.	
	519	8,845,543	09-30-2014	Diab et al.	
	520	8,847,740	09-30-2014	Kiani et al.	
	521	8,849,365	09-30-2014	Smith et al.	
	522	8,852,094	10-07-2014	Al-Ali et al.	

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U.S. PATENT DOCUMENTS					
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	523	8,852,994	10-07-2014	Wojtczuk et al.	
	524	8,868,147	10-21-2014	Stippick et al.	
	525	8,868,150	10-21-2014	Al-Ali et al.	
	526	8,870,792	10-28-2014	Al-Ali et al.	
	527	8,886,271	11-11-2014	Kiani et al.	
	528	8,888,539	11-18-2014	Al-Ali et al.	
	529	8,888,708	11-18-2014	Diab et al.	
	530	8,892,180	11-18-2014	Weber et al.	
	531	8,897,847	11-25-2014	Al-Ali	
	532	8,909,310	12-09-2014	Lamego et al.	
	533	8,911,377	12-16-2014	Al-Ali	
	534	8,912,909	12-16-2014	Al-Ali et al.	
	535	8,920,317	12-30-2014	Al-Ali et al.	
	536	8,921,699	12-30-2014	Al-Ali et al	
	537	8,922,382	12-30-2014	Al-Ali et al.	
	538	8,929,964	01-06-2015	Al-Ali et al.	
	539	8,942,777	01-27-2015	Diab et al.	
	540	8,948,834	02-03-2015	Diab et al.	
	541	8,948,835	02-03-2015	Diab	
	542	8,965,471	02-24-2015	Lamego	
	543	8,983,564	03-17-2015	Al-Ali	
	544	8,989,831	03-24-2015	Al-Ali et al.	
	545	8,996,085	03-31-2015	Kiani et al.	
	546	8,998,809	04-07-2015	Kiani	
	547	9,028,429	05-12-2015	Telfort et al.	
	548	9,037,207	05-19-2015	Al-Ali et al.	
	549	9,060,721	06-23-2015	Reichgott et al.	
	550	9,066,666	06-30-2015	Kiani	
	551	9,066,680	06-30-2015	Al-Ali et al.	

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U.S. PATENT DOCUMENTS					
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	552	9,072,437	07-07-2015	Paalasmaa	
	553	9,072,474	07-07-2015	Al-Ali et al.	
	554	9,078,560	07-14-2015	Schurman et al.	
	555	9,081,889	07-14-2015	Ingrassia, Jr. et al.	
	556	9,084,569	07-21-2015	Weber et al.	
	557	9,095,316	08-04-2015	Welch et al.	
	558	9,106,038	08-11-2015	Telfort et al.	
	559	9,107,625	08-18-2015	Telfort et al.	
	560	9,107,626	08-18-2015	Al-Ali et al.	
	561	9,113,831	08-25-2015	Al-Ali	
	562	9,113,832	08-25-2015	Al-Ali	
	563	9,119,595	09-01-2015	Lamego	
	564	9,131,881	09-15-2015	Diab et al.	
	565	9,131,882	09-15-2015	Al-Ali et al.	
	566	9,131,883	09-15-2015	Al-Ali	
	567	9,131,917	09-15-2015	Telfort et al.	
	568	9,138,180	09-22-2015	Coverston et al.	
	569	9,138,182	09-22-2015	Al-Ali et al.	
	570	9,138,192	09-22-2015	Weber et al.	
	571	9,142,117	09-22-2015	Muhsin et al.	
	572	9,153,112	10-06-2015	Kiani et al.	
	573	9,153,121	10-06-2015	Kiani et al.	
	574	9,161,696	10-20-2015	Al-Ali et al.	
	575	9,161,713	10-20-2015	Al-Ali et al.	
	576	9,167,995	10-27-2015	Lamego et al.	
	577	9,176,141	11-03-2015	Al-Ali et al.	
	578	9,186,102	11-17-2015	Bruinsma et al.	
	579	9,192,312	11-24-2015	Al-Ali	
	580	9,192,329	11-24-2015	Al-Ali	

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Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	581	9,192,351	11-24-2015	Telfort et al.	
	582	9,195,385	11-24-2015	Al-Ali et al.	
	583	9,210,566	12-08-2015	Ziemianska et al.	
	584	9,211,072	12-15-2015	Kiani	
	585	9,211,095	12-15-2015	Al-Ali	
	586	9,218,454	12-22-2015	Kiani et al.	
	587	9,226,696	01-05-2016	Kiani	
	588	9,241,662	01-26-2016	Al-Ali et al.	
	589	9,245,668	01-26-2016	Vo et al.	
	590	9,259,185	02-16-2016	Abdul-Hafiz et al.	
	591	9,267,572	02-23-2016	Barker et al.	
	592	9,277,880	03-08-2016	Poeze et al.	
	593	9,289,167	03-22-2016	Diab et al.	
	594	9,295,421	03-29-2016	Kiani et al.	
	595	9,307,928	04-12-2016	Al-Ali et al.	
	596	9,311,382	04-12-2016	Varoglu et al.	
	597	9,323,894	04-26-2016	Kiani	
	598	9,326,712	05-03-2016	Kiani	
	599	9,333,316	05-10-2016	Kiani	
	600	9,339,220	05-17-2016	Lamego et al.	
	601	9,341,565	05-17-2016	Lamego et al.	
	602	9,351,673	05-31-2016	Diab et al.	
	603	9,351,675	05-31-2016	Al-Ali et al.	
	604	9,357,665	05-31-2016	Myers et al.	
	605	9,364,181	06-14-2016	Kiani et al.	
	606	9,368,671	06-14-2016	Wojtczuk et al.	
	607	9,370,325	06-21-2016	Al-Ali et al.	
	608	9,370,326	06-21-2016	McHale et al.	
	609	9,370,335	06-21-2016	Al-ali et al.	

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Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	610	9,375,185	06-28-2016	Ali et al.	
	611	9,386,953	07-12-2016	Al-Ali	
	612	9,386,961	07-12-2016	Al-Ali et al.	
	613	9,392,945	07-19-2016	Al-Ali et al.	
	614	9,397,448	07-19-2016	Al-Ali et al.	
	615	9,489,081	11-08-2016	Anzures et al.	
	616	9,497,534	11-15-2016	Prest et al.	
	617	9,526,430	12-27-2016	Srinivas et al.	
	618	9,553,625	01-24-2017	Hatanaka et al.	
	619	9,591,975	03-14-2017	Dalvi et al.	
	620	9,593,969	03-14-2017	King	
	621	9,651,405	05-16-2017	Gowreesunker et al.	
	622	9,668,676	06-06-2017	Culbert	
	623	9,668,680	06-06-2017	Bruinsma et al.	
	624	9,699,546	07-04-2017	Qian et al.	
	625	9,716,937	07-25-2017	Qian et al.	
	626	9,717,425	08-01-2017	Kiani et al.	
	627	9,723,997	08-08-2017	Lamego	
	628	9,781,984	10-10-2017	Baranski et al.	
	629	9,838,775	12-05-2017	Qian et al.	
	630	9,848,823	12-26-2017	Raghuram et al.	
	631	9,866,671	01-09-2018	Thompson et al.	
	632	9,867,575	01-16-2018	Maani et al.	
	633	9,898,049	02-20-2018	Myers et al.	
	634	9,918,646	03-20-2018	Singh Alvarado et al.	
	635	9,952,095	04-24-2018	Hotelling et al.	
	636	10,039,080	07-31-2018	Miller et al.	
	637	10,055,121	08-21-2018	Chaudhri et al.	
	638	10,066,970	09-04-2018	Gowreesunker et al.	

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	639	10,076,257	09-18-2018	Lin et al.	
	640	10,078,052	09-18-2018	Ness et al.	
	641	10,258,265	04-16-2019	Poeze et al.	
	642	10,258,266	04-16-2019	Poeze et al.	
	643	2002/0099279	07-25-2002	Pfeiffer et al.	
	644	2006/0005944	01-12-2006	Wang et al.	
	645	2006/0025659	02-02-2006	Kiguchi et al.	
	646	2006/0076473	04-13-2006	Wilcken et al.	
	647	2007/0149864	06-28-2007	Laakkonen	
	648	2007/0238955	10-11-2007	Tearney et al.	
	649	2007/0293792	12-20-2007	Sliwa et al.	
	650	2008/0130232	06-05-2008	Yamamoto	
	651	2008/0139908	06-12-2008	Kurth	
	652	2009/0030327	01-29-2009	Chance, Britton	
	653	2009/0043180	02-12-2009	Tschautscher et al.	
	654	2009/0129102	05-21-2009	Xiao et al.	
	655	2009/0247984	10-01-2009	Lamego et al.	
	656	2009/0259114	10-15-2009	Johnson et al.	
	657	2009/0275844	11-05-2009	Al-Ali	
	658	2009/0306487	12-10-2009	Crowe et al.	
	659	2010/0004518	01-07-2010	Vo et al.	
	660	2010/0030040	02-04-2010	Poeze et al.	
	661	2010/0217102	08-26-2010	LeBoeuf et al.	
	662	2011/0001605	01-06-2011	Kiani et al.	
	663	2011/0004082	01-06-2011	Poeze et al.	
	664	2011/0082711	04-07-2011	Poeze et al.	
	665	2011/0105854	05-05-2011	Kiani et al.	
	666	2011/0105865	05-05-2011	Yu et al.	
	667	2011/0208015	08-25-2011	Welch et al.	

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Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	668	2011/0213212	09-01-2011	Al-Ali	
	669	2011/0230733	09-22-2011	Al-Ali	
	670	2011/0237911	09-29-2011	Lamego et al.	
	671	2012/0059267	03-08-2012	Lamego et al.	
	672	2012/0179006	07-12-2012	Jansen et al.	
	673	2012/0209082	08-16-2012	Al-Ali	
	674	2012/0209084	08-16-2012	Olsen et al.	
	675	2012/0227739	09-13-2012	Kiani	
	676	2012/0283524	11-08-2012	Kiani et al.	
	677	2012/0296178	11-22-2012	Lamego et al.	
	678	2012/0319816	12-20-2012	Al-Ali	
	679	2012/0330112	12-27-2012	Lamego et al.	
	680	2013/0023775	01-24-2013	Lamego et al.	
	681	2013/0041591	02-14-2013	Lamego	
	682	2013/0045685	02-21-2013	Kiani	
	683	2013/0046204	02-21-2013	Lamego et al.	
	684	2013/0060147	03-07-2013	Welch et al.	
	685	2013/0096405	04-18-2013	Garfio	
	686	2013/0096936	04-18-2013	Sampath et al.	
	687	2013/0190581	07-25-2013	Al-Ali et al.	
	688	2013/0197328	08-01-2013	Diab et al.	
	689	2013/0211214	08-15-2013	Olsen	
	690	2013/0243021	09-19-2013	Siskavich	
	691	2013/0253334	09-26-2013	Al-Ali et al.	
	692	2013/0296672	11-07-2013	O'Neil et al.	
	693	2013/0317370	11-28-2013	Dalvi et al.	
	694	2013/0324808	12-05-2013	Al-Ali et al.	
	695	2013/0331670	12-12-2013	Kiani	
	696	2013/0338461	12-19-2013	Lamego et al.	

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	First Named Inventor	Jeroen Poeze
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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	697	2014/0012100	01-09-2014	Al-Ali et al.	
	698	2014/0034353	02-06-2014	Al-Ali et al.	
	699	2014/0051953	02-20-2014	Lamego et al.	
	700	2014/0058230	02-27-2014	Abdul-Hafiz et al.	
	701	2014/0066783	03-06-2014	Kiani et al.	
	702	2014/0077956	03-20-2014	Sampath et al.	
	703	2014/0081100	03-20-2014	Muhsin et al.	
	704	2014/0081175	03-20-2014	Telfort	
	705	2014/0094667	04-03-2014	Schurman et al.	
	706	2014/0100434	04-10-2014	Diab et al.	
	707	2014/0114199	04-24-2014	Lamego et al.	
	708	2014/0120564	05-01-2014	Workman et al.	
	709	2014/0121482	05-01-2014	Merritt et al.	
	710	2014/0121483	05-01-2014	Kiani	
	711	2014/0127137	05-08-2014	Bellott et al.	
	712	2014/0129702	05-08-2014	Lamego et al.	
	713	2014/0135588	05-15-2014	Al-Ali et al.	
	714	2014/0142401	05-22-2014	Al-Ali et al.	
	715	2014/0155712	06-05-2014	Lamego et al.	
	716	2014/0163344	06-12-2014	Al-Ali	
	717	2014/0163402	06-12-2014	Lamego et al.	
	718	2014/0166076	06-19-2014	Kiani et al.	
	719	2014/0171146	06-19-2014	Ma et al.	
	720	2014/0171763	06-19-2014	Diab	
	721	2014/0180038	06-26-2014	Kiani	
	722	2014/0180154	06-26-2014	Sierra et al.	
	723	2014/0194709	07-10-2014	Al-Ali et al.	
	724	2014/0194711	07-10-2014	Al-Ali	
	725	2014/0194766	07-10-2014	Al-Ali et al.	

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U.S. PATENT DOCUMENTS					
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	726	2014/0206963	07-24-2014	Al-Ali	
	727	2014/0213864	07-31-2014	Abdul-Hafiz et al.	
	728	2014/0243627	08-28-2014	Diab et al.	
	729	2014/0266790	09-18-2014	Al-Ali et al.	
	730	2014/0275808	09-18-2014	Poeze et al.	
	731	2014/0275835	09-18-2014	Lamego et al.	
	732	2014/0275871	09-18-2014	Lamego et al.	
	733	2014/0275872	09-18-2014	Merritt et al.	
	734	2014/0275881	09-18-2014	Lamego et al.	
	735	2014/0288400	09-25-2014	Diab et al.	
	736	2014/0296664	10-27-2014	Bruinsma et al.	
	737	2014/0303520	10-09-2014	Telfort et al.	
	738	2014/0316228	10-23-2014	Blank et al.	
	739	2014/0323825	10-30-2014	Al-Ali et al.	
	740	2014/0330092	11-06-2014	Al-Ali et al.	
	741	2014/0330098	11-06-2014	Merritt et al.	
	742	2014/0330099	11-06-2014	Al-Ali et al.	
	743	2014/0333440	11-13-2014	Kiani	
	744	2014/0336481	11-13-2014	Shakespeare et al.	
	745	2014/0343436	11-20-2014	Kiani	
	746	2015/0018650	01-15-2015	Al-Ali et al.	
	747	2015/0173671	06-25-2015	Paalasmaa et al.	
	748	2015/0255001	09-10-2015	Haughav et al.	
	749	2015/0281424	10-01-2015	Vock et al.	
	750	2015/0318100	11-05-2015	Rothkopf et al.	
	751	2015/0351697	12-10-2015	Weber et al.	
	752	2015/0351704	12-20-2015	Kiani et al.	
	753	2015/0359429	12-17-2015	Al-Ali et al.	
	754	2015/0366472	12-24-2015	Kiani	

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U.S. PATENT DOCUMENTS					
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	755	2015/0366507	12-24-2015	Blank	
	756	2015/0374298	12-31-2015	Al-Ali et al.	
	757	2015/0380875	12-31-2015	Coverston et al.	
	758	2016/0000362	01-07-2016	Diab et al.	
	759	2016/0007930	01-14-2016	Weber et al.	
	760	2016/0019360	01-21-2016	Pahwa et al.	
	761	2016/0023245	01-28-2016	Zadesky et al.	
	762	2016/0029932	02-04-2016	Al-Ali	
	763	2016/0029933	02-04-2016	Al-Ali et al.	
	764	2016/0038045	02-11-2016	Shapiro	
	765	2016/0045118	02-18-2016	Kiani	
	766	2016/0051157	02-25-2016	Waydo	
	767	2016/0051158	02-25-2016	Silva	
	768	2016/0051205	02-25-2016	Al-Ali et al.	
	769	2016/0058302	03-03-2016	Raghuram et al.	
	770	2016/0058309	03-03-2016	Han	
	771	2016/0058312	03-03-2016	Han et al.	
	772	2016/0058338	03-03-2016	Schurman et al.	
	773	2016/0058347	03-03-2016	Reichgott et al.	
	774	2016/0058356	03-03-2016	Raghuram et al.	
	775	2016/0058370	03-03-2016	Raghuram et al.	
	776	2016/0066823	03-10-2016	Al-Ali et al.	
	777	2016/0066824	03-10-2016	Al-Ali et al.	
	778	2016/0066879	03-10-2016	Telfort et al.	
	779	2016/0071392	03-10-2016	Hankey et al.	
	780	2016/0072429	03-10-2016	Kiani et al.	
	781	2016/0073967	03-17-2016	Lamego et al.	
	782	2016/0081552	03-24-2016	Wojtczuk et al.	
	783	2016/0095543	04-07-2016	Telfort et al.	

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	784	2016/0095548	04-07-2016	Al-Ali et al.	
	785	2016/0103598	04-14-2016	Al-Ali et al.	
	786	2016/0113527	04-28-2016	Al-Ali et al.	
	787	2016/0143548	05-26-2016	Al-Ali	
	788	2016/0154950	06-02-2016	Nakajima et al.	
	789	2016/0157780	06-09-2016	Rimminen et al.	
	790	2016/0166183	06-16-2016	Poeze et al.	
	791	2016/0166210	06-16-2016	Al-Ali	
	792	2016/0192869	07-07-2016	Kiani et al.	
	793	2016/0196388	07-07-2016	Lamego	
	794	2016/0197436	07-07-2016	Barker et al.	
	795	2016/0213281	07-28-2016	Eckerbom, et al.	
	796	2016/0213309	07-28-2016	Sannholm et al.	
	797	2016/0256058	09-08-2016	Pham et al.	
	798	2016/0256082	09-08-2016	Ely et al.	
	799	2016/0267238	09-15-2016	Nag	
	800	2016/0287181	10-06-2016	Han et al.	
	801	2016/0296173	10-13-2016	Culbert	
	802	2016/0296174	10-13-2016	Isikman et al.	
	803	2016/0310027	10-27-2016	Han	
	804	2016/0378069	12-29-2016	Rothkopf	
	805	2016/0378071	12-29-2016	Rothkopf	
	806	2017/0007183	01-12-2017	Dusan et al.	
	807	2017/0010858	01-12-2017	Prest et al.	
	808	2017/0074897	03-16-2017	Mermel et al.	
	809	2017/0084133	03-23-2017	Cardinali et al.	
	810	2017/0086689	03-30-2017	Shui et al.	
	811	2017/0086742	03-30-2017	Harrison-Noonan et al.	
	812	2017/0086743	03-30-2017	Bushnell et al.	

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	813	2017/0094450	03-30-2017	Tu et al.	
	814	2017/0164884	06-15-2017	Culbert et al.	
	815	2017/0248446	08-31-2017	Gowreesunker et al.	
	816	2017/0273619	09-28-2017	Alvarado et al.	
	817	2017/0281024	10-05-2017	Narasimhan et al.	
	818	2017/0293727	10-12-2017	Klaassen et al.	
	819	2017/0325698	11-16-2017	Allec et al.	
	820	2017/0325744	11-16-2017	Allec et al.	
	821	2017/0340209	11-30-2017	Klaassen et al.	
	822	2017/0340219	11-30-2017	Sullivan et al.	
	823	2017/0347885	12-07-2017	Tan et al.	
	824	2017/0354332	12-14-2017	Lamego	
	825	2017/0354795	12-14-2017	Blahnik et al.	
	826	2017/0358239	12-14-2017	Arney et al.	
	827	2017/0358240	12-14-2017	Blahnik et al.	
	828	2017/0358242	12-14-2017	Thompson et al.	
	829	2017/0360306	12-14-2017	Narasimhan et al.	
	830	2017/0366657	12-21-2017	Thompson et al.	
	831	2018/0014781	01-18-2018	Clavelle et al.	
	832	2018/0025287	01-25-2018	Mathew et al.	
	833	2018/0042556	02-15-2018	Shahparnia et al.	
	834	2018/0049694	02-22-2018	Singh Alvarado et al.	
	835	2018/0050235	02-22-2018	Tan et al.	
	836	2018/0055375	03-01-2018	Martinez et al.	
	837	2018/0055390	03-01-2018	Kiani	
	838	2018/0055439	03-01-2018	Pham et al.	
	839	2018/0056129	01-01-2018	Narasimha Rao et al.	
	840	2018/0078151	03-22-2018	Allec et al.	
	841	2018/0078182	03-22-2018	Chen et al.	

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	842	2018/0110469	04-26-2018	Maani et al.	
	843	2018/0153418	06-07-2018	Sullivan et al.	
	844	2018/0164853	06-14-2018	Myers et al.	
	845	2018/0196514	07-12-2018	Allec et al.	
	846	2018/0228414	08-16-2018	Shao et al.	
	847	2018/0238734	08-23-2018	Hotelling et al.	
	848	2018/0279956	10-04-2018	Waydo et al.	
	849	2019/0104973	04-11-2019	Poeze et al.	
	850	2019/0110719	04-18-2019	Poeze et al.	
	851	D326,715	06-02-1992	Schmidt, Michael	
	852	D353,195	12-06-1994	Savage et al.	
	853	D353,196	12-06-1994	Savage et al.	
	854	D356,870	03-28-1995	Ivers et al.	
	855	D359,546	06-20-1995	Savage, et al.	
	856	D361,840	08-29-1995	Savage et al.	
	857	D362,063	09-05-1995	Savage et al.	
	858	D363,120	10-10-1995	Savage et al.	
	859	D378,414	03-11-1997	Allen et al.	
	860	D390,666	02-01-1998	Lagerlof, Ingemar	
	861	D393,830	04-28-1998	Tobler et al.	
	862	D403,070	12-22-1998	Maeda et al.	
	863	D414,870	10-05-1999	Saltzstein et al.	
	864	D452,012	12-11-2001	Phillips, Barney L.	
	865	D455,834	04-16-2002	Donars et al.	
	866	D463,561	09-24-2002	Fukatsu et al.	
	867	D481,459	10-28-2003	Nahm, Werner	
	868	D502,655	03-08-2005	Huang, Chun-Mu	
	869	D508,862	08-30-2005	Behar et al.	
	870	D510,625	10-11-2005	Widener et al.	

