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(54) **PHOTOBIOMODULATION THERAPY DEVICES AND METHODS OF USE**

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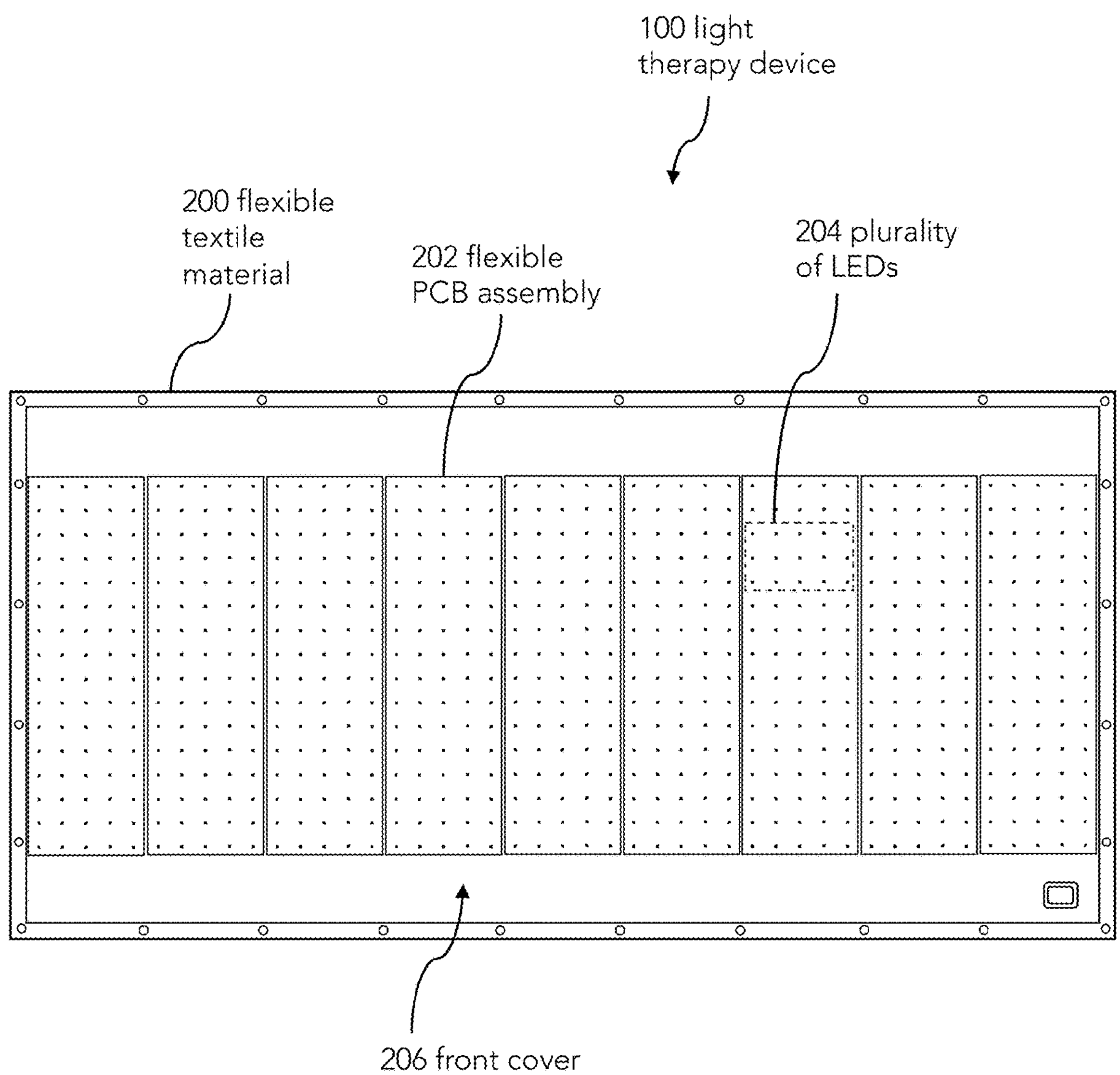
(57) **ABSTRACT**

The disclosure includes a light therapy device comprising a flexible textile material, a flexible printed circuit board (PCB) assembly coupled to the flexible textile material, a plurality of light emitting diodes (LEDs) electrically coupled to the flexible PCB assembly, wherein the plurality of LEDs is arranged and configured to emit at least one of red light and near-infrared light, and a controller electrically coupled to the flexible PCB assembly, configured to control emission of the at least one of red light and near-infrared light from the plurality of LEDs.



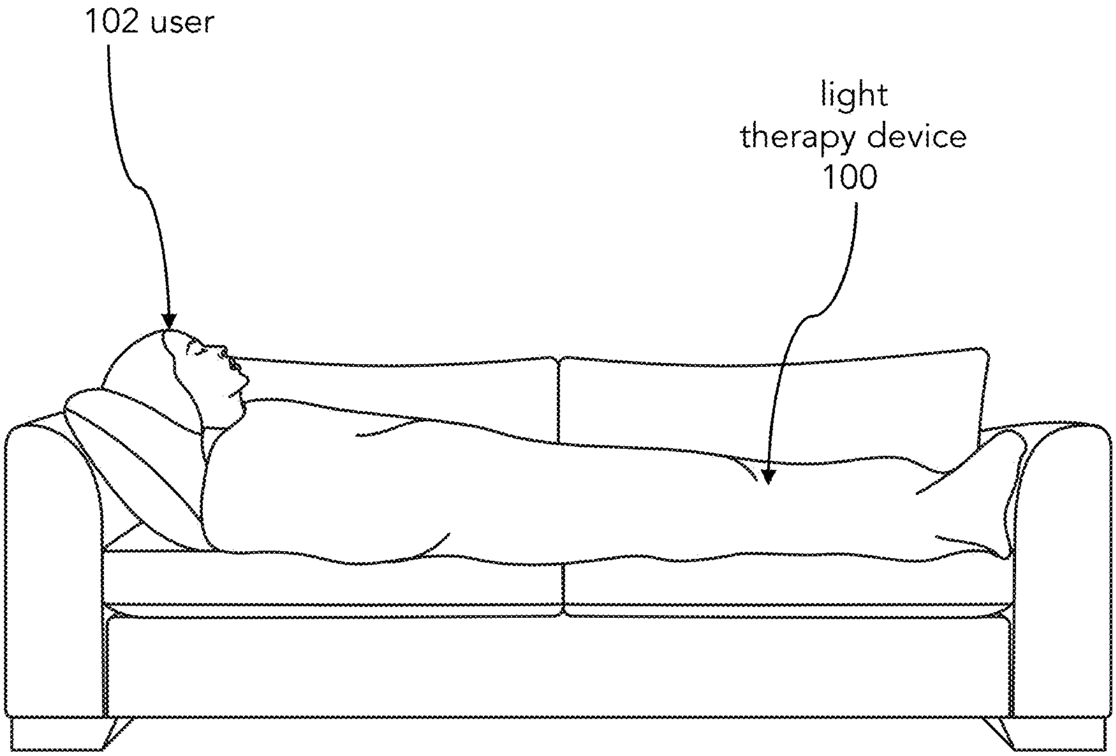


FIG. 1

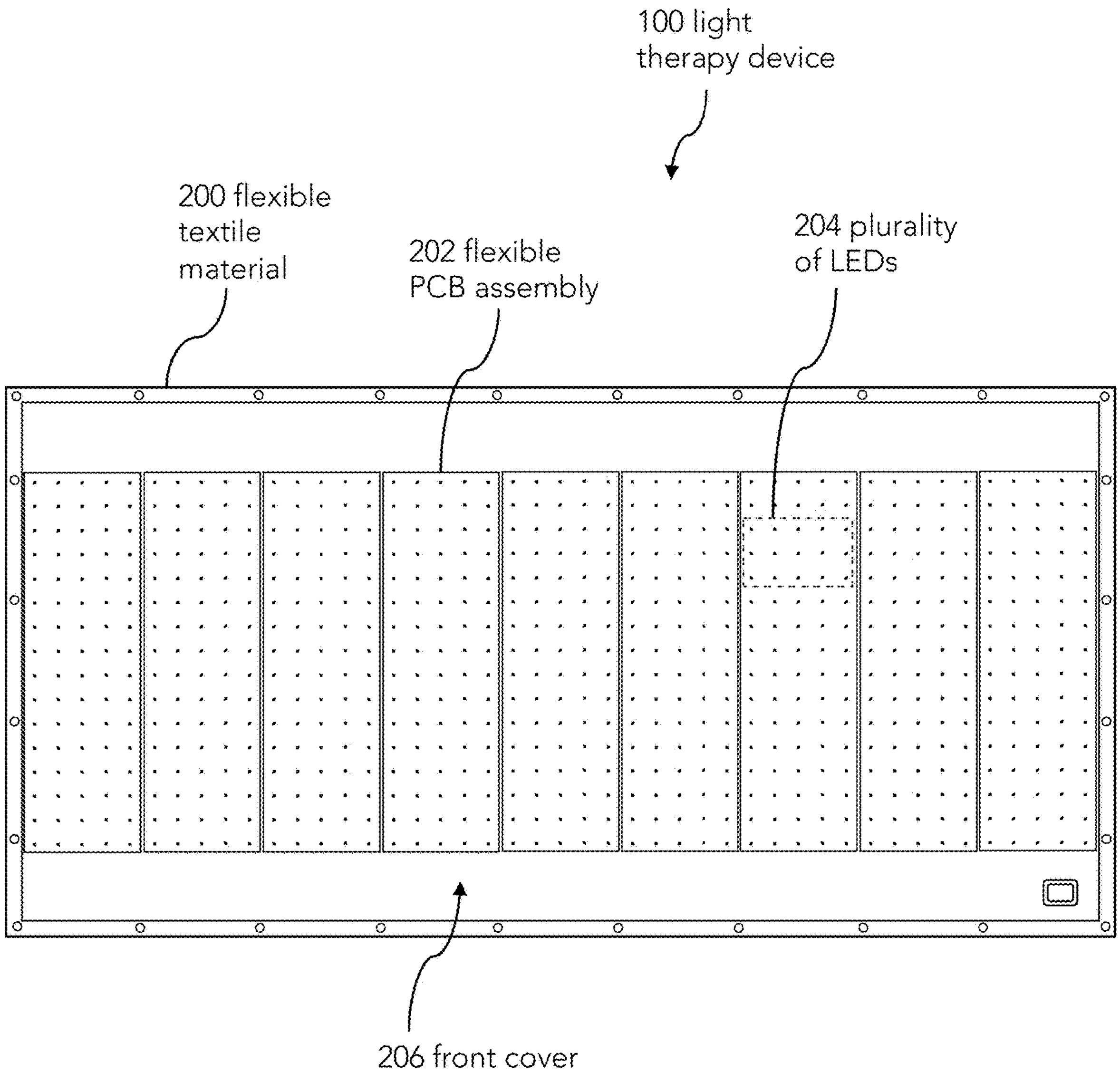

100 light
therapy device
200 flexible
textile
material
202 flexible
PCB assembly
204 plurality
of LEDs
206 front cover

