

<b>PATENT ASSIGNMENT COVER SHEET</b>
--------------------------------------

Electronic Version v1.1  
 Stylesheet Version v1.2

EPAS ID: PAT5755605

<b>SUBMISSION TYPE:</b>	NEW ASSIGNMENT
<b>NATURE OF CONVEYANCE:</b>	ASSIGNMENT

**CONVEYING PARTY DATA**

Name	Execution Date
CAS MEDICAL SYSTEMS, INC.	09/23/2019

**RECEIVING PARTY DATA**

<b>Name:</b>	EDWARDS LIFESCIENCES CORPORATION
<b>Street Address:</b>	ONE EDWARDS WAY
<b>City:</b>	IRVINE
<b>State/Country:</b>	CALIFORNIA
<b>Postal Code:</b>	92614

**PROPERTY NUMBERS Total: 30**

Property Type	Number
Patent Number:	6456862
Patent Number:	7072701
Patent Number:	8078250
Patent Number:	8788004
Patent Number:	8396526
Patent Number:	8923943
Patent Number:	9456773
Patent Number:	10117610
Patent Number:	8077312
Patent Number:	8761851
Patent Number:	8965472
Patent Number:	7313427
Patent Number:	8428674
Patent Number:	8391942
Patent Number:	9693717
Patent Number:	9364175
Patent Number:	8897848
Patent Number:	9782109
Patent Number:	9848808
Patent Number:	9913601

PATENT

Property Type	Number
Patent Number:	9714969
Patent Number:	9125563
Patent Number:	D694133
Patent Number:	9888873
Patent Number:	10261010
Application Number:	15172992
Application Number:	13985232
Application Number:	15845503
Application Number:	14947809
Application Number:	15407049

**CORRESPONDENCE DATA**

**Fax Number:**

*Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.*

**Phone:** 9492502500

**Email:** Monique\_LeSadahiro@edwards.com

**Correspondent Name:** EDWARDS LIFESCIENCES CORPORATION

**Address Line 1:** ONE EDWARDS WAY

**Address Line 2:** LEGAL DEPARTMENT

**Address Line 4:** IRVINE, CALIFORNIA 92614

**ATTORNEY DOCKET NUMBER:** CAS MED ACQUISITION

**NAME OF SUBMITTER:** MONIQUE LE SADAHIRO

**SIGNATURE:** /Monique Le Sadahiro/

**DATE SIGNED:** 10/04/2019

**Total Attachments: 28**

source=CASMED ELC IP assignment#page1.tif  
source=CASMED ELC IP assignment#page2.tif  
source=CASMED ELC IP assignment#page3.tif  
source=CASMED ELC IP assignment#page4.tif  
source=CASMED ELC IP assignment#page5.tif  
source=CASMED ELC IP assignment#page6.tif  
source=CASMED ELC IP assignment#page7.tif  
source=CASMED ELC IP assignment#page8.tif  
source=CASMED ELC IP assignment#page9.tif  
source=CASMED ELC IP assignment#page10.tif  
source=CASMED ELC IP assignment#page11.tif  
source=CASMED ELC IP assignment#page12.tif  
source=CASMED ELC IP assignment#page13.tif  
source=CASMED ELC IP assignment#page14.tif  
source=CASMED ELC IP assignment#page15.tif  
source=CASMED ELC IP assignment#page16.tif

source=CASMED ELC IP assignment#page17.tif  
source=CASMED ELC IP assignment#page18.tif  
source=CASMED ELC IP assignment#page19.tif  
source=CASMED ELC IP assignment#page20.tif  
source=CASMED ELC IP assignment#page21.tif  
source=CASMED ELC IP assignment#page22.tif  
source=CASMED ELC IP assignment#page23.tif  
source=CASMED ELC IP assignment#page24.tif  
source=CASMED ELC IP assignment#page25.tif  
source=CASMED ELC IP assignment#page26.tif  
source=CASMED ELC IP assignment#page27.tif  
source=CASMED ELC IP assignment#page28.tif

## **INTELLECTUAL PROPERTY ASSIGNMENT AGREEMENT**

This Intellectual Property Assignment Agreement (the "Assignment") is hereby entered into on September 23, 2019 (the "Effective Date"), between CAS Medical Systems, Inc., a Delaware corporation ("Seller"), and Edwards Lifesciences Corporation, a Delaware corporation ("Buyer").

1. Seller desires to transfer and assign to Buyer, and Buyer desires to accept the transfer and assignment of all of Seller's right, title and interest in, to and under, all of the following (hereafter collectively referred to as "Intellectual Property"):

(i) the entire worldwide right, title and interest of Seller in and to each and all patents in the United States and in all foreign countries including, without limitation, corresponding Patent Cooperation Treaty patent applications and corresponding National patent applications and all inventions, improvements and discoveries disclosed in said patents and applications, including, but not limited to, those set forth in Schedule A hereto, and in and to all substitutions, divisions, continuations, continuations-in-part, reexaminations, extensions, renewals and reissues (as applicable) thereof, including, without limitation of generality, all rights of priority resulting from the filing of patent applications relating to any of the foregoing as well as any and all choses in action and any and all claims and demands, both at law and in equity, that Seller has or may have for damages or profits accrued or to accrue on account of the infringement of any of said patents, patent applications, inventions, improvements and discoveries (or any provisional rights therein), the same to be held and enjoyed by Buyer, its successors and assigns, as fully and entirely as the same would have been held and enjoyed by Seller if the assignment set forth in this Assignment had not been made;

(ii) the full and complete right to file patent applications in the name of the Seller or the Buyer, at the Buyer's or its designee's election, on the aforesaid inventions, improvements, discoveries and applications in all countries of the world;

(iii) the entire right, title and interest of Seller in and to any patent which may issue thereon in the United States or in any country, and any renewals, revivals, reissues, reexaminations and extensions thereof, and any patents of confirmation, registration and importation of the same;

(iv) any and all trademark and service mark rights throughout the world, including any and all applications, registrations, and common law marks, whether registered or not, together with the goodwill of the business associated with and symbolized by same, held by Seller, including, but not limited to, those set forth on Schedule A hereto, together with all common law rights therein, and the right of Seller to sue for and recover damages or profits arising out of past, present, or future infringement of any and all of said rights as fully and entirely as the same would have been held and enjoyed by Seller had this Assignment not been made;

(v) any and all works of authorship, copyrightable works, and/or copyrights throughout the world, including any and all applications, registrations, and like protections, whether registered or not, whether published or unpublished, together with all common law rights therein, and the right of Seller to sue for and recover damages or profits arising out of past, present, or future infringement of any and all of said rights as fully and entirely as the same would have been held and enjoyed by Seller had this Assignment not been made;

(vi) any and all right in and to trade secrets, know-how, inventions, methods, processes, technical data, specifications, research and development information (including safety, effectiveness, clinical, quality control and assurance data and information), design history file, design, listing file and other design control documentation, manufacturing information, technology, product roadmaps, and any other information, including rights Seller may have under the laws governing confidential information or rights in law to prevent the unauthorized use or disclosure of such information; and the right of Seller to sue for and recover damages or profits arising out of past, present, or future unauthorized use or disclosure of such information and/or infringement of any and all of said rights as fully and entirely as the same would have been held and enjoyed by Seller had this Assignment not been made; and

(vii) any other titles, rights and interests and intangible assets recognized under any laws or international conventions in any country in the world as intellectual property to which rights of ownership accrue pursuant to such laws or conventions, whether now existing or hereafter created, including, but not limited to, all of Seller's rights to the domain names set forth on Schedule A hereto; and any and all rights to sue for past, present, and future infringements, misappropriations, dilutions, violations, and other unauthorized uses of any of the foregoing clauses (i) through (vii), including the right to recover damages and to obtain any other relief.