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	871	D514,461	02-07-2006	Harju, Jonne	
	872	D535,031	01-09-2007	Barrett et al.	
	873	D537,164	02-20-2007	Shigemori et al.	
	874	D547,454	07-24-2007	Hsieh, Chin-Chih	
	875	D549,830	08-28-2007	Behar et al.	
	876	D550,364	09-04-2007	Glover et al.	
	877	D551,350	09-18-2007	Lorimer et al.	
	878	D553,248	10-16-2007	Nguyen	
	879	D554,263	10-30-2007	Al-Ali	
	880	D562,985	02-26-2008	Brefka et al.	
	881	D566,282	04-08-2008	Al-Ali et al.	
	882	D567,125	04-22-2008	Okabe et al.	
	883	D569,001	05-13-2008	Omaki	
	884	D569,521	05-20-2008	Omaki	
	885	D587,657	03-03-2009	Al-Ali et al.	
	886	D603,966	11-10-2009	Jones et al.	
	887	D606,659	12-22-2009	Kiani et al.	
	888	D609,193	02-02-2010	Al-Ali et al.	
	889	D614,305	04-20-2010	Al-Ali et al.	
	890	D621,516	08-10-2010	Kiani et al.	
	891	D692,145	10-22-2013	Al-Ali et al.	
	892	D755,392	05-03-2016	Hwang et al.	
	893	RE 37,922	12--2002	Sharan	
	894	RE 38,476	03-01-2004	Diab et al.	
	895	RE 38,492	04-06-2004	Diab et al.	
	896	RE 39,672	06-05-2007	Shehada et al.	
	897	RE 41,317	05-04-2010	Parker	
	898	RE 41,912	11-02-2010	Parker	
	899	RE 42,753	09-27-2011	Kiani-Azarbayjany et al.	

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	900	RE 43,169	02-07-2012	Parker	
	901	RE 43,860	12-11-2012	Parker	
	902	RE 44,823	04-01-2014	Parker	
	903	RE 44,875	04-29-2014	Kiani et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials	Cite No.	Foreign Patent Document *Country Code-Number-Kind Code* Example: JP 1234567 A1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear	T[1]
	904	EP 419223	03-27-1991	Minnesota Mining and Manufacturing Company		
	905	EP 1 518 494	03-30-2005	Hitachi, Ltd.		
	906	JP 08-185864	07-16-1996	Matsushita Electric Ind Co Ltd		
	907	JP 2002-500908 A	01-15-2002	Lightouch Medical Inc.		
	908	JP 2007-389463 A	11-08-2007	Konica Minolta Sensing Inc.		
	909	JP 2003-265444 A	09-24-2003	Shimadzu Corp.		
	910	JP 2003-508104 A	09-24-2003	Shimadzu Corp.		
	911	JP 08-185864	07-16-1996	Matsushita Electric Ind Co Ltd		
	912	JP 2001-66990	03-16-2001	Sumitomo Bakelite Co Ltd		
	913	JP 05-325705 A	12-10-1993	Fuji Porimatetsuku KK		
	914	JP 2001-087250 A	04-03-2001	Cas Medical Systems Inc.		
	915	JP 2006-177837 A	07-06-2006	Hitachi Ltd.		
	916	JP 2003-024276 A	01-28-2003	Pentax Corp.		
	917	JP 2008-099222 A	04-24-2008	Konica Minolta Holdings Inc.		
	918	JP 2006-198321 A	08-03-2006	Hitachi Ltd.		
	919	JP 2003-508104 A	03-04-2003	Quantum Vision Inc.		
	920	JP 5756752	06-05-2015	Masimo Laboratories, Inc.		
	921	WO 1993/12712	07-08-1993	Vivascan Corp		
	922	WO 1999/000053	01-07-1999	TOA Medical Electronics		

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	923	WO 2000/25112	05-04-2000	Rolfe		
	924	WO 2001/09589	02-08-2001	Abbott Laboratories		
	925	WO 2010/003134	01-07-2010	Masimo Laboratories, Inc.		
	926	WO 2014/149781	09-25-2014	Cercacor Laboratories, Inc.		
	927	WO 2014/158820	10-02-2014	Cercacor Laboratories, Inc.		
	928	WO 1999/01704	07-29-1999	General Electric Company		

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[1]
	929	PCT International Search Report, App. No. PCT/US2010/047899, Date of Actual Completion of Search: 01/26/2011, 4 pages.	
	930	International Search Report and Written Opinion for PCT/US2009/049638, mailed January 7, 2010.	
	931	International Search Report issued in Application No. PCT/US2009/052756, mailed February 10, 2009 in 14 pages.	
	932	International Preliminary Report on Patentability and Written Opinion of the International Searching Authority issued in Application No. PCT US2009/049638, mailed January 5, 2011 in 9 pages.	
	933	International Preliminary Report on Patentability and Written Opinion of the International Searching Authority issued in Application No. PCT/US2009/052756, mailed February 8, 2011 in 8 pages.	
	934	Burritt, Mary F.; Current Analytical Approaches to Measuring Blood Analytes; Vol. 36; No. 8(B); 1990	
	935	Hall, et al., Jeffrey W.; Near-Infrared Spectrophotometry: A New Dimension in Clinical Chemistry; Vol. 38; No. 9; 1992	
	936	Kuenstner, et al., J. Todd; Measurement of Hemoglobin in Unlysed Blood by Near-Infrared Spectroscopy; Vol. 48; Number 4, 1994	
	937	Manzke, et al., B., Multi Wavelength Pulse Oximetry in the Measurement of Hemoglobin Fractions; SPIE, Vol. 2676, April 24, 1996	
	938	Naumenko, E. K.; Choice of Wavelengths for Stable Determination of Concentrations of Hemoglobin Derivatives from Absorption Spectra of Erythrocytes; Vol. 63; No. 1; pp. 60-66 January – February 1996; Original article submitted November 3, 1994	
	939	Schmitt, Joseph M.; Simple Photon Diffusion Anaylsis of the Effects of Multiple Scattering on Pulse Oximetry; March 14, 1991; revised August 30, 1991	
	940	Schmitt, et al., Joseph M.; Measurement of Blood Hematocrit by Dual-Wavelength near-IR Photoplethysmography; Vol. 1641; 1992	

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

T[1] - Place a check mark in this area when an English language Translation is attached.

PTO/SB/08 Equivalent

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	16/409515
	Filing Date	May 10, 2019
	First Named Inventor	Jeroen Poeze
	Art Unit	2688
(Multiple sheets used when necessary)	Examiner	Unassigned
SHEET 34 OF 35	Attorney Docket No.	MASCER.002C8

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[1]
	941	Schnapp, et al., L.M.; Pulse Oximetry. Uses and Abuses.; Chest 1990; 98; 1244-1250 DOI 10.1378/Chest.98.5.1244	
	942	http://www.masimo.com/rainbow/pronto.htm Noninvasive & Immediate Hemoglobin Testing, printed on August 20, 2009	
	943	http://www.masimo.com/pulseOximeter/Rad5.htm; Signal Extraction Pulse Oximeter, printed on August 20, 2009	
	944	http://blogderoliveira.blogspot.com/2008_02_01_archive.html; Ricardo Oliveira, printed on August 20, 2009	
	945	http://www.masimo.com/rad-57/; Noninvasive Measurement of Methemoglobin, Carboxyhemoglobin and Oxyhemoglobin in the blood. Printed on August 20, 2009	
	946	http://amivital.ugr.es/blog/?tag+spo2; Monitorizacion de la hemoglobina...y mucho mas, printed on August 20, 2009	
	947	http://www.masimo.com/spco/; Carboxyhemoglobin Noninvasive > Continuous > Immediate, printed on August 20, 2009	
	948	http://www.masimo.com/PARTNERS/WELCHALLYN.htm; Welch Allyn Expands Patient Monitor Capabilities with Masimo Pulse Oximetry Technology, printed on August 20, 2009	
	949	http://www.masimo.com/pulseOximeter/PPO.htm; Masimo Personal Pulse Oximeter, printed on August 20, 2009	
	950	http://www.masimo.com/generalFloor/system.htm; Masimo Patient SafetyNet System at a Glance, printed on August 20, 2009	
	951	http://www.masimo.com/partners/GRASEBY.htm; Graseby Medical Limited, printed on August 20, 2009	
	952	Japanese Office Action, re JP Application No. 2011-516895, mailed September 2, 2014, with translation. (CERCA.007JP).	
	953	Japanese Notice of Allowance, re JP Application No. 2011-516895, issued on May 12, 2015, no translation. (CERCA/MASCER.007JP).	
	954	European Office Action issued in application no. 10763901.5 on 01/11/2013. (CERCA.008EP).	
	955	European Office Action issued in application no. 10763901.5 on 08/27/2014. (CERCA.008EP).	
	956	European Office Action issued in application no. 10763901.5 on 08/06/2015. (CERCA.008EP).	
	957	European Office Action issued in Application No. 09791157.2, dated June 20, 2016. (MASCER.002EP).	
	958	KANUKURTHY et al., "Data Acquisition Unit for an Implantable Multi-Channel Optical Glucose Sensor", Electro/Information Technology Conference, Chicago, IL, USA, May 17-20, 2007, pp. 1-6	
	959	SMITH, "The Pursuit of Noninvasive Glucose: 'Hunting the Deceitful Turkey'", 2006	

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

T[1] - Place a check mark in this area when an English language Translation is attached.

PTO/SB/08 Equivalent

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	16/409515
	Filing Date	May 10, 2019
	First Named Inventor	Jeroen Poeze
	Art Unit	2688
(Multiple sheets used when necessary)	Examiner	Unassigned
SHEET 35 OF 35	Attorney Docket No.	MASCER.002C8

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[1]
	960	SMALL et al., "Data Handling Issues for Near-Infrared Glucose Measurements", http://www.ieee.org/organizations/pubs/newsletters/leos/apr98/datahandling.htm, accessed 11/27/2007	

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

T[1] - Place a check mark in this area when an English language Translation is attached.

INFORMATION DISCLOSURE STATEMENT

First Inventor	:	Jeroen Poeze
App. No.	:	16/409515
Filed	:	May 10, 2019
For	:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
Examiner	:	Unassigned
Art Unit	:	2688
Conf. No.	:	8759

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

References and Listing

Pursuant to 37 CFR 1.56, an Information Disclosure Statement listing references is provided herewith. References numbered 904-960 are of record in U.S. patent application No. 16/261326, filed January 29, 2019, which is relied upon for an earlier filing date under 35 USC 120. Accordingly, copies of references numbered 904-960 are not submitted pursuant to 37 CFR 1.98(d).

Pursuant to 37 CFR 1.97(g) and (h), Applicant makes no representation that the information is considered to be material to patentability. Additionally, inclusion on this list is not an admission that any of the cited documents are prior art in this application. Further, Applicant makes no representation regarding the completeness of this list, or that better art does not exist.

Electronic Acknowledgement Receipt	
EFS ID:	36005989
Application Number:	16409515
International Application Number:	
Confirmation Number:	8759
Title of Invention:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
First Named Inventor/Applicant Name:	Jeroen Poeze
Customer Number:	64735
Filer:	Scott Cromar/Sandra Autry
Filer Authorized By:	Scott Cromar
Attorney Docket Number:	MASCER.002C8
Receipt Date:	14-MAY-2019
Filing Date:	
Time Stamp:	14:49:51
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		PAmd_MASCER002C8.pdf	37519 e065c4cf0898e8e0292e15bee6b2415a39dbee1c	yes	6

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	5	6
	Claims	2	4
	Preliminary Amendment	1	1

Warnings:					
Information:					
2		IDS_MASCER002C8.pdf	308173 eb29481e263e36dce85bbbdcf38d5f328877b359	yes	39

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Information Disclosure Statement (IDS) Form (SB08)	2	39
	Transmittal Letter	1	1

Warnings:	
Information:	
Total Files Size (in bytes):	345692

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.

REMARKS

By way of summary, Claim 1 was pending in this application. In the present amendment, the Applicant has canceled Claim 1, without prejudice or disclaimer of subject matter, and added new Claims 2-20. Applicant reserves the right to pursue previously pending claims in this or another application (e.g., a continuing application). Accordingly, Claims 2-20 are pending for consideration.

No Disclaimers or Disavowals

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicant is not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicant reserves the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

Co-Pending Applications of Assignee

Applicant wishes to draw the Examiner's attention to the following co-pending applications of the present application's assignee.

Docket No.	Serial No.	Title	Filed
MASCER.002C2	14/981290	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	12/28/2015
MASCER.002C5	16/261366	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	01/29/2019
MASCER.002C6	16/261326	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	01/29/2019
MASCER.002C7	16/409304	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	05/10/2019

Docket No.	Serial No.	Title	Filed
MASCER.006C2	15/660743	NOISE SHIELDING FOR A NONINVASIVE DEVICE	07/26/2017

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: May 14, 2019

By: /Scott Cromar/_____
Scott A. Cromar
Registration No. 65,066
Registered Practitioner
Customer No. 64735
(949) 760-0404

30489706

AMENDMENTS TO THE CLAIMS

1. (**Canceled**)

2. (**New**) A noninvasive optical physiological sensor comprising:

a plurality of emitters configured to emit light into tissue of a user;

a plurality of detectors configured to detect light that has been attenuated by tissue of the user, wherein the plurality of detectors comprise at least four detectors;

a housing configured to house at least the plurality of detectors in a circular portion of the housing; and

a lens configured to be located between tissue of the user and the plurality of detectors when the noninvasive optical physiological sensor is worn by the user, wherein the lens comprises a single outwardly protruding convex surface configured to cause tissue of the user to conform to at least a portion of the single outwardly protruding convex surface when the noninvasive optical physiological sensor is worn by the user and during operation of the noninvasive optical physiological sensor.

3. (**New**) The noninvasive optical physiological sensor of Claim 2, wherein the plurality of detectors are arranged on a two-dimensional surface of the housing.

4. (**New**) The noninvasive optical physiological sensor of Claim 3, wherein a first detector and a second detector of the plurality of detectors are arranged across from each other on opposite sides of a central point along a first axis, and a third detector and a fourth detector of the plurality of detectors are arranged across from each other on opposite sides of the central point along a second axis which is perpendicular to the first axis.

5. (**New**) The noninvasive optical physiological sensor of Claim 4, wherein the lens is comprised of a rigid material.

6. (**New**) The noninvasive optical physiological sensor of Claim 5, wherein the at least four detectors are evenly spaced from one another.

7. (**New**) The noninvasive optical physiological sensor of Claim 5, wherein the lens is configured to reduce a mean path length of light traveling to the plurality of detectors.

8. (**New**) The noninvasive optical physiological sensor of Claim 5, wherein the lens is configured to increase a signal to noise ratio of the noninvasive optical physiological sensor.

9. (**New**) The noninvasive optical physiological sensor of Claim 5, wherein the lens is configured to increase a signal strength per area of the plurality of detectors.

10. (**New**) An optical physiological measurement sensor comprising:

a plurality of emitters configured to emit light into tissue of a user;

a housing including a planar surface;

at least four detectors arranged on the planar surface of the housing, wherein the four detectors are arranged in a grid pattern; and

a lens forming a cover of the housing, wherein at least a portion of the lens protrudes from the housing and the lens comprises a single convex surface.

11. (**New**) The optical physiological measurement sensor of Claim 10, wherein the lens is configured to cause tissue of the user to conform to at least a portion of the single convex surface when the optical physiological measurement sensor is worn by the user.

12. (**New**) The optical physiological measurement sensor of Claim 11, wherein the four detectors are arranged in a grid pattern such that a first detector and a second detector are arranged across from each other on opposite sides of a central point along a first axis, and a third detector and a fourth detector are arranged across from each other on opposite sides of the central point along a second axis which is perpendicular to the first axis.

13. (**New**) The optical physiological measurement sensor of Claim 12, wherein the lens is comprised of a rigid material.

14. (**New**) The optical physiological measurement sensor of Claim 13, wherein the lens is configured to be positioned between the at least four detectors and tissue of a user when the optical physiological measurement sensor is worn by the user.

15. (**New**) The optical physiological measurement sensor of Claim 14, wherein the lens is configured to press against and at least partially deform tissue of the user when the optical physiological measurement sensor is worn by the user.

16. (**New**) The optical physiological measurement sensor of Claim 15, wherein the at least four detectors are evenly spaced from one another.

17. (**New**) The optical physiological measurement sensor of Claim 16, wherein the lens is configured to reduce a mean path length of light traveling to the at least four detectors.

18. (**New**) The optical physiological measurement sensor of Claim 16, wherein the lens is configured to increase a signal to noise ratio of the optical physiological measurement sensor.

19. (**New**) The optical physiological measurement sensor of Claim 16, wherein the lens is configured to increase a signal strength per area of the at least four detectors.

20. (**New**) The optical physiological measurement sensor of Claim 10, wherein the lens comprises a light concentration window.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/409,515	05/10/2019	2688	2120	MASCER.002C8	19	2

CONFIRMATION NO. 8759

FILING RECEIPT

64735
KNOBBE, MARTENS, OLSON & BEAR, LLP
MASIMO CORPORATION (MASIMO)
2040 MAIN STREET
FOURTEENTH FLOOR
IRVINE, CA 92614

Date Mailed: 05/22/2019

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)

Jeroen Poeze, Rancho Santa Margarita, CA;
Marcelo Lamego, Cupertino, CA;
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Greg Olsen, Lake Forest, CA;

Applicant(s)

Masimo Corporation, Irvine, CA;

Power of Attorney: The patent practitioners associated with Customer Number 64735

Domestic Priority data as claimed by applicant

This application is a CON of 16/261,326 01/29/2019 PAT 10292628
which is a CON of 16/212,537 12/06/2018 PAT 10258266
which is a CON of 14/981,290 12/28/2015
which is a CON of 12/829,352 07/01/2010 PAT 9277880
which is a CON of 12/534,827 08/03/2009 ABN
which claims benefit of 61/086,060 08/04/2008
and claims benefit of 61/086,108 08/04/2008
and claims benefit of 61/086,063 08/04/2008

and claims benefit of 61/086,057 08/04/2008
and claims benefit of 61/091,732 08/25/2008
and said 12/829,352 07/01/2010
is a CIP of 12/497,528 07/02/2009 PAT 8577431
which claims benefit of 61/086,060 08/04/2008
and claims benefit of 61/086,108 08/04/2008
and claims benefit of 61/086,063 08/04/2008
and claims benefit of 61/086,057 08/04/2008
and claims benefit of 61/078,228 07/03/2008
and claims benefit of 61/078,207 07/03/2008
and claims benefit of 61/091,732 08/25/2008
and is a CIP of 29/323,408 08/25/2008 PAT D606659
and is a CIP of 29/323,409 08/25/2008 PAT D621516
and said 12/829,352 07/01/2010
is a CIP of 12/497,523 07/02/2009 PAT 8437825
which claims benefit of 61/086,060 08/04/2008
and claims benefit of 61/086,108 08/04/2008
and claims benefit of 61/086,063 08/04/2008
and claims benefit of 61/086,057 08/04/2008
and claims benefit of 61/078,228 07/03/2008
and claims benefit of 61/078,207 07/03/2008
and claims benefit of 61/091,732 08/25/2008
and is a CIP of 29/323,408 08/25/2008 PAT D606659
and is a CIP of 29/323,409 08/25/2008 PAT D621516

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

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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

If Required, Foreign Filing License Granted: 05/21/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/409,515**

Projected Publication Date: 08/29/2019

Non-Publication Request: No

Early Publication Request: No

Title

MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

Preliminary Class

369

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).

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/409,515

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	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))	19 minus 20 =	*			OR	x 100 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 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).						400
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	2120

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($)	ADDITIONAL FEE($)	OR	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.

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.
16/409,515	05/10/2019	Jeroen Poeze	MASCER.002C8	8759

64735 7590 05/22/2019

KNOBBE, MARTENS, OLSON & BEAR, LLP
MASIMO CORPORATION (MASIMO)
2040 MAIN STREET
FOURTEENTH FLOOR
IRVINE, CA 92614

EXAMINER	
ART UNIT	PAPER NUMBER
3791	

NOTIFICATION DATE	DELIVERY MODE
05/22/2019	ELECTRONIC

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

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

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

efiling@knobbe.com
jayna.cartee@knobbe.com

Decision Granting Request for Prioritized Examination (Track I)	**Application No.** 16/409,515	**Applicant(s)** Poeze et al.	
	Examiner BRIAN W BROWN	**Art Unit** OPET	**AIA (FITF) Status** No

1. THE REQUEST FILED 10 May 2019 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)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor	:	Jeroen Poeze
App. No.	:	16/409515
Filed	:	May 10, 2019
For	:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
Examiner	:	Unassigned
Art Unit	:	3791
Conf. No.	:	8759

PRELIMINARY AMENDMENT

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

Dear Commissioner:

Prior to examination, please amend the application as follows:

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

Remarks begin on page 4 of this paper.

Electronic Acknowledgement Receipt	
EFS ID:	36194934
Application Number:	16409515
International Application Number:	
Confirmation Number:	8759
Title of Invention:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
First Named Inventor/Applicant Name:	Jeroen Poeze
Customer Number:	64735
Filer:	Scott Cromar/Sandra Autry
Filer Authorized By:	Scott Cromar
Attorney Docket Number:	MASCER.002C8
Receipt Date:	04-JUN-2019
Filing Date:	10-MAY-2019
Time Stamp:	15:47:34
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		PAmd_MASCER002C8.pdf	35409 56262df52dc1870021647bdbf82565da862d1f08	yes	5

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	4	5
	Specification	2	3
	Preliminary Amendment	1	1
Warnings:			
Information:			
	Total Files Size (in bytes):	35409	

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.