FIG. 2A

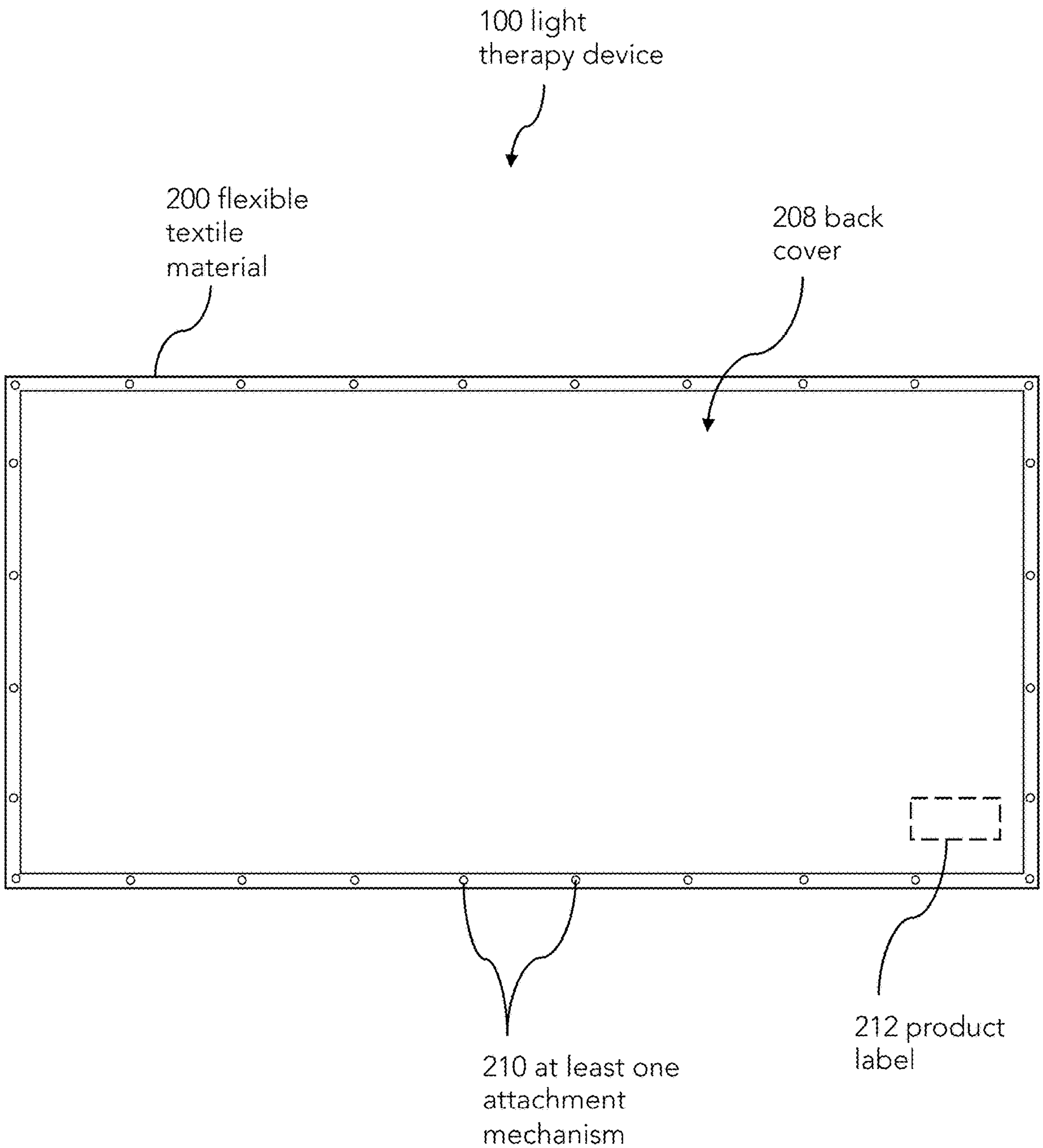

100 light therapy device
200 flexible textile material
208 back cover
210 at least one attachment mechanism
212 product label

FIG. 2B

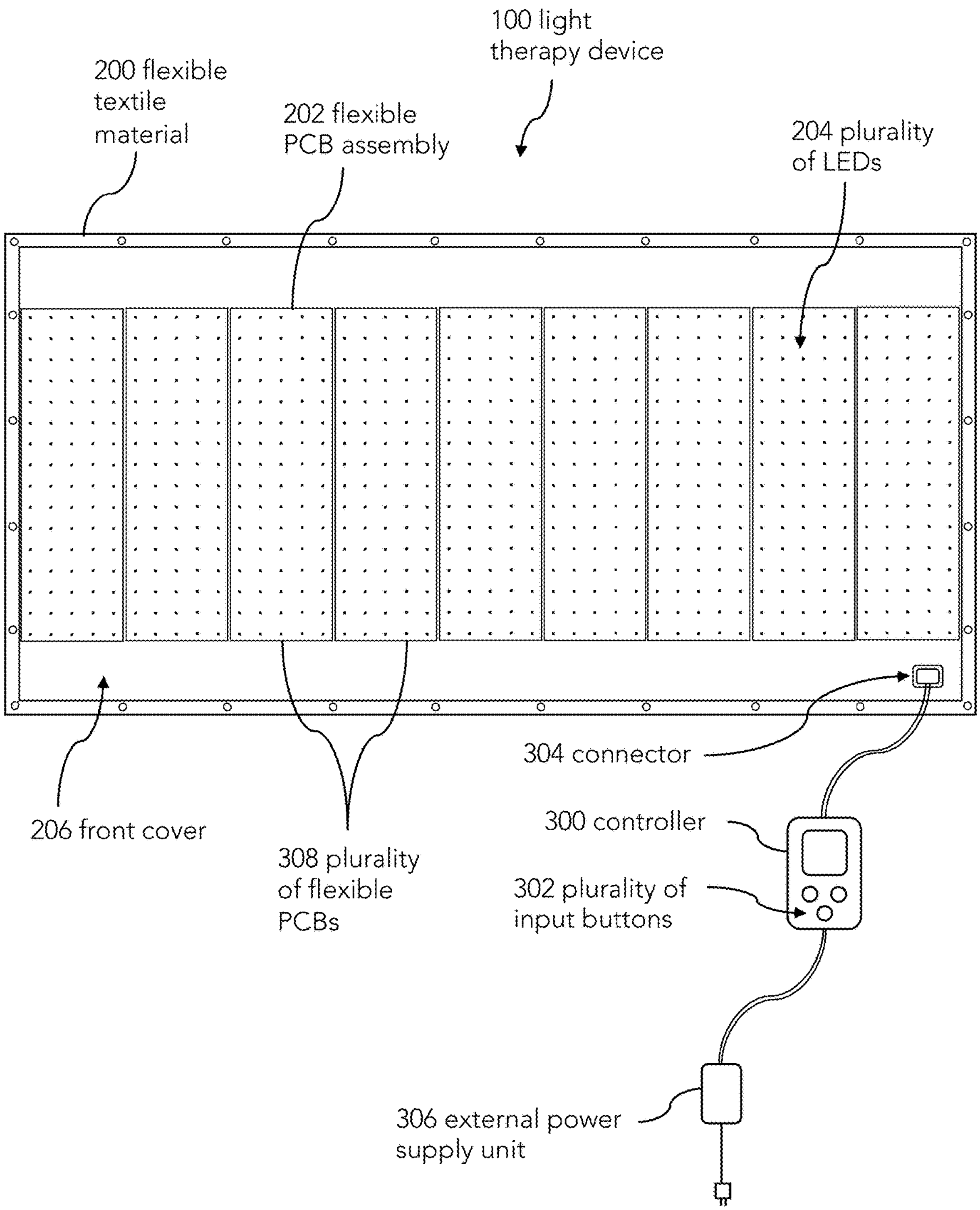

100 light therapy device
200 flexible textile material
202 flexible PCB assembly
204 plurality of LEDs
304 connector
206 front cover
308 plurality of flexible PCBs
300 controller
302 plurality of input buttons
306 external power supply unit