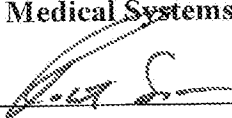
2. Seller, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, does hereby sell, convey, transfer and assign to Buyer, and Buyer hereby accepts the sale, conveyance, transfer and assignment of all right, title and interest of Seller in, to and under the Intellectual Property, including all worldwide right, title and interest of Seller in, to and under the Intellectual Property, together with the right of Seller to claim priority in all countries in accordance with international law, any and all rights of Seller corresponding to said Intellectual Property in countries throughout the world, and all of Seller's rights to sue for past, present or future infringement of said Intellectual Property worldwide together with all claims for damages by reason of past, present or future infringement of said Intellectual Property, and the right to sue for and collect the same for Buyer's own use and enjoyment, all to be held and enjoyed by said Buyer, its successors and assigns, as fully and entirely as the same would have been held and enjoyed by Seller had this Assignment not been made. Seller hereby authorizes and requests the United States Patent and Trademarks Office to issue said Patents and Trademarks in accordance with this Assignment.

3. This Assignment shall be binding upon and shall inure to the benefit of the parties and their respective successors and assigns.

4. This Assignment shall be governed by and construed in accordance with federal law, to the extent applicable, and, where state law is implicated, the internal laws of the State of California, without giving effect to any principles of conflicts of law.

IN WITNESS WHEREOF, Seller and Buyer executed and delivered this Assignment by their duly authorized representatives as of the Effective Date.

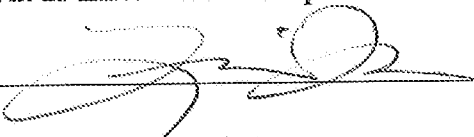
**CAS Medical Systems, Inc.**

By:  \_\_\_\_\_

Name: Robert W.A. Sellers

Title: Vice President, Corporate Controller

**Edwards Lifesciences Corporation**

By:  \_\_\_\_\_

Name: Linda J. Park

Title: Vice President, Associate General Counsel and Secretary

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

CIVIL CODE § 1189

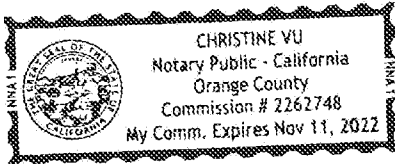
A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California )
County of Orange )
On 9/30/2019 before me, Christine Vu, Notary Public
Date Here Insert Name and Title of the Officer
personally appeared Linda J. Park
Name(s) of Signer(s)

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.



Signature [Handwritten Signature]
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: Document Date:

Number of Pages: Signer(s) Other Than Named Above:

Capacity(ies) Claimed by Signer(s)

Signer's Name:
[ ] Corporate Officer -- Title(s):
[ ] Partner -- [ ] Limited [ ] General
[ ] Individual [ ] Attorney in Fact
[ ] Trustee [ ] Guardian or Conservator
[ ] Other:
Signer Is Representing:

Signer's Name:
[ ] Corporate Officer -- Title(s):
[ ] Partner -- [ ] Limited [ ] General
[ ] Individual [ ] Attorney in Fact
[ ] Trustee [ ] Guardian or Conservator
[ ] Other:
Signer Is Representing:

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

CIVIL CODE § 1189

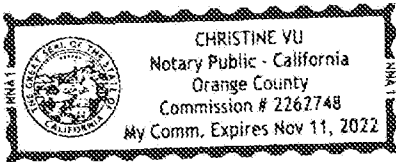
A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California )
County of Orange )
On 9/30/2019 before me, Christine Vu, Notary Public
Date Here Insert Name and Title of the Officer
personally appeared Robert W.A. Sellers
Name(s) of Signer(s)

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.



Signature Christine Vu
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document

Title or Type of Document: Document Date:
Number of Pages: Signer(s) Other Than Named Above:

Capacity(ies) Claimed by Signer(s)

Signer's Name:
Corporate Officer -- Title(s):
Partner -- Limited General
Individual Attorney in Fact
Trustee Guardian or Conservator
Other:
Signer Is Representing:

Signer's Name:
Corporate Officer -- Title(s):
Partner -- Limited General
Individual Attorney in Fact
Trustee Guardian or Conservator
Other:
Signer Is Representing:



# **Schedule A**

## **Intellectual Property**

1) Issued Patents

CAS MEDICAL SYSTEMS, INC.  
ISSUED PATENTS

Patent Ref	App Title	Country	Status	Filed Date	Application Number	Patent No.	Grant Date	Abstract
5180-0001-1	METHOD FOR NON-INVASIVE SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	United States of America	Granted	2001-04-30	09/845,146	8,458,862	2002-09-24	A method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided that utilizes a near infrared spectrophotometric (NIRS) sensor capable of transmitting a light signal into the tissue of a subject and sensing the light signal once it has passed through the tissue via transmittance or reflectance. The method includes the step of determining attenuation of the light signal as the sum of: (i) attenuation attributable to deoxyhemoglobin; (ii) attenuation attributable to oxyhemoglobin; and (iii) attenuation attributable to light scattering within the subject's tissue. The present method also makes it possible to account for attenuation attributable to fixed or constant light absorbing biological tissue components, and attenuation attributable to variable characteristics of the sensor. By determining differential attenuation as a function of wavelength, the attenuation attributable to tissue light scattering characteristics, fixed light absorbing components, and measuring apparatus characteristics are mathematically cancelled out or minimized relative to the attenuation attributable to deoxyhemoglobin, and attenuation attributable to oxyhemoglobin.
5180-0001W0EP	METHOD FOR NON-INVASIVE SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	European Patent	Granted	2001-04-30	1932756.8	1259791		A method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided that utilizes a near infrared spectrophotometric (NIRS) sensor capable of transmitting a light signal into the tissue of a subject and sensing the light signal once it has passed through the tissue via transmittance or reflectance. The method includes the step of determining attenuation of the light signal as the sum of: (i) attenuation attributable to deoxyhemoglobin; (ii) attenuation attributable to oxyhemoglobin, and (iii) attenuation attributable to light scattering within the subject's tissue. The present method also makes it possible to account for attenuation attributable to fixed or constant light absorbing biological tissue components, and attenuation attributable to variable characteristics of the sensor. By determining differential attenuation as a function of wavelength, the attenuation attributable to tissue light scattering characteristics, fixed light absorbing components, and measuring apparatus characteristics are mathematically cancelled out or minimized relative to the attenuation attributable to deoxyhemoglobin, and attenuation attributable to oxyhemoglobin. _X000D_

1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC.  
ISSUED PATENTS

5180-0001W0EPDE	METHOD FOR NON-INVASIVE SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	Germany (Federal Republic of)	Granted	2001-04-30	1932756.8	1259791	2013-11-13	A method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided that utilizes a near infrared spectrophotometric (NIRS) sensor capable of transmitting a light signal into the tissue of a subject and sensing the light signal once it has passed through the tissue via transmittance or reflectance. The method includes the step of determining attenuation of the light signal as the sum of: (i) attenuation attributable to deoxyhemoglobin; (ii) attenuation attributable to oxyhemoglobin; and (iii) attenuation attributable to light scattering within the subject's tissue. The present method also makes it possible to account for attenuation attributable to fixed or constant light absorbing biological tissue components, and attenuation attributable to variable characteristics of the sensor. By determining differential attenuation as a function of wavelength, the attenuation attributable to tissue light scattering characteristics, fixed light absorbing components, and measuring apparatus characteristics are mathematically cancelled out or minimized relative to the attenuation attributable to deoxyhemoglobin, and attenuation attributable to oxyhemoglobin.
5180-0001W0EPFR	METHOD FOR NON-INVASIVE SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	France	Granted	2001-04-30	1932756.8	1259791	2013-11-13	A method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided that utilizes a near infrared spectrophotometric (NIRS) sensor capable of transmitting a light signal into the tissue of a subject and sensing the light signal once it has passed through the tissue via transmittance or reflectance. The method includes the step of determining attenuation of the light signal as the sum of: (i) attenuation attributable to deoxyhemoglobin; (ii) attenuation attributable to oxyhemoglobin; and (iii) attenuation attributable to light scattering within the subject's tissue. The present method also makes it possible to account for attenuation attributable to fixed or constant light absorbing biological tissue components, and attenuation attributable to variable characteristics of the sensor. By determining differential attenuation as a function of wavelength, the attenuation attributable to tissue light scattering characteristics, fixed light absorbing components, and measuring apparatus characteristics are mathematically cancelled out or minimized relative to the attenuation attributable to deoxyhemoglobin, and attenuation attributable to oxyhemoglobin.