REMARKS

As indicated above, Applicant has amended paragraphs [0037], [0044], [0157], [0160], [0220], and [0322] of the Specification, and amended the Abstract, to correct typographical errors. No new matter is added. Accordingly, Applicant respectfully requests entry of the amendments.

No Disclaimers or Disavowals

Although the present communication may include alterations to the application or claims, or characterizations of claim scope or referenced art, Applicant is not conceding in this application that previously pending claims are not patentable over the cited references. Rather, any alterations or characterizations are being made to facilitate expeditious prosecution of this application. Applicant reserves the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child, or related prosecution history shall not reasonably infer that Applicant has made any disclaimers or disavowals of any subject matter supported by the present application.

Co-Pending Applications of Assignee

Applicant wishes to draw the Examiner's attention to the following co-pending applications of the present application's assignee.

Docket No.	Serial No.	Title	Filed
MASCER.002C2	14/981290	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	12/28/2015
MASCER.002C7	16/409304	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	05/10/2019
MASCER.006C2	15/660743	NOISE SHIELDING FOR A NONINVASIVE DEVICE	07/26/2017

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: June 4, 2019

By: /Scott Cromar/_____
Scott A. Cromar
Registration No. 65,066
Registered Practitioner
Customer No. 64735
(949) 760-0404

30651983

AMENDMENTS TO THE SPECIFICATION

Please amend the following paragraphs of the Specification as indicated:

[0037] FIGURES 7A through 7B illustrate example arrangements of conductive glass that may be employed in the system of FIGURE 1, according to embodiments of the disclosure[[.]];

[0044] FIGURE 11D illustrates another exemplary emitter that may be employed in the sensor according to an embodiment of the disclosure[[.]];

[0157] In addition, sensors 301a-f has extra length – extends to second joint on finger - Easier to place, harder to move due to cable, better for light piping.

[0160] The measurement site contact area 470 can also include differently shaped surfaces that conform the measurement site into different shapes. For example, the measurement site contact area 470 can be generally curved and/or convex with respect to the measurement site. The measurement site contact area 470 can be other shapes that reduce or even minimize air between the protrusion 405 [[and or]]and/or the measurement site. Additionally, the surface pattern of the measurement site contact area 470 can vary from smooth to bumpy, e.g., to provide varying levels of grip.

[0220] **FIGURES 12E through 12H** illustrate several embodiments of photodiodes that may be used in detectors 106. As shown in these figures, a photodiode 1202 of detector 106 may comprise a plurality of active areas 1204[[,]]. These active areas 204 may be coupled together via a common cathode 1206 or anode 1208 in order to provide a larger effective detection area.

[0322] **FIGURE 19** shows the results obtained by an exemplary sensor 101 of the present disclosure that was configured for measuring glucose. This sensor 101 was tested using a turbid ex-vivo sample. In particular, 25 samples of water/glucose/[[Lyposin]]Liposyn were

prepared that ranged from 0-55 mg/dL. Five samples were used as a training set and 20 samples were then used as a test population. As shown, embodiments of sensor 101 were able to obtain at least a standard deviation of 37 mg/dL in the training set and 32 mg/dL in the test population.

Please amend the Abstract as indicated:

The present disclosure relates to noninvasive methods, devices, and systems for measuring various blood constituents or analytes, such as glucose. In an embodiment, a light source comprises LEDs and super-luminescent LEDs. The light source emits light at at least wavelengths of about 1610 nm, about 1640 nm, and about 1665 nm. In an embodiment, the detector comprises a plurality of photodetectors arranged in a special geometry comprising one of a substantially linear substantially equal spaced geometry, a substantially linear substantially non-equal spaced geometry, and a substantially grid geometry.

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 16/409,515	Filing Date 05/10/2019	☐ 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	06/04/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 0		x $100 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $460 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	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".	/ANGELA S WHITE/
*** 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.

Please Direct All Correspondence to Customer Number 64735

SUMMARY OF INTERVIEW

Inventor	:	Jeroen Poeze
App. No	:	16/409515
Filed	:	May 10, 2019
For	:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
Examiner	:	Liu, Chu Chuan
Art Unit	:	3791
Conf No.	:	8759

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

Dear Commissioner:

Pursuant to the Examiner Interview on June 11, 2019, Applicant submits this Summary of Interview for recording in the official file.

Attendees, Date and Type of Interview

A telephone interview was conducted on June 11, 2019, and attended by Examiner Chu Chuan Liu, and Applicant's representative Scott Cromar.

Substance and Results of Interview

The examiner orally issued Non-Statutory Obviousness-Type Double Patenting rejections over U.S. Patent No. 8,437,825, U.S. Patent No. 10,258,266, U.S. Patent No. 10,292,628, and U.S. Patent No. 10,299,708. The examiner additionally orally issued a provisional Non-Statutory Obviousness-Type Double Patenting rejection over co-pending U.S. Patent Appl. No. 16/409304. Without agreeing with the double patenting rejections, in order to expedite allowance of the application, Applicant agreed to electronically file an appropriate Terminal Disclaimer.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: June 12, 2019

By: /Scott Cromar/_____
Scott A. Cromar
Registration No. 65,066
Registered Practitioner
Customer No. 64735
(949) 760-0404

30714476

Electronic Acknowledgement Receipt	
EFS ID:	36281079
Application Number:	16409515
International Application Number:	
Confirmation Number:	8759
Title of Invention:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
First Named Inventor/Applicant Name:	Jeroen Poeze
Customer Number:	64735
Filer:	Scott Cromar/ThuyQuyen Nguyen
Filer Authorized By:	Scott Cromar
Attorney Docket Number:	MASCER.002C8
Receipt Date:	12-JUN-2019
Filing Date:	10-MAY-2019
Time Stamp:	17:28:40
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	Applicant summary of interview with examiner	MASCER002C8.pdf	19864 f1394f452cad47970bbdbeda4ebce840ded dd5da	no	2

Warnings:

Information:	
Total Files Size (in bytes):	19864

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.

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	16409515
Filing Date	10-May-2019
First Named Inventor	Jeroen Poeze
Attorney Docket Number	MASCER.002C8
Title of Invention	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

☒ 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
Masimo Corporation	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)

10299708

10292628

10258266

8437825

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.

○ 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 65066

○ 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	/Scott Cromar/
Name	Scott Cromar

*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:	16409515
Filing Date:	10-May-2019
Title of Invention:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
First Named Inventor/Applicant Name:	Jeroen Poeze
Filer:	Scott Cromar/Wendi Manzanares
Attorney Docket Number:	MASCER.002C8

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	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**160**

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

Application No.: 16409515

Filing Date: 10-May-2019

Applicant/Patent under Reexamination: Poeze

Electronic Terminal Disclaimer filed on June 12, 2019

☒ 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:	36281440
Application Number:	16409515
International Application Number:	
Confirmation Number:	8759
Title of Invention:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
First Named Inventor/Applicant Name:	Jeroen Poeze
Customer Number:	64735
Filer:	Scott Cromar/Wendi Manzanares
Filer Authorized By:	Scott Cromar
Attorney Docket Number:	MASCER.002C8
Receipt Date:	12-JUN-2019
Filing Date:	10-MAY-2019
Time Stamp:	17:37:19
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$160
RAM confirmation Number	061319INTEFSW17371700
Deposit Account	111410
Authorized User	Wendi Manzanares
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

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	34872 8714a3fd31d3a65eeaa50303a29f3a89b2b74c87	no	3
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30422 aceef9c18b6b6ccbf780fcd6f7e56ed3d89ffe16	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	65294		

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

NOTICE OF ALLOWANCE AND FEE(S) DUE

64735 7590 06/19/2019

KNOBBE, MARTENS, OLSON & BEAR, LLP
MASIMO CORPORATION (MASIMO)
2040 MAIN STREET
FOURTEENTH FLOOR
IRVINE, CA 92614

EXAMINER	
LIU, CHU CHUAN	
ART UNIT	PAPER NUMBER
3791	

DATE MAILED: 06/19/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/409,515	05/10/2019	Jeroen Poeze	MASCER.002C8	8759

TITLE OF INVENTION: MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	09/19/2019

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)

64735 7590 06/19/2019

KNOBBE, MARTENS, OLSON & BEAR, LLP
MASIMO CORPORATION (MASIMO)
2040 MAIN STREET
FOURTEENTH FLOOR
IRVINE, CA 92614

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.
16/409,515	05/10/2019	Jeroen Poeze	MASCER.002C8	8759

TITLE OF INVENTION: MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	09/19/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
LIU, CHU CHUAN	3791	600-310000

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
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/409,515	05/10/2019	Jeroen Poeze	MASCER.002C8	8759

64735 7590 06/19/2019

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IRVINE, CA 92614

EXAMINER	
LIU, CHU CHUAN	

ART UNIT	PAPER NUMBER
3791	

DATE MAILED: 06/19/2019

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.

Notice of Allowability	Application No. 16/409,515	Applicant(s) Poeze et al.	
	Examiner CHU CHUAN LIU	Art Unit 3791	AIA (FITF) Status No

-- 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 the preliminary amendments filed on 05/14/2019.
   ☐ 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 2-20 . 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 areply 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 05/14/2019.
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 _____.

/CHU CHUAN LIU/ Examiner, Art Unit 3791	/ERIC F WINAKUR/ Primary Examiner, Art Unit 3791

DETAILED ACTION

1. Claims 2-20 are allowed.

2. The following is an examiner's statement of reasons for allowance: The terminal disclaimer to USPNs 8,437,825; 10,299,708; 10,292,628; and 10,258,266 has been approved on 06/12/2019 to resolve the double patenting issue(s). Schulz et al. (USPN 7,341,559 – applicant cited) teaches a noninvasive optical physiological sensor (Figs. 1-4 and 19 and associated descriptions) comprising: an emitter configured to emit light into tissue of a user (element 400, Figs. 1-4 and 19 and associated descriptions); a detector configured to detect light that has been transmitted through the tissue of the user (elements 800 and 802, Figs. 1, 4, 8, and 19 and associated descriptions); a housing configured to house the detector (Figs. 1-4 and 19 and associated descriptions); and a lens configured to be located between the tissue of the user and the plurality of detectors when the noninvasive optical physiological sensor is proximate the tissue of the user, wherein the lens comprises a single outwardly protruding convex surface (element 1921A and 1920A, Fig. 19B and associated descriptions). Chaiken et al. (USPN 6,223,063 – applicant cited) teaches an optical physiological measurement sensor (Figs. 1-9 and associated descriptions) comprising: a laser configured to emit light into tissue of a user (element 130, Figs. 1-2 and associated descriptions); a circular housing including a planar surface (elements 110 and 140, Figs. 1-2 and associated descriptions); at least four detectors arranged on the planar surface of the circular housing (elements 160, Figs. 1-2 and associated descriptions), wherein the four detectors are arranged in a grid pattern (Figs. 1-2 and associated descriptions); and a

lens (element 110, Figs. 1-7 and associated descriptions), wherein at least a portion of the lens protrudes from the housing (elements 150, Figs. 1-3 and associated descriptions). Mannheimer et al. (USPN 5,099,842 – applicant cited) teaches a noninvasive optical physiological sensor (Figs. 1-5 and associated descriptions) comprising: a plurality of emitters configured to emit light into tissue of a user (three LEDs in element 120, Figs. 1 and associated descriptions); a detector (element 120, Figs. 1-3 and associated descriptions) configured to detect light that has been transmitted through the tissue of the user; a housing configured to house the detector (Figs. 1-3 and associated descriptions); and light transmissive bumps (elements 100, Figs. 1-3 and associated descriptions) configured to be located between the tissue of the user and the plurality of detectors when the noninvasive optical physiological sensor is proximate the tissue of the user (Figs. 1-3 and associated descriptions). Wong et al. (USPN 5,601,079 – applicant cited) teaches a noninvasive optical physiological measurement device (Figs. 4-8 and associated descriptions) comprises a plurality of emitters; a housing configured to house at least the plurality of detectors in a circular portion of the housing (see Figs. 4-8 and associated descriptions). However, the prior art of record does not teach or suggest "*a plurality of detectors configured to detect light that has been attenuated by tissue of the user, wherein the plurality of detectors comprise at least four detectors;… and a lens configured to be located between the tissue of the user and the plurality of detectors when the noninvasive optical physiological sensor is worn by the user, wherein the lens comprises a single outwardly protruding convex surface*" or "*a housing including a planar surface; at least four detectors arranged on the planar surface of the housing, wherein the four detectors are*

arranged in a grid pattern; and a lens forming a cover of the housing, wherein at least a portion of the lens protrudes from the housing and the lens comprises a single convex surface", in combination with the other claimed elements/ steps.

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."

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHU CHUAN LIU whose telephone number is (571)270-5507. The examiner can normally be reached on M-Th (8am-6pm).

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, Jacqueline Cheng can be reached on (571) 272-5596. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ERIC F WINAKUR/
Primary Examiner, Art Unit 3791

/CHU CHUAN LIU/
Examiner, Art Unit 3791

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/409,515	Poeze et al.
	Examiner	Art Unit
	CHU CHUAN LIU	3791

CPC - Searched*		
Symbol	Date	Examiner
A61B5/ 0205,1455,14551,14552,14532,14546,6829,6843,6826,6816,6838	06/13/2019	CCL

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 Name Search (PALM and EAST)	06/13/2019	CCL
EAST Search (TEXT, USPGPUB, USPAT, CPC) See Search History	06/13/2019	CCL
Google NPL Search	06/13/2019	CCL
Allowance consultation with Eric Winakur	06/13/2019	CCL

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
A61B5	0205,1455,14551,14552,14532,14546,6829,6843,6826,6816,6838	06/13/2019	CCL

/CHU CHUAN LIU/ Examiner, Art Unit 3791	

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/409,515	Poeze et al.
	Examiner	Art Unit
	CHU CHUAN LIU	3791

CPC						
Symbol					Type	Version
A61B	/	5	/	1455	F	2013-01-01
A61B	/	5	/	6829	I	2013-01-01
A61B	/	5	/	6826	I	2013-01-01
A61B	/	5	/	14532	I	2013-01-01
A61B	/	5	/	14546	I	2013-01-01
A61B	/	5	/	6843	I	2013-01-01
A61B	/	5	/	6816	I	2013-01-01
A61B	/	5	/	14552	I	2013-01-01
A61B	/	5	/	6838	I	2013-01-01
A61B	/	2562	/	046	A	2013-01-01
A61B	/	2562	/	146	A	2013-01-01
A61B	/	2562	/	04	A	2013-01-01
A61B	/	2562	/	0233	A	2013-01-01

CPC Combination Sets							
Symbol					Type	Set	Ranking	Version
	/		/					

/CHU CHUAN LIU/ Examiner, Art Unit 3791 (Assistant Examiner)	13 June 2019 (Date)	**Total Claims Allowed:** 19	
/ERIC F WINAKUR/ Primary Examiner, Art Unit 3791 (Primary Examiner)	13 June 2019 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 14D

U.S. Patent and Trademark Office — Part of Paper No.: 20190613

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/409,515	Poeze et al.
	Examiner	**Art Unit**
	CHU CHUAN LIU	3791

INTERNATIONAL CLASSIFICATION					
CLAIMED					
A61B	/	5	/	1455	

NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

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

/CHU CHUAN LIU/ Examiner, Art Unit 3791	13 June 2019	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	19	
/ERIC F WINAKUR/ Primary Examiner, Art Unit 3791	13 June 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	14D

U.S. Patent and Trademark Office — Part of Paper No.: 20190613

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/409,515	Poeze et al.
	Examiner	**Art Unit**
	CHU CHUAN LIU	3791

☐ 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
	1	9	10	18	19										
1	2	10	11	19	20										
2	3	11	12												
3	4	12	13												
4	5	13	14												
5	6	14	15												
6	7	15	16												
7	8	16	17												
8	9	17	18												

/CHU CHUAN LIU/ Examiner, Art Unit 3791 (Assistant Examiner)	13 June 2019 (Date)	**Total Claims Allowed:** 19	
/ERIC F WINAKUR/ Primary Examiner, Art Unit 3791 (Primary Examiner)	13 June 2019 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 14D

U.S. Patent and Trademark Office Part of Paper No.: 20190613

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	553	("2001/0051766").URPN.	USPAT	OR	ON	2019/06/13 14:57
L3	6	L2 and lens$2 with (protru$5 pressure compress$4 press$4)	USPAT	OR	ON	2019/06/13 14:57
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L5	11	L4 and protru$5.clm. same housing.clm.	US-PGPUB; USPAT	OR	ON	2019/06/13 14:58
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S6	8	S2 and protrusion and housing.clm. and four.clm.	US-PGPUB; USPAT	OR	ON	2019/06/10 09:56
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		"5638818" | "5645440" | "5676143" | "5685299" | "5743262" | "5750927" | "5752914" | "5758644" | "5760910" | "5769785" | "5782757" | "5785659" | "5791347" | "5792052" | "5810734" | "5823950" | "5826885" | "5830131" | "5833618" | "5860919" | "5890929" | "5902235" | "5904654" | "5919134" | "5934925" | "5940182" | "5995855" | "5997343" | "6002952" | "6011986" | "6027452" | "6036642" | "6045509" | "6049727" | "6067462" | "6081735" | "6088607" | "6110522" | "6124597").PN. OR ("6128521" | "6129675" | "6144866" | "6144868" | "6151516" | "6152754" | "6157850" | "6165005" | "6172743" | "6181958" | "6184521" | "6206830" | "6223063" | "6229856" | "6232609" | "6236872" | "6241683" | "6253097" | "6256523" | "6263222" | "6278522" | "6280213" | "6285896" | "6301493" | "6317627" | "6321100" | "6334065" | "6343224" | "6345194" | "6349228" | "6353750" | "6360113" | "6360114" | "6360115" | "6368283" | "6371921" | "6377829" | "6388240" | "6397091" | "6430437" | "6430525" | "6463311" | "6470199" | "6501975" | "6505059" | "6515273" | "6519487" | "6525386" | "6526300" | "6541756" | "6542764" | "6580086" | "6584336" | "6595316" | "6597932" | "6597933" | "6606509" | "6606511" | "6632181" | "6639668" | "6640116" | "6643530" | "6650917" | "6654624" | "6658276" | "6661161" | "6671531" | "6678543" | "6684090" | "6684091" | "6697656" | "6697657" | "6697658" | "6699194" | "6714804" | "6721582" | "6721585" | "6725075" | "6728560" | "6735459" | "6745060" | "6760607" | "6770028" | "6771994" | "6792300" | "6813511" | "6816241" | "6816741" | "6822564" | "6826419" | "6830711" | "6850787" | "6850788" | "6852083" | "6861639" | "6898452" | "6920345" | "6931268" | "6934570" | "6939305" | "6943348" | "6950687" | "6961598" | "6970792" | "6979812" | "6985764" | "6993371" | "6996427" | "6999904" | "7003338" | "7003339" | "7015451" | "7024233" | "7027849" | "7030749" | "7039449" | "7041060" | "7044918" | "7067893" | "7096052" | "7096054" | "7132641" | "7142901" | "7149561" | "7186966").PN. OR ("7190261" | "7215984" | "7215986" | "7221971" | "7225006" | "7225007" | "7239905" | "7245953" | "7254429" | "7254431" | "7254433" | "7254434" | "7272425" | "7274955" | "7280858" | "7289835" | "7292883" | "7295866" | "7328053" | "7332784" | "7340287" | "7341559" | "7343186" | "7355512" | "7356365" | "7371981" | "7373193" | "7373194" | "7376453" | "7377794" | "7377899" | "7383070" | "7415297" | "7428432" | "7438683" | "7440787" | "7454240" | "7467002" | "7469157" | "7471969" | "7471971" | "7483729" | "7483730" | "7489958" | "7496391" | "7496393" | "7499741" | "7499835" | "7500950" | "7509154" | "7509494" | "7510849" | "7526328" | "7530942" | "7530949" | "7530955" | "7563110" | "7596398" | "7618375" | "7647083" | "7657294" | "7657295" | "7657296" | "7729733" | "7734320" | "7761127" | "7761128" | "7764982" | "7791155" | "7801581" | "7822452" | "7844313" | "7844314" | "7844315" | "7865222" | "7873497" | "7880606" | "7880626" | "7891355" | "7894868" | "7899507" | "7899518" | "7904132" | "7909772" | "7910875" | "7919713" | "7937128" | "7937129" | "7937130" | "7941199" | "7951086" | "7957780" | "7962188" | "7962190" | "7976472" | "7988637" | "7990382" | "7991446" | "8000761" | "8008088" | "8019400" | "8028701" | "8029765" | "8036728" | "8046040" | "8046041" | "8046042" | "8048040" | "8050728" | "8118620" | "8126528" | "8128572" | "8130105" | "8145287" | "8150487" | "8175672" | "8180420" | "8182443" | "8185180" | "8190223" | "8190227" | "8203438" | "8203704" | "8224411" | "8228181").PN. OR ("8229533" | "D326715" | "D353195" | "D353196" | "D356870" | "D359546" | "D361840" | "D362063" | "D363120" | "D378414" | "D390666" | "D393830" | "D403070" | "D414870" | "D452012" | "D455834" | "D463561" | "D481459" | "D502655" | "D508862" | "D510625" | "D514461" | "D535031" | "D537164" | "D547454" | "D549830" | "D550364" | "D551350" | "D553248" | "D554263" | "D562985" | "D566282" | "D567125" | "D569001" | "D569521" | "D587657" | "D603966" | "D606659" | "D609193" | "D614305" | "D621516" | "RE38476" | "RE38492" | "RE39672" | "RE41317" | "RE41912" | "RE42753" | "RE43169").PN. OR ("8437825").URPN.				
S8	177	S7 and (lens$2 protru$5)	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/10 09:59
S9	1	("20060005944").PN.	US-PGPUB; USPAT	OR	OFF	2019/06/10 10:01
S10	3	(("5601079") or ("7341559") or ("6223063")).PN.	US-PGPUB; USPAT	OR	OFF	2019/06/10 10:02
S11	2406	A61B5/0205,1455,14551,14552,14532,14546,6829,6843,6826,6816,6838.cpc. and (convex protrus$3 bump$3 lens$2) same (tissue finger)	US-PGPUB;	OR	ON	2019/06/11 09:53