FIG. 3

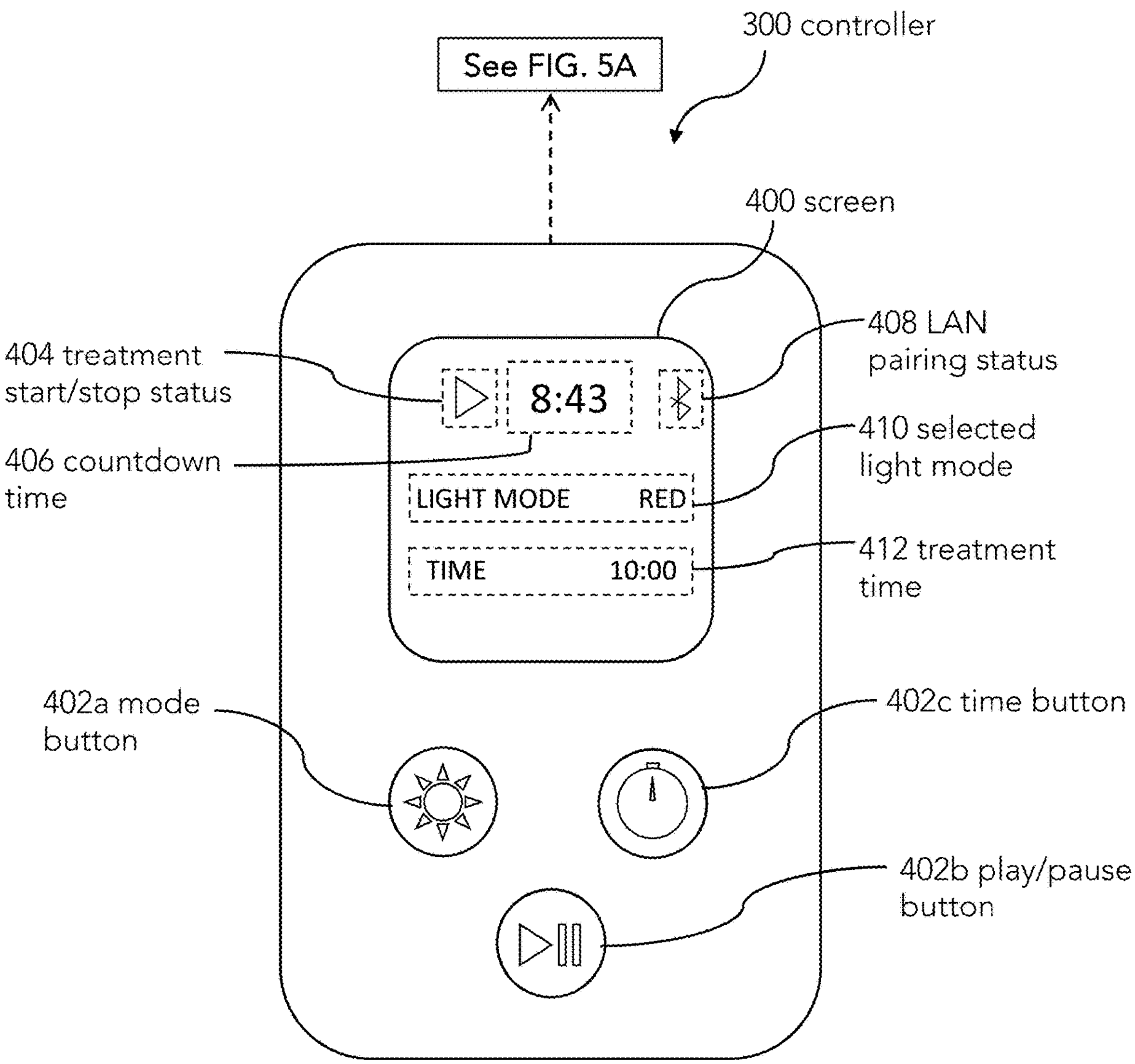

See FIG. 5A
300 controller
400 screen
404 treatment start/stop status
8:43
408 LAN pairing status
406 countdown time
410 selected light mode
LIGHT MODE RED
TIME 10:00
412 treatment time
402a mode button
402c time button
402b play/pause button

FIG. 4A

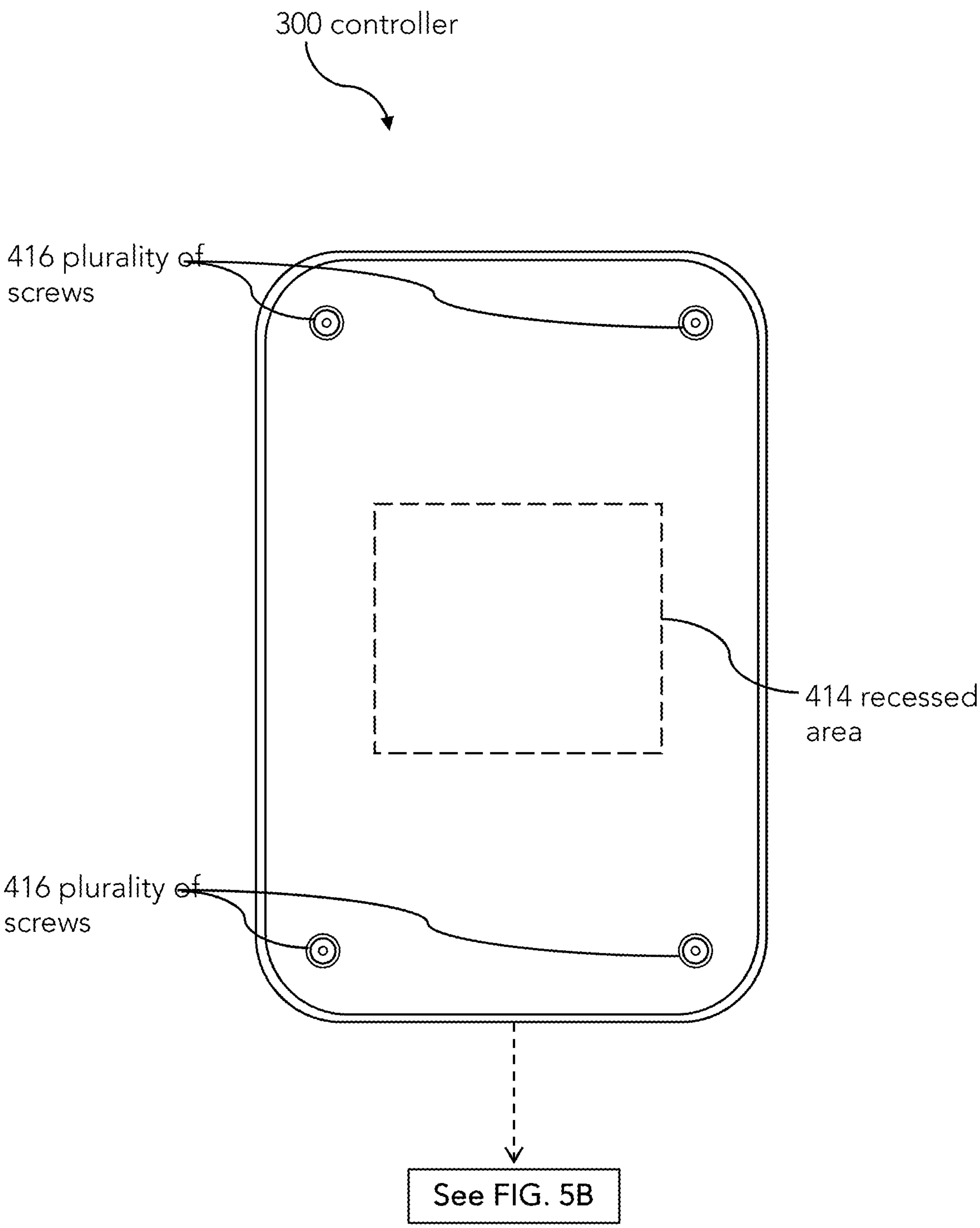

300 controller
416 plurality of screws
416 plurality of screws
414 recessed area
See FIG. 5B