1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC.  
ISSUED PATENTS

5180-0001W0EPUK	METHOD FOR NON-INVASIVE SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	United Kingdom	Granted	2001-04-30	1932756.8	1259791	2013-11-13	A method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided that utilizes a near infrared spectrophotometric (NIRS) sensor capable of transmitting a light signal into the tissue of a subject and sensing the light signal once it has passed through the tissue via transmittance or reflectance. The method includes the step of determining attenuation of the light signal as the sum of: (i) attenuation attributable to deoxyhemoglobin; (ii) attenuation attributable to oxyhemoglobin; and (iii) attenuation attributable to light scattering within the subject's tissue. The present method also makes it possible to account for attenuation attributable to fixed or constant light absorbing biological tissue components, and attenuation attributable to variable characteristics of the sensor. By determining differential attenuation as a function of wavelength, the attenuation attributable to tissue light scattering characteristics, fixed light absorbing components, and measuring apparatus characteristics are mathematically cancelled out or minimized relative to the attenuation attributable to deoxyhemoglobin, and attenuation attributable to oxyhemoglobin. _x000D_
5180-0002-1-1	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	United States of America	Granted	2003-07-24	1,062,806.8	7,072,701	2006-07-04	A method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided that utilizes a near infrared spectrophotometric (NIRS) sensor capable of transmitting a light signal into the tissue of a subject and sensing the light signal once it has passed through the tissue via transmittance or reflectance. The method includes the steps of: (1) transmitting a light signal into the subject's tissue, wherein the transmitted light signal includes a first wavelength, a second wavelength, and a third wavelength; (2) sensing a first intensity and a second intensity of the light signal, along the first, second, and third wavelengths after the light signal travels through the subject at a first and second predetermined distance; (3) determining an attenuation of the light signal for each of the first, second, and third wavelengths using the sensed first intensity and sensed second intensity of the first, second, and third wavelengths; (4) determining a difference in attenuation of the light signal between the first wavelength and the second wavelength; and (5) determining the blood oxygen saturation level within the subject's tissue using the difference in attenuation between the first wavelength and the second wavelength, and the difference in attenuation between the first wavelength and the third wavelength.
5180-0002-1-1-1	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	United States of America	Granted	2003-07-24	1,137,689.4	8,078,250	2011-12-13	A method and apparatus for non-invasively determining the blood oxygenation within a subject's tissue is provided that utilizes a near infrared spectrophotometric (NIRS) sensor capable of transmitting a light signal into the tissue of a subject and sensing the light signal once it has passed through the tissue via transmittance or reflectance.
5180-0002-1-1-1-1	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	United States of America	Granted	2003-07-24	13,923,479	8,788,004	2014-07-22	A method and apparatus for non-invasively determining the blood oxygenation within a subject's tissue is provided that utilizes a near infrared spectrophotometric (NIRS) sensor capable of transmitting a light signal into the tissue of a subject and sensing the light signal once it has passed through the tissue via transmittance or reflectance.

1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC. ISSUED PATENTS									
5180-0002-1WOCA	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	Canada	Granted	2003-07-24	2494030	2494030	2009-06-09	<p>A method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided that utilizes a near infrared spectrophotometric (NIRS) sensor capable of transmitting a light signal into the tissue of a subject and sensing the light signal once it has passed through the transmitting a light signal into the subject's tissue, wherein the transmitted light signal includes a first wavelength, a second wavelength, and a third wavelength; (2) sensing a first intensity and a second intensity of the light signal, along the first, second, and third wavelengths after the light signal travels through the subject at a first and second predetermined distance; (3) determining an attenuation of the light signal for each of the first, second, and third wavelengths using the sensed first intensity and sensed second intensity of the first, second, and third wavelengths; (4) determining a difference in attenuation of the light signal between the first wavelength and the second wavelength, and between the first wavelength and the third wavelength; and (5) determining the blood oxygen saturation level within the subject's tissue using the difference in attenuation between the first wavelength and the second wavelength, and the difference in attenuation between the first wavelength and the third wavelength. _X000D_</p>	
5180-0002-1WOJP	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	Japan	Granted	2005-01-25	2004-524717	4465271	2010-02-28	<p>A method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided that utilizes a near infrared spectrophotometric (NIRS) sensor capable of transmitting a light signal into the tissue of a subject and sensing the light signal once it has passed through the transmitting a light signal into the subject's tissue, wherein the transmitted light signal includes a first wavelength, a second wavelength, and a third wavelength; (2) sensing a first intensity and a second intensity of the light signal, along the first, second, and third wavelengths after the light signal travels through the subject at a first and second predetermined distance; (3) determining an attenuation of the light signal for each of the first, second, and third wavelengths using the sensed first intensity and sensed second intensity of the first, second, and third wavelengths; (4) determining a difference in attenuation of the light signal between the first wavelength and the second wavelength, and between the first wavelength and the third wavelength; and (5) determining the blood oxygen saturation level within the subject's tissue using the difference in attenuation between the first wavelength and the second wavelength, and the difference in attenuation between the first wavelength and the third wavelength. _X000D_</p>	

1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC. ISSUED PATENTS	5180-0008WVOCA	IMPROVED METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	Canada	Granted	2006-05-10	2608426	2608426	2014-10-07	According to the present invention, a method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided. The method comprises the steps of: 1) providing a near infrared spectrophotometric sensor operable to transmit light along a plurality of wavelengths into the subject's tissue; 2) sensing the light transmitted into the subject's tissue using the sensor, and producing signal data representative of the light sensed from the subject's tissue; 3) processing the signal data to account for physical characteristics of the subject; and 4) determining the blood oxygen saturation level within the subject's tissue using a difference in attenuation between the wavelengths. The apparatus includes a sensor having a light source and at least one light detector, which sensor is operably connected to a processor. The sensor is operable to transmit light along a plurality of wavelengths into the subject's tissue, and produce signal data representative of the light sensed from the subject's tissue. The algorithm is operable to process the signal data to account for the physical characteristics of the subject being sensed.
	5180-0008WQEP	IMPROVED METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	European Patent	Granted	2006-05-10	1885235	06770173.0	2013-12-18	According to the present invention, a method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided. The method comprises the steps of: 1) providing a near infrared spectrophotometric sensor operable to transmit light along a plurality of wavelengths into the subject's tissue; 2) sensing the light transmitted into the subject's tissue using the sensor, and producing signal data representative of the light sensed from the subject's tissue; 3) processing the signal data to account for physical characteristics of the subject; and 4) determining the blood oxygen saturation level within the subject's tissue using a difference in attenuation between the wavelengths. The apparatus includes a sensor having a light source and at least one light detector, which sensor is operably connected to a processor. The sensor is operable to transmit light along a plurality of wavelengths into the subject's tissue, and produce signal data representative of the light sensed from the subject's tissue. The algorithm is operable to process the signal data to account for the physical characteristics of the subject being sensed.