			USPAT; USOCR			
S12	319	S11 and lens$2 with (convex protrus$3 bump$3)	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 09:54
S13	287	S12 and (enclos$5 hous$3)	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 09:54
S14	55	("4556057" | "4894547" | "4957114" | "4981138" | "5341805" | "5348018" | "5370114").PN. OR ("5601079").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 11:14
S15	57	("5099842" | "5313940" | "6088540").PN. OR ("6223063").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 11:14
S16	176	("3505993" | "4537197" | "4859057" | "4880304").PN. OR ("5099842").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 11:14
S17	206	("3910701" | "3922090" | "4086915" | "4167331" | "4447150" | "4451530" | "4484819" | "4586513" | "4624572").PN. OR ("4880304").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 11:18
S18	632	("20020016536" | "20020052547" | "20020091322" | "20020115918" | "20040049237" | "20040054269" | "20040054291" | "20060167347" | "20060208191" | "20060211924" | "20060258922" | "20070165218" | "20070197886" | "20070293792" | "20080036855" | "20080071154" | "20080130232" | "20080139908" | "20080208006" | "20090043180" | "20090105565" | "20090163775" | "20090259114" | "20100004518" | "20100090118" | "4114604" | "4258719" | "4267844" | "4444471" | "4655225" | "4755676" | "4781195" | "4805623" | "4880304" | "4960128" | "4964408" | "5028787" | "5035243" | "5041187" | "5069213" | "5069214" | "5077476" | "5131391" | "5137023" | "5159929" | "5163438" | "5222495" | "5222496" | "5249576" | "5278627" | "5297548" | "5319355" | "5337744" | "5337745" | "5341805" | "5362966" | "5377676" | "5431170" | "5437275" | "5452717" | "5456252" | "5479934" | "5482034" | "5482036" | "5490505" | "5494043" | "5511546" | "5533511" | "5534851" | "5553615" | "5553616" | "5561275" | "5562002" | "5590649" | "5602924" | "5632272" | "5638816" | "5638818" | "5645440" | "5676143" | "5685299" | "5743262" | "5750927" | "5752914" | "5758644" | "5760910" | "5769785" | "5782757" | "5785659" | "5791347" | "5792052" | "5810734" | "5823950" | "5826885" | "5830131" | "5833618" | "5860919" | "5890929" | "5902235" | "5904654" | "5919134" | "5934925" | "5940182" | "5995855" | "5997343" | "6002952" | "6011986" | "6027452" | "6036642" | "6045509" | "6049727" | "6067462" | "6081735" | "6088607" | "6110522" | "6124597").PN. OR ("6128521" | "6129675" | "6144866" | "6144868" | "6151516" | "6152754" | "6157850" | "6165005" | "6172743" | "6181958" | "6184521" | "6206830" | "6223063" | "6229856" | "6232609" | "6236872" | "6241683" | "6253097" | "6256523" | "6263222" | "6278522" | "6280213" | "6285896" | "6301493" | "6317627" | "6321100" | "6334065" | "6343224" | "6345194" | "6349228" | "6353750" | "6360113" | "6360114" | "6360115" | "6368283" | "6371921" | "6377829" | "6388240" | "6397091" | "6430437" | "6430525" | "6463311" | "6470199" | "6501975" | "6505059" | "6515273" | "6519487" | "6525386" | "6526300" | "6541756" | "6542764" | "6580086" | "6584336" | "6595316" | "6597932" | "6597933" | "6606509" | "6606511" | "6632181" | "6639668" | "6640116" | "6643530" | "6650917" | "6654624" | "6658276" | "6661161" | "6671531" | "6678543" | "6684090" | "6684091" | "6697656" | "6697657" | "6697658" | "6699194" | "6714804" | "6721582" | "6721585" | "6725075" | "6728560" | "6735459" | "6745060" | "6760607" | "6770028" | "6771994" | "6792300" | "6813511" | "6816241" | "6816741" | "6822564" | "6826419" | "6830711" | "6850787" | "6850788" | "6852083" | "6861639" | "6898452" | "6920345" | "6931268" | "6934570" | "6939305" | "6943348" | "6950687" | "6961598" | "6970792" | "6979812" | "6985764" | "6993371" | "6996427" | "6999904" | "7003338" | "7003339" | "7015451" | "7024233" | "7027849" | "7030749" | "7039449" | "7041060" | "7044918" | "7067893" | "7096052" | "7096054" | "7132641" | "7142901" | "7149561" | "7186966").PN. OR ("7190261" | "7215984" |	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 12:18

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S19	55	("4556057" | "4894547" | "4957114" | "4981138" | "5341805" | "5348018" | "5370114").PN. OR ("5601079").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 13:52
S20	57	("5099842" | "5313940" | "6088540").PN. OR ("6223063").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 13:52
S21	176	("3505993" | "4537197" | "4859057" | "4880304").PN. OR ("5099842").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 13:52
S22	206	("3910701" | "3922090" | "4086915" | "4167331" | "4447150" | "4451530" | "4484819" | "4586513" | "4624572").PN. OR ("4880304").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 13:52
S23	632	("20020016536" | "20020052547" | "20020091322" | "20020115918" | "20040049237" | "20040054269" | "20040054291" | "20060167347" | "20060208191" | "20060211924" | "20060258922" | "20070165218" | "20070197886" | "20070293792" | "20080036855" | "20080071154" | "20080130232" | "20080139908" | "20080208006" | "20090043180" | "20090105565" | "20090163775" | "20090259114" | "20100004518" | "20100090118" | "4114604" | "4258719" | "4267844" | "4444471" | "4655225" | "4755676" | "4781195" | "4805623" | "4880304" | "4960128" | "4964408" | "5028787" | "5035243" | "5041187" | "5069213" | "5069214" | "5077476" | "5131391" | "5137023" | "5159929" | "5163438" | "5222495" | "5222496" | "5249576" | "5278627" | "5297548" | "5319355" | "5337744" | "5337745" | "5341805" | "5362966" | "5377676" | "5431170" | "5437275" | "5452717" | "5456252" | "5479934" | "5482034" | "5482036" | "5490505" | "5494043" | "5511546" | "5533511" | "5534851" | "5553615" | "5553616" | "5561275" | "5562002" | "5590649" | "5602924" | "5632272" | "5638816" | "5638818" | "5645440" | "5676143" | "5685299" | "5743262" | "5750927" | "5752914" | "5758644" | "5760910" | "5769785" | "5782757" | "5785659" | "5791347" | "5792052" | "5810734" | "5823950" | "5826885" | "5830131" | "5833618" | "5860919" | "5890929" | "5902235" | "5904654" | "5919134" | "5934925" | "5940182" | "5995855" | "5997343" | "6002952" | "6011986" | "6027452" | "6036642" | "6045509" | "6049727" | "6067462" | "6081735" | "6088607" | "6110522" | "6124597").PN. OR ("6128521" | "6129675" | "6144866" | "6144868" | "6151516" | "6152754" | "6157850" | "6165005" | "6172743" | "6181958" | "6184521" | "6206830" | "6223063" | "6229856" |	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 13:52

		"6232609" | "6236872" | "6241683" | "6253097" | "6256523" | "6263222" | "6278522" | "6280213" | "6285896" | "6301493" | "6317627" | "6321100" | "6334065" | "6343224" | "6345194" | "6349228" | "6353750" | "6360113" | "6360114" | "6360115" | "6368283" | "6371921" | "6377829" | "6388240" | "6397091" | "6430437" | "6430525" | "6463311" | "6470199" | "6501975" | "6505059" | "6515273" | "6519487" | "6525386" | "6526300" | "6541756" | "6542764" | "6580086" | "6584336" | "6595316" | "6597932" | "6597933" | "6606509" | "6606511" | "6632181" | "6639668" | "6640116" | "6643530" | "6650917" | "6654624" | "6658276" | "6661161" | "6671531" | "6678543" | "6684090" | "6684091" | "6697656" | "6697657" | "6697658" | "6699194" | "6714804" | "6721582" | "6721585" | "6725075" | "6728560" | "6735459" | "6745060" | "6760607" | "6770028" | "6771994" | "6792300" | "6813511" | "6816241" | "6816741" | "6822564" | "6826419" | "6830711" | "6850787" | "6850788" | "6852083" | "6861639" | "6898452" | "6920345" | "6931268" | "6934570" | "6939305" | "6943348" | "6950687" | "6961598" | "6970792" | "6979812" | "6985764" | "6993371" | "6996427" | "6999904" | "7003338" | "7003339" | "7015451" | "7024233" | "7027849" | "7030749" | "7039449" | "7041060" | "7044918" | "7067893" | "7096052" | "7096054" | "7132641" | "7142901" | "7149561" | "7186966").PN. OR ("7190261" | "7215984" | "7215986" | "7221971" | "7225006" | "7225007" | "7239905" | "7245953" | "7254429" | "7254431" | "7254433" | "7254434" | "7272425" | "7274955" | "7280858" | "7289835" | "7292883" | "7295866" | "7328053" | "7332784" | "7340287" | "7341559" | "7343186" | "7355512" | "7356365" | "7371981" | "7373193" | "7373194" | "7376453" | "7377794" | "7377899" | "7383070" | "7415297" | "7428432" | "7438683" | "7440787" | "7454240" | "7467002" | "7469157" | "7471969" | "7471971" | "7483729" | "7483730" | "7489958" | "7496391" | "7496393" | "7499741" | "7499835" | "7500950" | "7509154" | "7509494" | "7510849" | "7526328" | "7530942" | "7530949" | "7530955" | "7563110" | "7596398" | "7618375" | "7647083" | "7657294" | "7657295" | "7657296" | "7729733" | "7734320" | "7761127" | "7761128" | "7764982" | "7791155" | "7801581" | "7822452" | "7844313" | "7844314" | "7844315" | "7865222" | "7873497" | "7880606" | "7880626" | "7891355" | "7894868" | "7899507" | "7899518" | "7904132" | "7909772" | "7910875" | "7919713" | "7937128" | "7937129" | "7937130" | "7941199" | "7951086" | "7957780" | "7962188" | "7962190" | "7976472" | "7988637" | "7990382" | "7991446" | "8000761" | "8008088" | "8019400" | "8028701" | "8029765" | "8036728" | "8046040" | "8046041" | "8046042" | "8048040" | "8050728" | "8118620" | "8126528" | "8128572" | "8130105" | "8145287" | "8150487" | "8175672" | "8180420" | "8182443" | "8185180" | "8190223" | "8190227" | "8203438" | "8203704" | "8224411" | "8228181").PN. OR ("8229533" | "D326715" | "D353195" | "D353196" | "D356870" | "D359546" | "D361840" | "D362063" | "D363120" | "D378414" | "D390666" | "D393830" | "D403070" | "D414870" | "D452012" | "D455834" | "D463561" | "D481459" | "D502655" | "D508862" | "D510625" | "D514461" | "D535031" | "D537164" | "D547454" | "D549830" | "D550364" | "D551350" | "D553248" | "D554263" | "D562985" | "D566282" | "D567125" | "D569001" | "D569521" | "D587657" | "D603966" | "D606659" | "D609193" | "D614305" | "D621516" | "RE38476" | "RE38492" | "RE39672" | "RE41317" | "RE41912" | "RE42753" | "RE43169").PN. OR ("8437825").URPN.				
S24	38	(S19 S20 S21 S22 S23) and lens$2 with (convex protrus$3 bump$3)	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 13:52
S25	2406	A61B5/0205,1455,14551,14552,14532,14546,6829,6843,6826,6816,6838.cpc. and (convex protrus$3 bump$3 lens$2) same (tissue finger)	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 15:20
S26	131	S25 and lens$2 with (convex protrus$3 bump$3) same tissue	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/11 15:20
S28	1	("8437825").PN.	US-PGPUB; USPAT	OR	OFF	2019/06/12 07:10
S29	632	("20020016536" | "20020052547" | "20020091322" | "20020115918" | "20040049237" | "20040054269" | "20040054291" | "20060167347" | "20060208191" | "20060211924" | "20060258922" | "20070165218" | "20070197886" | "20070293792" | "20080036855" | "20080071154" | "20080130232" | "20080139908" | "20080208006" | "20090043180" | "20090105565" | "20090163775" | "20090259114" | "20100004518" |	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/12 07:10

		"20100090118" | "4114604" | "4258719" | "4267844" | "4444471" | "4655225" | "4755676" | "4781195" | "4805623" | "4880304" | "4960128" | "4964408" | "5028787" | "5035243" | "5041187" | "5069213" | "5069214" | "5077476" | "5131391" | "5137023" | "5159929" | "5163438" | "5222495" | "5222496" | "5249576" | "5278627" | "5297548" | "5319355" | "5337744" | "5337745" | "5341805" | "5362966" | "5377676" | "5431170" | "5437275" | "5452717" | "5456252" | "5479934" | "5482034" | "5482036" | "5490505" | "5494043" | "5511546" | "5533511" | "5534851" | "5553615" | "5553616" | "5561275" | "5562002" | "5590649" | "5602924" | "5632272" | "5638816" | "5638818" | "5645440" | "5676143" | "5685299" | "5743262" | "5750927" | "5752914" | "5758644" | "5760910" | "5769785" | "5782757" | "5785659" | "5791347" | "5792052" | "5810734" | "5823950" | "5826885" | "5830131" | "5833618" | "5860919" | "5890929" | "5902235" | "5904654" | "5919134" | "5934925" | "5940182" | "5995855" | "5997343" | "6002952" | "6011986" | "6027452" | "6036642" | "6045509" | "6049727" | "6067462" | "6081735" | "6088607" | "6110522" | "6124597").PN. OR ("6128521" | "6129675" | "6144866" | "6144868" | "6151516" | "6152754" | "6157850" | "6165005" | "6172743" | "6181958" | "6184521" | "6206830" | "6223063" | "6229856" | "6232609" | "6236872" | "6241683" | "6253097" | "6256523" | "6263222" | "6278522" | "6280213" | "6285896" | "6301493" | "6317627" | "6321100" | "6334065" | "6343224" | "6345194" | "6349228" | "6353750" | "6360113" | "6360114" | "6360115" | "6368283" | "6371921" | "6377829" | "6388240" | "6397091" | "6430437" | "6430525" | "6463311" | "6470199" | "6501975" | "6505059" | "6515273" | "6519487" | "6525386" | "6526300" | "6541756" | "6542764" | "6580086" | "6584336" | "6595316" | "6597932" | "6597933" | "6606509" | "6606511" | "6632181" | "6639668" | "6640116" | "6643530" | "6650917" | "6654624" | "6658276" | "6661161" | "6671531" | "6678543" | "6684090" | "6684091" | "6697656" | "6697657" | "6697658" | "6699194" | "6714804" | "6721582" | "6721585" | "6725075" | "6728560" | "6735459" | "6745060" | "6760607" | "6770028" | "6771994" | "6792300" | "6813511" | "6816241" | "6816741" | "6822564" | "6826419" | "6830711" | "6850787" | "6850788" | "6852083" | "6861639" | "6898452" | "6920345" | "6931268" | "6934570" | "6939305" | "6943348" | "6950687" | "6961598" | "6970792" | "6979812" | "6985764" | "6993371" | "6996427" | "6999904" | "7003338" | "7003339" | "7015451" | "7024233" | "7027849" | "7030749" | "7039449" | "7041060" | "7044918" | "7067893" | "7096052" | "7096054" | "7132641" | "7142901" | "7149561" | "7186966").PN. OR ("7190261" | "7215984" | "7215986" | "7221971" | "7225006" | "7225007" | "7239905" | "7245953" | "7254429" | "7254431" | "7254433" | "7254434" | "7272425" | "7274955" | "7280858" | "7289835" | "7292883" | "7295866" | "7328053" | "7332784" | "7340287" | "7341559" | "7343186" | "7355512" | "7356365" | "7371981" | "7373193" | "7373194" | "7376453" | "7377794" | "7377899" | "7383070" | "7415297" | "7428432" | "7438683" | "7440787" | "7454240" | "7467002" | "7469157" | "7471969" | "7471971" | "7483729" | "7483730" | "7489958" | "7496391" | "7496393" | "7499741" | "7499835" | "7500950" | "7509154" | "7509494" | "7510849" | "7526328" | "7530942" | "7530949" | "7530955" | "7563110" | "7596398" | "7618375" | "7647083" | "7657294" | "7657295" | "7657296" | "7729733" | "7734320" | "7761127" | "7761128" | "7764982" | "7791155" | "7801581" | "7822452" | "7844313" | "7844314" | "7844315" | "7865222" | "7873497" | "7880606" | "7880626" | "7891355" | "7894868" | "7899507" | "7899518" | "7904132" | "7909772" | "7910875" | "7919713" | "7937128" | "7937129" | "7937130" | "7941199" | "7951086" | "7957780" | "7962188" | "7962190" | "7976472" | "7988637" | "7990382" | "7991446" | "8000761" | "8008088" | "8019400" | "8028701" | "8029765" | "8036728" | "8046040" | "8046041" | "8046042" | "8048040" | "8050728" | "8118620" | "8126528" | "8128572" | "8130105" | "8145287" | "8150487" | "8175672" | "8180420" | "8182443" | "8185180" | "8190223" | "8190227" | "8203438" | "8203704" | "8224411" | "8228181").PN. OR ("8229533" | "D326715" | "D353195" | "D353196" | "D356870" | "D359546" | "D361840" | "D362063" | "D363120" | "D378414" | "D390666" | "D393830" | "D403070" | "D414870" | "D452012" | "D455834" | "D463561" | "D481459" | "D502655" | "D508862" | "D510625" | "D514461" | "D535031" | "D537164" | "D547454" | "D549830" | "D550364" | "D551350" | "D553248" | "D554263" | "D562985" | "D566282" | "D567125" | "D569001" | "D569521" | "D587657" | "D603966" | "D606659" | "D609193" | "D614305" | "D621516" | "RE38476" | "RE38492" | "RE39672" | "RE41317" | "RE41912" | "RE42753" | "RE43169").PN. OR ("8437825").URPN.				
S30	2409	A61B5/0205,1455,14551,14552,14532,14546,6829,6843,6826,6816,6838.cpc. and (convex protrus$3 bump$3 lens$2) same (tissue finger)	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/12 07:11

S31	132	S30 and lens$2 with (convex protrus$3 bump$3) same tissue	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/12 07:11
S35	3620	A61B5/0205,1455,14551,14552,14532,14546,6829,6843,6826,6816,6838.cpc. and (convex protrus$3 bump$3 lens$2) same (tissue finger pressure compres$5 press$3)	US-PGPUB; USPAT	OR	ON	2019/06/13 09:42
S36	781	S35 and (hous$3 enclos$4) same lens$2	US-PGPUB; USPAT	OR	ON	2019/06/13 09:43
S37	115	S35 and (hous$3 enclos$4) same lens$2 same (pressure compres$5 press$3)	US-PGPUB; USPAT	OR	ON	2019/06/13 09:50
S38	1	("5099842").PN.	US-PGPUB; USPAT	OR	OFF	2019/06/13 09:55
S39	176	("3505993" | "4537197" | "4859057" | "4880304").PN. OR ("5099842").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/13 10:21
S40	206	("3910701" | "3922090" | "4086915" | "4167331" | "4447150" | "4451530" | "4484819" | "4586513" | "4624572").PN. OR ("4880304").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2019/06/13 10:23
S41	781	S35 and (hous$3 enclos$4) same lens$2 same (lens$2 cover window)	US-PGPUB; USPAT	OR	ON	2019/06/13 10:27
S42	1342	S35 and (hous$3 enclos$4) same (lens$2 cover window)	US-PGPUB; USPAT	OR	ON	2019/06/13 10:27
S43	286	S35 and (hous$3 enclos$4) same (lens$2 cover window) same (pressure compres$5 press$3)	US-PGPUB; USPAT	OR	ON	2019/06/13 10:29
S44	555	("5638818" | "5645440" | "5676143" | "5685299" | "5743262" | "5750927" | "5752914" | "5758644" | "5760910" | "5769785" | "5782757" | "5785659" | "5791347" | "5792052" | "5810734" | "5823950" | "5826885" | "5830131" | "5833618" | "5860919" | "5890929" | "5902235" | "5904654" | "5919134" | "5934925" | "5940182" | "5995855" | "5997343" | "6002952" | "6011986" | "6027452" | "6036642" | "6045509" | "6049727" | "6067462" | "6081735" | "6088607" | "6110522" | "6124597").PN. OR ("6128521" | "6129675" | "6144866" | "6144868" | "6151516" | "6152754" | "6157850" | "6165005" | "6172743" | "6181958" | "6184521" | "6206830" | "6223063" | "6229856" | "6232609" | "6236872" | "6241683" | "6253097" | "6256523" | "6263222" | "6278522" | "6280213" | "6285896" | "6301493" | "6317627" | "6321100" | "6334065" | "6343224" | "6345194" | "6349228" | "6353750" | "6360113" | "6360114" | "6360115" | "6368283" | "6371921" | "6377829" | "6388240" | "6397091" | "6430437" | "6430525" | "6463311" | "6470199" | "6501975" | "6505059" | "6515273" | "6519487" | "6525386" | "6526300" | "6541756" | "6542764" | "6580086" | "6584336" | "6595316" | "6597932" | "6597933" | "6606509" | "6606511" | "6632181" | "6639668" | "6640116" | "6643530" | "6650917" | "6654624" | "6658276" | "6661161" | "6671531" | "6678543" | "6684090" | "6684091" | "6697656" | "6697657" | "6697658" | "6699194" | "6714804" | "6721582" | "6721585" | "6725075" | "6728560" | "6735459" | "6745060" | "6760607" | "6770028" | "6771994" | "6792300" | "6813511" | "6816241" | "6816741" | "6822564" | "6826419" | "6830711" | "6850787" | "6850788" | "6852083" | "6861639" | "6898452" | "6920345" | "6931268" | "6934570" | "6939305" | "6943348" | "6950687" | "6961598" | "6970792" | "6979812" | "6985764" | "6993371" | "6996427" | "6999904" | "7003338" | "7003339" | "7015451" | "7024233" | "7027849" | "7030749" | "7039449" | "7041060" | "7044918" | "7067893" | "7096052" | "7096054" | "7132641" | "7142901" | "7149561" | "7186966").PN. OR ("7190261" | "7215984" | "7215986" | "7221971" | "7225006" | "7225007" | "7239905" | "7245953" | "7254429" | "7254431" | "7254433" | "7254434" | "7272425" | "7274955" | "7280858" | "7289835" | "7292883" | "7295866" | "7328053" | "7332784" | "7340287" | "7341559" | "7343186" | "7355512" | "7356365" | "7371981" | "7373193" | "7373194" | "7376453" | "7377794" | "7377899" | "7383070" | "7415297" | "7428432" | "7438683" | "7440787" | "7454240" | "7467002" | "7469157" | "7471969" | "7471971" | "7483729" | "7483730" | "7489958" |	US-PGPUB; USPAT	OR	ON	2019/06/13 10:31