FIG. 4B

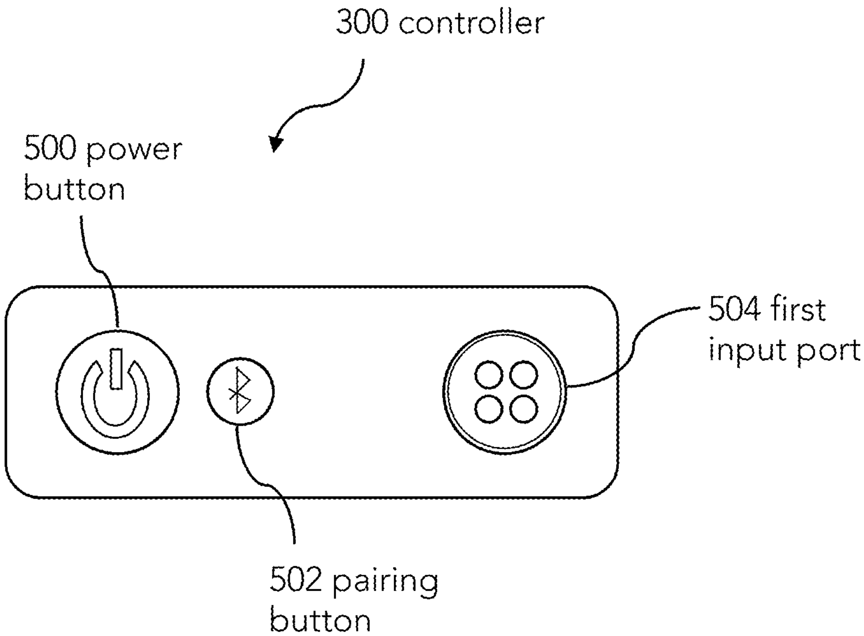

300 controller
500 power button
504 first input port
502 pairing button

FIG. 5A

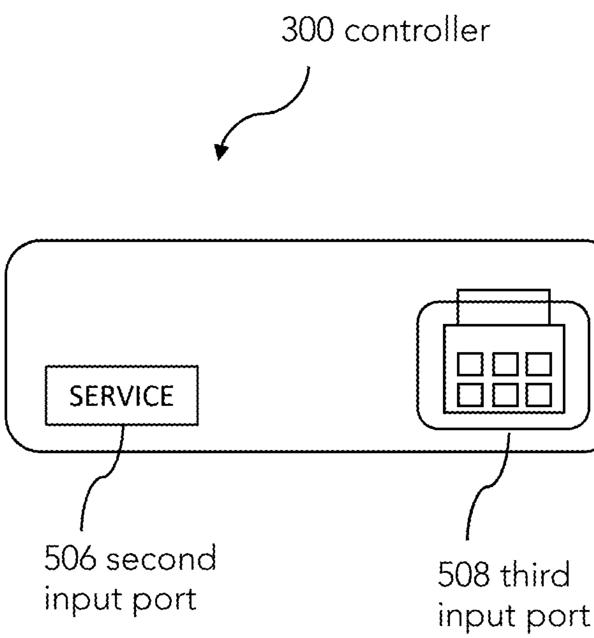

300 controller
SERVICE
506 second input port
508 third input port

FIG. 5B

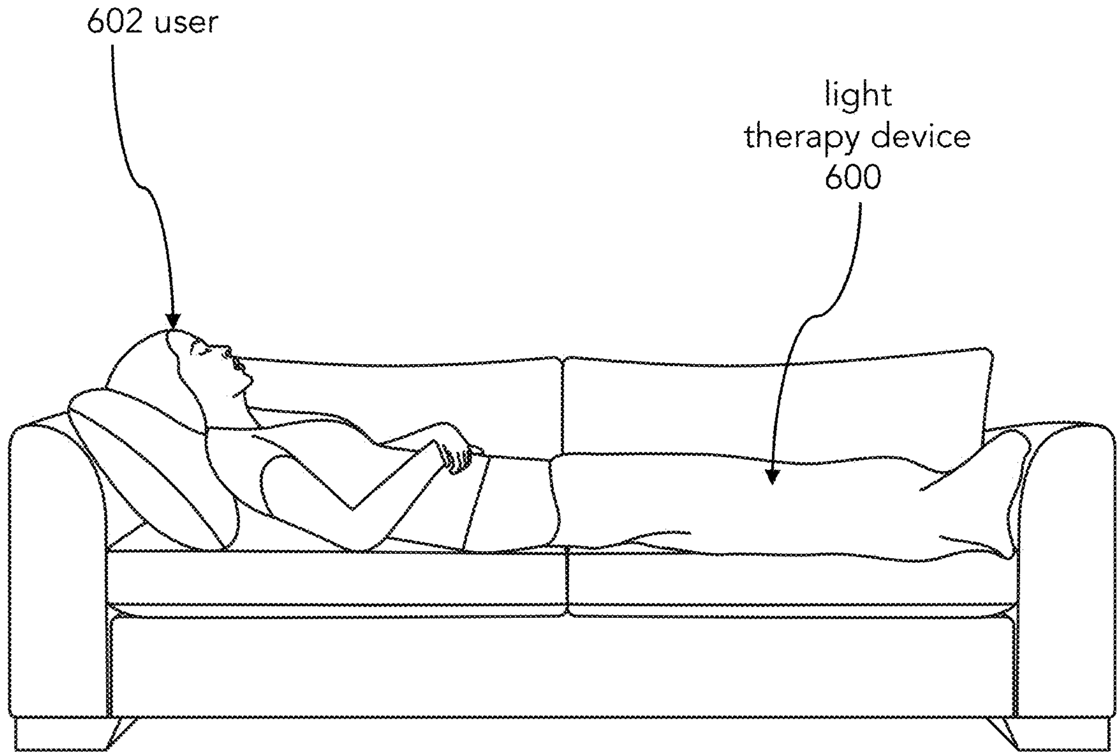


FIG. 6

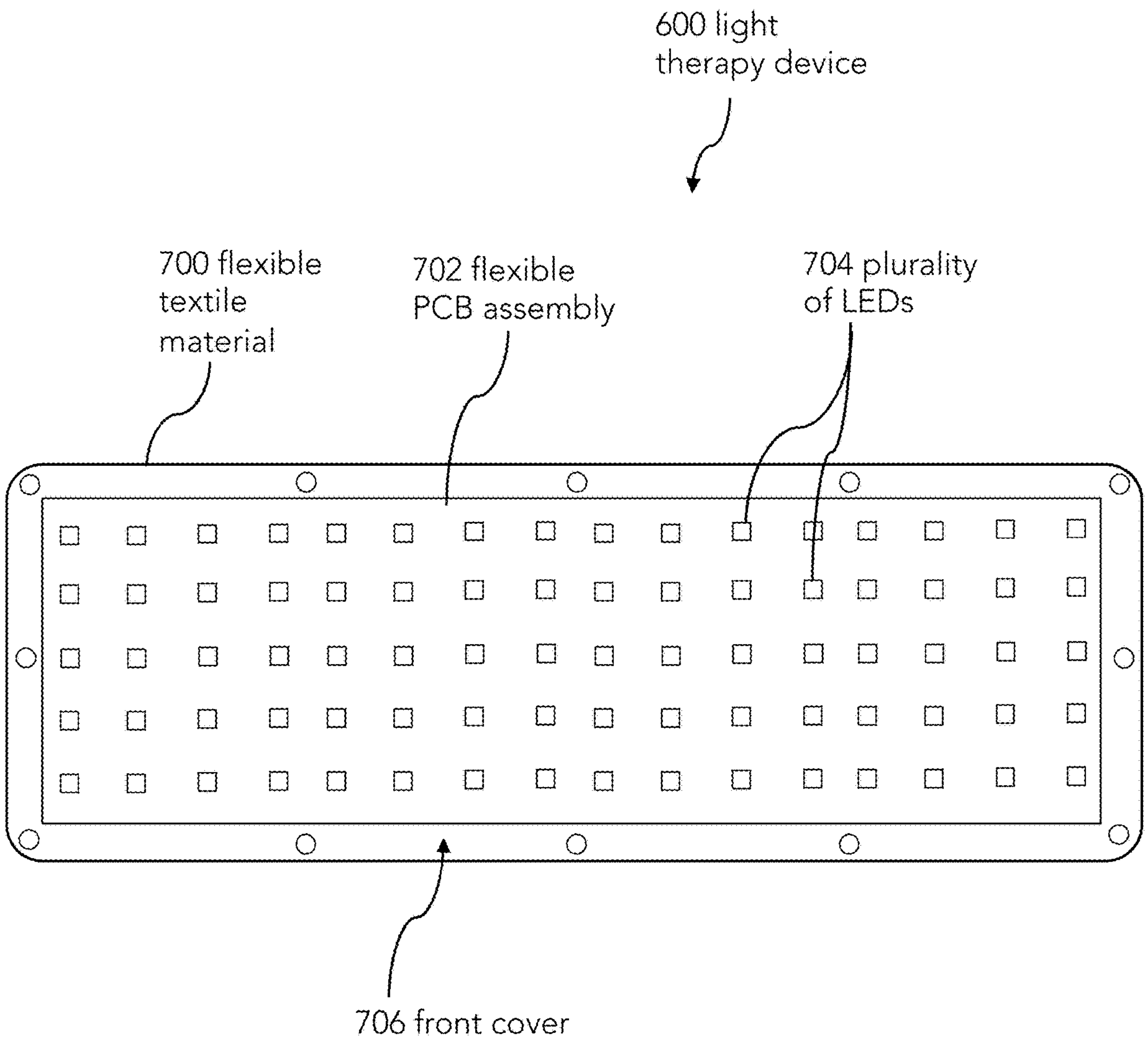

600 light therapy device
700 flexible textile material
702 flexible PCB assembly
704 plurality of LEDs
706 front cover

FIG. 7A

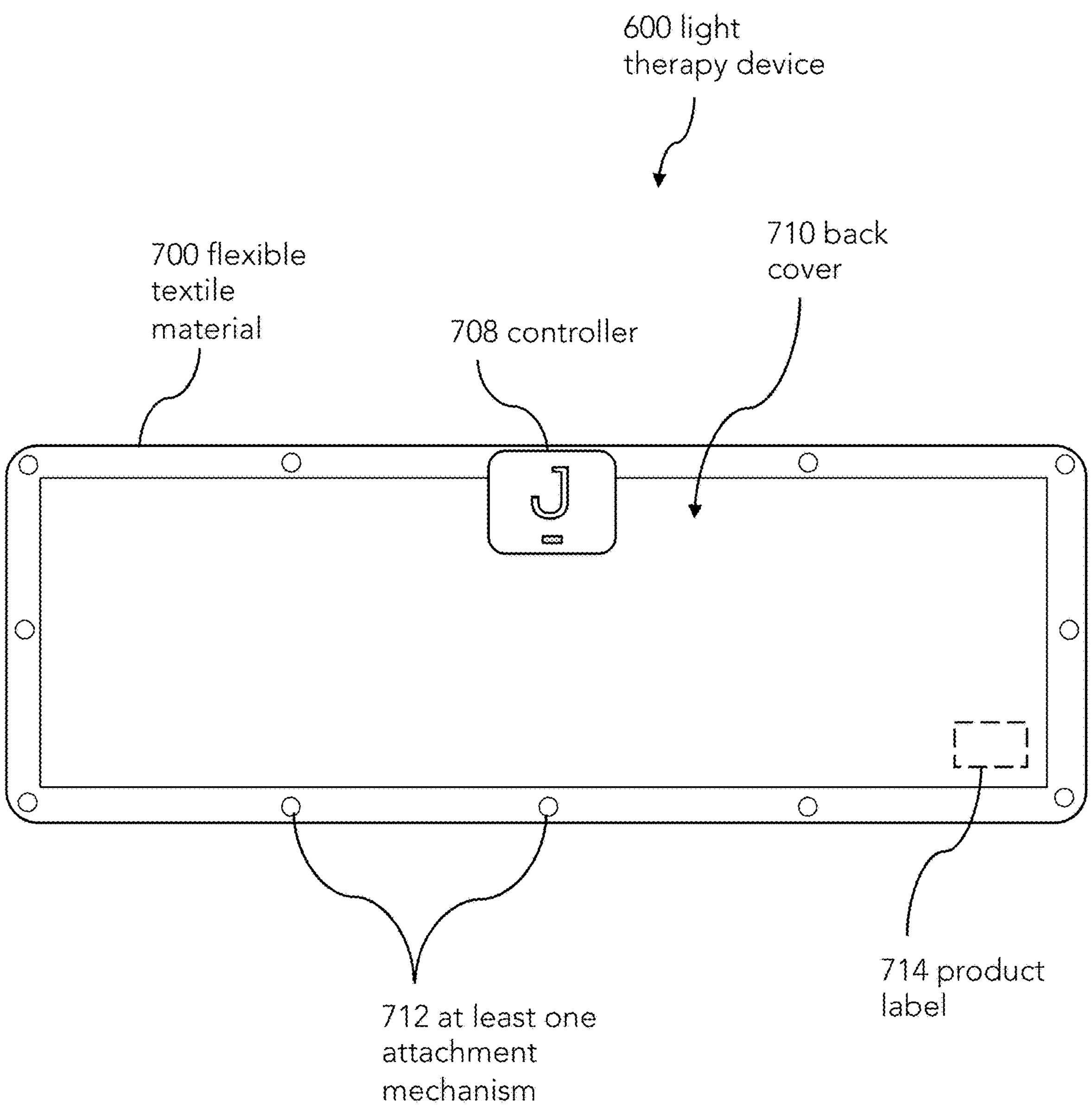
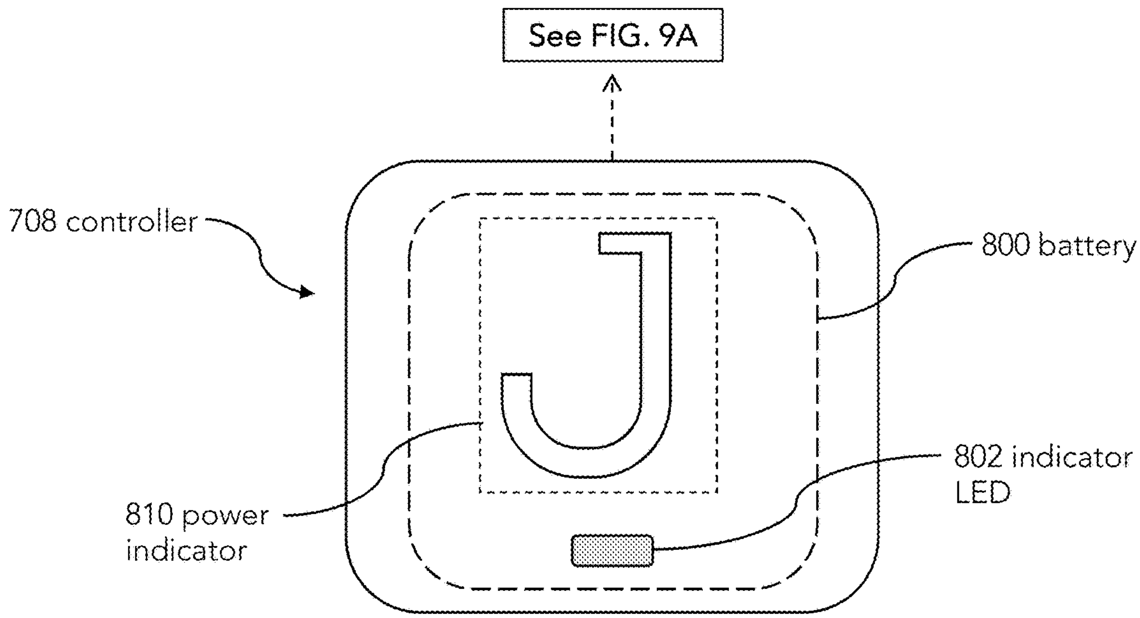
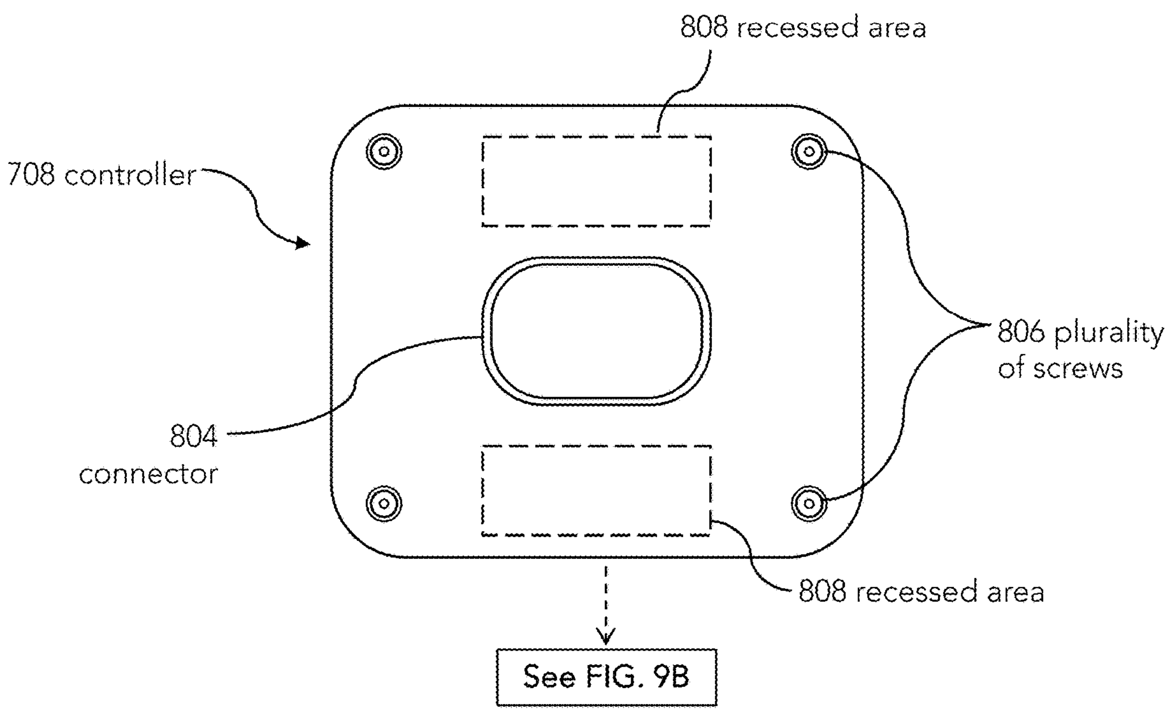

