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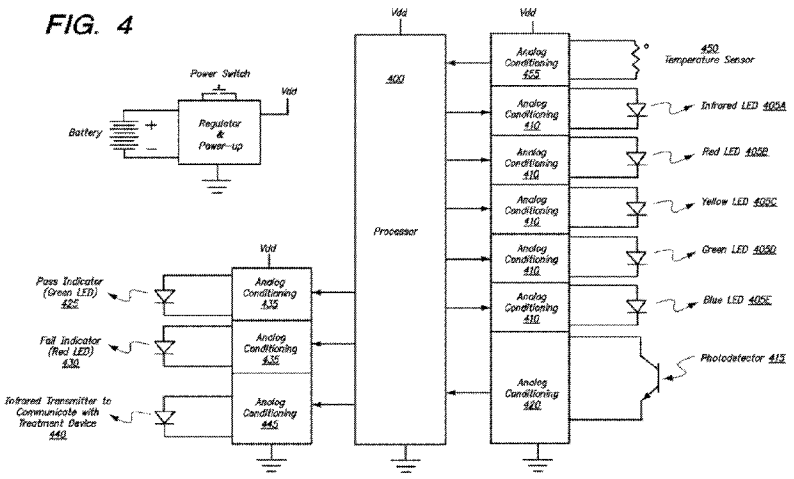
(54) **Title**: OPTICAL SENSOR AND METHOD FOR IDENTIFYING THE PRESENCE OF SKIN AND THE PIGMENTATION OF SKIN

FIG. 4



(57) **Abstract**: Apparatus and methods are provided to control a device, such as a light emitting dermatologic or cosmetic treatment device, and ensure that the device is in contact with skin while also determining the pigmentation level of skin. One or more light sources contact the skin and one or more detectors measure spectral remission from the skin. The obtained remission measurements are compared with known skin spectral remission values, and calibration allows measurements of absolute remission to be converted to fractional remission values. Skin pigmentation levels are compared to known base-line levels to determine and control appropriate treatment parameters. A temperature sensor allows correction for temperature variations. The apparatus may or may not be incorporated into the treatment device.

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OPTICAL SENSOR AND METHOD FOR IDENTIFYING THE PRESENCE OF SKIN AND THE PIGMENTATION OF SKIN

Related applications

[001] This application claims the benefit of U.S. Patent application No. 10/787,720, "Optical sensor and method for identifying the presence of skin," filed 2/25/2004, now U.S. Patent No. 7,413,567, issued on 8/19/2008, which in turn claims the benefit of U.S. Provisional Patent Applications S.N. 60/450,243, filed 2/25/2003; 60/450,598, filed 2/26/2003; 60/451,091, filed 2/28/2003; 60/452,304, filed 3/4/2003, 60/451,981 filed 3/4/2003; 60/452,591, filed 3/6/2003; 60/456,379, filed 3/20/2003; 60/456,586, filed 3/21/2003; 60/458,861, filed 3/27/2003, and 60/472,056, filed 5/20/2003, and further claims the benefit of U.S. Provisional Patent Application S.N. 61/048,154, filed 4/25/2008, having the same title and inventors as the present application, all of which are incorporated herein by reference.

Field of the Invention

[002] The present application relates generally to devices and methods for differentiating human skin from other materials, and more particularly relates to devices and methods for optically differentiating human skin on a live person from other materials including other human tissue.

Background of the Invention

[003] Prior art devices that attempt to optically detect human skin have typically suffered from a number of limitations. Among them have been the issues of temperature sensitivity, that is, performance fluctuations caused by variations in operating or environmental temperature; variations in output power of the source, or sensitivity of the sensor.

[004] Firstly, the device as described may be sensitive to temperature fluctuations. Since the LED's used as optical sources have an optical output power that depends on the temperature of the LED, the precise output power of each of the LED sources may vary with ambient temperature and may vary due to self-heating or by heating from the control electronics. Additionally, since the sensitivity of the phototransistor used to detect the remitted light may depend on the temperature of the phototransistor, the measurement of the remitted light may vary due to self-heating or by heating from the control electronics. Sources that vary in output power will affect the amount of light remitted. A phototransistor which has a sensitivity to temperature will give a measurement that has some error in the actual amount of remitted light.

[005] Further, skin sensors in the prior art typically indicate only a broad indication of the presence of skin, which is less than ideal in at least some instances. None of the prior art measures the actual spectral remission at multiple wavelengths and reports that spectral remission for

each wavelength as the fractional amount of light remitted at each wavelength. Thus, in the present invention, the ratio of the amount of light remitted at each wavelength is divided by the amount of light of that wavelength incident on the skin, and this fraction is then available for further use.

[006] In addition, the prior art is typically unable to ascertain the degree of pigmentation of the skin. This is desirable in at least some applications, especially for devices which rely upon thermolysis.

[007] As a result, there are significant shortcomings with prior art devices, and there has been a long felt need for a device and a technique which overcomes or substantially reduces these limitations.