		"7496391" | "7496393" | "7499741" | "7499835" | "7500950" | "7509154" | "7509494" | "7510849" | "7526328" | "7530942" | "7530949" | "7530955" | "7563110" | "7596398" | "7618375" | "7647083" | "7657294" | "7657295" | "7657296" | "7729733" | "7734320" | "7761127" | "7761128" | "7764982" | "7791155" | "7801581" | "7822452" | "7844313" | "7844314" | "7844315" | "7865222" | "7873497" | "7880606" | "7880626" | "7891355" | "7894868" | "7899507" | "7899518" | "7904132" | "7909772" | "7910875" | "7919713" | "7937128" | "7937129" | "7937130" | "7941199" | "7951086" | "7957780" | "7962188" | "7962190" | "7976472" | "7988637" | "7990382" | "7991446" | "8000761" | "8008088" | "8019400" | "8028701" | "8029765" | "8036728" | "8046040" | "8046041" | "8046042" | "8048040" | "8050728" | "8118620" | "8126528" | "8128572" | "8130105" | "8145287" | "8150487" | "8175672" | "8180420" | "8182443" | "8185180" | "8190223" | "8190227" | "8203438" | "8203704" | "8224411" | "8228181").PN. OR ("8229533" | "D326715" | "D353195" | "D353196" | "D356870" | "D359546" | "D361840" | "D362063" | "D363120" | "D378414" | "D390666" | "D393830" | "D403070" | "D414870" | "D452012" | "D455834" | "D463561" | "D481459" | "D502655" | "D508862" | "D510625" | "D514461" | "D535031" | "D537164" | "D547454" | "D549830" | "D550364" | "D551350" | "D553248" | "D554263" | "D562985" | "D566282" | "D567125" | "D569001" | "D569521" | "D587657" | "D603966" | "D606659" | "D609193" | "D614305" | "D621516" | "RE38476" | "RE38492" | "RE39672" | "RE41317" | "RE41912" | "RE42753" | "RE43169").PN. OR ("8437825").URPN.				
S45	77	("20020016536" | "20020052547" | "20020091322" | "20020115918" | "20040049237" | "20040054269" | "20040054291" | "20060167347" | "20060208191" | "20060211924" | "20060258922" | "20070165218" | "20070197886" | "20070293792" | "20080036855" | "20080071154" | "20080130232" | "20080139908" | "20080208006" | "20090043180" | "20090105565" | "20090163775" | "20090259114" | "20100004518" | "20100090118" | "4114604" | "4258719" | "4267844" | "4444471" | "4655225" | "4755676" | "4781195" | "4805623" | "4880304" | "4960128" | "4964408" | "5028787" | "5035243" | "5041187" | "5069213" | "5069214" | "5077476" | "5131391" | "5137023" | "5159929" | "5163438" | "5222495" | "5222496" | "5249576" | "5278627" | "5297548" | "5319355" | "5337744" | "5337745" | "5341805" | "5362966" | "5377676" | "5431170" | "5437275" | "5452717" | "5456252" | "5479934" | "5482034" | "5482036" | "5490505" | "5494043" | "5511546" | "5533511" | "5534851" | "5553615" | "5553616" | "5561275" | "5562002" | "5590649" | "5602924" | "5632272" | "5638816").PN.	US-PGPUB; USPAT	OR	ON	2019/06/13 10:31
S46	312	("8118620" | "8126528" | "8126531" | "8128572" | "8130105" | "8145287" | "8150487" | "8175672" | "8180420" | "8182443" | "8185180" | "8190223" | "8190227" | "8203438" | "8203704" | "8219170" | "8224411" | "8228181" | "8229532" | "8229533" | "8233955" | "8244325" | "8255026" | "8255027" | "8255028" | "8260577" | "8265723" | "8274360" | "8289130" | "8301217" | "8306596" | "8310336" | "8315683" | "8332006" | "8337403" | "8346330" | "8353842" | "8355766" | "8359080" | "8364223" | "8364226" | "8364389" | "8374665" | "8380272" | "8385995" | "8385996" | "8388353" | "8399822" | "8401602" | "8405608" | "8414499" | "8418524" | "8421022" | "8423106" | "8428674" | "8428967" | "8430817" | "8437825" | "8455290" | "8457703" | "8457707" | "8463349" | "8466286" | "8471713" | "8473020" | "8483787" | "8489364" | "8498684" | "8504128" | "8509867" | "8515509" | "8523781" | "8529301" | "8532727" | "8532728" | "8547209" | "8548548" | "8548549" | "8548550" | "8560032" | "8560034" | "8570167" | "8570503" | "8571617" | "8571618" | "8571619" | "8577431" | "8581732" | "8584345" | "8588880" | "8600467" | "8602971" | "8606342" | "8615290" | "8626255" | "8630691" | "8634889").PN. OR ("8641631" | "8652060" | "8655004" | "8663107" | "8666468" | "8667967" | "8670811" | "8670814" | "8676286" | "8682407" | "8688183" | "8690799" | "8700112" | "8702627" | "8706179" | "8712494" | "8715206" | "8718735" | "8718737" | "8718738" | "8720249" | "8721541" | "8721542" | "8723677" | "8740792" | "8754776" | "8755535" | "8755856" | "8755872" | "8760517" | "8761850" | "8764671" | "8768423" | "8771204" | "8777634" | "8781543" | "8781544" | "8781549" | "8788003" | "8790268" | "8801613" | "8821397" | "8821415" | "8830449" | "8831700" | "8840549" | "8847740" | "8849365" | "8852094" | "8852994" | "8868147" | "8868150" | "8870792" | "8886271" | "8888539" | "8888708" | "8892180" | "8897847" | "8909310" | "8911377" | "8912909" | "8920317" | "8921699" | "8922382" | "8929964" | "8942777" | "8948834" | "8948835" | "8965471" | "8983564" | "8989831" | "8996085" | "8998809" | "9028429" | "9037207" | "9060721" | "9066666" | "9066680" | "9072437" | "9072474" | "9078560" | "9081889" | "9084569" | "9095316" | "9106038" | "9107625" | "9107626" | "9113831" | "9113832" | "9119595" | "9131881" | "9131882" | "9131883" | "9131917" |	US-PGPUB; USPAT	OR	ON	2019/06/13 10:32

		"9138180" | "9138182" | "9138192" | "9142117" | "9153112" | "9153121" | "9161696" | "9161713" | "9167995" | "9176141" | "9186102" | "9192312" | "9192329" | "9192351" | "9195385" | "9210566" | "9211072" | "9211095" | "9218454" | "9226696" | "9241662" | "9245668" | "9259185" | "9267572" | "9277880" | "9289167" | "9295421" | "9307928" | "9311382" | "9323894" | "9326712").PN. OR ("9333316" | "9339220" | "9341565" | "9351673" | "9351675" | "9357665" | "9364181" | "9368671" | "9370325" | "9370326" | "9370335" | "9375185" | "9386953" | "9386961" | "9392945" | "9397448" | "9489081" | "9497534" | "9526430" | "9553625" | "9591975" | "9593969" | "9651405" | "9668676" | "9668680" | "9699546" | "9716937" | "9717425" | "9723997" | "9781984" | "9838775" | "9848823" | "9866671" | "9867575" | "9898049" | "9918646" | "9952095" | "D326715" | "D353195" | "D353196" | "D356870" | "D359546" | "D361840" | "D362063" | "D363120" | "D378414" | "D390666" | "D393830" | "D403070" | "D414870" | "D452012" | "D455834" | "D463561" | "D481459" | "D502655" | "D508862" | "D510625" | "D514461" | "D535031" | "D537164" | "D547454" | "D549830" | "D550364" | "D551350" | "D553248" | "D554263" | "D562985" | "D566282" | "D567125" | "D569001" | "D569521" | "D587657" | "D603966" | "D606659" | "D609193" | "D614305" | "D621516" | "D692145" | "D755392" | "RE37922" | "RE38476" | "RE38492" | "RE39672" | "RE41317" | "RE41912" | "RE42753" | "RE43169" | "RE43860" | "RE44823" | "RE44875").PN. OR ("10258265").URPN.				
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S58	168	S57 and lens$2	USPAT	OR	ON	2019/06/13 13:01

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S32	2407	A61B5/0205,1455,14551,14552,14532,14546,6829,6843,6826,6816,6838.cpc. and (convex protrus$3 bump$3 lens$2) same (tissue finger)	US-PGPUB; USPAT	OR	ON	2019/06/13 07:18
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6/13/2019 3:01:30 PM
C:\Users\cliu\Documents\EAST\Workspaces\16409515.wsp

References for Examiner Consideration

Applicant wishes to draw the Examiner's attention to, and encourages the Examiner to review, the following co-owned patents and/or applications and their existing and ongoing prosecution history, including without limitation Office Actions, Amendments, Remarks, and any other potentially relevant documents:

Docket No.	Patent No.	Title	Issued
MASCER.002C1	9,277,880	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	03/08/2016
MASCER.002C3	10,258,265	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	04/16/2019
MASCER.002C4	10,258,266	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	04/16/2019
MASCER.003A	8,630,691	MULTI-STREAM SENSOR FRONT ENDS FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	01/14/2014
MASCER.003D1	8,909,310	MULTI-STREAM SENSOR FRONT ENDS FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	12/09/2014
MASCER.004A	8,203,704	MULTI-STREAM SENSOR FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	06/19/2012
MASCER.004C1	8,570,503	HEAT SINK FOR NONINVASIVE MEDICAL SENSOR	10/29/2013
CERCA.005A	8,515,509	MULTI-STREAM EMITTER FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	08/20/2013
MASCER.006A	8,577,431	NOISE SHIELDING FOR A NONINVASIVE DEVICE	11/05/2013
MASCER.006C1	9,717,425	NOISE SHIELDING FOR A NONINVASIVE DEVICE	08/01/2017
MASCER.007A	8,437,825	CONTOURED PROTRUSION FOR IMPROVING SPECTROSCOPIC MEASUREMENT OF BLOOD CONSTITUENTS	05/07/2013
MASCER.007C1	9,591,975	CONTOURED PROTRUSION FOR IMPROVING SPECTROSCOPIC MEASUREMENT OF BLOOD CONSTITUENTS	03/14/2017
MASCER.008A	8,688,183	EMITTER DRIVER FOR NONINVASIVE PATIENT MONITOR	04/01/2014
MASCER.008C1	9,186,102	EMITTER DRIVER FOR NONINVASIVE PATIENT MONITOR	11/17/2015
MASCER.008C2	9,668,680	EMITTER DRIVER FOR NONINVASIVE PATIENT MONITOR	06/06/2017
MASCER.009DA	D621516	PATIENT MONITORING SENSOR	08/10/2010
MASCER.010DA	D606659	PATIENT MONITOR	12/22/2009

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

Docket No.	Serial No.	Title	Filed
MASCER.002A	12/534827	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	08/03/2009
MASCER.002C2	14/981290	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	12/28/2015
MASCER.002C5	16/261366	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	01/29/2019
MASCER.002C6	16/261326	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	01/29/2019
MASCER.002C7	16/409304	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	05/10/2019
MASCER.004C3	14/064055	MULTI-STREAM SENSOR FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	10/25/2013
MASCER.006C2	15/660743	NOISE SHIELDING FOR A NONINVASIVE DEVICE	07/26/2017
MASCER.011A	12/497506	HEAT SINK FOR NONINVASIVE MEDICAL SENSOR	07/02/2009

Applicant notes that cited references, office actions, responses and notices of allowance currently exist or will exist with reference to the above-referenced matters. Applicant also understands that the Examiner has access to sophisticated online Patent Office computing systems that provide ready access to the full file histories of these matters including, for example, specifications, drawings, pending claims, cited art, office actions, responses, declarations, and notices of allowance. Rather than submit copies of these file histories, Applicant respectfully requests that the Examiner continue to review these file histories online for past, current, and future information about these matters that may be relevant to examination of the present application. Also, if the Examiner cannot readily access these file histories, Applicant would be pleased to provide any portion of any of the file histories at any time upon specific Examiner request.

No Disclaimers

To the extent that anything in the Information Disclosure Statement or the listed references could be construed as a disclaimer of any subject matter supported by the present application, Applicant hereby rescinds and retracts such disclaimer.

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

Timing of Disclosure

This Information Disclosure Statement is being filed within three months of the filing date, and no fee is believed to be required.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: May 14, 2019

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30489763

PTO/SB/08 Equivalent

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	16/409515
	Filing Date	May 10, 2019
	First Named Inventor	Jeroen Poeze
	Art Unit	2688
(Multiple sheets used when necessary)	Examiner	Unassigned
SHEET 1 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	1	3,910,701	10-07-1975	Henderson et al.	
	2	4,114,604	09-19-1978	Shaw et al.	
	3	4,258,719	03-31-1981	Lewyn	
	4	4,267,844	05-19-1981	Yamanishi	
	5	4,438,338	03-20-1984	Stitt	
	6	4,444,471	04-24-1984	Ford et al.	
	7	4,653,498	03-31-1987	New, Jr. et al.	
	8	4,655,225	04-07-1987	Dahne et al.	
	9	4,684,245	08-04-1987	Goldring	
	10	4,709,413	11-24-1987	Forrest	
	11	4,755,676	07-05-1988	Gaalema et al.	
	12	4,781,195	11-01-1988	Martin	
	13	4,805,623	02-21-1989	Jöbsis	
	14	4,880,304	11-14-1989	Jaeb et al.	
	15	4,960,128	10-02-1990	Gordon et al.	
	16	4,964,408	10-23-1990	Hink et al.	
	17	5,028,787	07-02-1991	Rosenthal, et al.	
	18	5,035,243	07-30-1991	Muz, Edwin	
	19	5,041,187	08-20-1991	Hink et al.	
	20	5,043,820	08-27-1991	Wyles et al.	
	21	5,069,213	12-03-1991	Polczynski	
	22	5,069,214	12-03-1991	Samaras et al.	
	23	5,077,476	12-31-1991	Rosenthal	
	24	5,086,229	02-04-1992	Rosenthal et al.	
	25	5,099,842	03-31-1992	Mannheimer et al.	
	26	5,122,925	06-16-1992	Inpyn	
	27	5,131,391	07-21-1992	Sakai et al.	
	28	5,137,023	08-11-1992	Mendelson, et al.	
	29	5,159,929	11-03-1992	McMillen et al.	

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

T[1] - Place a check mark in this area when an English language Translation is attached.

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

PTO/SB/08 Equivalent

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	16/409515
	Filing Date	May 10, 2019
	First Named Inventor	Jeroen Poeze
	Art Unit	2688
(Multiple sheets used when necessary)	Examiner	Unassigned
SHEET 2 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	30	5,163,438	11-17-1992	Gordon et al.	
	31	5,222,295	06-29-1993	Dorris, Jr.	
	32	5,222,495	06-29-1993	Clarke et al.	
	33	5,222,496	06-29-1993	Clarke et al.	
	34	5,249,576	10-05-1993	Goldberger et al.	
	35	5,250,342	10-05-1993	Lang	
	36	5,278,627	01-11-1994	Aoyagi et al.	
	37	5,297,548	03-29-1994	Pologe, Jonas A.	
	38	5,319,355	06-07-1994	Russek	
	39	5,337,744	08-16-1994	Branigan	
	40	5,337,745	08-16-1994	Benaron	
	41	5,341,805	08-30-1994	Stavridi, et al.	
	42	5,362,966	11-08-1994	Rosenthal et al.	
	43	5,377,676	01-03-1995	Vari, et al.	
	44	5,427,093	06-27-1995	Ogawa et al.	
	45	5,431,170	07-11-1995	Mathews	
	46	5,437,275	08-01-1995	Amundsen et al.	
	47	5,441,054	08-15-1995	Tsuchiya	
	48	5,452,717	09-26-1995	Branigan et al.	
	49	5,456,252	10-10-1995	Vari, et al.	
	50	5,479,934	01-02-1996	Imran	
	51	5,482,034	01-09-1996	Lewis et al.	
	52	5,482,036	01-09-1996	Diab et al.	
	53	5,490,505	02-13-1996	Diab et al.	
	54	5,490,506	02-13-1996	Takatani et al.	
	55	5,494,043	02-27-1996	O'Sullivan et al.	
	56	5,511,546	04-30-1996	Hon	
	57	5,533,511	07-09-1996	Kaspari et al.	
	58	5,534,851	07-09-1996	Russek	

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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	59	5,551,422	09-03-1996	Simonsen et al.	
	60	5,553,615	09-10-1996	Carim et al.	
	61	5,553,616	09-09-1996	Ham et al.	
	62	5,561,275	10-01-1996	Savage, et al.	
	63	5,562,002	10-08-1996	Lalin	
	64	5,590,649	01-07-1997	Caro et al.	
	65	5,601,079	02-11-1997	Wong et al.	
	66	5,602,924	02-11-1997	Durand et al.	
	67	5,625,458	04-29-1997	Alfano et al.	
	68	5,632,272	05-27-1997	Diab et al.	
	69	5,638,816	06-17-1997	Kiani-Azarbayjany et al.	
	70	5,638,818	06-17-1997	Diab et al.	
	71	5,645,440	07-08-1997	Tobler et al.	
	72	5,676,143	10-14-1997	Simonsen, et al.	
	73	5,685,299	11-11-1997	Diab et al.	
	74	5,743,262	04-28-1998	Lepper, Jr. et al.	
	75	5,750,927	05-12-1998	Baltazar, Osni	
	76	5,752,914	05-19-1998	Delonzor et al.	
	77	5,758,644	06-02-1998	Diab et al.	
	78	5,760,910	06-02-1998	Lepper, Jr. et al.	
	79	5,766,131	06-16-1998	Kondo et al.	
	80	5,769,785	06-23-1998	Diab et al.	
	81	5,782,757	07-21-1998	Diab et al.	
	82	5,785,659	07-28-1998	Caro et al.	
	83	5,791,347	08-11-1998	Flaherty et al.	
	84	5,792,052	08-11-1998	Isaacson et al.	
	85	5,810,734	09-22-1998	Caro et al.	
	86	5,823,950	10-20-1998	Diab et al.	
	87	5,826,885	10-27-1998	Helgeland	

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U.S. PATENT DOCUMENTS					
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	88	5,830,131	11-03-1998	Caro et al.	
	89	5,833,618	11-10-1998	Caro et al.	
	90	5,851,178	12-22-1998	Aronow	
	91	5,860,919	01-19-1999	Kiani-Azarbayjany et al.	
	92	5,890,929	04-06-1999	Mills et al.	
	93	5,902,235	05-11-1999	Lewis et al.	
	94	5,903,357	05-11-1999	Colak	
	95	5,904,654	05-18-1999	Wohltmann et al.	
	96	5,919,134	07-06-1999	Diab	
	97	5,934,925	08-10-1999	Tobler et al.	
	98	5,940,182	08-17-1999	Lepper, Jr. et al.	
	99	5,957,840	09-28-1999	Terasawa et al.	
	100	5,995,855	11-30-1999	Kiani et al.	
	101	5,997,343	12-07-1999	Mills et al.	
	102	6,002,952	12-14-1999	Diab et al.	
	103	6,011,986	01-04-2000	Diab et al.	
	104	6,027,452	02-22-2000	Flaherty et al.	
	105	6,036,642	03-14-2000	Diab et al.	
	106	6,045,509	04-04-2000	Caro et al.	
	107	6,049,727	04-11-2000	Crothall, Katherine D.	
	108	6,067,462	05-23-2000	Diab et al.	
	109	6,081,735	06-27-2000	Diab et al.	
	110	6,088,607	07-11-2000	Diab et al.	
	111	6,110,522	08-29-2000	Lepper, Jr. et al.	
	112	6,124,597	09-26-2000	Shehada	
	113	6,128,521	10-03-2000	Marro et al.	
	114	6,129,675	10-10-2000	Jay	
	115	6,144,866	11-07-2000	Miesel et al.	
	116	6,144,868	11-07-2000	Parker	

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U.S. PATENT DOCUMENTS					
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	117	6,151,516	11-21-2000	Kiani-Azarbayjany et al.	
	118	6,152,754	11-28-2000	Gerhardt et al.	
	119	6,157,850	12-05-2000	Diab et al.	
	120	6,165,005	12-26-2000	Mills et al.	
	121	6,172,743	01-09-2001	Kley, et al.	
	122	6,181,958	01-30-2001	Steuer et al.	
	123	6,184,521	02-06-2001	Coffin, IV et al.	
	124	6,206,830	03-27-2001	Diab et al.	
	125	6,223,063	04-24-2001	Chaiken et al.	
	126	6,229,856	05-08-2001	Diab et al.	
	127	6,232,609	05-15-2001	Snyder, et al.	
	128	6,236,872	05-22-2001	Diab et al.	
	129	6,241,683	06-05-2001	Macklem, et al.	
	130	6,253,097	06-26-2001	Aronow et al.	
	131	6,256,523	07-03-2001	Diab et al.	
	132	6,263,222	07-17-2001	Diab et al.	
	133	6,278,522	08-21-2001	Lepper, Jr. et al.	
	134	6,278,889	08-21-2001	Robinson	
	135	6,280,213	08-28-2001	Tobler et al.	
	136	6,285,896	09-04-2001	Tobler et al.	
	137	6,301,493	10-09-2001	Marro et al.	
	138	6,317,627	11-13-2001	Ennen et al.	
	139	6,321,100	11-20-2001	Parker	
	140	6,325,761	12-04-2001	Jay	
	141	6,334,065	12-25-2001	Al-Ali et al.	
	142	6,343,223	01-29-2002	Chin et al.	
	143	6,343,224	01-29-2002	Parker	
	144	6,345,194	02-05-2002	Robert Nelson, et al.	
	145	6,349,228	02-19-2002	Kiani et al.	