1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC.  
ISSUED PATENTS

5180-0008WOEP-1	IMPROVED METHOD FOR EUROPEAN SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	Granted	2006-05-10	13197280.6	2708180	2018-10-24	<p>According to the present invention, a method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided. The method comprises the steps of: 1) providing a near infrared spectrophotometric sensor operable to transmit light along a plurality of wavelengths into the subject's tissue; 2) sensing the light transmitted into the subject's tissue using the sensor; and 3) producing signal data representative of the light sensed from the subject's tissue; 4) determining the blood oxygen saturation level within the subject's tissue using a difference in attenuation between the wavelengths. The apparatus includes a sensor having a light source and at least one light detector, which sensor is operably connected to a processor. The sensor is operable to transmit light along a plurality of wavelengths into the subject's tissue, and produce signal data representative of the light sensed from the subject's tissue. The algorithm is operable to process the signal data to account for the physical characteristics of the subject being sensed.</p>
5180-0008WOEP-2	IMPROVED METHOD FOR EUROPEAN SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	Granted	2006-05-10	06770173.0	1885235	2013-12-18	<p>According to the present invention, a method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided. The method comprises the steps of: 1) providing a near infrared spectrophotometric sensor operable to transmit light along a plurality of wavelengths into the subject's tissue; 2) sensing the light transmitted into the subject's tissue using the sensor; and 3) producing signal data representative of the light sensed from the subject's tissue; 4) determining the blood oxygen saturation level within the subject's tissue using a difference in attenuation between the wavelengths. The apparatus includes a sensor having a light source and at least one light detector, which sensor is operably connected to a processor. The sensor is operable to transmit light along a plurality of wavelengths into the subject's tissue, and produce signal data representative of the light sensed from the subject's tissue. The algorithm is operable to process the signal data to account for the physical characteristics of the subject being sensed.</p>

1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC.  
ISSUED PATENTS

5180-0008WOEPDE-1	IMPROVED METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	Germany (Federal Republic of)	Granted	2006-05-10	13187260.6	2708180	2018-10-24	<p>According to the present invention, a method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided. The method comprises the steps of: 1) providing a near infrared spectrophotometric sensor operable to transmit light along a plurality of wavelengths into the subject's tissue; 2) sensing the light transmitted into the subject's tissue using the sensor, and producing signal data representative of the light sensed from the subject's tissue; 3) processing the signal data to account for physical characteristics of the subject; and 4) determining the blood oxygen saturation level within the subject's tissue using a difference in attenuation between the wavelengths. The apparatus includes a sensor having a light source and at least one light detector, which sensor is operably connected to a processor. The sensor is operable to transmit light along a plurality of wavelengths into the subject's tissue, and produce signal data representative of the light sensed from the subject's tissue. The algorithm is operable to process the signal data to account for the physical characteristics of the subject being sensed.</p>
5180-0008WOEPUK	IMPROVED METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	United Kingdom	Granted	2006-05-10	06770173.0	1885235	2013-12-18	<p>According to the present invention, a method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided. The method comprises the steps of: 1) providing a near infrared spectrophotometric sensor operable to transmit light along a plurality of wavelengths into the subject's tissue; 2) sensing the light transmitted into the subject's tissue using the sensor, and producing signal data representative of the light sensed from the subject's tissue; 3) processing the signal data to account for physical characteristics of the subject; and 4) determining the blood oxygen saturation level within the subject's tissue using a difference in attenuation between the wavelengths. The apparatus includes a sensor having a light source and at least one light detector, which sensor is operably connected to a processor. The sensor is operable to transmit light along a plurality of wavelengths into the subject's tissue, and produce signal data representative of the light sensed from the subject's tissue. The algorithm is operable to process the signal data to account for the physical characteristics of the subject being sensed.</p>



1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC.  
ISSUED PATENTS

5180-0008WO/EPUK-1	IMPROVED METHOD FOR UNITED KINGDOM SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	Granted	2008-05-10	13197260.6	2708180	2018-10-24	<p>According to the present invention, a method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided. The method comprises the steps of: 1) providing a near infrared spectrophotometric sensor operable to transmit light along a plurality of wavelengths into the subject's tissue; 2) sensing the light transmitted into the subject's tissue using the sensor, and producing signal data representative of the light sensed from the subject's tissue; 3) processing the signal data to account for physical characteristics of the subject; and 4) determining the blood oxygen saturation level within the subject's tissue using a difference in attenuation between the wavelengths. The apparatus includes a sensor having a light source and at least one light detector, which sensor is operably connected to a processor. The sensor is operable to transmit light along a plurality of wavelengths into the subject's tissue, and produce signal data representative of the light sensed from the subject's tissue. The algorithm is operable to process the signal data to account for the physical characteristics of the subject being sensed.</p>
5180-0008WO/JP	IMPROVED METHOD FOR JAPAN SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	Granted	2008-05-10	2008-511319	5175179	2013-01-11	<p>According to the present invention, a method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided. The method comprises the steps of: 1) providing a near infrared spectrophotometric sensor operable to transmit light along a plurality of wavelengths into the subject's tissue; 2) sensing the light transmitted into the subject's tissue using the sensor, and producing signal data representative of the light sensed from the subject's tissue; 3) processing the signal data to account for physical characteristics of the subject; and 4) determining the blood oxygen saturation level within the subject's tissue using a difference in attenuation between the wavelengths. The apparatus includes a sensor having a light source and at least one light detector, which sensor is operably connected to a processor. The sensor is operable to transmit light along a plurality of wavelengths into the subject's tissue, and produce signal data representative of the light sensed from the subject's tissue. The algorithm is operable to process the signal data to account for the physical characteristics of the subject being sensed.</p>

1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC.  
ISSUED PATENTS

5180-008W00S	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	United States of America	Granted	2006-05-10	11/914,074	8,398,526	2013-03-12	According to the present invention, a method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided. The method comprises the steps of: 1) providing a near infrared spectrophotometric sensor operable to transmit light along a plurality of wavelengths into the subject's tissue; 2) sensing the light transmitted into the subject's tissue using the sensor, and producing signal data representative of the light sensed from the subject's tissue; 3) processing the signal data to account for physical characteristics of the subject; and 4) determining the blood oxygen saturation level within the subject's tissue using a difference in attenuation between the wavelengths. The apparatus includes a sensor having a light source and at least one light detector, which sensor is operably connected to a processor. The sensor is operable to transmit light along a plurality of wavelengths into the subject's tissue, and produce signal data representative of the light sensed from the subject's tissue. The algorithm is operable to process the signal data to account for the physical characteristics of the subject being sensed.
5180-0008W00S-1	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	United States of America	Granted	2006-05-10	13/783,964	8,923,943	2014-12-30	According to the present invention, a method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided. The method includes the steps of: a) providing a spectrophotometric sensor operable to transmit light into the subject's tissue, and to sense the light; b) detecting light after passage through the subject's tissue using the sensor, and producing initial signal data from the light sensed; c) calibrating the sensor to that particular subject using the initial signal data, thereby accounting for the specific physical characteristics of the particular subject's tissue being sensed; and d) using the calibrated sensor to determine the blood oxygen parameter value within the subject's tissue.
5180-0008W00S-1-1	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	United States of America	Granted	2006-05-10	14/549,135	9,456,773	2015-10-04	According to the present invention, a method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided. The method comprises the steps of: a) providing a spectrophotometric sensor operable to transmit light into the subject's tissue, and to sense the light; b) detecting light after passage through the subject's tissue using the sensor, and producing initial signal data from the light sensed; c) calibrating the sensor to that particular subject using the initial signal data, thereby accounting for the specific physical characteristics of the particular subject's tissue being sensed; and d) using the calibrated sensor to determine the blood oxygen parameter value within the subject's tissue.

1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC.  
ISSUED PATENTS

5180-0008W0US-1-1-1	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	United States of America	Granted	2006-05-10	15/283,883	10,117,610	2018-11-06	<p>According to the present invention, a method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided. The method comprises the steps of: 1) providing a near infrared spectrophotometric sensor operable to transmit light along a plurality of wavelengths into the subject's tissue; 2) sensing the light transmitted into the subject's tissue using the sensor; and producing signal data representative of the light sensed from the subject's tissue; 3) processing the signal data to account for physical characteristics of the subject; and 4) determining the blood oxygen saturation level within the subject's tissue using a difference in attenuation between the wavelengths. The apparatus includes a sensor having a light source and at least one light detector, which sensor is operably connected to a processor. The sensor is operable to transmit light along a plurality of wavelengths into the subject's tissue, and produce signal data representative of the light sensed from the subject's tissue. The algorithm is operable to process the signal data to account for the physical characteristics of the subject being sensed.</p>
5180-0009-1W0US	CALIBRATION DEVICE FOR A SPECTROPHOTOMETRIC SYSTEM	United States of America	Granted	2006-11-03	12/092,778	8,077,312	2011-12-13	<p>A method and apparatus for calibrating an NIRS system which includes a sensor portion and for evaluating an NIRS system for proper functioning is provided that includes an enclosure with at least two windows disposed in a wall of the enclosure. The windows allow the light source and one or more detectors of an NIRS system sensor to interface with the enclosure. One window is dedicated to the light source while each light detector has a window dedicated thereto. Thus, the enclosure includes a number of windows equal to the number of light detectors in the NIRS system sensor plus one. The inner surface of the wall(s) of the enclosure is of a light-absorbing color; e.g., black. A diffuse reflectance member of a light-reflecting color, e.g., white, is disposed in the enclosure spaced apart from the surface with the windows disposed therein.</p>