Summary of the Invention

[008] In accordance with the present invention, a single broad-band source, or alternatively, multiple sources each of a unique emission spectra are used to illuminate a surface of interest. Multiple detectors each sensitive to a unique optical band or, alternatively, a single broad-band detector, respectively, is used to measure the amount of light remitted from said surface in each of the unique optical bands. Thus, a single broadband source can be used with multiple detectors each sensitive to a narrow wavelength band, or, alternatively, multiple narrow band sources with a single broadband detector. Still further, if increased cost and complexity is acceptable, multiple narrow band sources can be

used with multiple narrow band detectors. In such a way, the spectral remission of the surface can be measured.

[009] The spectral remission of skin, and particularly human skin in at least some embodiments, is characteristically different from most other materials. Therefore by obtaining the spectral remission from a surface of interest and by then comparing the obtained spectral remission to the spectral remission that is known to be skin one can determine whether the surface of interest is skin.

[0010] The present invention also addresses various other shortcomings of the prior art. While typical prior art optical skin-sensing devices can give variable results depending upon the operating temperature of the device, the present invention overcomes this limitation.

[0011] Therefore, the present invention provides a method for calibrating the skin sensor so that measurements of absolute remission can be converted to fractional remission.

[0012] In another embodiment of the present invention, a sensor is provided that can determine the presence of skin and also the pigmentation level of the skin.

[0013] The present invention further provides a device that is much less sensitive to ambient temperature conditions and is less sensitive to temperature variations caused by self-heating within the device.

[0014] In a preferred embodiment of the present invention a dermatological treatment device is provided which is self-contained, hand-

held, and battery powered, and which has a skin sensor that compensates for temperature fluctuations and inhibits the emission of the treatment device unless the presence of skin is detected. In this preferred embodiment the sensor further detects the pigmentation level of the skin and emission of the treatment device is inhibited unless the pigmentation level of the skin is less than a predetermined level.

[0015] Alternatively, for some embodiments, the emission of the treatment device can be adjusted in accordance with the pigmentation level of the skin.

[0016] These and other attributes of the present invention may be better appreciated from the following description of the invention, together with the Figures.

Brief Description Of The Drawings

[0017] Figure 1 illustrates in cross-sectional view an embodiment of the optical portion of a device in accordance with the invention.

[0018] Figure 2 illustrates in exploded isometric view the major components of a device as shown in Figure 1.

[0019] Figure 3 illustrates in cross-sectional side a device as shown in Figure 2.

[0020] Figure 4 illustrates a schematic diagram of the circuit of an embodiment of the invention.

Detailed Description Of The Preferred Embodiments

[0021] Apparatus and methods are provided to detect whether a device is in contact with skin and to determine the pigmentation level of skin. To determine skin contact, the apparatus and methods utilize light emitted onto the skin and detectors and sensors to measure spectral remission from the skin. The apparatus and methods further compare the obtained remission measurement with known skin spectral remission values. The sensors may be calibrated to allow measurements of absolute remission to be converted to fractional remission values. Measurements of skin pigmentation levels are compared to known base-line levels to determine appropriate treatment parameters.

[0022] The apparatus and methods may be used by incorporating the apparatus into the device itself, such as into a light based dermatologic or cosmetic treatment device, or the apparatus may be remote from and remotely control the treatment device.

[0023] The apparatus includes one or more light sources and one or more detectors. The one or more light sources may be a single broad band source or multiple single spectrum sources. The one or more detectors may be a single broad band detector or multiple detectors each sensitive to a unique optical band. In one embodiment, a single broad band source is utilized together with multiple detectors. In a second embodiment, multiple single spectrum sources are utilized together with a single broad band detector. In a third embodiment, multiple single

spectrum sources are utilized together with multiple detectors each sensitive to a unique optical band.

[0024] The apparatus and methods of the present invention include use of measured and calculated values to control operation of the device, for instance, to allow the device to turn on or to prevent the device from turning on, or, alternatively, to adjust emission levels of the device to correspond to the treatment appropriate with the measured and calculated values.

[0025] In alternative embodiments of the present invention, the apparatus and methods include temperature sensors that compensate for temperature fluctuations.

[0026] In one embodiment of the present invention, the device is incorporated within a dermatological treatment device which is self-contained, hand-held, and battery powered. A skin sensor in this embodiment compensates for temperature fluctuations and inhibits emission of the treatment device unless the presence of skin is detected and further inhibits emission unless the pigmentation level of the skin is less than a predetermined threshold level. In an alternative embodiment, the emission level is adjustable in accordance with the determined pigmentation level of the skin.