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	146	6,353,750	03-05-2002	Kimura et al.	
	147	6,360,113	03-09-2002	Dettling, Allen	
	148	6,360,114	03-09-2002	Diab et al.	
	149	6,360,115	03-19-2002	Roger Greenwald, et al.	
	150	6,368,283	04-09-2002	Xu, et al.	
	151	6,371,921	04-16-2002	Caro et al.	
	152	6,377,829	04-23-2002	Al-Ali	
	153	6,388,240	05-14-2002	Schulz et al.	
	154	6,397,091	05-28-2002	Diab et al.	
	155	6,430,437	08-06-2002	Marro	
	156	6,430,525	08-06-2002	Weber et al.	
	157	6,463,311	10-08-2002	Diab	
	158	6,470,199	10-22-2002	Kopotic et al.	
	159	6,501,975	12-31-2002	Diab et al.	
	160	6,505,059	01-07-2003	Kollias, et al.	
	161	6,515,273	02-04-2003	Al-Ali	
	162	6,519,487	02-11-2003	Parker	
	163	6,522,521	02-18-2003	Mizuno et al.	
	164	6,525,386	02-25-2003	Mills et al.	
	165	6,526,300	02-25-2003	Kiani et al.	
	166	6,541,756	04-01-2003	Schulz et al.	
	167	6,542,764	04-01-2003	Al-Ali et al.	
	168	6,580,086	06-17-2003	Schulz et al.	
	169	6,584,336	06-24-2003	Ali et al.	
	170	6,595,316	07-22-2003	Cybulski et al.	
	171	6,597,932	07-22-2003	Tian et al.	
	172	6,597,933	07-22-2003	Kiani et al.	
	173	6,606,509	08-12-2003	Schmitt, Joseph M.	
	174	6,606,511	08-12-2003	Ali et al.	

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U.S. PATENT DOCUMENTS					
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	175	6,632,181	10-14-2003	Flaherty et al.	
	176	6,636,759	10-21-2003	Robinson	
	177	6,639,668	10-28-2003	Trepagnier, Pierre	
	178	6,639,867	10-28-2003	Shim	
	179	6,640,116	10-28-2003	Diab	
	180	6,643,530	11-04-2003	Diab et al.	
	181	6,650,917	11-18-2003	Diab et al.	
	182	6,654,624	11-25-2003	Diab et al.	
	183	6,658,276	12-02-2003	Kiani et al.	
	184	6,661,161	12-09-2003	Lanzo et al.	
	185	6,668,185	12-23-2003	Toida	
	186	6,671,531	12-30-2003	Al-Ali et al.	
	187	6,678,543	01-13-2004	Diab et al.	
	188	6,681,133	01-20-2004	Chaiken et al.	
	189	6,684,090	01-27-2004	Ali et al.	
	190	6,684,091	01-27-2004	Parker	
	191	6,697,656	02-24-2004	Al-Ali	
	192	6,697,657	02-24-2004	Shehada, et al.	
	193	6,697,658	02-24-2004	Al-Ali	
	194	6,699,194	03-02-2004	Diab et al.	
	195	6,714,804	03-30-2004	Al-Ali et al.	
	196	6,721,582	04-13-2004	Trepagnier, et al.	
	197	6,721,585	04-13-2004	Parker	
	198	6,725,075	04-20-2004	Al-Ali	
	199	6,728,560	04-27-2004	Kollias, et al.	
	200	6,735,459	05-11-2004	Parker	
	201	6,745,060	06-01-2004	Diab et al.	
	202	6,748,254	06-08-2004	O'Neil et al.	
	203	6,760,607	07-06-2004	Al-Ali	

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	204	6,770,028	08-03-2004	Ali et al.	
	205	6,771,994	08-03-2004	Kiani et al.	
	206	6,792,300	09-14-2004	Diab et al.	
	207	6,813,511	11-02-2004	Diab et al.	
	208	6,816,010	11-09-2004	Seetharaman et al.	
	209	6,816,241	11-09-2004	Grubisic, et al.	
	210	6,816,741	11-09-2004	Diab	
	211	6,822,564	11-23-2004	Al-Ali	
	212	6,826,419	11-30-2004	Diab et al.	
	213	6,830,711	12-14-2004	Mills et al.	
	214	6,850,787	02-01-2005	Weber et al.	
	215	6,850,788	02-01-2005	Al-Ali	
	216	6,852,083	02-08-2005	Caro et al.	
	217	6,861,639	03-01-2005	Al-Ali	
	218	6,898,452	05-24-2005	Al-Ali et al.	
	219	6,912,413	06-28-2005	Rantala et al.	
	220	6,920,345	07-19-2005	Al-Ali et al.	
	221	6,931,268	08-16-2005	Kiani-Azarbayjany et al.	
	222	6,934,570	08-23-2005	Kiani et al.	
	223	6,939,305	09-06-2005	Flaherty et al.	
	224	6,943,348	09-13-2005	Coffin IV	
	225	6,950,687	09-27-2005	Al-Ali	
	226	6,961,598	11-01-2005	Diab	
	227	6,970,792	11-29-2005	Diab	
	228	6,979,812	12-27-2005	Al-Ali	
	229	6,985,764	01-10-2006	Mason et al.	
	230	6,993,371	01-31-2006	Kiani et al.	
	231	6,995,400	02-07-2006	Mizuyoshi	
	232	6,996,427	02-07-2006	Ali et al.	

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	233	6,999,904	02-14-2006	Weber et al.	
	234	7,003,338	02-21-2006	Weber et al.	
	235	7,003,339	02-21-2006	Diab et al.	
	236	7,015,451	03-21-2006	Dalke et al.	
	237	7,024,233	04-04-2006	Ali et al.	
	238	7,026,619	04-11-2006	Cranford	
	239	7,027,849	04-11-2006	Al-Ali	
	240	7,030,749	04-18-2006	Al-Ali	
	241	7,039,449	05-02-2006	Al-Ali	
	242	7,041,060	05-09-2006	Flaherty et al	
	243	7,044,918	05-16-2006	Diab	
	244	7,047,054	05-16-2006	Benni	
	245	7,067,893	06-27-2006	Mills et al.	
	246	7,092,757	08-15-2006	Larson et al.	
	247	7,096,052	08-22-2006	Mason et al.	
	248	7,096,054	08-22-2006	Abdul-Hafiz et al.	
	249	7,113,815	09-26-2006	O'Neil et al.	
	250	7,132,641	11-07-2006	Schulz et al.	
	251	7,142,901	11-28-2006	Kiani et al.	
	252	7,149,561	12-12-2006	Diab	
	253	7,186,966	03-06-2007	Al-Ali	
	254	7,190,261	03-13-2007	Al-Ali	
	255	7,215,984	05-08-2007	Diab	
	256	7,215,986	05-08-2007	Diab	
	257	7,221,971	05-22-2007	Diab	
	258	7,225,006	05-29-2007	Al-Ali et al.	
	259	7,225,007	05-29-2007	Al-Ali	
	260	7,230,227	06-12-2007	Wilcken et al.	
	261	7,239,905	07-03-2007	Kiani-Azarbayjany et al.	

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	262	7,245,953	07-17-2007	Parker	
	263	7,254,429	08-07-2007	Schurman et al.	
	264	7,254,431	08-07-2007	Al-Ali	
	265	7,254,433	08-07-2007	Diab et al.	
	266	7,254,434	08-07-2007	Schulz et al.	
	267	7,272,425	09-18-2007	Al-Ali	
	268	7,274,955	09-25-2007	Kiani et al.	
	269	7,280,858	10-09-2007	Al-Ali et al.	
	270	7,289,835	10-30-2007	Mansfield et al.	
	271	7,292,883	11-06-2007	De Felice et al.	
	272	7,295,866	11-13-2007	Al-Ali	
	273	7,328,053	02-05-2008	Diab et al.	
	274	7,332,784	02-19-2008	Mills, et al.	
	275	7,340,287	03-04-2008	Mason et al.	
	276	7,341,559	03-11-2008	Schulz et al.	
	277	7,343,186	03-11-2008	Lamego et al.	
	278	7,355,512	04-08-2008	Al-Ali	
	279	7,356,365	04-08-2008	Schurman	
	280	7,365,923	04-29-2008	Hargis et al.	
	281	7,371,981	05-13-2008	Abdul-Hafiz	
	282	7,373,193	05-13-2008	Al-Ali et al.	
	283	7,373,194	05-13-2008	Weber et al.	
	284	7,376,453	05-20-2008	Diab et al.	
	285	7,377,794	05-27-2008	Al Ali et al.	
	286	7,377,899	05-27-2008	Weber et al.	
	287	7,383,070	06-03-2008	Diab et al.	
	288	7,395,189	07-01-2008	Qing et al.	
	289	7,415,297	08-19-2008	Al-Ali et al.	
	290	7,428,432	09-23-2008	Ali et al.	

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	291	7,438,683	10-21-2008	Al-Ali et al.	
	292	7,440,787	10-21-2008	Diab	
	293	7,454,240	11-18-2008	Diab et al.	
	294	7,467,002	12-16-2008	Weber et al.	
	295	7,469,157	12-23-2008	Diab et al.	
	296	7,471,969	12-30-2008	Diab et al.	
	297	7,471,971	12-30-2008	Diab et al.	
	298	7,483,729	01-27-2009	Al-Ali et al.	
	299	7,483,730	01-27-2009	Diab et al.	
	300	7,489,958	02-10-2009	Diab et al.	
	301	7,496,391	02-24-2009	Diab et al.	
	302	7,496,393	02-24-2009	Diab et al.	
	303	7,499,741	03-03-2009	Diab et al.	
	304	7,499,835	03-03-2009	Weber et al.	
	305	7,500,950	03-10-2009	Al-Ali et al.	
	306	7,509,153	03-24-2009	Blank et al.	
	307	7,509,154	03-24-2009	Diab et al.	
	308	7,509,494	03-24-2009	Al-Ali	
	309	7,510,849	03-31-2009	Schurman et al.	
	310	7,519,327	04-14-2009	White	
	311	7,526,328	04-28-2009	Diab et al.	
	312	7,530,942	05-12-2009	Diab	
	313	7,530,949	05-12-2009	Al Ali et al.	
	314	7,530,955	05-12-2009	Diab et al.	
	315	7,563,110	07-21-2009	Al-Ali et al.	
	316	7,596,398	09-29-2009	Al-Ali et al.	
	317	7,601,123	10-13-2009	Tweed, et al.	
	318	7,606,606	10-20-2009	Laakkonen	
	319	7,618,375	11-17-2009	Flaherty	

Examiner Signature	Date Considered
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	16/409515
	Filing Date	May 10, 2019
	First Named Inventor	Jeroen Poeze
	Art Unit	2688
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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	320	7,647,083	01-12-2010	Al-Ali et al.	
	321	7,657,294	02-02-2010	Eghbal et al.	
	322	7,657,295	02-02-2010	Coakley et al.	
	323	7,657,296	02-02-2010	Raridan et al.	
	324	7,726,209	06-01-2010	Ruotoistenmäki	
	325	7,729,733	06-01-2010	Al-Ali et al.	
	326	7,734,320	06-08-2010	Al-Ali	
	327	7,761,127	07-20-2010	Al-Ali et al.	
	328	7,761,128	07-20-2010	Al-Ali et al.	
	329	7,764,982	07-27-2010	Dalke et al.	
	330	7,791,155	09-07-2010	Diab	
	331	7,801,581	09-21-2010	Diab	
	332	7,809,418	10-05-2010	Xu	
	333	7,822,452	10-26-2010	Schurman et al.	
	334	7,844,313	11-30-2010	Kiani et al.	
	335	7,844,314	11-30-2010	Al-Ali	
	336	7,844,315	11-30-2010	Al-Ali	
	337	7,862,523	01-04-2011	Ruotoistenmaki	
	338	7,865,222	01-04-2011	Weber et al.	
	339	7,873,497	01-18-2011	Weber et al.	
	340	7,880,606	02-01-2011	Al-Ali	
	341	7,880,626	02-01-2011	Al-Ali et al.	
	342	7,891,355	02-22-2011	Al-Ali et al.	
	343	7,894,868	02-22-2011	Al-Ali et al.	
	344	7,899,506	03-01-2011	Xu et al.	
	345	7,899,507	03-01-2011	Al-Ali et al.	
	346	7,899,518	03-01-2011	Trepagnier et al.	
	347	7,904,132	03-08-2011	Weber et al.	
	348	7,909,772	03-22-2011	Popov et al.	

Examiner Signature	Date Considered
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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	349	7,910,875	03-22-2011	Al-Ali	
	350	7,919,713	04-05-2011	Al-Ali et al.	
	351	7,937,128	05-03-2011	Al-Ali	
	352	7,937,129	05-03-2011	Mason et al.	
	353	7,937,130	05-03-2011	Diab et al.	
	354	7,941,199	05-10-2011	Kiani	
	355	7,951,086	05-31-2011	Flaherty et al.	
	356	7,957,780	06-07-2011	Lamego et al.	
	357	7,962,188	06-14-2011	Kiani et al.	
	358	7,962,190	06-14-2011	Diab et al.	
	359	7,976,472	07-12-2011	Kiani	
	360	7,988,637	08-02-2011	Diab	
	361	7,990,382	08-02-2011	Kiani	
	362	7,991,446	08-02-2011	Ali et al.	
	363	8,000,761	08-16-2011	Al-Ali	
	364	8,008,088	08-08-2011	Bellott et al.	
	365	8,019,400	09-13-2011	Diab et al.	
	366	8,028,701	10-04-2011	Al-Ali et al.	
	367	8,029,765	10-04-2011	Bellott et al.	
	368	8,036,728	10-11-2011	Diab et al.	
	369	8,044,998	10-25-2011	Heenan	
	370	8,046,040	10-25-2011	Ali et al.	
	371	8,046,041	10-25-2011	Diab et al.	
	372	8,046,042	10-25-2011	Diab et al.	
	373	8,048,040	11-01-2011	Kiani	
	374	8,050,728	11-01-2011	Al-Ali et al.	
	375	8,118,620	02-21-2012	Al-Ali et al.	
	376	8,126,528	02-28-2012	Diab et al.	
	377	8,126,531	02-28-2012	Crowley	

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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	378	8,128,572	03-06-2012	Diab et al.	
	379	8,130,105	03-06-2012	Al-Ali et al.	
	380	8,145,287	03-27-2012	Diab et al.	
	381	8,150,487	04-03-2012	Diab et al.	
	382	8,175,672	05-08-2012	Parker	
	383	8,180,420	05-15-2012	Diab et al.	
	384	8,182,443	05-22-2012	Kiani	
	385	8,185,180	05-22-2012	Diab et al.	
	386	8,190,223	05-29-2012	Al-Ali et al.	
	387	8,190,227	05-29-2012	Diab et al.	
	388	8,203,438	06-19-2012	Kiani et al.	
	389	8,203,704	06-19-2012	Merritt et al.	
	390	8,219,170	07-10-2012	Hausmann et al.	
	391	8,224,411	07-17-2012	Al-Ali et al.	
	392	8,228,181	07-24-2012	Al-Ali	
	393	8,229,532	07-24-2012	Davis	
	394	8,229,533	07-24-2012	Diab et al.	
	395	8,233,955	07-31-2012	Al-Ali et al.	
	396	8,244,325	08-14-2012	Al-Ali et al.	
	397	8,255,026	08-28-2012	Al-Ali	
	398	8,255,027	08-28-2012	Al-Ali et al.	
	399	8,255,028	08-28-2012	Al-Ali et al.	
	400	8,260,577	09-04-2012	Weber et al.	
	401	8,265,723	09-11-2012	McHale et al.	
	402	8,274,360	09-25-2012	Sampath et al.	
	403	8,289,130	10-16-2012	Nakajima et al.	
	404	8,301,217	10-30-2012	Al-Ali et al.	
	405	8,306,596	11-06-2012	Schurman et al.	
	406	8,310,336	11-13-2012	Muhsin et al.	

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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	407	8,315,683	11-20-2012	Al-Ali et al.	
	408	8,332,006	12-11-2012	Naganuma et al.	
	409	8,337,403	12-25-2012	Al-Ali et al.	
	410	8,346,330	01-01-2013	Lamego	
	411	8,353,842	01-15-2013	Al-Ali et al.	
	412	8,355,766	01-15-2013	MacNeish, III et al.	
	413	8,359,080	01-22-2013	Diab et al.	
	414	8,364,223	01-29-2013	Al-Ali et al.	
	415	8,364,226	01-29-2013	Diab et al.	
	416	8,364,389	01-29-2013	Dorogusker et al.	
	417	8,374,665	02-12-2013	Lamego	
	418	8,380,272	02-19-2013	Barrett et al.	
	419	8,385,995	02-26-2013	Al-ali et al.	
	420	8,385,996	02-26-2013	Smith et al.	
	421	8,388,353	03-05-2013	Kiani et al.	
	422	8,399,822	03-19-2013	Al-Ali	
	423	8,401,602	03-19-2013	Kiani	
	424	8,405,608	03-26-2013	Al-Ali et al.	
	425	8,414,499	04-09-2013	Al-Ali et al.	
	426	8,418,524	04-16-2013	Al-Ali	
	427	8,421,022	04-16-2013	Rozenfeld	
	428	8,423,106	04-16-2013	Lamego et al.	
	429	8,428,674	04-23-2013	Duffy et al.	
	430	8,428,967	04-23-2013	Olsen et al.	
	431	8,430,817	04-30-2013	Al-Ali et al.	
	432	8,437,825	05-07-2013	Dalvi et al.	
	433	8,455,290	06-04-2013	Siskavich	
	434	8,457,703	06-04-2013	Al-Ali	
	435	8,457,707	06-04-2013	Kiani	

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	436	8,463,349	06-11-2013	Diab et al.	
	437	8,466,286	06-18-2013	Bellot et al.	
	438	8,471,713	06-25-2013	Poeze et al.	
	439	8,473,020	06-25-2013	Kiani et al.	
	440	8,483,787	07-09-2013	Al-Ali et al.	
	441	8,489,364	07-16-2013	Weber et al.	
	442	8,498,684	07-30-2013	Weber et al.	
	443	8,504,128	08-06-2013	Blank et al.	
	444	8,509,867	08-13-2013	Workman et al.	
	445	8,515,509	08-20-2013	Bruinsma et al.	
	446	8,523,781	09-03-2013	Al-Ali	
	447	8,529,301	09-10-2013	Al-Ali et al.	
	448	8,532,727	09-10-2013	Ali et al.	
	449	8,532,728	09-10-2013	Diab et al.	
	450	8,547,209	10-01-2013	Kiani et al.	
	451	8,548,548	10-01-2013	Al-Ali	
	452	8,548,549	10-01-2013	Schurman et al.	
	453	8,548,550	10-01-2013	Al-Ali et al.	
	454	8,560,032	10-15-2013	Al-Ali et al.	
	455	8,560,034	10-15-2013	Diab et al.	
	456	8,570,167	10-29-2013	Al-Ali	
	457	8,570,503	10-29-2013	Hung Vo	
	458	8,571,617	10-29-2013	Reichgott et al.	
	459	8,571,618	10-29-2013	Lamego et al.	
	460	8,571,619	10-29-2013	Al-Ali et al.	
	461	8,577,431	11-05-2013	Lamego et al.	
	462	8,581,732	11-12-2013	Al-Ali et al.	
	463	8,584,345	11-19-2013	Al-Ali et al.	
	464	8,588,880	11-19-2013	Abdul-Hafiz et al.	