1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC.  
ISSUED PATENTS

5180-0013-1WQUS	INDICATORS FOR A SPECTROPHOTOMETRIC SYSTEM	United States of America	Granted	2006-12-06	12,096,132	8,761,851	2014-06-24	<p>A near-infrared spectrophotometric system (e.g., a cerebral oximeter) includes a sensor portion and a monitor portion. The monitor portion includes a processor that runs an algorithm which utilizes the amount of detected light to determine the value of the oxygen concentration (e.g., the absolute level) of oxygen concentration). The monitor portion also includes a visual display that displays the determined oxygen concentration values in various formats. The monitor portion may also include an audible device (e.g., a speaker), that provides audible indications of the determined oxygen concentration values. Various visual indicators may include, for example, color-coded graphs of the determined oxygenation values to alert the system user, for example, whether one hemisphere of the brain, or one or more regions of the brain, is in danger of adverse and potentially permanent damage. Also, data may be pre-processed by selecting the most clinically concerning sensor value (e.g., the sensor with the lowest value), and displaying only that sensor value and its identification on the display screen. Alternatively, an average value of multiple sensor measurements may be displayed. This reduces screen clutter and increases the speed of interpretation by the system user. Also, all sensor values may be averaged, and the average value displayed. The determined oxygenation values may also be provided in an audible format.</p>
5180-0014-1WQUS	METHOD AND APPARATUS FOR SPECTROPHOTOMETRIC BASED OXIMETRY	United States of America	Granted	2006-10-18	12,090,671	8,965,472	2015-02-24	<p>A near infrared spectrophotometric (NIRS) sensor assembly for non-invasive monitoring of blood oxygenation levels in a subject's body is provided that includes a pad, at least one light source, a near light detector, a far light detector, and a cover. The light source is operative to emit near infrared light signals of a plurality of different wavelengths. The near light detector is separated from the light source by a first distance that is great enough to position the first light detector outside of an optical shunt field extending out from the light source. The far light detector is substantially linearly aligned with the near light detector and light source, and is separated from the near light detector by a second distance, wherein the second distance is greater than the first distance.</p>

1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC.  
ISSUED PATENTS

5180-0036-1	LASER DIODE OPTICAL TRANSDUCER ASSEMBLY FOR NON-INVASIVE SPECTROPHOTOMETRIC BLOOD OXYGENATION	United States of America	Granted	1999-11-04	110384,615	7,313,427	2007-12-25	A non-invasive near infrared spectrophotometric monitoring transducer assembly includes a housing member, which is adhered directly on a patient's skin. The housing member contains a prism coupled to a flexible and lightweight single core optical light guide, which provides a means of transferring narrow spectral bandwidth light from multiple distant laser diodes of different wavelengths by use of a multi-fiber optic light combining assembly. Different wavelengths are needed to monitor the level of blood oxygenation in the patient. The assembly also contains a planar light guide mounted on the prism located in the housing member, which light guide contacts the patient's skin when the housing member is adhered to the patient's skin. The light guide controls the spacing between the prism and the patient's skin, and therefore controls the intensity of the area on the patient's skin which is illuminated by the laser light. The housing member contains a photodiode assembly, which detects the infrared light at a second location on the skin to determine light absorption. The photodiode assembly is preferably shielded from ambient electromagnetic interference (EMI) by an optically transparent EMI attenuating window. This rigid window placed over the photodiode also provides a planar interface between the assembly and the skin, improving optical coupling and stability as well as reducing the capacitive coupling between skin and the photodiode resulting in further EMI attenuation. The housing may be associated with a disposable sterile hydrogel coated adhesive envelope, or pad, which when applied to the patient's skin will adhere the housing to the patient's skin. The transducer assembly will thus be reusable, and skin-contacting part of the device, i.e., the envelope or pad can be discarded after a single use. The assembly also includes a laser safety interlock means, which is operable to turn off the laser light output in the event that the assembly accidentally becomes detached from the patient's skin.
5180-0040-1W00S	APPARATUS FOR SPECTROMETRIC BASED OXIMETRY	United States of America	Granted	2007-11-14	120514,855	8,428,674	2013-04-23	A spectrophotometric sensor assembly for non-invasive monitoring of a blood metabolite within a subject's body tissue is provided that includes a pad, a light source, and a light detector. The light source is operative to emit light signals of a plurality of different wavelengths. The light detector is operative to detect light emitted by the light source and passed through the subject's body tissue. The light detector is at least partially enclosed in EMI shielding. In some embodiments, the light detector and EMI shielding are disposed in a detector housing that encloses the light detector and shielding. The housing is aligned with a detector aperture disposed in the pad.
5180-0066-1	METHOD AND APPARATUS FOR DETERMINING CEREBRAL DESATURATION IN PATIENTS UNDERGOING DEEP HYPOTHERMIC CIRCULATORY ARREST	United States of America	Granted	2009-10-06	120574,412	8,391,942	2013-03-05	A method and apparatus for determining cerebral oxygen saturation in a subject is provided. The method comprises the steps of: a) determining tissue oxygen saturation values using a NIRS type oximeter over a period of time; b) modeling a rate of change in the tissue oxygen saturation values; and c) determining an amount of time until a predetermined tissue oxygen saturation value is reached using the modeling of the tissue oxygen saturation values.

1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC.  
ISSUED PATENTS

5180-0073-1-1W00S	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING OF THE LOWER GASTROINTESTINAL TRACT	United States of America	Granted	2010-07-12	13,383,391	9,869,717	2017-07-04	A method and apparatus for non-invasively determining a blood oxygen saturation level and/or the presence of fecal matter within a subject's lower GI tissue is provided. The method includes the steps of: a) providing a spectrophotometric sensor operable to transmit light into the subject's tissue, and to sense the light; b) sensing the subject's lower GI tissue using the sensor, and producing signal data from sensing the subject's tissue; c) processing the signal data, including determining the presence of one or more wavelength dependent light absorbing materials not present within blood within the subject's lower GI tract from the signal data; and d) determining the blood oxygen saturation level and/or presence of fecal matter within the subject's lower GI tissue, including accounting for the presence of the wavelength dependent light absorbing material not present within blood within the subject's lower GI tract determined using the signal data.
5180-0080-1W00S	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING OF ORGANS IN THE BODY	United States of America	Granted	2010-11-24	13,511,928	9,364,175	2016-06-14	A method and apparatus for non-invasively determining a blood oxygen saturation level within an organ of a subject using direct application of a near infrared spectrophotometric sensor is provided. The method includes the steps of: a) transmitting a light signal directly into the subject's organ using the sensor; b) sensing a first intensity of the light signal and a second intensity of the light signal, after the light signal travels a predetermined distance through the organ of the subject; c) determining an attenuation of the light signal along multiple different wavelengths using the sensed first intensity and sensed second intensity; d) determining a difference in attenuation of the light signal between wavelengths; and e) determining the blood oxygen saturation level within the subject's organ using the difference in attenuation between wavelengths.
5180-0084-1	APPARATUS AND METHOD FOR NON-INVASIVELY DETERMINING OXYGEN SATURATION OF VENOUS BLOOD AND CARDIAC OUTPUT USING NIRS	United States of America	Granted	2011-09-08	13,228,183	8,897,848	2014-11-25	A method and apparatus for determining a venous oxygen saturation value (SV02) of a subject is provided. The method includes the steps of: a) sensing a plurality of tissue regions on a subject using a NIRS oximeter adapted to determine a tissue oxygen saturation value (SIO2) for each region, each region independent of the other regions and each region sensed using a NIRS oximeter sensor specific to that region, and determining a SIO2 value for that region; b) assigning a coefficient to each region, each of which coefficients reflects a portion of the SIO2 value for the region attributable to a composite venous blood return representative of the tissue regions measured; and c) determining a composite SV02 value for the subject using the SIO2 region values and the respective coefficients.
5180-0085-1-1W00N	NIRS SENSOR ASSEMBLY INCLUDING ELECTRICALLY CONDUCTIVE AND OPTICALLY TRANSPARENT EMI SHIELDING	China	Granted	2012-02-13	20128001814 6.8	ZL20128001814 146.8	2016-10-26	A near infrared spectrophotometric sensor assembly for non-invasive monitoring of blood oxygenation levels in a subject's body is provided. The assembly includes at least one light source, at least one light detector operable to detect light emitted by the light source, an electromagnetic interference shielding disposed around at least a portion of the light detector, wherein the electromagnetic interference shielding includes an electrically conductive substrate that is optically transparent, and one or both of a light blocking sheet disposed relative to at least one of the light detectors and an encapsulating material.

I) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC. ISSUED PATENTS								
5180-0090-1	APPARATUS FOR MEASURING THE LUMINANCE AND TEMPERATURE OF A LIGHT SOURCE OF A SPECTROPHOTOMETRIC DEVICE	United States of America	Granted	2012-07-06	13/543,180	9,782,109	2017-10-10	A system for measuring the luminance and temperature of a light source element of a spectrophotometric device is provided. The system includes a photodiode, a luminance measuring device, a temperature measuring device, a first switch, and a controller. The photodiode is operable to receive light signals emitted by the light source element and passing through a subject's body tissue. The luminance measuring device is operable to measure luminance of the light signals received by the photodiode. The temperature measuring device is operable to measure the temperature of the photodiode. The first switch is operable to connect the photodiode to the luminance measuring device or the temperature measuring device. The controller is operable to control the connection of the first switch.
5180-0090-1EP	APPARATUS FOR MEASURING THE LUMINANCE AND TEMPERATURE OF A LIGHT SOURCE	European Patent	Granted	2012-07-06	12/175451.9	2543316	2018-09-26	A system for measuring the luminance and temperature of a light source element of a spectrophotometric device, the system comprising: a photodiode operable to receive light signals emitted by the light source element and passing through a subject's body tissue, a luminance measuring device operable to measure luminance of the light signals received by the photodiode; a temperature measuring device operable to measure the temperature of the photodiode; a first switch operable to connect the photodiode to the luminance measuring device or the temperature measuring device; a controller operable to control the connection of the first switch.
5180-0093-1-1	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	United States of America	Granted	2014-07-18	14/535,458	9,848,808	2017-12-26	An apparatus and method for non-invasively determining a blood oxygen parameter value of a subject's tissue is provided. An embodiment of the method includes the steps of: a) providing a spectrophotometric sensor that includes a processing portion and a transducer, b) detecting at least a portion of transmitted light after passage through the subject's tissue and producing initial signal data from the detected light; and c) using the processing portion to: (i) determine a value representative of an attenuation of at least one wavelength of light detected; (ii) determine whether the representative attenuation value is outside a predefined range of attenuation values; and (iii) determine the blood oxygen parameter value using a first interrogation or an alternate interrogation setting.
5180-0098-1	METHOD AND APPARATUS FOR MONITORING A BLOOD OXYGEN SATURATION LEVEL WITHIN A SUBJECT'S TISSUE	United States of America	Granted	2013-02-04	13/758,511	9,913,601	2018-03-13	A method and apparatus for monitoring a blood oxygen saturation level within a subject's tissue is provided. The method includes the steps of: a) sensing the subject's tissue using a near infrared spectrophotometric oximeter, and producing a value representative of the oxygen saturation level within the sensed tissue; b) comparing the determined saturation value to a predetermined threshold oxygen saturation value; and c) determining at least one of a time under threshold (TUT) value or an area under threshold (AUT) value using the determined saturation value and the threshold value.

1) Issued Patents (cont.)

CAS MEDICAL SYSTEMS, INC.  
ISSUED PATENTS

5180-0099-1	SYSTEMS AND METHODS FOR SPECTROSCOPIC MEASUREMENT OF A CHARACTERISTIC OF BIOLOGICAL TISSUE	United States of America	Granted	2013-09-30	14/041,733	9,714,989	2017-07-25	A method and system for spectroscopic measurement of a characteristic of a biological tissue is provided. The method includes the steps of: (1) using at least one light source to emit light that penetrates the biological tissue; (2) using at least one light detector to detect light emitted by the tissue; (3) using at least one light source and passed through the biological tissue, and to at least one light source and passed through the biological tissue, the detection signal convert the detected light into a detection signal, the detection signal including an unwanted noise component; and (3) using a processor to process the detection signal and to determine an adjusted peak-to-peak amplitude value that is representative of an amplitude of the detection signal adjusted for the unwanted noise component.
5180-0102-1	SIGNAL MONITORING SYSTEM INCLUDING EMI-SHIELDING COUPLER	United States of America	Granted	2013-10-23	14/061,308	9,125,563	2015-09-08	An apparatus for electrically and mechanically coupling a connection portion of a sensor assembly with a connection portion of an interface cable is provided. The apparatus includes a frame having an EMI shielding material. The frame defines a first port operable to engage the connection portion of the sensor assembly and a second port operable to engage the connection portion of the interface cable. The frame includes attachment features operable to mechanically secure the connection portion of the sensor assembly and the connection portion of the interface cable relative to the frame. The frame is configured to provide a Faraday Cage around substantially all of the connection portion of the sensor assembly and the connection portion of the interface cable when the connection portions are in coupled configuration.
5180-0103	NIRS SENSOR ASSEMBLY	United States of America	Granted	2012-08-07	29/429,448	D684,133	2013-11-26	Design Application
5180-0104-1	NIRS SENSOR ASSEMBLY INCLUDING EMI SHIELDING	United States of America	Granted	2013-12-10	14/102,004	9,888,873	2018-02-13	A NIRS sensor assembly includes a light source, a light detector, a first insulating layer, an EMI shielding layer, and a second insulating layer. The first insulating layer covers an exposed portion of the light detector. An optically transparent portion of the first insulating layer is aligned with an active area of the light detector. The EMI shielding layer covers the first insulating layer. An optically transparent portion of the EMI shielding layer is aligned with the active area of the light detector. The second insulating layer covers the EMI shielding layer and the first insulating layer. An optically transparent portion of the second insulating layer is aligned with the active area of the at least one light detector.



2) Pending Patent Applications

Patent Ref	App Title	Country	Status	Filed Date	Application Number	Abstract
5180-0002-1WOEP	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	European Patent	Application	2003-07-24	03771738.6	A method and apparatus for non-invasively determining the blood oxygen saturation level within a subject's tissue is provided that utilizes a near infrared spectrophotometric (NIRS) sensor capable of transmitting a light signal into the tissue of a subject and sensing the light signal once it has passed through the transmitting a light signal into the subject's tissue, wherein the transmitted light signal includes a first wavelength, a second wavelength, and a third wavelength; (2) sensing a first intensity and a second intensity of the light signal, along the first, second, and third wavelengths after the light signal travels through the subject at a first and second predetermined distance; (3) determining an attenuation of the light signal for each of the first, second, and third wavelengths using the sensed first intensity and sensed second intensity of the first, second, and third wavelengths; (4) determining a difference in attenuation of the light signal between the first wavelength and the second wavelength, and between the first wavelength and the third wavelength; and (5) determining the blood oxygen saturation level within the subject's tissue using the difference in attenuation between the first wavelength and the second wavelength, and the difference in attenuation between the first wavelength and the third wavelength. _X000D_
5180-0073-1-1-1WOEP	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING OF THE LOWER GASTROINTESTINAL TRACT	European Patent	Application	2010-07-12	10797969.2	A method and apparatus for non-invasively determining a blood oxygen saturation level and/or the presence of fecal matter within a subject's lower GI tract is provided. The method includes the steps of: a) providing a spectrophotometric sensor operable to transmit light into the subject's tissue, and to sense the light; b) sensing the subject's lower GI tissue using the sensor, and producing signal data from sensing the subject's tissue; c) processing the signal data, including determining the presence of one or more wavelength dependent light absorbing materials not present within blood within the subject's lower GI tract from the signal data; and d) determining the blood oxygen saturation level and/or presence of fecal matter within the subject's lower GI tissue, including accounting for the presence of the wavelength dependent light absorbing material not present within blood within the subject's lower GI tract determined using the signal data.
5180-0080-1WOEP	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	European Patent	Application	2010-11-24	10833955.7	A method and apparatus for non-invasively determining a blood oxygen saturation level within an organ of a subject using direct application of a near infrared spectrophotometric sensor is provided. The method includes the steps of: a) transmitting a light signal directly into the subject's organ using the sensor; b) sensing a first intensity of the light signal and a second intensity of the light signal, after the light signal travels a predetermined distance through the organ of the subject; c) determining an attenuation of the light signal along multiple different wavelengths using the sensed first intensity and sensed second intensity; d) determining a difference in attenuation of the light signal between wavelengths; and e) determining the blood oxygen saturation level within the subject's organ using the difference in attenuation between wavelengths.