[0027] Referring now to Figures 1-3, an embodiment of the present invention is shown in various views. In the illustrated embodiment, the present invention is contained within a housing 806A-B which, depending

upon the implementation, can be either a housing separate from a treatment device or the housing of the treatment device itself. When used, a measurement aperture 814 is held against the surface of skin 813 or any other material that is suitably flat over the area of the measurement aperture. The user turns on the electronics by pressing switch 808, or any other suitable arrangement, to begin the measurement. The switch 808 is actuated by pressing button 806C. Contained within housing 806A-B are light sources 801 which emit light into a lightguide, or mixer 805. Each of light sources 801 emits a distinct and unique wavelength band, such as LED's operating in, for example, blue, green, yellow, red and infrared bands, as shown in Table I, below:

LED colors used in Skin Sensor	Peak Emission Wavelength(nm)	Spectral Line Half-Width(nm)
LED GREEN	574	15
LED SUPER RED	639	20
LED YELLOW	588	15
LED BLUE	468	25
LED INFRARED(IR)	940	50

[0028] Mixer 805 is an optically transparent material made from acrylic plastic, quartz, sapphire, glass or other suitable material for transporting light having a proximal surface nearest the sources 801 and distal surface furthest from sources 801. The walls of mixer 805 are sufficiently smooth to reduce scattering of light and to ensure that substantially all the light incident on the side walls undergoes total internal reflection. In some embodiments, mixer 805 is comprised of a material

whose index of refraction is greater than about 1.5. This ensures that substantially all of the light from sources 801 that is incident on the proximal surface of mixer 805 that is not reflected by the proximal surface of mixer 805 will undergo total internal reflection when incident on the side walls of mixer 805. In some alternative embodiments, a hollow light guide can be used. In an embodiment, the length and width of mixer 805 are chosen so that the light transported by mixer 805 is substantially spatially uniform when incident on the distal surface of mixer 805. In some embodiments, a baffle 803, is incorporated into the skin sensor so that light that undergoes Fresnel reflection when incident on the proximal surface of mixer 805 is not reflected into detector 804, since the intensity of that light would not be remitted from the skin or other surface being tested.

[0029] Light entering the proximal end of mixer 805 will travel the length of the mixer 805 to the distal end where substantially all of the light leaves the mixer and exits the device through measurement aperture 814.

[0030] In some embodiments, some of the light incident on the distal end of mixer 805 can be reflected back towards detector 804 and could contribute a non-significant offset in the measurement. To overcome this, during calibration a measurement into a black surface is made so that the light reflected by this black surface can be measured and then subtracted from subsequent measurements.

[0031] In some embodiments, a significant amount of the light that is remitted by the skin may not be collected, and therefore measured, by the device of the present invention. This is because the light incident upon the skin from the device can scatter laterally in the skin, and remit outside the area covered by the aperture of the device. The extent to which such lateral scattering occurs in skin varies with wavelength, where the scattering of blue light is small compared with the scattering of red and infrared light. In materials other than skin, the extent of such scattering can be greater or less depending upon the properties of those materials. However, such lateral scattering in skin is compensated for in at least some embodiments because the scattering adds a reproducible offset to the measurements. The lateral scattering effect can therefore be adjusted for when comparing the sample to the "known spectral remittance of skin". This compensation can be used, depending upon the embodiment, both when determining whether the sampled material is skin and also when comparing the sampled material against threshold value(s) for determining pigmentation level.

[0032] Light exiting the measurement aperture 814 of the device is incident on the skin 813 or other surface held against the measurement aperture 814 of the device. Light incident on the skin 813 or other surface is either reflected back into the mixer or enters the skin 813 or other surface. Once inside the material being measured, the light undergoes scattering and absorption. A portion of the light entering the skin is

remitted by the skin 813 or other material being measured and travels back towards the detector 804 at the proximal end of the mixer. In one embodiment, the detector 804 is a broadband detector, although detector 804 can be replaced in other embodiments by a plurality of detectors, each matched to the wavelength of one the light sources 801.

[0033] In use, each of the sources 801 is turned on sequentially, in turn, and a measurement is made of the intensity of the light remitted by the skin for that source 801 by detector 804.

[0034] In some embodiments, a temperature sensor 802 is located sufficiently near sources 801 and detector 804 so that the temperature of the sources 801 and detector 804 can be measured at nearly the same time as the remission measurement. The temperature sensor 802 can be a thermistor, thermocouple, or other suitable means for sensing the temperature in the vicinity of the sources 801 and detector 804.

[0035] In one embodiment, the device comprises a printed circuit board (PCB) 811 on which the sources 801, detector 804, temperature sensor 802, and a switch 808 are mounted. Also mounted on the PCB 811 are a processor 810, battery 812, and other electronics components 809 suitable for powering the light sources 801, and for interfacing with the temperature sensor 802, detector 804, switch 808, and indicator 807.

[0036] Processor 810 can be a simple 8 bit microcontroller. Common microcontrollers are capable of storing calibration constants and can compute the fraction of light that is remitted, including computing the

fraction of light remitted for each light source. Using appropriate programming, once the spectral remission has been calculated, the processor determines whether the spectral remission is within the range indicative of skin. Additionally the processor is programmed to determine the level of pigmentation. One suitable algorithm for determining skin pigmentation is to measure the amount of light remitted at the red wavelength and compare this to a predefined threshold. The predetermined red threshold can vary significantly depending upon the implementation, but in at least some embodiments is set in the range of 20% - 40%, before adjusting for the lateral scattering effect discussed above. In some embodiments, the red threshold is set at 28% or lower, while in other embodiments the red threshold is set to 34% or higher. If a scattering loss of approximately 30% is assumed, a 28% threshold setting becomes a 40% real threshold, 28%/(1-.3) = 40%.