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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	465	8,600,467	12-03-2013	Al-Ali et al.	
	466	8,602,971	12-10-2013	Farr	
	467	8,606,342	12-10-2013	Diab	
	468	8,615,290	12-24-2013	Lin et al.	
	469	8,626,255	01-07-2014	Al-Ali et al.	
	470	8,630,691	01-14-2014	Lamego et al.	
	471	8,634,889	01-21-2014	Al-Ali et al.	
	472	8,641,631	02-04-2014	Sierra et al.	
	473	8,652,060	02-18-2014	Al-Ali	
	474	8,655,004	02-18-2014	Prest et al.	
	475	8,663,107	03-04-2014	Kiani	
	476	8,666,468	03-04-2014	Al-Ali	
	477	8,667,967	03-11-2014	Al-Ali et al.	
	478	8,670,811	03-11-2014	O'Reilly	
	479	8,670,814	03-11-2014	Diab et al.	
	480	8,676,286	03-18-2014	Weber et al.	
	481	8,682,407	03-25-2014	Al-Ali	
	482	8,688,183	04-01-2014	Bruinsma et al.	
	483	8,690,799	04-08-2014	Telfort et al.	
	484	8,700,111	04-15-2014	LeBoeuf et al.	
	485	8,700,112	04-15-2014	Kiani	
	486	8,702,627	04-22-2014	Telfort et al.	
	487	8,706,179	04-22-2014	Parker	
	488	8,712,494	04-29-2014	MacNeish, III et al.	
	489	8,715,206	05-06-2014	Telfort et al.	
	490	8,718,735	05-06-2014	Lamego et al.	
	491	8,718,737	05-06-2014	Diab et al.	
	492	8,718,738	05-06-2014	Blank et al.	
	493	8,720,249	05-13-2014	Al-Ali	

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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	494	8,721,541	05-13-2014	Al-Ali et al.	
	495	8,721,542	05-13-2014	Al-Ali et al.	
	496	8,723,677	05-13-2014	Kiani	
	497	8,740,792	06-03-2014	Kiani et al.	
	498	8,754,776	06-17-2014	Poeze et al.	
	499	8,755,535	06-17-2014	Telfort et al.	
	500	8,755,856	06-17-2014	Diab et al.	
	501	8,755,872	06-17-2014	Marinow	
	502	8,760,517	06-24-2014	Sarwar et al.	
	503	8,761,850	06-24-2014	Lamego	
	504	8,764,671	07-01-2014	Kiani	
	505	8,768,423	07-01-2014	Shakespeare et al.	
	506	8,771,204	07-08-2014	Telfort et al.	
	507	8,777,634	07-15-2014	Kiani et al.	
	508	8,781,543	07-15-2014	Diab et al.	
	509	8,781,544	07-15-2014	Al-Ali et al.	
	510	8,781,549	07-15-2014	Al-Ali et al.	
	511	8,788,003	07-22-2014	Schurman et al.	
	512	8,790,268	07-29-2014	Al-Ali	
	513	8,801,613	08-12-2014	Al-Ali et al.	
	514	8,821,397	09-02-2014	Al-Ali et al.	
	515	8,821,415	09-02-2014	Al-Ali et al.	
	516	8,830,449	09-09-2014	Lamego et al.	
	517	8,831,700	09-09-2014	Schurman et al.	
	518	8,840,549	09-23-2014	Al-Ali et al.	
	519	8,845,543	09-30-2014	Diab et al.	
	520	8,847,740	09-30-2014	Kiani et al.	
	521	8,849,365	09-30-2014	Smith et al.	
	522	8,852,094	10-07-2014	Al-Ali et al.	

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	523	8,852,994	10-07-2014	Wojtczuk et al.	
	524	8,868,147	10-21-2014	Stippick et al.	
	525	8,868,150	10-21-2014	Al-Ali et al.	
	526	8,870,792	10-28-2014	Al-Ali et al.	
	527	8,886,271	11-11-2014	Kiani et al.	
	528	8,888,539	11-18-2014	Al-Ali et al.	
	529	8,888,708	11-18-2014	Diab et al.	
	530	8,892,180	11-18-2014	Weber et al.	
	531	8,897,847	11-25-2014	Al-Ali	
	532	8,909,310	12-09-2014	Lamego et al.	
	533	8,911,377	12-16-2014	Al-Ali	
	534	8,912,909	12-16-2014	Al-Ali et al.	
	535	8,920,317	12-30-2014	Al-Ali et al.	
	536	8,921,699	12-30-2014	Al-Ali et al	
	537	8,922,382	12-30-2014	Al-Ali et al.	
	538	8,929,964	01-06-2015	Al-Ali et al.	
	539	8,942,777	01-27-2015	Diab et al.	
	540	8,948,834	02-03-2015	Diab et al.	
	541	8,948,835	02-03-2015	Diab	
	542	8,965,471	02-24-2015	Lamego	
	543	8,983,564	03-17-2015	Al-Ali	
	544	8,989,831	03-24-2015	Al-Ali et al.	
	545	8,996,085	03-31-2015	Kiani et al.	
	546	8,998,809	04-07-2015	Kiani	
	547	9,028,429	05-12-2015	Telfort et al.	
	548	9,037,207	05-19-2015	Al-Ali et al.	
	549	9,060,721	06-23-2015	Reichgott et al.	
	550	9,066,666	06-30-2015	Kiani	
	551	9,066,680	06-30-2015	Al-Ali et al.	

Examiner Signature	Date Considered
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PTO/SB/08 Equivalent

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	16/409515
	Filing Date	May 10, 2019
	First Named Inventor	Jeroen Poeze
	Art Unit	2688
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SHEET 20 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	552	9,072,437	07-07-2015	Paalasmaa	
	553	9,072,474	07-07-2015	Al-Ali et al.	
	554	9,078,560	07-14-2015	Schurman et al.	
	555	9,081,889	07-14-2015	Ingrassia, Jr. et al.	
	556	9,084,569	07-21-2015	Weber et al.	
	557	9,095,316	08-04-2015	Welch et al.	
	558	9,106,038	08-11-2015	Telfort et al.	
	559	9,107,625	08-18-2015	Telfort et al.	
	560	9,107,626	08-18-2015	Al-Ali et al.	
	561	9,113,831	08-25-2015	Al-Ali	
	562	9,113,832	08-25-2015	Al-Ali	
	563	9,119,595	09-01-2015	Lamego	
	564	9,131,881	09-15-2015	Diab et al.	
	565	9,131,882	09-15-2015	Al-Ali et al.	
	566	9,131,883	09-15-2015	Al-Ali	
	567	9,131,917	09-15-2015	Telfort et al.	
	568	9,138,180	09-22-2015	Coverston et al.	
	569	9,138,182	09-22-2015	Al-Ali et al.	
	570	9,138,192	09-22-2015	Weber et al.	
	571	9,142,117	09-22-2015	Muhsin et al.	
	572	9,153,112	10-06-2015	Kiani et al.	
	573	9,153,121	10-06-2015	Kiani et al.	
	574	9,161,696	10-20-2015	Al-Ali et al.	
	575	9,161,713	10-20-2015	Al-Ali et al.	
	576	9,167,995	10-27-2015	Lamego et al.	
	577	9,176,141	11-03-2015	Al-Ali et al.	
	578	9,186,102	11-17-2015	Bruinsma et al.	
	579	9,192,312	11-24-2015	Al-Ali	
	580	9,192,329	11-24-2015	Al-Ali	

Examiner Signature	Date Considered
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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	581	9,192,351	11-24-2015	Telfort et al.	
	582	9,195,385	11-24-2015	Al-Ali et al.	
	583	9,210,566	12-08-2015	Ziemianska et al.	
	584	9,211,072	12-15-2015	Kiani	
	585	9,211,095	12-15-2015	Al-Ali	
	586	9,218,454	12-22-2015	Kiani et al.	
	587	9,226,696	01-05-2016	Kiani	
	588	9,241,662	01-26-2016	Al-Ali et al.	
	589	9,245,668	01-26-2016	Vo et al.	
	590	9,259,185	02-16-2016	Abdul-Hafiz et al.	
	591	9,267,572	02-23-2016	Barker et al.	
	592	9,277,880	03-08-2016	Poeze et al.	
	593	9,289,167	03-22-2016	Diab et al.	
	594	9,295,421	03-29-2016	Kiani et al.	
	595	9,307,928	04-12-2016	Al-Ali et al.	
	596	9,311,382	04-12-2016	Varoglu et al.	
	597	9,323,894	04-26-2016	Kiani	
	598	9,326,712	05-03-2016	Kiani	
	599	9,333,316	05-10-2016	Kiani	
	600	9,339,220	05-17-2016	Lamego et al.	
	601	9,341,565	05-17-2016	Lamego et al.	
	602	9,351,673	05-31-2016	Diab et al.	
	603	9,351,675	05-31-2016	Al-Ali et al.	
	604	9,357,665	05-31-2016	Myers et al.	
	605	9,364,181	06-14-2016	Kiani et al.	
	606	9,368,671	06-14-2016	Wojtczuk et al.	
	607	9,370,325	06-21-2016	Al-Ali et al.	
	608	9,370,326	06-21-2016	McHale et al.	
	609	9,370,335	06-21-2016	Al-ali et al.	

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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	610	9,375,185	06-28-2016	Ali et al.	
	611	9,386,953	07-12-2016	Al-Ali	
	612	9,386,961	07-12-2016	Al-Ali et al.	
	613	9,392,945	07-19-2016	Al-Ali et al.	
	614	9,397,448	07-19-2016	Al-Ali et al.	
	615	9,489,081	11-08-2016	Anzures et al.	
	616	9,497,534	11-15-2016	Prest et al.	
	617	9,526,430	12-27-2016	Srinivas et al.	
	618	9,553,625	01-24-2017	Hatanaka et al.	
	619	9,591,975	03-14-2017	Dalvi et al.	
	620	9,593,969	03-14-2017	King	
	621	9,651,405	05-16-2017	Gowreesunker et al.	
	622	9,668,676	06-06-2017	Culbert	
	623	9,668,680	06-06-2017	Bruinsma et al.	
	624	9,699,546	07-04-2017	Qian et al.	
	625	9,716,937	07-25-2017	Qian et al.	
	626	9,717,425	08-01-2017	Kiani et al.	
	627	9,723,997	08-08-2017	Lamego	
	628	9,781,984	10-10-2017	Baranski et al.	
	629	9,838,775	12-05-2017	Qian et al.	
	630	9,848,823	12-26-2017	Raghuram et al.	
	631	9,866,671	01-09-2018	Thompson et al.	
	632	9,867,575	01-16-2018	Maani et al.	
	633	9,898,049	02-20-2018	Myers et al.	
	634	9,918,646	03-20-2018	Singh Alvarado et al.	
	635	9,952,095	04-24-2018	Hotelling et al.	
	636	10,039,080	07-31-2018	Miller et al.	
	637	10,055,121	08-21-2018	Chaudhri et al.	
	638	10,066,970	09-04-2018	Gowreesunker et al.	

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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	639	10,076,257	09-18-2018	Lin et al.	
	640	10,078,052	09-18-2018	Ness et al.	
	641	10,258,265	04-16-2019	Poeze et al.	
	642	10,258,266	04-16-2019	Poeze et al.	
	643	2002/0099279	07-25-2002	Pfeiffer et al.	
	644	2006/0005944	01-12-2006	Wang et al.	
	645	2006/0025659	02-02-2006	Kiguchi et al.	
	646	2006/0076473	04-13-2006	Wilcken et al.	
	647	2007/0149864	06-28-2007	Laakkonen	
	648	2007/0238955	10-11-2007	Tearney et al.	
	649	2007/0293792	12-20-2007	Sliwa et al.	
	650	2008/0130232	06-05-2008	Yamamoto	
	651	2008/0139908	06-12-2008	Kurth	
	652	2009/0030327	01-29-2009	Chance, Britton	
	653	2009/0043180	02-12-2009	Tschautscher et al.	
	654	2009/0129102	05-21-2009	Xiao et al.	
	655	2009/0247984	10-01-2009	Lamego et al.	
	656	2009/0259114	10-15-2009	Johnson et al.	
	657	2009/0275844	11-05-2009	Al-Ali	
	658	2009/0306487	12-10-2009	Crowe et al.	
	659	2010/0004518	01-07-2010	Vo et al.	
	660	2010/0030040	02-04-2010	Poeze et al.	
	661	2010/0217102	08-26-2010	LeBoeuf et al.	
	662	2011/0001605	01-06-2011	Kiani et al.	
	663	2011/0004082	01-06-2011	Poeze et al.	
	664	2011/0082711	04-07-2011	Poeze et al.	
	665	2011/0105854	05-05-2011	Kiani et al.	
	666	2011/0105865	05-05-2011	Yu et al.	
	667	2011/0208015	08-25-2011	Welch et al.	

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U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	668	2011/0213212	09-01-2011	Al-Ali	
	669	2011/0230733	09-22-2011	Al-Ali	
	670	2011/0237911	09-29-2011	Lamego et al.	
	671	2012/0059267	03-08-2012	Lamego et al.	
	672	2012/0179006	07-12-2012	Jansen et al.	
	673	2012/0209082	08-16-2012	Al-Ali	
	674	2012/0209084	08-16-2012	Olsen et al.	
	675	2012/0227739	09-13-2012	Kiani	
	676	2012/0283524	11-08-2012	Kiani et al.	
	677	2012/0296178	11-22-2012	Lamego et al.	
	678	2012/0319816	12-20-2012	Al-Ali	
	679	2012/0330112	12-27-2012	Lamego et al.	
	680	2013/0023775	01-24-2013	Lamego et al.	
	681	2013/0041591	02-14-2013	Lamego	
	682	2013/0045685	02-21-2013	Kiani	
	683	2013/0046204	02-21-2013	Lamego et al.	
	684	2013/0060147	03-07-2013	Welch et al.	
	685	2013/0096405	04-18-2013	Garfio	
	686	2013/0096936	04-18-2013	Sampath et al.	
	687	2013/0190581	07-25-2013	Al-Ali et al.	
	688	2013/0197328	08-01-2013	Diab et al.	
	689	2013/0211214	08-15-2013	Olsen	
	690	2013/0243021	09-19-2013	Siskavich	
	691	2013/0253334	09-26-2013	Al-Ali et al.	
	692	2013/0296672	11-07-2013	O'Neil et al.	
	693	2013/0317370	11-28-2013	Dalvi et al.	
	694	2013/0324808	12-05-2013	Al-Ali et al.	
	695	2013/0331670	12-12-2013	Kiani	
	696	2013/0338461	12-19-2013	Lamego et al.	

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Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	697	2014/0012100	01-09-2014	Al-Ali et al.	
	698	2014/0034353	02-06-2014	Al-Ali et al.	
	699	2014/0051953	02-20-2014	Lamego et al.	
	700	2014/0058230	02-27-2014	Abdul-Hafiz et al.	
	701	2014/0066783	03-06-2014	Kiani et al.	
	702	2014/0077956	03-20-2014	Sampath et al.	
	703	2014/0081100	03-20-2014	Muhsin et al.	
	704	2014/0081175	03-20-2014	Telfort	
	705	2014/0094667	04-03-2014	Schurman et al.	
	706	2014/0100434	04-10-2014	Diab et al.	
	707	2014/0114199	04-24-2014	Lamego et al.	
	708	2014/0120564	05-01-2014	Workman et al.	
	709	2014/0121482	05-01-2014	Merritt et al.	
	710	2014/0121483	05-01-2014	Kiani	
	711	2014/0127137	05-08-2014	Bellott et al.	
	712	2014/0129702	05-08-2014	Lamego et al.	
	713	2014/0135588	05-15-2014	Al-Ali et al.	
	714	2014/0142401	05-22-2014	Al-Ali et al.	
	715	2014/0155712	06-05-2014	Lamego et al.	
	716	2014/0163344	06-12-2014	Al-Ali	
	717	2014/0163402	06-12-2014	Lamego et al.	
	718	2014/0166076	06-19-2014	Kiani et al.	
	719	2014/0171146	06-19-2014	Ma et al.	
	720	2014/0171763	06-19-2014	Diab	
	721	2014/0180038	06-26-2014	Kiani	
	722	2014/0180154	06-26-2014	Sierra et al.	
	723	2014/0194709	07-10-2014	Al-Ali et al.	
	724	2014/0194711	07-10-2014	Al-Ali	
	725	2014/0194766	07-10-2014	Al-Ali et al.	

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	726	2014/0206963	07-24-2014	Al-Ali	
	727	2014/0213864	07-31-2014	Abdul-Hafiz et al.	
	728	2014/0243627	08-28-2014	Diab et al.	
	729	2014/0266790	09-18-2014	Al-Ali et al.	
	730	2014/0275808	09-18-2014	Poeze et al.	
	731	2014/0275835	09-18-2014	Lamego et al.	
	732	2014/0275871	09-18-2014	Lamego et al.	
	733	2014/0275872	09-18-2014	Merritt et al.	
	734	2014/0275881	09-18-2014	Lamego et al.	
	735	2014/0288400	09-25-2014	Diab et al.	
	736	2014/0296664	10-27-2014	Bruinsma et al.	
	737	2014/0303520	10-09-2014	Telfort et al.	
	738	2014/0316228	10-23-2014	Blank et al.	
	739	2014/0323825	10-30-2014	Al-Ali et al.	
	740	2014/0330092	11-06-2014	Al-Ali et al.	
	741	2014/0330098	11-06-2014	Merritt et al.	
	742	2014/0330099	11-06-2014	Al-Ali et al.	
	743	2014/0333440	11-13-2014	Kiani	
	744	2014/0336481	11-13-2014	Shakespeare et al.	
	745	2014/0343436	11-20-2014	Kiani	
	746	2015/0018650	01-15-2015	Al-Ali et al.	
	747	2015/0173671	06-25-2015	Paalasmaa et al.	
	748	2015/0255001	09-10-2015	Haughav et al.	
	749	2015/0281424	10-01-2015	Vock et al.	
	750	2015/0318100	11-05-2015	Rothkopf et al.	
	751	2015/0351697	12-10-2015	Weber et al.	
	752	2015/0351704	12-20-2015	Kiani et al.	
	753	2015/0359429	12-17-2015	Al-Ali et al.	
	754	2015/0366472	12-24-2015	Kiani	

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Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	755	2015/0366507	12-24-2015	Blank	
	756	2015/0374298	12-31-2015	Al-Ali et al.	
	757	2015/0380875	12-31-2015	Coverston et al.	
	758	2016/0000362	01-07-2016	Diab et al.	
	759	2016/0007930	01-14-2016	Weber et al.	
	760	2016/0019360	01-21-2016	Pahwa et al.	
	761	2016/0023245	01-28-2016	Zadesky et al.	
	762	2016/0029932	02-04-2016	Al-Ali	
	763	2016/0029933	02-04-2016	Al-Ali et al.	
	764	2016/0038045	02-11-2016	Shapiro	
	765	2016/0045118	02-18-2016	Kiani	
	766	2016/0051157	02-25-2016	Waydo	
	767	2016/0051158	02-25-2016	Silva	
	768	2016/0051205	02-25-2016	Al-Ali et al.	
	769	2016/0058302	03-03-2016	Raghuram et al.	
	770	2016/0058309	03-03-2016	Han	
	771	2016/0058312	03-03-2016	Han et al.	
	772	2016/0058338	03-03-2016	Schurman et al.	
	773	2016/0058347	03-03-2016	Reichgott et al.	
	774	2016/0058356	03-03-2016	Raghuram et al.	
	775	2016/0058370	03-03-2016	Raghuram et al.	
	776	2016/0066823	03-10-2016	Al-Ali et al.	
	777	2016/0066824	03-10-2016	Al-Ali et al.	
	778	2016/0066879	03-10-2016	Telfort et al.	
	779	2016/0071392	03-10-2016	Hankey et al.	
	780	2016/0072429	03-10-2016	Kiani et al.	
	781	2016/0073967	03-17-2016	Lamego et al.	
	782	2016/0081552	03-24-2016	Wojtczuk et al.	
	783	2016/0095543	04-07-2016	Telfort et al.	

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SHEET 28 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	784	2016/0095548	04-07-2016	Al-Ali et al.	
	785	2016/0103598	04-14-2016	Al-Ali et al.	
	786	2016/0113527	04-28-2016	Al-Ali et al.	
	787	2016/0143548	05-26-2016	Al-Ali	
	788	2016/0154950	06-02-2016	Nakajima et al.	
	789	2016/0157780	06-09-2016	Rimminen et al.	
	790	2016/0166183	06-16-2016	Poeze et al.	
	791	2016/0166210	06-16-2016	Al-Ali	
	792	2016/0192869	07-07-2016	Kiani et al.	
	793	2016/0196388	07-07-2016	Lamego	
	794	2016/0197436	07-07-2016	Barker et al.	
	795	2016/0213281	07-28-2016	Eckerbom, et al.	
	796	2016/0213309	07-28-2016	Sannholm et al.	
	797	2016/0256058	09-08-2016	Pham et al.	
	798	2016/0256082	09-08-2016	Ely et al.	
	799	2016/0267238	09-15-2016	Nag	
	800	2016/0287181	10-06-2016	Han et al.	
	801	2016/0296173	10-13-2016	Culbert	
	802	2016/0296174	10-13-2016	Isikman et al.	
	803	2016/0310027	10-27-2016	Han	
	804	2016/0378069	12-29-2016	Rothkopf	
	805	2016/0378071	12-29-2016	Rothkopf	
	806	2017/0007183	01-12-2017	Dusan et al.	
	807	2017/0010858	01-12-2017	Prest et al.	
	808	2017/0074897	03-16-2017	Mermel et al.	
	809	2017/0084133	03-23-2017	Cardinali et al.	
	810	2017/0086689	03-30-2017	Shui et al.	
	811	2017/0086742	03-30-2017	Harrison-Noonan et al.	
	812	2017/0086743	03-30-2017	Bushnell et al.	