2) Pending Patent Applications (cont.)

5180-0080-1WOUS-1	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING OF ORGANS IN THE BODY	United States of America	Published	2010-11-24	15/172,992	A method and apparatus for non-invasively determining a blood oxygen saturation level within an organ of a subject using direct application of a near infrared spectrophotometric sensor is provided. The method includes the steps of: a) transmitting a light signal directly into the subject's organ using the sensor; b) sensing a first intensity of the light signal and a second intensity of the light signal, after the light signal travels a predetermined distance through the organ of the subject; c) determining an attenuation of the light signal along multiple different wavelengths using the sensed first intensity and sensed second intensity; d) determining a difference in attenuation of the light signal between the subject's organ using the difference in attenuation between wavelengths.
5180-0085-1-1WOEP	NIRS SENSOR ASSEMBLY INCLUDING ELECTRICALLY CONDUCTIVE AND OPTICALLY TRANSPARENT EMI SHIELDING	European Patent	Application	2012-02-13	12744543.5	A near infrared spectrophotometric sensor assembly for non-invasive monitoring of blood oxygenation levels in a subject's body is provided. The assembly includes at least one light source, at least one light detector operable to detect light emitted by the light source, an electromagnetic interference shielding disposed around at least a portion of the light detector, wherein the electromagnetic interference shielding includes an electrically conductive substrate that is optically transparent, and one or both of a light blocking sheet disposed relative to at least one of the light detectors and an encapsulating material.
5180-0085-1-1WOUS	NIRS SENSOR ASSEMBLY INCLUDING ELECTRICALLY CONDUCTIVE AND OPTICALLY TRANSPARENT EMI SHIELDING	United States of America	Published	2012-02-13	13/985,232	A near infrared spectrophotometric sensor assembly for non-invasive monitoring of blood oxygenation levels in a subject's body is provided. The assembly includes at least one light source, at least one light detector operable to detect light emitted by the light source, an electromagnetic interference shielding disposed around at least a portion of the light detector, wherein the electromagnetic interference shielding includes an electrically conductive substrate that is optically transparent, and one or both of a light blocking sheet disposed relative to at least one of the light detectors and an encapsulating material.
5180-0093-1-1-1-1	METHOD FOR SPECTROPHOTOMETRIC BLOOD OXYGENATION MONITORING	United States of America	Published	2017-12-18	15/845,503	An apparatus and method for non-invasively determining a blood oxygen parameter value of a subject's tissue is provided. An embodiment of the method includes the steps of: a) providing a spectrophotometric sensor that includes a processing portion and a transducer; b) detecting at least a portion of transmitted light after passage through the subject's tissue and producing initial signal data from the detected light; and c) using the processing portion to: (i) determine a value representative of an attenuation of at least one wavelength of light detected; (ii) determine whether the representative attenuation value is outside a predefined range of attenuation values; and (iii) determine the blood oxygen parameter value using a first interrogation or an alternate interrogation setting.
5180-0099-1EP	SYSTEMS AND METHODS FOR SPECTROSCOPIC MEASUREMENT OF A CHARACTERISTIC OF BIOLOGICAL TISSUE	European Patent	Application	2013-09-30	13186637.8	A method and system for spectroscopic measurement of a characteristic of a biological tissue is provided. The method includes the steps of: (1) using at least one light source to emit light that penetrates the biological tissue; (2) using at least one light detector to detect light emitted by the at least one light source and passed through the biological tissue, and to convert the detected light into a detection signal, the detection signal including an unwanted noise component; and (3) using a processor to process the detection signal and to determine an adjusted peak-to-peak amplitude value that is representative of an amplitude of the detection signal adjusted for the unwanted noise component.

2) Pending Patent Applications (cont.)

5180-0107-1WOEP	METHOD AND APPARATUS FOR SPECTROPHOTOMETRICALLY DETERMINING A BLOOD OXYGEN	European Patent	Application	2013-12-10	13861614.9	According to an aspect of the present invention, a near infrared spectroscopy (NIRS) sensor assembly, system, and method for measuring a characteristic of a biological tissue is provided. The NIRS sensor assembly includes a light source, at least one light detector, and a subject contact layer. The light source is operable to emit light at one or more predetermined wavelengths. The light detector has an active area for detecting light emitted by the light source and passed through the biological tissue. The detector is operable to produce signals representative of the detected light. The subject contact layer is disposed to cover one or both of the light detector and the light source. The subject contact layer has at least one optically transmissive portion.
5180-0107-1WOUS	METHOD FOR SPECTROPHOTOMETRICALLY DETERMINING A BLOOD OXYGEN PARAMETER	United States of America	Allowed	2013-12-10	14/651,160	According to an aspect of the present invention, a near infrared spectroscopy (NIRS) sensor assembly, system, and method for measuring a characteristic of a biological tissue is provided. The NIRS sensor assembly includes a light source, at least one light detector, and a subject contact layer. The light source is operable to emit light at one or more predetermined wavelengths. The light detector has an active area for detecting light emitted by the light source and passed through the biological tissue. The detector is operable to produce signals representative of the detected light. The subject contact layer is disposed to cover one or both of the light detector and the light source. The subject contact layer has at least one optically transmissive portion.
5180-0113-1	SPECTROPHOTOMETRIC SENSOR	United States of America	Published	2015-11-20	14/947,809	A near-infrared spectroscopy (NIRS) sensor assembly for measuring a characteristic of a biological tissue is provided. The NIRS sensor assembly includes a light source, at least one light detector, and a layer disposed within the sensor assembly. The light source is operable to emit light at one or more predetermined wavelengths. The at least one light detector has an active area for detecting light emitted by the light source and passed through the biological tissue. The light detector is operable to produce signals representative of the detected light. The layer disposed within the sensor assembly has at least one deflection element.
5180-0113EP	SPECTROPHOTOMETRIC SENSOR	European Patent	Application	2015-11-20	15275238.2	A near infrared spectroscopy (NIRS) sensor assembly for measuring a characteristic of a biological tissue, the NIRS sensor assembly comprising: a light source operable to emit light at one or more predetermined wavelengths; at least one light detector having an active area for detecting light emitted by the light source and passed through the biological tissue, and which detector is operable to produce signals representative of the detected light; and a layer disposed within the sensor assembly having at least one deflection element.
5180-0117-1-1	SHIELDED, FOLDED CONNECTOR FOR A SENSOR	United States of America	Published	2017-01-16	15/407,049	An oximetry sensor assembly connector, and a method for making the same, is provided that includes a flexible circuit and a stiffener panel. The flexible circuit has a plurality of layers including at least one electrical trace layer and at least one electromagnetic interference (EMI) shield layer. The stiffener panel has a first side surface and a second side surface, which second side surface is opposite the first side surface. The flexible circuit includes a first segment and a second segment, and one or more of the plurality of layers are disposed within the first segment and the second segment. The flexible circuit is folded such that the first segment is contiguous with the first side surface of the stiffener panel, and the second segment is contiguous with the second side surface of the stiffener panel.

2) Pending Patent Applications (cont.)