600 light therapy device
700 flexible textile material
708 controller
710 back cover
J
712 at least one attachment mechanism
714 product label

FIG. 7B



See FIG. 9A
708 controller
800 battery
802 indicator LED
810 power indicator

FIG. 8A



808 recessed area
708 controller
806 plurality of screws
804 connector
808 recessed area
See FIG. 9B

FIG. 8B

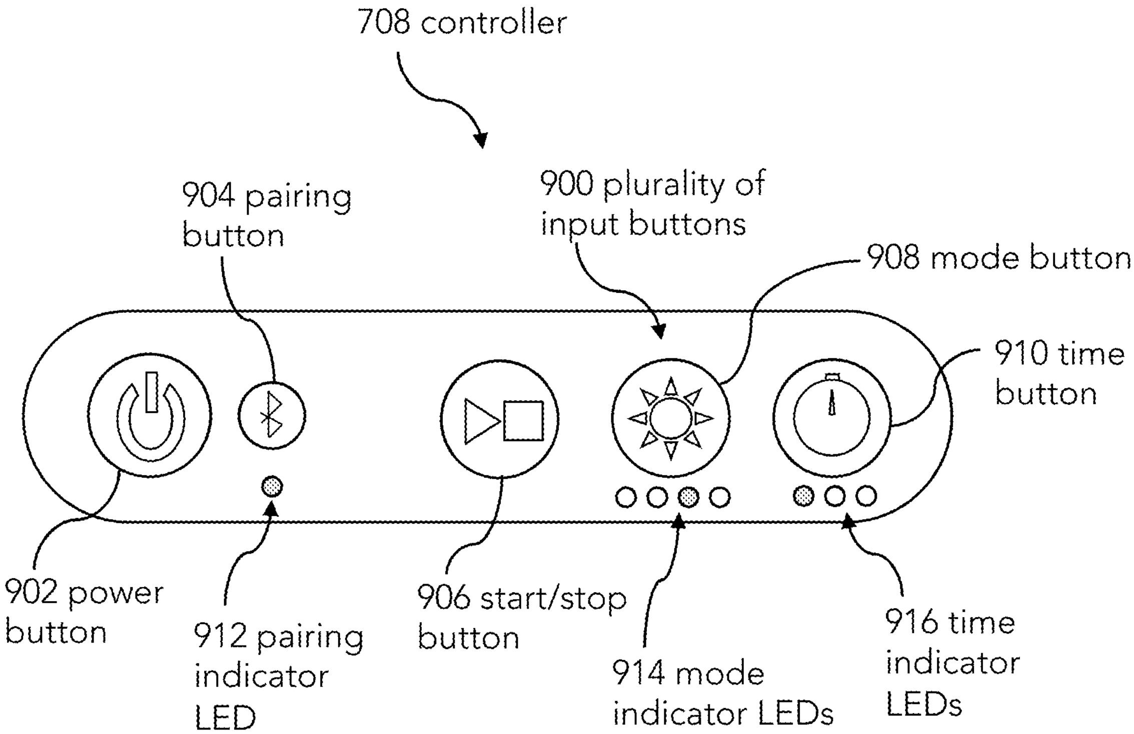

708 controller
904 pairing button
900 plurality of input buttons
908 mode button
910 time button
902 power button
912 pairing indicator LED
906 start/stop button
914 mode indicator LEDs
916 time indicator LEDs