[0037] Other algorithms can be used, for example algorithms considering additional wavelengths, or algorithms including adjustments for temperature or noise. The red wavelength has been determined to offer advantages over other wavelengths because it has comparatively high remission, and is less affected by variations in temperature. Alternatively, an LED operating at the same wavelength as the treatment device, for example 810 nm, can be used.

[0038] Whichever algorithm is programmed into the processor 810, the processor determines (1) whether the spectral remission is suitably

similar to skin, and (2) whether the pigmentation is below that which would present a hazard to the user undergoing treatment. The result is displayed by indicator 807. The display 807 can be a simple "go/no go" display or, alternatively, can display the results of both the skin test, i.e., skin or not skin, and the pigmentation level.

[0039] Depending upon the results of the various tests, the present invention can communicate with the treatment device to either permit or prevent emissions from the treatment device. Alternatively, the maximum fluence permitted to be emitted by the treatment device can be adjusted in accordance with the pigmentation level determined by the device of the present invention. If the device of the present invention is integrated into the treatment device, such adjustment can be implemented into the processor used to control emissions. If the device of the present invention is separate from the treatment device, the two can communicate by any suitable means, such as a wired or wireless link. Wireless links include infrared, RF, and so on, and can use any suitable protocol.

[0040] In some embodiments, the processor 810 is also programmed to correct for temperature variations at the sources 801 and detector 804. In an embodiment, the correction factor for each temperature is stored in a lookup table. Alternatively, the temperature correction factor can be implemented algorithmically. In some embodiments, temperature compensation is provided both for LED power and phototransistor sensitivity, and the LED's and phototransistor can

have opposite sensitivities so that the net sensitivity can be either positive or negative depending on whether the LED sensitivity dominates the detector sensitivity, or vice-versa. Depending on the wavelength, both positive and negative adjustments can be applied. In an embodiment, the correction is linear with temperatures over the temperature range that the detection device is expected to operate.

[0041] Figure 4 illustrates in schematic diagram of the circuit of an embodiment of the invention, in which a processor 400 sequentially pulses LEDs 405A-405E, each of which is a different wavelength band, with appropriate signal conditioning 410. The LED's illuminate the material being testing, generally skin, and the remittance from the skin for each wavelength is detected by photodetector 415, which sends the information to the processor after appropriate signal conditioning. The processor then determines whether the material being tested is skin, using the algorithms discussed above, and also determines the level of pigmentation as discussed above. Depending upon the result, one of indicators 425 or 430 is energized by the processor through appropriate signal conditioning 435. The indicators can, depending upon the embodiment, simply be a red or green LED, or can be an alphanumeric display. If the present invention is not integrated into the treatment device, the processor can also communicate with the treatment device using, for example, an infrared transmitter 440. A temperature sensor 450 also provides an input to the

processor 400 to permit the processor to compensate for temperature-induced performance variations in the LEDs and photodetector.

[0042] In the event that the device determines that the skin being tested is too heavily pigmented for safe use of the maximum fluence available from the associated treatment device, the present invention includes inhibiting the emissions of the treatment device. Such inhibition can take the form of preventing emissions above a predetermined threshold, or can proportionately degrade the fluence of one or more output levels normally available from the treatment device. For example, if a treatment device offers three fluence levels, but the pigmentation is too high for safe operation at the two top levels, in some embodiments the top two levels are simply inhibited. In other embodiments, the top two, or even all three, levels can be proportionately diminished, or shifted, to ensure safe operation. In still other embodiments, particularly for devices where the detection device and treatment device are integrated, the pigmentation is tested before each emission, and the fluence is adjusted to be appropriate for that level of pigmentation, or at least not to exceed a safe threshold for that level of pigmentation.

[0043] As stated above, the optical sensor apparatus may be integrated into various dermatologic and cosmetic devices. For purposes of illustration only, and without limited the scope of the present invention, the device may be integrated into the dermatologic devices shown in U.S. Pats. 7,452,356, 7,250,045, and 7,118,563, which are hereby incorporated

by reference in their entirety. The optical sensor apparatus is incorporated into these devices by placing the sensors/detectors around the output window of the device. Alternatively, optical fibers may be used to deliver light from the sensors to the area of the output window when the optical sensors are mounted behind the output window. In another embodiment, remission light is returned to the detectors through the mixer.

[0044] Having fully described a preferred embodiment of the invention and various alternatives, those skilled in the art will recognize, given the teachings herein, that numerous alternatives and equivalents exist which do not depart from the invention. It is therefore intended that the invention not be limited by the foregoing description, but only by the appended claims.

WHAT IS CLAIMED IS:

1. An optical device for identifying the presence of skin and a level of pigmentation in the skin, the optical device comprising,

a housing having a surface contacting aperture;

one or more light sources in the housing;

one or more detectors in the housing; and

control circuitry coupled to the one or more light sources and the one or more detectors, the control circuitry comprising a microprocessor and configured to identify whether the surface contacting aperture is in contact with skin and to determine a pigmentation level of said skin.

2. The optical device of Claim 1 further comprising a temperature sensor coupled to the control circuitry.

3. The optical device of Claim 1 wherein the one or more light sources is a single broad band light source, and the one or more detectors is selected from a single broad band detector and multiple detectors, each of the multiple detectors detecting a different optical band.