Examiner Signature	Date Considered
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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /C.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT	Application No.	16/409515
	Filing Date	May 10, 2019
	First Named Inventor	Jeroen Poeze
	Art Unit	2688
(Multiple sheets used when necessary)	Examiner	Unassigned
SHEET 29 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	813	2017/0094450	03-30-2017	Tu et al.	
	814	2017/0164884	06-15-2017	Culbert et al.	
	815	2017/0248446	08-31-2017	Gowreesunker et al.	
	816	2017/0273619	09-28-2017	Alvarado et al.	
	817	2017/0281024	10-05-2017	Narasimhan et al.	
	818	2017/0293727	10-12-2017	Klaassen et al.	
	819	2017/0325698	11-16-2017	Allec et al.	
	820	2017/0325744	11-16-2017	Allec et al.	
	821	2017/0340209	11-30-2017	Klaassen et al.	
	822	2017/0340219	11-30-2017	Sullivan et al.	
	823	2017/0347885	12-07-2017	Tan et al.	
	824	2017/0354332	12-14-2017	Lamego	
	825	2017/0354795	12-14-2017	Blahnik et al.	
	826	2017/0358239	12-14-2017	Arney et al.	
	827	2017/0358240	12-14-2017	Blahnik et al.	
	828	2017/0358242	12-14-2017	Thompson et al.	
	829	2017/0360306	12-14-2017	Narasimhan et al.	
	830	2017/0366657	12-21-2017	Thompson et al.	
	831	2018/0014781	01-18-2018	Clavelle et al.	
	832	2018/0025287	01-25-2018	Mathew et al.	
	833	2018/0042556	02-15-2018	Shahparnia et al.	
	834	2018/0049694	02-22-2018	Singh Alvarado et al.	
	835	2018/0050235	02-22-2018	Tan et al.	
	836	2018/0055375	03-01-2018	Martinez et al.	
	837	2018/0055390	03-01-2018	Kiani	
	838	2018/0055439	03-01-2018	Pham et al.	
	839	2018/0056129	01-01-2018	Narasimha Rao et al.	
	840	2018/0078151	03-22-2018	Allec et al.	
	841	2018/0078182	03-22-2018	Chen et al.	

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PTO/SB/08 Equivalent

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	Filing Date	May 10, 2019
	First Named Inventor	Jeroen Poeze
	Art Unit	2688
(Multiple sheets used when necessary)	Examiner	Unassigned
SHEET 30 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	842	2018/0110469	04-26-2018	Maani et al.	
	843	2018/0153418	06-07-2018	Sullivan et al.	
	844	2018/0164853	06-14-2018	Myers et al.	
	845	2018/0196514	07-12-2018	Allec et al.	
	846	2018/0228414	08-16-2018	Shao et al.	
	847	2018/0238734	08-23-2018	Hotelling et al.	
	848	2018/0279956	10-04-2018	Waydo et al.	
	849	2019/0104973	04-11-2019	Poeze et al.	
	850	2019/0110719	04-18-2019	Poeze et al.	
	851	D326,715	06-02-1992	Schmidt, Michael	
	852	D353,195	12-06-1994	Savage et al.	
	853	D353,196	12-06-1994	Savage et al.	
	854	D356,870	03-28-1995	Ivers et al.	
	855	D359,546	06-20-1995	Savage, et al.	
	856	D361,840	08-29-1995	Savage et al.	
	857	D362,063	09-05-1995	Savage et al.	
	858	D363,120	10-10-1995	Savage et al.	
	859	D378,414	03-11-1997	Allen et al.	
	860	D390,666	02-01-1998	Lagerlof, Ingemar	
	861	D393,830	04-28-1998	Tobler et al.	
	862	D403,070	12-22-1998	Maeda et al.	
	863	D414,870	10-05-1999	Saltzstein et al.	
	864	D452,012	12-11-2001	Phillips, Barney L.	
	865	D455,834	04-16-2002	Donars et al.	
	866	D463,561	09-24-2002	Fukatsu et al.	
	867	D481,459	10-28-2003	Nahm, Werner	
	868	D502,655	03-08-2005	Huang, Chun-Mu	
	869	D508,862	08-30-2005	Behar et al.	
	870	D510,625	10-11-2005	Widener et al.	

Examiner Signature	Date Considered
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	Filing Date	May 10, 2019
	First Named Inventor	Jeroen Poeze
	Art Unit	2688
(Multiple sheets used when necessary)	Examiner	Unassigned
SHEET 31 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	871	D514,461	02-07-2006	Harju, Jonne	
	872	D535,031	01-09-2007	Barrett et al.	
	873	D537,164	02-20-2007	Shigemori et al.	
	874	D547,454	07-24-2007	Hsieh, Chin-Chih	
	875	D549,830	08-28-2007	Behar et al.	
	876	D550,364	09-04-2007	Glover et al.	
	877	D551,350	09-18-2007	Lorimer et al.	
	878	D553,248	10-16-2007	Nguyen	
	879	D554,263	10-30-2007	Al-Ali	
	880	D562,985	02-26-2008	Brefka et al.	
	881	D566,282	04-08-2008	Al-Ali et al.	
	882	D567,125	04-22-2008	Okabe et al.	
	883	D569,001	05-13-2008	Omaki	
	884	D569,521	05-20-2008	Omaki	
	885	D587,657	03-03-2009	Al-Ali et al.	
	886	D603,966	11-10-2009	Jones et al.	
	887	D606,659	12-22-2009	Kiani et al.	
	888	D609,193	02-02-2010	Al-Ali et al.	
	889	D614,305	04-20-2010	Al-Ali et al.	
	890	D621,516	08-10-2010	Kiani et al.	
	891	D692,145	10-22-2013	Al-Ali et al.	
	892	D755,392	05-03-2016	Hwang et al.	
	893	RE 37,922	12--2002	Sharan	
	894	RE 38,476	03-01-2004	Diab et al.	
	895	RE 38,492	04-06-2004	Diab et al.	
	896	RE 39,672	06-05-2007	Shehada et al.	
	897	RE 41,317	05-04-2010	Parker	
	898	RE 41,912	11-02-2010	Parker	
	899	RE 42,753	09-27-2011	Kiani-Azarbayjany et al.	

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	First Named Inventor	Jeroen Poeze
	Art Unit	2688
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SHEET 32 OF 35	Attorney Docket No.	MASCER.002C8

U.S. PATENT DOCUMENTS					
Examiner Initials	Cite No.	Document Number *Number - Kind Code (if known)* Example: 1,234,567 B1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear
	900	RE 43,169	02-07-2012	Parker	
	901	RE 43,860	12-11-2012	Parker	
	902	RE 44,823	04-01-2014	Parker	
	903	RE 44,875	04-29-2014	Kiani et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initials	Cite No.	Foreign Patent Document *Country Code-Number-Kind Code* Example: JP 1234567 A1	Publication Date MM-DD-YYYY	Name	Pages, Columns, Lines Where Relevant Passages or Relevant Figures Appear	T[1]
	904	EP 419223	03-27-1991	Minnesota Mining and Manufacturing Company		
	905	EP 1 518 494	03-30-2005	Hitachi, Ltd.		
	906	JP 08-185864	07-16-1996	Matsushita Electric Ind Co Ltd		
	907	JP 2002-500908 A	01-15-2002	Lightouch Medical Inc.		
	908	JP 2007-389463 A	11-08-2007	Konica Minolta Sensing Inc.		
	909	JP 2003-265444 A	09-24-2003	Shimadzu Corp.		
	910	JP 2003-508104 A	09-24-2003	Shimadzu Corp.		
	911	JP 08-185864	07-16-1996	Matsushita Electric Ind Co Ltd		
	912	JP 2001-66990	03-16-2001	Sumitomo Bakelite Co Ltd		
	913	JP 05-325705 A	12-10-1993	Fuji Porimatetsuku KK		
	914	JP 2001-087250 A	04-03-2001	Cas Medical Systems Inc.		
	915	JP 2006-177837 A	07-06-2006	Hitachi Ltd.		
	916	JP 2003-024276 A	01-28-2003	Pentax Corp.		
	917	JP 2008-099222 A	04-24-2008	Konica Minolta Holdings Inc.		
	918	JP 2006-198321 A	08-03-2006	Hitachi Ltd.		
	919	JP 2003-508104 A	03-04-2003	Quantum Vision Inc.		
	920	JP 5756752	06-05-2015	Masimo Laboratories, Inc.		
	921	WO 1993/12712	07-08-1993	Vivascan Corp		
	922	WO 1999/000053	01-07-1999	TOA Medical Electronics		

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SHEET 33 OF 35	Attorney Docket No.	MASCER.002C8

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	923	WO 2000/25112	05-04-2000	Rolfe		
	924	WO 2001/09589	02-08-2001	Abbott Laboratories		
	925	WO 2010/003134	01-07-2010	Masimo Laboratories, Inc.		
	926	WO 2014/149781	09-25-2014	Cercacor Laboratories, Inc.		
	927	WO 2014/158820	10-02-2014	Cercacor Laboratories, Inc.		
	928	WO 1999/01704	07-29-1999	General Electric Company		

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[1]
	929	PCT International Search Report, App. No. PCT/US2010/047899, Date of Actual Completion of Search: 01/26/2011, 4 pages.	
	930	International Search Report and Written Opinion for PCT/US2009/049638, mailed January 7, 2010.	
	931	International Search Report issued in Application No. PCT/US2009/052756, mailed February 10, 2009 in 14 pages.	
	932	International Preliminary Report on Patentability and Written Opinion of the International Searching Authority issued in Application No. PCT US2009/049638, mailed January 5, 2011 in 9 pages.	
	933	International Preliminary Report on Patentability and Written Opinion of the International Searching Authority issued in Application No. PCT/US2009/052756, mailed February 8, 2011 in 8 pages.	
	934	Burritt, Mary F.; Current Analytical Approaches to Measuring Blood Analytes; Vol. 36; No. 8(B); 1990	
	935	Hall, et al., Jeffrey W.; Near-Infrared Spectrophotometry: A New Dimension in Clinical Chemistry; Vol. 38; No. 9; 1992	
	936	Kuenstner, et al., J. Todd; Measurement of Hemoglobin in Unlysed Blood by Near-Infrared Spectroscopy; Vol. 48; Number 4, 1994	
	937	Manzke, et al., B., Multi Wavelength Pulse Oximetry in the Measurement of Hemoglobin Fractions; SPIE, Vol. 2676, April 24, 1996	
	938	Naumenko, E. K.; Choice of Wavelengths for Stable Determination of Concentrations of Hemoglobin Derivatives from Absorption Spectra of Erythrocytes; Vol. 63; No. 1; pp. 60-66 January – February 1996; Original article submitted November 3, 1994	
	939	Schmitt, Joseph M.; Simple Photon Diffusion Anaylsis of the Effects of Multiple Scattering on Pulse Oximetry; March 14, 1991; revised August 30, 1991	
	940	Schmitt, et al., Joseph M.; Measurement of Blood Hematocrit by Dual-Wavelength near-IR Photoplethysmography; Vol. 1641; 1992	

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	First Named Inventor	Jeroen Poeze
	Art Unit	2688
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SHEET 34 OF 35	Attorney Docket No.	MASCER.002C8

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[1]
	941	Schnapp, et al., L.M.; Pulse Oximetry. Uses and Abuses.; Chest 1990; 98; 1244-1250 DOI 10.1378/Chest.98.5.1244	
	942	http://www.masimo.com/rainbow/pronto.htm Noninvasive & Immediate Hemoglobin Testing, printed on August 20, 2009	
	943	http://www.masimo.com/pulseOximeter/Rad5.htm; Signal Extraction Pulse Oximeter, printed on August 20, 2009	
	944	http://blogderoliveira.blogspot.com/2008_02_01_archive.html; Ricardo Oliveira, printed on August 20, 2009	
	945	http://www.masimo.com/rad-57/; Noninvasive Measurement of Methemoglobin, Carboxyhemoglobin and Oxyhemoglobin in the blood. Printed on August 20, 2009	
	946	http://amivital.ugr.es/blog/?tag+spo2; Monitorizacion de la hemoglobina...y mucho mas, printed on August 20, 2009	
	947	http://www.masimo.com/spco/; Carboxyhemoglobin Noninvasive > Continuous > Immediate, printed on August 20, 2009	
	948	http://www.masimo.com/PARTNERS/WELCHALLYN.htm; Welch Allyn Expands Patient Monitor Capabilities with Masimo Pulse Oximetry Technology, printed on August 20, 2009	
	949	http://www.masimo.com/pulseOximeter/PPO.htm; Masimo Personal Pulse Oximeter, printed on August 20, 2009	
	950	http://www.masimo.com/generalFloor/system.htm; Masimo Patient SafetyNet System at a Glance, printed on August 20, 2009	
	951	http://www.masimo.com/partners/GRASEBY.htm; Graseby Medical Limited, printed on August 20, 2009	
	952	Japanese Office Action, re JP Application No. 2011-516895, mailed September 2, 2014, with translation. (CERCA.007JP).	
	953	Japanese Notice of Allowance, re JP Application No. 2011-516895, issued on May 12, 2015, no translation. (CERCA/MASCER.007JP).	
	954	European Office Action issued in application no. 10763901.5 on 01/11/2013. (CERCA.008EP).	
	955	European Office Action issued in application no. 10763901.5 on 08/27/2014. (CERCA.008EP).	
	956	European Office Action issued in application no. 10763901.5 on 08/06/2015. (CERCA.008EP).	
	957	European Office Action issued in Application No. 09791157.2, dated June 20, 2016. (MASCER.002EP).	
	958	KANUKURTHY et al., "Data Acquisition Unit for an Implantable Multi-Channel Optical Glucose Sensor", Electro/Information Technology Conference, Chicago, IL, USA, May 17-20, 2007, pp. 1-6	
	959	SMITH, "The Pursuit of Noninvasive Glucose: 'Hunting the Deceitful Turkey'", 2006	

Examiner Signature	Date Considered
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PTO/SB/08 Equivalent

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(Multiple sheets used when necessary)	Examiner	Unassigned
SHEET 35 OF 35	Attorney Docket No.	MASCER.002C8

NON PATENT LITERATURE DOCUMENTS			
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	960	SMALL et al., "Data Handling Issues for Near-Infrared Glucose Measurements", http://www.ieee.org/organizations/pubs/newsletters/leos/apr98/datahandling.htm, accessed 11/27/2007	

Examiner Signature	/CHU CHUAN LIU/	Date Considered	06/13/2019

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

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PART B - FEE(S) TRANSMITTAL

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

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

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(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/409,515	05/10/2019	Jeroen Poeze	MASCER.002C8	8759

TITLE OF INVENTION: MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1000	$0.00	$0.00	$1000	09/19/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
LIU, CHU CHUAN	3791	600-310000

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 Knobbe Martens
2 Olson & Bear LLP
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: Masimo Corporation

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Irvine, CA

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. 11-1410

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 /Scott Cromar/ Date 2019-06-20

Typed or printed name Scott Cromar Registration No. 65066

Please Direct All Correspondence to Customer Number 64735

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Inventor	:	Jeroen Poeze
App. No.	:	16/409515
Filed	:	May 10, 2019
For	:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
Examiner	:	Liu, Chu Chuan
Art Unit	:	3791
Conf. No.	:	8759

COMMENTS ON EXAMINER'S STATEMENT OF REASONS FOR ALLOWANCE

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

Dear Commissioner:

In response to the Examiner's Statement of Reasons for Allowance mailed on June 19, 2019, Applicant respectfully submits the following comments.

Applicant acknowledges the Examiner's statement regarding Allowable Subject Matter and agrees that the claimed subject matter is patentable. To the extent that there is any implication that the patentability of the claims rests on the recitation of a single feature, Applicant respectfully disagrees with the Examiner's Statement because it is the combination of features that makes the claims patentable. Accordingly, Applicant submits that the claims of the present application are allowable because each of the claims recites a combination of features that are not taught or suggested by the prior art. Applicant takes no other positions regarding the Allowable Subject Matter presented by the Examiner other than the positions Applicant may have previously taken during prosecution. Therefore, the Examiner's statement regarding Allowable Subject Matter should not be attributed to Applicant as an indication of the basis for

Applicant's belief that the claims are patentable. Furthermore, Applicant respectfully asserts that there may also be additional reasons for patentability of the claimed subject matter not explicitly stated in this record and Applicant does not waive rights to such arguments by not further addressing such reasons herein.

To the extent that there is any implication that the patentability of dependent claims is only attributable to the limitations in the independent claim from which each depends or that the dependent claims have the same scope as the claims from which they depend, Applicant respectfully disagrees and notes that it is each claim, taken as a whole, that is patentable. For dependent claims, their additional limitations may also provide additional reasons for patentability. Accordingly, Applicant submits that each of the allowed claims is allowable because the prior art does not teach or suggest the combination of features.

Applicant reserves the right to pursue at a later date any previously pending or other broader or narrower claims that capture any subject matter supported by the application's disclosure. Accordingly, reviewers of this or any child or related prosecution history shall not reasonably infer that the Applicant has made any disclaimers, disavowals, or abandonments of any subject matter supported by the present application, and any prior or alleged disclaimers, disavowals, or abandonments are hereby rescinded.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: June 20, 2019

By: /Scott Cromar/_____
Scott A. Cromar
Registration No. 65,066
Registered Practitioner
Customer No. 64735
(949) 760-0404

30770270

Electronic Patent Application Fee Transmittal

Application Number:	16409515
Filing Date:	10-May-2019
Title of Invention:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
First Named Inventor/Applicant Name:	Jeroen Poeze
Filer:	Scott Cromar/Frances Tsai
Attorney Docket Number:	MASCER.002C8

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	1000	1000

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1000**

Electronic Acknowledgement Receipt	
EFS ID:	36358674
Application Number:	16409515
International Application Number:	
Confirmation Number:	8759
Title of Invention:	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS
First Named Inventor/Applicant Name:	Jeroen Poeze
Customer Number:	64735
Filer:	Scott Cromar/Christina Graul
Filer Authorized By:	Scott Cromar
Attorney Docket Number:	MASCER.002C8
Receipt Date:	20-JUN-2019
Filing Date:	10-MAY-2019
Time Stamp:	14:33:19
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1000
RAM confirmation Number	062119INTEFSW14335000
Deposit Account	111410
Authorized User	Christina Graul
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	IssueFee_MASCER002C8.pdf	184482 04b91fce18cc786d7261ff671d82ebc96f98a2df	no	1
Warnings:					
Information:					
2	Post Allowance Communication - Incoming	Comments_MASCER002C8.pdf	21485 e35d3077936d3ed3ebfe70c92ee6fa51acf41831	no	2
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30186 457229e9fe4491b57197ddd77601455a6dc8c47e	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	236153		

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.

Application No.: **16/409515**
Filing Date: **May 10, 2019**

References for Examiner Consideration

Applicant wishes to draw the Examiner's attention to, and encourages the Examiner to review, the following co-owned patents and/or applications and their existing and ongoing prosecution history, including without limitation Office Actions, Amendments, Remarks, and any other potentially relevant documents:

Docket No.	Patent No.	Title	Issued
MASCER.002C1	9,277,880	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	03/08/2016 Poeze et al.
MASCER.002C3	10,258,265	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	04/16/2019 Poeze et al.
MASCER.002C4	10,258,266	MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	04/16/2019 Poeze et al.
MASCER.003A	8,630,691	MULTI-STREAM SENSOR FRONT ENDS FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	01/14/2014 Lamego et al.
MASCER.003D1	8,909,310	MULTI-STREAM SENSOR FRONT ENDS FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	12/09/2014 Lamego et al.
MASCER.004A	8,203,704	MULTI-STREAM SENSOR FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	06/19/2012 Merritt et al.
MASCER.004C1	8,570,503	HEAT SINK FOR NONINVASIVE MEDICAL SENSOR	10/29/2013 Vo et al.
CERCA.005A	8,515,509	MULTI-STREAM EMITTER FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS	08/20/2013 Bruinsma et al.
MASCER.006A	8,577,431	NOISE SHIELDING FOR A NONINVASIVE DEVICE	11/05/2013 Lamego et al.
MASCER.006C1	9,717,425	NOISE SHIELDING FOR A NONINVASIVE DEVICE	08/01/2017 Kiani et al.
MASCER.007A	8,437,825	CONTOURED PROTRUSION FOR IMPROVING SPECTROSCOPIC MEASUREMENT OF BLOOD CONSTITUENTS	05/07/2013 Dalvi et al.
MASCER.007C1	9,591,975	CONTOURED PROTRUSION FOR IMPROVING SPECTROSCOPIC MEASUREMENT OF BLOOD CONSTITUENTS	03/14/2017 Dalvi et al.
MASCER.008A	8,688,183	EMITTER DRIVER FOR NONINVASIVE PATIENT MONITOR	04/01/2014 Bruinsma et al.
MASCER.008C1	9,186,102	EMITTER DRIVER FOR NONINVASIVE PATIENT MONITOR	11/17/2015 Bruinsma et al.
MASCER.008C2	9,668,680	EMITTER DRIVER FOR NONINVASIVE PATIENT MONITOR	06/06/2017 Bruinsma et al.
MASCER.009DA	D621516	PATIENT MONITORING SENSOR	08/10/2010 Kiani et al.
MASCER.010DA	D606659	PATIENT MONITOR	12/22/2009 Kiani et al.

Change(s) applied to document
/J.M./
6/26/2019

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

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/409,515	08/13/2019	10376191	MASCER.002C8	8759

64735 7590 07/24/2019

KNOBBE, MARTENS, OLSON & BEAR, LLP
MASIMO CORPORATION (MASIMO)
2040 MAIN STREET
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IRVINE, CA 92614

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):

Jeroen Poeze, Rancho Santa Margarita, CA;
Masimo Corporation, Irvine, CA;
Marcelo Lamego, Cupertino, CA;
Sean Merritt, Lake Forest, CA;
Cristiano Dalvi, Lake Forest, CA;
Hung Vo, Fountain Valley, CA;
Johannes Bruinsma, Opeinde, NETHERLANDS;
Ferdyan Lesmana, Irvine, CA;
Massi Joe E. Kiani, Laguna Niguel, CA;
Greg Olsen, Lake Forest, CA;

IR103 (Rev. 10/09)

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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
16/409,515	05/10/2019	Jeroen Poeze	MASCER.002C8

CONFIRMATION NO. 8759

64735
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PUBLICATION NOTICE

OC000000110766347

Title:MULTI-STREAM DATA COLLECTION SYSTEM FOR NONINVASIVE MEASUREMENT OF BLOOD CONSTITUENTS

Publication No.US-2019-0261896-A1
Publication Date:08/29/2019

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