FIG. 9A

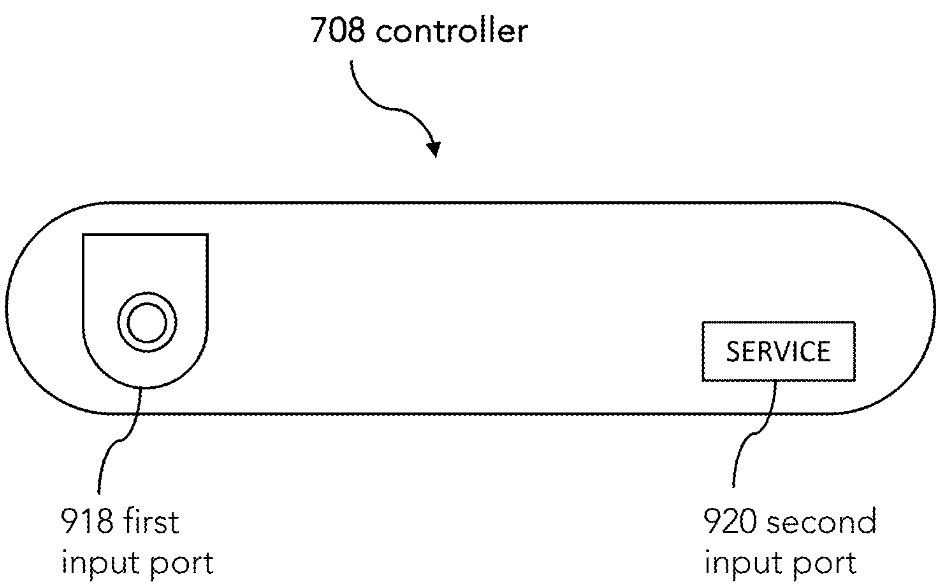

708 controller
SERVICE
918 first input port
920 second input port

FIG. 9B

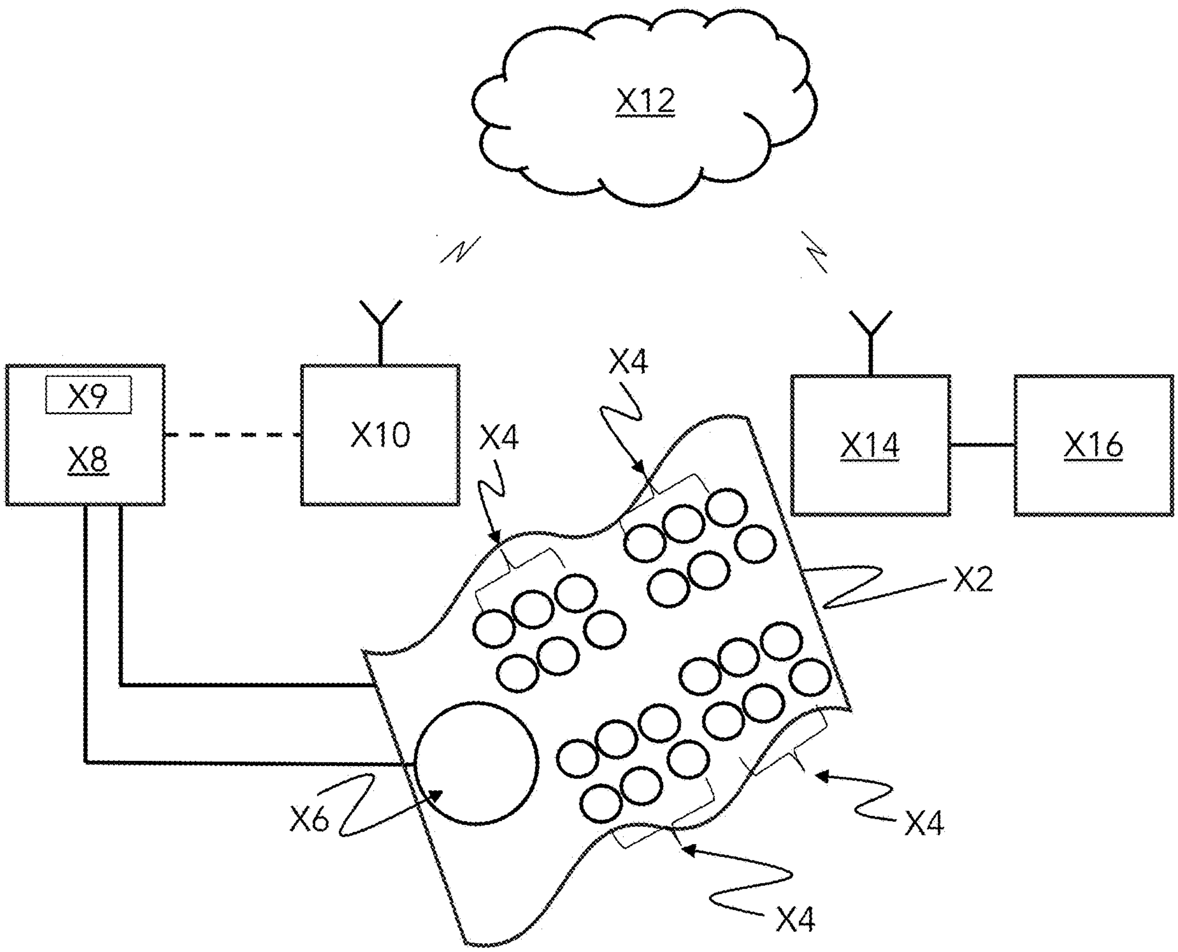


FIG. 10

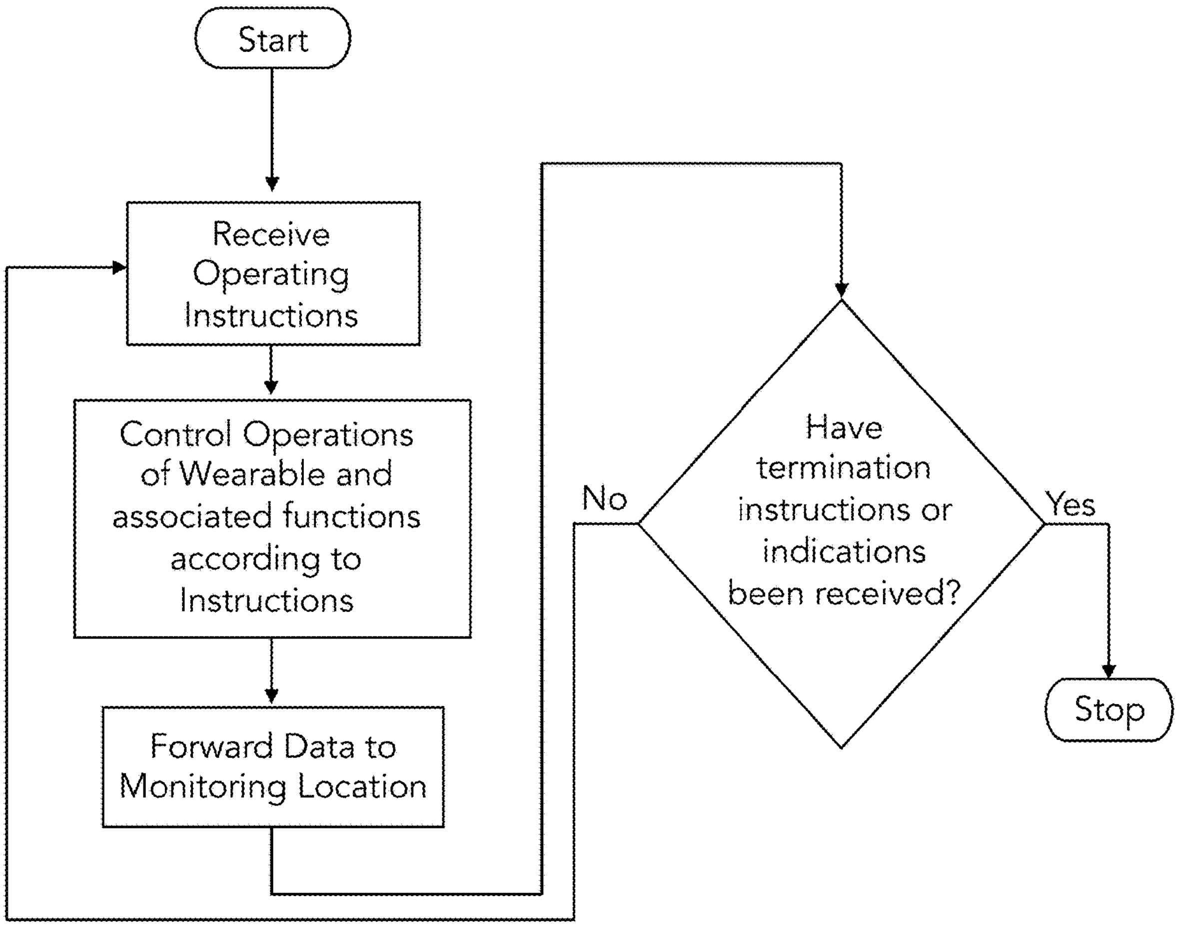
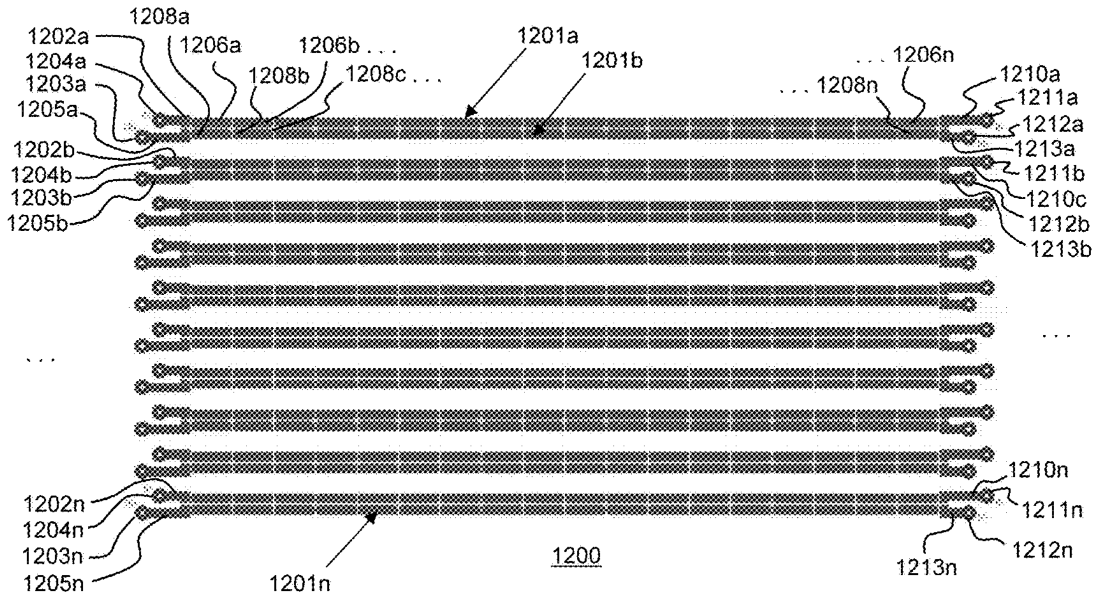
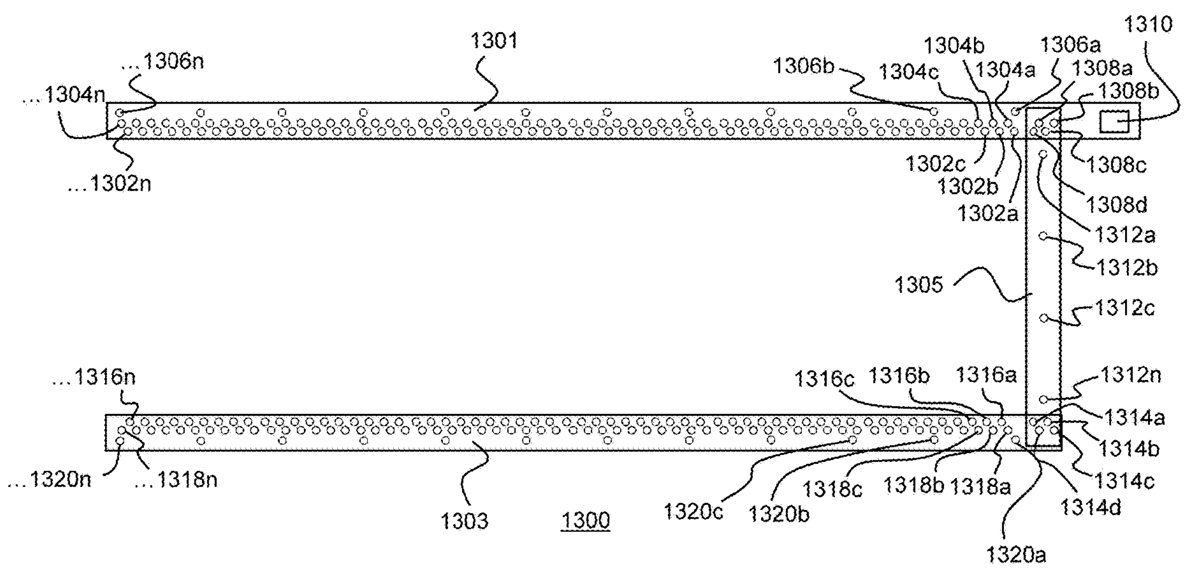

Start
Receive Operating Instructions
Control Operations of Wearable and associated functions according to Instructions
Forward Data to Monitoring Location
Have termination instructions or indications been received?
No
Yes
Stop