4. The optical device of Claim 1 wherein the one or more light sources is multiple light sources, each of the multiple light sources having a different wavelength, and the one or more detectors is a single broad band detector.

5. The optical device of Claim 1 wherein the one or more light sources is multiple light sources, each of the multiple light sources having a different wavelength, and the one or more detectors is multiple detectors, each of the multiple detectors detecting a different wavelength.

6. The optical device of Claim 1 wherein the one or more light sources is one or more LEDs selected from green, super red, yellow, blue and infrared LEDs.

7. The optical device of Claim 1 further comprising an indicator coupled to the control circuitry.

8. The optical device of Claim 7 wherein the indicator displays whether the surface contacting aperture is in contact with the skin and information about pigmentation in the skin.

9. A dermatologic treatment device having a skin contacting structure, the device comprising

a housing;

a treatment source within the housing capable of being activated to supply at least a first level and a second level of a dermatologic treatment through the skin contacting structure;

an optical control system mounted within the housing, the optical control system comprising one or more light sources and one or more detectors coupled to control circuitry having a microprocessor, the control circuitry configured to identify whether the skin contacting structure is in contact with skin and to determine a pigmentation level of said skin.

10. The dermatologic treatment device of Claim 9 wherein the optical control system further comprises a temperature sensor coupled to the control circuitry.

11. The dermatologic treatment device of Claim 9 wherein the one or more light sources is a single broad band light source, and the one or more detectors is selected from a single broad band detector and multiple detectors, each of the multiple detectors detecting a different optical band.

12. The dermatologic treatment device of Claim 9 wherein the one or more light sources is multiple light sources, each of the multiple light sources having a different wavelength, and the one or more detectors is a single broad band detector.

13. The dermatologic treatment device of Claim 9 wherein the one or more light sources is multiple light sources, each of the multiple light sources

having a different wavelength, and the one or more detectors is multiple detectors, each of the multiple detectors detecting a different wavelength.

14. The dermatologic treatment device of Claim 9 wherein the one or more light sources is one or more LEDs selected from green, super red, yellow, blue and infrared LEDs.

15. The dermatologic treatment device of Claim 9 further comprising an indicator coupled to the control circuitry.

16. The dermatologic treatment device of Claim 15 wherein the indicator displays whether the surface contacting aperture is in contact with skin and information about pigmentation in the skin.

17. A method for identifying the presence of skin and a level of pigmentation in the skin, the method comprising:

providing an optical device having a light source, a detector and control circuitry, the control circuitry having a microprocessor programmed with control data comprising known skin spectral remission values and known skin pigmentation threshold values;

determining whether the optical device is contacting skin by

placing the optical device on a surface to be identified, directing light from the light source onto the surface, detecting a surface spectral remission value, comparing the surface spectral remission value to the known skin spectral remission values and calculating a fractional remission value; and

determining a level of pigmentation in the skin by sensing a pigmentation level of the skin to be tested and comparing the pigmentation level of the skin to be tested with the known skin pigmentation threshold values.

18. The method of Claim 17 further comprising the step of providing to a user of the optical device results of determining whether the optical device is contacting skin and determining a level of pigmentation in the skin.

19. The method of Claim 17 further comprising the step of controlling a dermatologic treatment device to prevent operation of the treatment device unless the treatment device is in contact with skin.

20. The method of Claim 17 further comprising the step of controlling an output level of a light-based dermatologic treatment device in accordance with determined pigmentation levels of the skin.

21. The method of Claim 17 further comprising the step of adjusting for light scattering when comparing the known skin spectral remission values to the spectral remission of the skin.

22. The method of Claim 17 further comprising the step of calibrating to correct for light that is reflected back to the detector without reaching the skin to be tested.