5180-0117-1WODE	SHIELDED, FOLDED CONNECTOR FOR A SENSOR	Germany (Federal Republic of)	Application	2017-01-16	11 2017 000 403.9	An oximetry sensor assembly connector, and a method for making the same, is provided that includes a flexible circuit and a stiffener panel. The flexible circuit has a plurality of layers including at least one electrical trace layer and at least one electromagnetic interference (EMI) shield layer. The stiffener panel has a first side surface and a second side surface, which second side surface is opposite the first side surface. The flexible circuit includes a first segment and a second segment, and one or more of the plurality of layers are disposed within the first segment and the second segment. The flexible circuit is folded such that the first segment is contiguous with the first side surface of the stiffener panel, and the second segment is contiguous with the second side surface of the stiffener panel.
5180-0117-1W0JP	SHIELDED, FOLDED CONNECTOR FOR A SENSOR	Japan	Application	2017-01-16	2018-536627	An oximetry sensor assembly connector, and a method for making the same, is provided that includes a flexible circuit and a stiffener panel. The flexible circuit has a plurality of layers including at least one electrical trace layer and at least one electromagnetic interference (EMI) shield layer. The stiffener panel has a first side surface and a second side surface, which second side surface is opposite the first side surface. The flexible circuit includes a first segment and a second segment, and one or more of the plurality of layers are disposed within the first segment and the second segment. The flexible circuit is folded such that the first segment is contiguous with the first side surface of the stiffener panel, and the second segment is contiguous with the second side surface of the stiffener panel.
5180-0118-1W0	Method and Apparatus for Non-Invasively Measuring Circulatory Hemoglobin	Patent Cooperation Treaty	Application	2018-04-04	PCT/US2018/026140	A method of determining a non-invasive circulatory hemoglobin value, comprising: determining a NIRS totalHb value; determining a circulatory THb value by converting the NIRS TotalHb value using an empirically determined circulatory THb calibration slope value.
5180-0121-1W0	AUTOREGULATION SYSTEM AND METHOD USING TISSUE OXIMETRY AND BLOOD PRESSURE	Patent Cooperation Treaty	Application	2018-12-20	PCT/US2018/066772	A method for determining a cerebral autoregulation data in a subject, comprising: using a near-infrared spectrophotometric system (NIRS) to sense a level of a surrogate to cerebral blood flow within the subject during a period of time, which NIRS system produces signals representative of the level of a surrogate to cerebral blood flow during the period of time; using a blood pressure device configured to measure a blood pressure level of the subject during the period of time, which blood pressure device produces signals representative of the blood pressure of the subject during the period of time; determining one or more average coherence values (COHZ) in a plurality of different frequency bands using the signals representative of the level of a surrogate to cerebral blood flow during the period of time, and the signals representative of the blood pressure of the subject during the period of time; determining one or more highest COHZ values using the determined one or more COHZ values in a plurality of different frequency bands; and determining a cerebral autoregulation data using the one or more highest COHZ values.

3) Registered Trademarks

CAS MEDICAL SYSTEMS, INC.  
REGISTERED TRADEMARKS

Trademark Reference	Mark Name	Country	Status	Application Number	Filed Date	Registration Number	Registration Date	Class Description
5180-0021CA	CAS	Canada	Registered	1118945	2001-10-19	TMA605367	2004-03-16	10 - Medical devices, namely electronic respiratory monitoring apparatus for detecting sleep apnea in Int'l Class 10
5180-0027	CAS	United States of America	Registered	73/779,026	1989-02-06	1,560,705	1989-10-17	10 - Medical equipment, namely, limb boards; automatic blood pressure measuring units; blood pressure cuffs; and medical electrodes
5180-0044	CASMED	United States of America	Registered	76/662,465	2006-07-03	3,226,686	2007-04-10	10 - Medical apparatus, namely diagnostic lasers for use in measuring clinical parameters, automated blood pressure monitoring apparatus, apnea detection apparatus, blood pressure cuffs, limb boards, blood oxygenation monitoring apparatus, vital signs monitors, non-invasive blood pressure apparatus, and pressure infuser cuffs
5180-0044CT	CASMED	European Union IPO	Registered	005342308	2006-09-13	005342308	2007-08-30	10 - Medical apparatus, namely diagnostic lasers for use in measuring clinical parameters, automated blood pressure monitoring apparatus, apnea detection apparatus, blood pressure cuffs, limb boards, blood oxygenation monitoring apparatus, vital signs monitors, non-invasive blood pressure apparatus, and pressure infuser cuffs
5180-0047	FOR WHAT'S VITAL	United States of America	Registered	76/662,466	2006-07-03	3,281,295	2007-08-21	10 - Medical apparatus, namely diagnostic lasers for use in measuring clinical parameters, automated blood pressure monitoring apparatus, apnea detection apparatus, blood pressure cuffs, limb boards, blood oxygenation monitoring apparatus, vital signs monitors, non-invasive blood pressure apparatus, and pressure infuser cuffs
5180-0051	FORE-SIGHT	United States of America	Registered	76/656,020	2006-03-03	3,313,195	2007-10-16	10 - Medical apparatus, namely, cerebral oximeter for non-invasive patient monitoring
5180-0078	COOL-LIGHT	United States of America	Registered	76/698,567	2009-07-22	3,735,396	2010-07-13	10 - Medical apparatus, namely, diagnostic laser systems for use in non-invasive measurement and monitoring of oxygen saturation in a patient's blood
5180-0101	FORE-SIGHT ELITE	United States of America	Registered	85/609,577	2012-04-26	4,506,004	2009-12-29	10 - Medical apparatus, namely, oximeter for non-invasive patient monitoring
5180-0112	INTELLIGENT MONITORING DEFINED	United States of America	Registered	86/232,898	2014-03-26	4,778,304	2015-07-21	10 - Patient medical monitors for monitoring vital signs
5180-0119	THE CONFIDENCE OF KNOWING	United States of America	Registered	86/892,585	2016-02-01	5,192,345	2017-04-25	10 - Medical apparatus, namely, oximeter for non-invasive patient monitoring
5180-0120JP	SiHb	Japan	Registered	2016-129308	2016-11-17	5928817	2017-03-03	10 - Medical oximetry devices for non-invasive patient monitoring; Medical apparatus

4) Copyrights

TITLE	REGISTRATION NUMBER	COPYRIGHT NUMBER	DATE
Operation program for oscillometric blood pressure monitor	TXu2547728	V9915D244	2014
Operational program for oscillometric blood pressure monitor	n/a	TXu000254728	1986
Operational program for oscillometric blood pressure monitor	TXu2545728	V9943D130	2016

5) Domain Names:

[www.casmed.com](http://www.casmed.com)  
[www.fore-sight.com](http://www.fore-sight.com)  
[fore-sightelite.com](http://fore-sightelite.com)  
[foresightelite.com](http://foresightelite.com)  
[absoluteoximetry.com](http://absoluteoximetry.com)  
[absolutetissueoximetry.com](http://absolutetissueoximetry.com)  
[casmedical.com](http://casmedical.com)  
[casmedicalsystems.com](http://casmedicalsystems.com)  
[cerebral-oximetry.com](http://cerebral-oximetry.com)  
[cerebraloximetry.com](http://cerebraloximetry.com)  
[fore-sight-oximeter.com](http://fore-sight-oximeter.com)  
[maxnibp.com](http://maxnibp.com)  
[oemnibp.com](http://oemnibp.com)  
[tissueoximetry.net](http://tissueoximetry.net)

[foresightmedicaldevices.com](http://foresightmedicaldevices.com)  
[foresightmonitoringsolutions.com](http://foresightmonitoringsolutions.com)  
[foresighttheconfidenceofknowing.com](http://foresighttheconfidenceofknowing.com)  
[foresightconfidenceofknowing.com](http://foresightconfidenceofknowing.com)  
[foresightglobalinc.com](http://foresightglobalinc.com)  
[foresightmedicalsystems.com](http://foresightmedicalsystems.com)  
[foresightcerebraloximetry.com](http://foresightcerebraloximetry.com)  
[theconfidenceofknowing.com](http://theconfidenceofknowing.com)  
[foresightaccuracy.com](http://foresightaccuracy.com)  
[foresightconfidence.com](http://foresightconfidence.com)  
[confidenceofknowing.com](http://confidenceofknowing.com)

(6) Unregistered Copyrights

FORE-SIGHT® Manual and Software.

(7) Trade Secrets

FORE-SIGHT® algorithm.