FIG. 11



Flexible Substrate Assy

FIG. 12



Flexible Textile Cable

FIG. 13

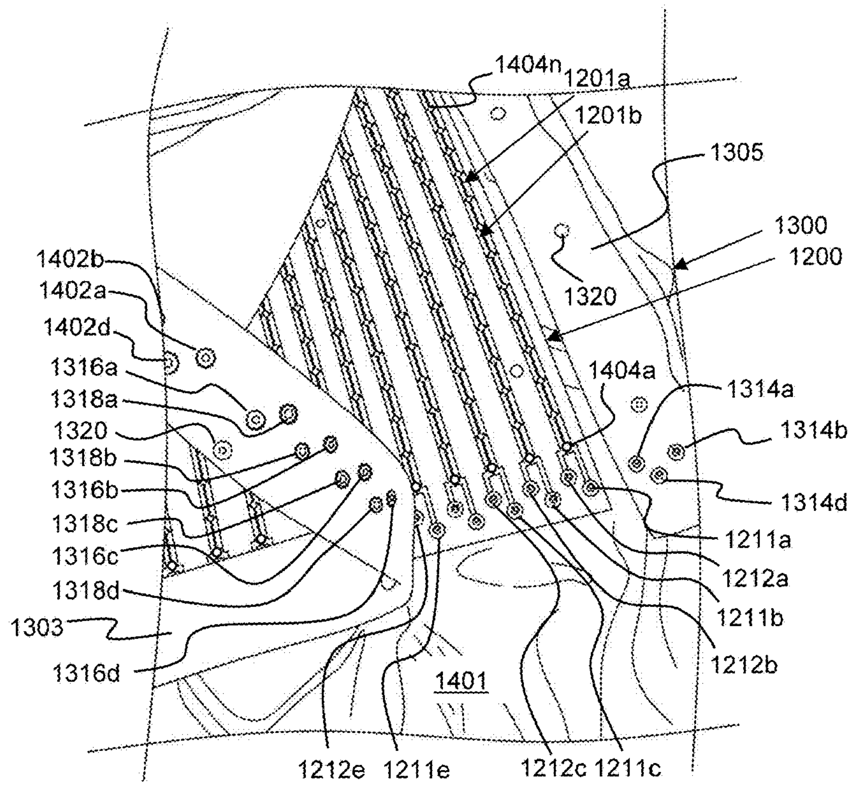

1404n
1201a
1201b
1305
1300
1200
1320
1402b
1402a
1402d
1316a
1318a
1320
1318b
1316b
1318c
1316c
1318d
1303
1316d
1404a
1314a
1314b
1314d
1211a
1212a
1211b
1212b
1401
1212e
1211e
1212c
1211c

FIG. 14

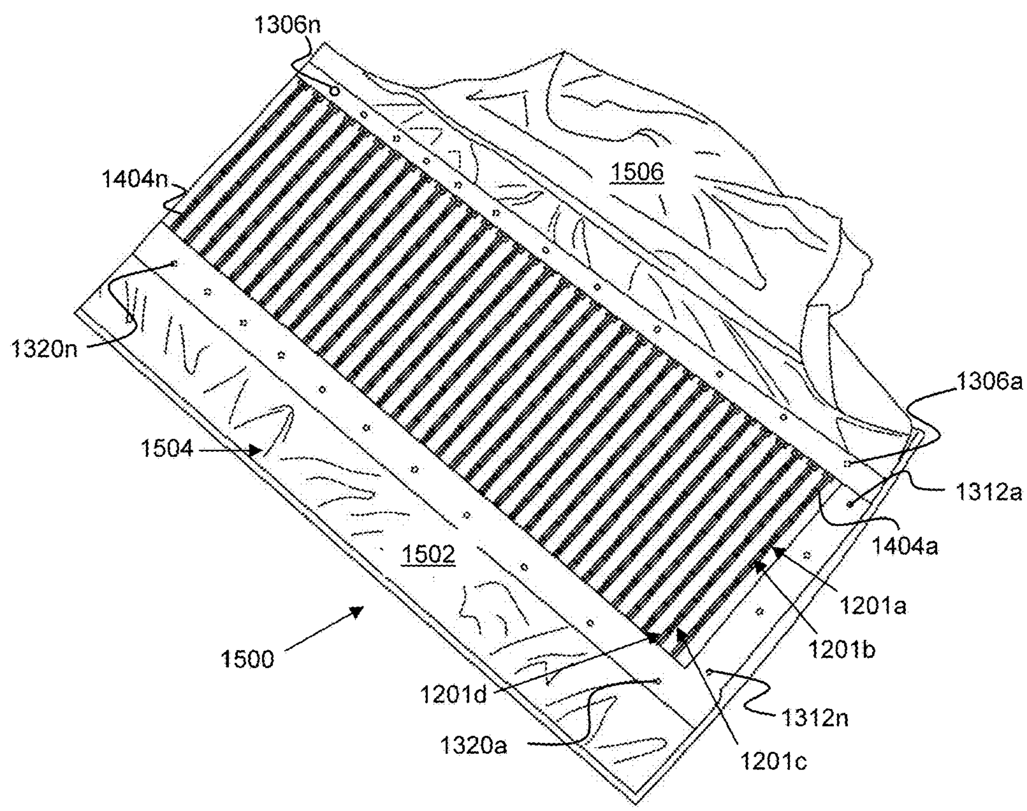

1306n
1404n
1506
1320n
1306a
1504
1312a
1404a
1502
1201a
1201b
1500
1201d
1312n
1320a
1201c

FIG. 15

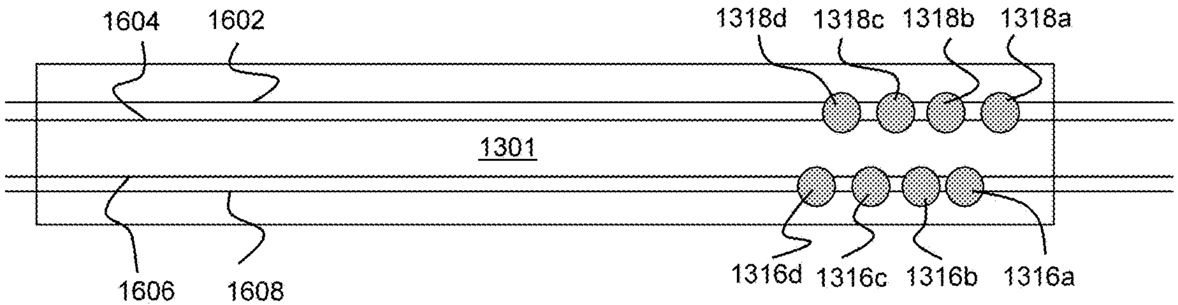

1604
1602
1318d
1318c
1318b
1318a
1301
1606
1608
1316d
1316c
1316b
1316a

FIG. 16

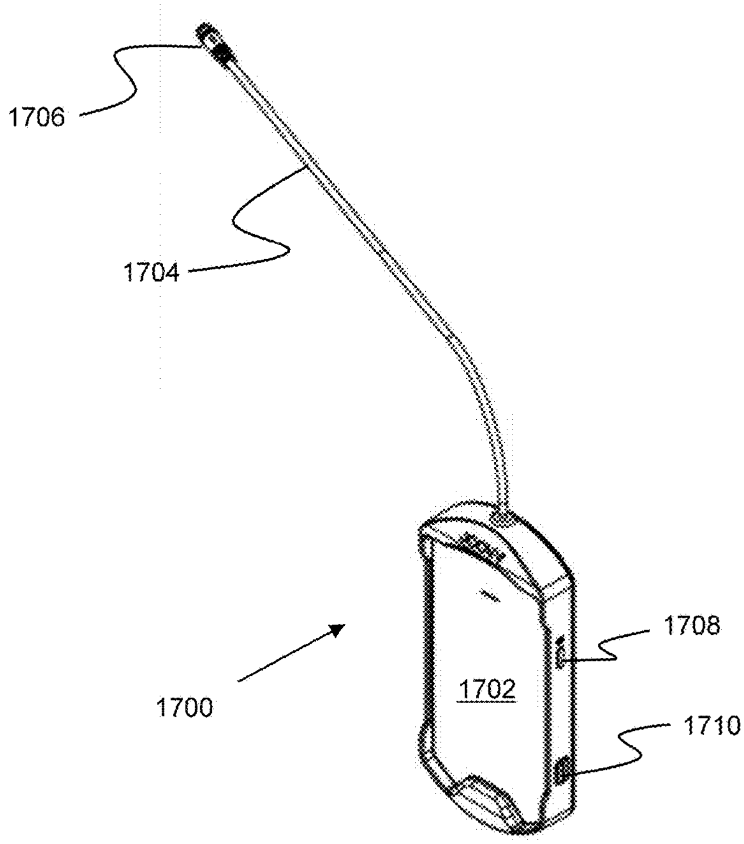

1706
1704
1708
1700
1702
1710

FIG. 17

PHOTOBIOMODULATION THERAPY DEVICES AND METHODS OF USE

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to U.S. Provisional Patent Application No. 63/554,498 filed Feb. 16, 2024, the entirety of which is incorporated by reference.

FIELD OF THE INVENTION

[0002] The present invention generally relates to red light therapy and, more particularly, relates to flexible textile material that emits therapeutic red light.

BACKGROUND OF THE INVENTION

[0003] Red light therapy (RLT) involves having red or near-infrared (NIR) light wavelengths emitted directly through the skin. Red or NIR light can be absorbed into the skin to a depth of about eight to 10 millimeters, at which point it has positive effects on cellular energy and multiple nervous system and metabolic processes.

[0004] Red light therapy has shown promise for treating symptoms of joint pain or osteoarthritis due to aging, those caused by cancer treatments like chemotherapy or radiation, hair loss, wounds or incisions, acne, wrinkles and skin discoloration, chronic muscular pain, neurological damage, and tissue damage (often at the root of tears, sprains or pulls).

[0005] Many of the current light therapy devices and lighting arrays are designed for desktop use or are complete chambers that the user enters. The vast majority of RLT devices on the market are either hand-held (very small treatment area) or a countertop unit that treats the face. Tanning salons offer red light treatment sessions in converted tanning beds using fluorescent circuits but the cost and size make these devices impractical for home use. In addition, the fluorescent circuits are very inefficient so the intensity of the light compromises the effectiveness of these devices.

[0006] Each of these prior-art devices rely on built-in structural elements that inherently restrict flexibility. The incorporation of rigid internal frameworks has been a standard feature, a design choice that compromises the device's ability to mold to the body's natural form. These internal supports, while sometimes necessary for other functional reasons, create a barrier to achieving the full range of motion and comfort required for intimate, ergonomic applications.