23. The method of Claim 17 further comprising the step of correcting for temperature variations.

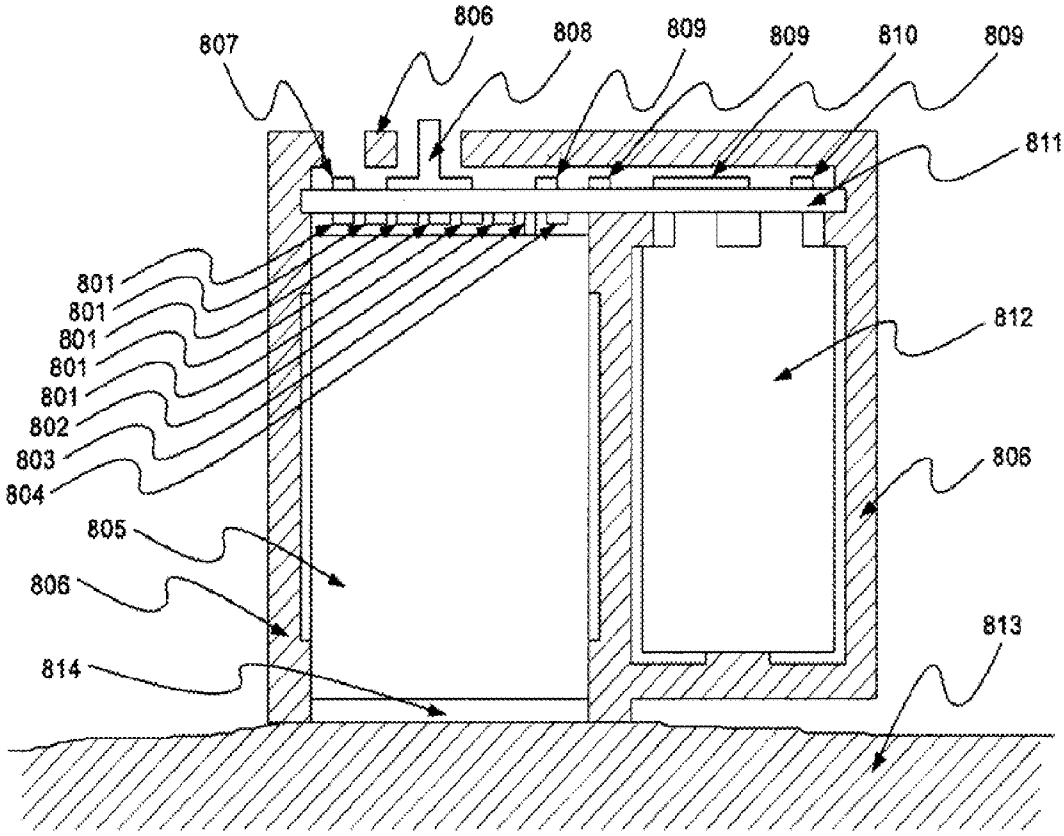
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Figure 1

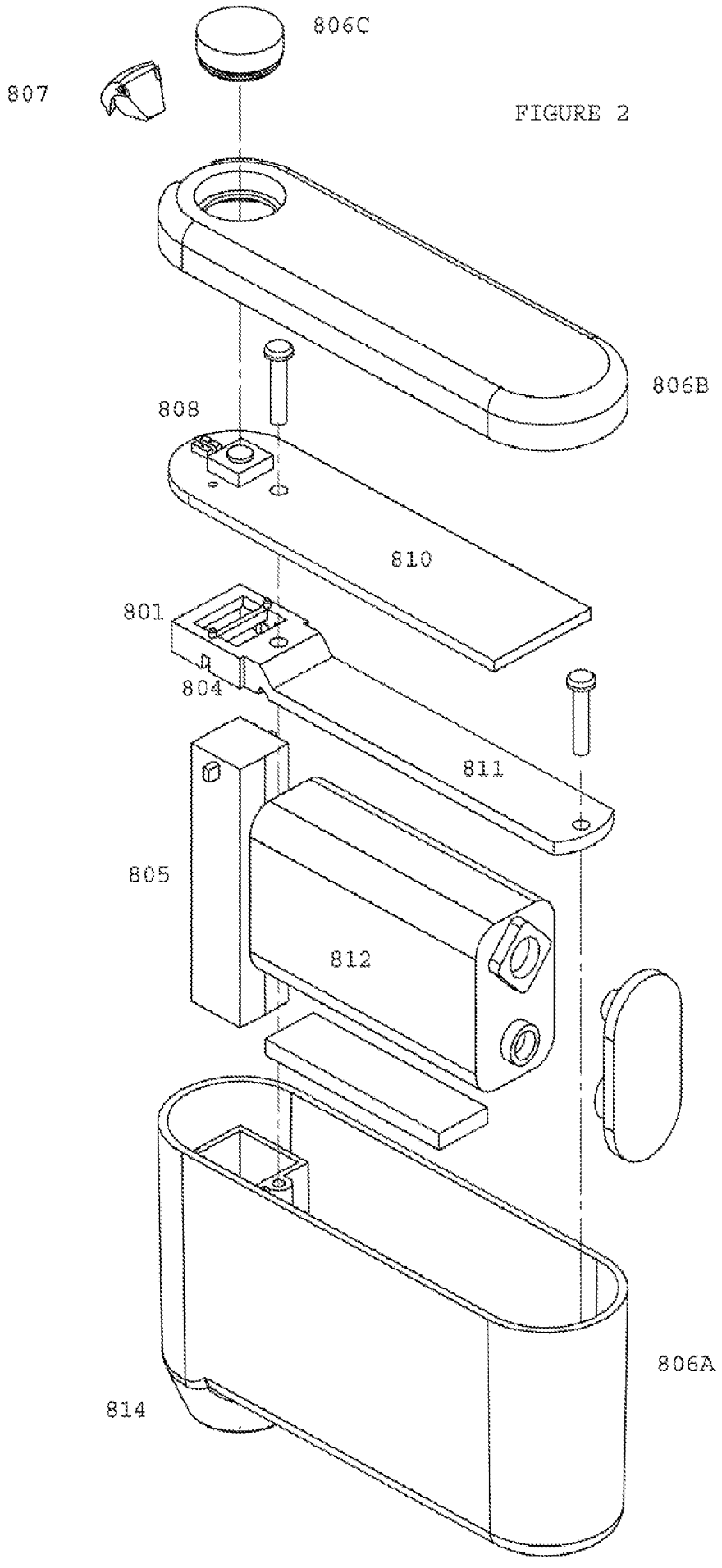

FIGURE 2

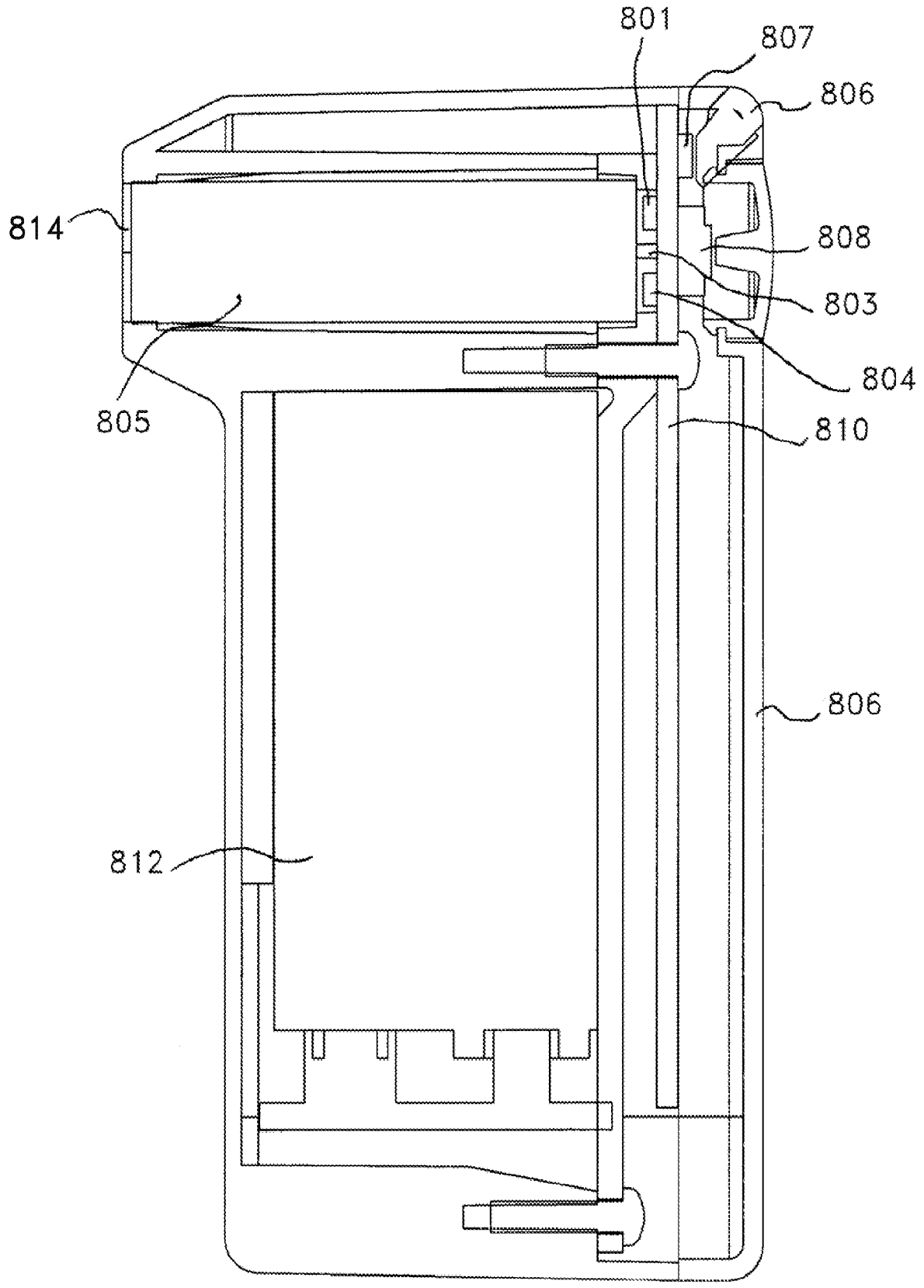

Figure 3

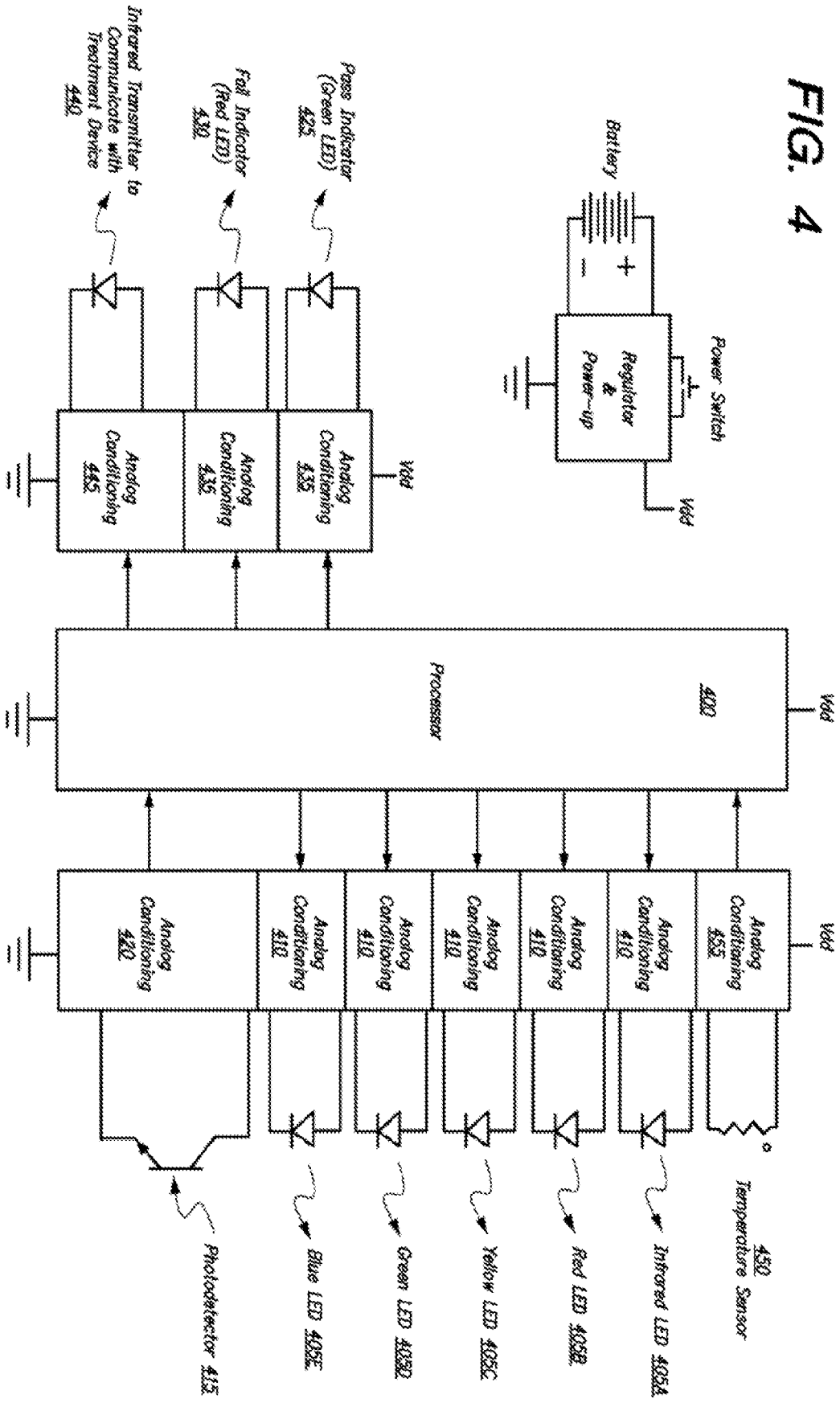
Infrared Transmitter to Communicate with Treatment Device 440
Fail Indicator (Red LED) 430
Pass Indicator (Green LED) 425
Battery
Power Switch
Regulator & Power-up
Vdd
Analog Conditioning 445
Analog Conditioning 435
Analog Conditioning 435
Processor 400
Analog Conditioning 420
Analog Conditioning 410
Analog Conditioning 410
Analog Conditioning 410
Analog Conditioning 410
Analog Conditioning 410
Analog Conditioning 455
Photodetector 415
Blue LED 405E
Green LED 405D
Yellow LED 405C
Red LED 405B
Infrared LED 405A
450 Temperature Sensor

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/041843

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61B 5/00 (2009.01)
USPC - 600/306
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - A61B 5/00, 5/06, 6/00; G01N 21/27, 21/47 (2009.01)
USPC - 600/306; 606/9

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2004/010884 A1 (PEDERSEN) 05 February 2004 (05.02.2004) entire document	1-2,5,7-10,13,15,16
X	US 2007/0060819 A1 (ALTSHULER et al) 15 March 2007 (15.03.2007) entire document	1,3-4,6,9,11-12,14,17-23
A	US 4,749,865 A (SCHELLER) 07 June 1988 (07.06.1988) entire document	1-23

☐ Further documents are listed in the continuation of Box C. ☐

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Date of the actual completion of the international search	Date of mailing of the international search report
18 June 2009	25 JUN 2009
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

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

专利名称(译)	光学传感器和用于识别皮肤的存在和皮肤色素沉着的方法		
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申请号	EP2009735456	申请日	2009-04-27
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申请(专利权)人(译)	TRIA BEAUTY，INC.		
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其他公开文献	EP2268198A4		
外部链接	Espacenet		

摘要(译)

提供装置和方法来控制装置，例如发光皮肤病学或美容治疗装置，并确保装置与皮肤接触，同时还确定皮肤的色素沉着水平。一个或多个光源接触皮肤，并且一个或多个检测器测量来自皮肤的光谱消退。将获得的缓解测量值与已知的皮肤光谱缓解值进行比较，并且校准允许将绝对缓解的测量值转换为分数缓解值。将皮肤色素沉着水平与已知的基线水平进行比较，以确定和控制适当的治疗参数。温度传感器可以校正温度变化。该装置可以或可以不包含在治疗装置中。