[0007] Therefore, a lighting apparatus/system is needed that can be better adapted for use with various parts of the body of a user than that which, up to now, has not been available. What is needed is a novel design that is entirely devoid of internal structural impediments and that allows the light-emitting device to adapt seamlessly to various body shapes.

SUMMARY OF THE INVENTION

[0008] The disclosure includes a light therapy device comprising a flexible textile material, a flexible printed circuit board (PCB) assembly coupled to the flexible textile material, a plurality of light emitting diodes (LEDs) electrically coupled to the flexible PCB assembly, wherein the plurality of LEDs is arranged and configured to emit at least one of red light and near-infrared light, and a controller electrically coupled to the flexible PCB assembly, configured to control emission of the at least one of red light and near-infrared light from the plurality of LEDs.

[0009] In some embodiments, the flexible textile material comprises a front cover and a back cover removably coupled to the front cover via at least one attachment mechanism. The front cover may be configured to receive the flexible PCB assembly and may include a semi-transparent material configured to diffuse at least a portion of the at least one of red light and near-infrared light emitted by the plurality of LEDs. In some embodiments, the flexible PCB assembly and the plurality of LEDs are detachably coupled to the flexible textile material. The flexible textile material may be machine washable. In some embodiments, the flexible textile material is capable of diffusing heat generated by the plurality of LEDs.

[0010] The controller may include a plurality of input buttons. In some embodiments, the plurality of input buttons includes a play/pause button configured to start and stop emission of the at least one of red light and near-infrared light from the plurality of LEDs, a mode button configured to select a light emission mode of the plurality of LEDs, and a time button configured to select a treatment time. The light emission mode is selected from the group consisting of red-light emission only, near-infrared light emission only, red and near-infrared light emission, and a recovery mode. In some embodiments, the recovery mode comprises substantially continuous red-light emission with pulsed near-infrared light emission. The controller may comprise a power button configured to at least one of enter and exit a standby state and a pairing button configured to at least one of turn on and off local area network pairing with a third-party device.

[0011] In some embodiments, the light therapy device includes a connector coupled to the flexible textile material and electrically coupled to the flexible PCB assembly, wherein the connector is configured to receive a cable coupled to the controller, thereby electrically coupling the controller to the flexible PCB assembly. The controller may be electrically coupled to an external power supply unit configured to provide power to the light therapy device.

[0012] In some embodiments, the controller comprises a display screen. The display screen may be configured to display information selected from the group consisting of treatment time, light emission mode, local area network pairing status, and treatment start/stop status. In some embodiments, the controller comprises a touch screen configured to receive a user input.

[0013] The flexible PCB assembly may comprise a plurality of flexible printed circuit boards (PCBs). In some embodiments, the light therapy device further comprises a connector coupled to each flexible PCB of the plurality of flexible PCBs.

[0014] The flexible textile material may define a length of about 1840 millimeters and a width of about 915 millimeters.

[0015] In some embodiments, the flexible textile material comprises a first side coupled to the flexible PCB assembly and a second side located opposite the first side. The controller may be detachably coupled to the second side of the flexible textile material. In some embodiments, the controller comprises a built-in rechargeable battery configured to provide power to the light therapy device. The controller may comprise a light emitting diode (LED) configured to indicate a status of a charge level of the built-in rechargeable battery.

[0016] In some embodiments, the controller comprises a plurality of input buttons. The plurality of input buttons may comprise a time button configured to select a predetermined treatment time defining 10, 20, or 30 minutes.

[0017] In some embodiments, the flexible textile material defines a length of about 620 millimeters and a width of about 220 millimeters.

[0018] The disclosure includes a wearable system comprising a plurality of light-emitting diode (LED) devices coupled to a wearable device, one or more sensors coupled to the wearable device, and a controller coupled to the plurality of LED devices. In some embodiments, the system includes a transceiver being configured to couple the controller to a wireless network. The plurality of LED devices may comprise one or more arrays of LED devices wherein LED devices with an associated array may be configured to emit light within a wavelength of between 660 nanometers and 850 nanometers. In some embodiments, the transceiver is included in a smartphone or a tablet. Ones of the plurality of LED devices may be configured to emit light in a wavelength range of between 600 nanometers and 630 nanometers.

[0019] The disclosure includes a method for providing light therapy, comprising receiving one or more instructions from a controller, operating a plurality of light-emitting diodes (LEDs) coupled to a wearable device, in accordance with the one or more instructions received from the controller, the plurality of LEDs providing light therapy at light wavelengths between about 630 nanometers and 660 nanometers, measuring one or more parameters associated with the wearable device or a user of the wearable device, and transmitting data, including one or more of the one or more parameters measured, to a remote location. In some embodiments, the one or more parameters are selected from the group consisting of temperature, power output, user temperature, user heart rate and a combination thereof.

[0020] Ones of the plurality of LEDs may operate to provide light at a wavelength of between about 630 nanometers and 660 nanometers. In some embodiments, ones of the plurality of LEDs operate to provide light at a wavelength of between about 800 nanometers and 900 nanometers. Ones of the plurality of LEDs may operate to provide light at a wavelength of between about 600 nanometers and 750 nanometers. In some embodiments, ones of the plurality of LEDs operate to provide light at a wavelength of between about 900 nanometers and 1 millimeter.

[0021] Ones of the plurality of LEDs may be operable to produce light at wavelengths selected from the group consisting of light at a wavelength of between about 630 nanometers and 660 nanometers, light at a wavelength of between about 800 nanometers and 900 nanometers, light at a wavelength of between about 600 nanometers and 750 nanometers, light at a wavelength of between about 900 nanometers and 1 millimeter and a combination thereof.

[0022] In some embodiments, the one or more instructions from the controller include instructions to selectively turn on or turn off selected LEDs from the plurality of LEDs producing light at selected wavelengths. The method may include storing the data at the remote location.

[0023] The disclosure includes a computer-readable, non-transitory, programmable product, comprising code, executable by a processor, for causing the processor to do the following: cause reception of instructions from a remote location, operate a plurality of arrays of light-emitting diodes (LEDs) coupled to a wearable device, according to the instructions, receive sensor data associated with

[0024] the wearable device, and cause transmission of the sensor data to a remote location. In some embodiments, the instructions include operating a plurality of LEDs in the plurality of arrays in a manner that delivers light over a range of wavelengths. The range of wavelengths may be between about 600 nanometers and 750 nanometers. In some embodiments, the range of wavelengths is between about 800 nanometers and 900 nanometers. The range of wavelengths may be between about 900 nanometers and 1 millimeter.

[0025] The light therapy device also includes a flexible textile material. The device also includes a flexible substrate assembly coupled to and interior of the flexible textile material; a flexible textile cable assembly coupled to an interior of the flexible textile material; a plurality of light emitting diodes (LEDs) electrically coupled to the flexible substrate assembly, where the plurality of LEDs is arranged and configured to emit at least one of red light and near-infrared light; and a controller electrically coupled to the flexible textile cable assembly and the flexible substrate assembly, configured to control emission of the at least one of red light and near-infrared light from the plurality of LEDs.

[0026] Implementations may include one or more of the following features. The light therapy device where the flexible textile material may include: at least one attachment mechanism removably coupling the flexible substrate assembly and the flexible textile cable assembly to the interior of the flexible textile material. The at least one attachment mechanism is a non-conductive snap structure. The flexible textile material may include: a front cover of a semi-transparent material configured to diffuse at least a portion of the at least one of red light and near-infrared light emitted by the plurality of LEDs. The flexible textile material is at least partially metallic and is capable of diffusing heat generated by the plurality of LEDs. The controller may include: a select mode button configured to select a light emission mode of the plurality of LEDs; a help button configured to open up help menus; a settings button configured to open up a settings menu; a play button configured to start/stop/pause emission mode of the plurality of LEDs; and a time button configured to select a treatment time. The light emission mode may include preset modes and a custom mode selection, where the preset modes include red and near-infrared light in continuous and pulsed waveform at preset time durations and where the custom mode selection includes red and near-infrared light in continuous and pulsed waveform at customizable time durations. The recovery mode may include: substantially continuous red-light emission with pulsed near-infrared light emission. The controller may include: a power button configured to at least one of enter and exit a standby state; and a pairing button configured to at least one of turn on and off local area network pairing with a third-party device. The textile cable assembly is electrically coupled to the substrate assembly and the connector is configured to receive a cable coupled to a controller docking station, thereby electrically coupling the controller docking station to the nonwoven coated substrate assembly. The controller may include: a display screen configured to display information indicating at least one of treatment time, light emission mode, local area network pairing status, and treatment start/stop status. The flexible PCB assembly may include: a nonwoven coated substrate; a plurality of flexible printed circuit boards (PCBs) on the nonwoven coated substrate; and a plurality of electrically conductive connectors each attached to one of the plurality of flexible PCBs. The controller may include a built-in rechargeable battery configured to provide power to the light therapy device.

[0027] The wearable led treatment system also includes a flexible substrate assembly; a flexible textile cable assembly physically and electrically coupled to the flexible substrate assembly; a plurality of light emitting diodes (LEDs) physically and electrically coupled to the flexible substrate assembly, where the plurality of LEDs is arranged and configured to emit at least one of red light and near-infrared light; a power source electrically coupled to the flexible textile cable assembly; and a flexible textile cover including: a front panel having a semi-transparent portion configured to diffuse at least a portion of the at least one of red light and near-infrared light emitted by the plurality of LEDs; and a back panel with fasteners configured to removably couple and decouple the flexible textile cable assembly to the flexible textile cover.

[0028] The wearable led treatment system where the back panel is made of a metallic material and is capable of diffusing heat generated by the plurality of LEDs The fasteners are non-conductive snap structures. The wearable led treatment system may include: a controller electrically coupled to the flexible textile cable assembly and the flexible substrate assembly, configured to control emission of the at least one of red light and near-infrared light from the plurality of LEDs The wearable led treatment system may include: a transceiver configured to couple the controller to a wireless network. The transceiver is included in a smartphone or a tablet. Ones of the plurality of LEDs are operable to produce light at wavelengths selected from the group may include of light at a wavelength of between about 630 nanometers and 660 nanometers, light at a wavelength of between about 800 nanometers and 900 nanometers, light at a wavelength of between about 600 nanometers and 750 nanometers, light at a wavelength of between about 900 nanometers and 1 millimeter and a combination thereof.

[0029] The disclosure includes a computer-readable, non-transitory, programmable product wherein the code further causes the processor to produce training inputs for a training model used to produce artificial intelligence-generated instructions for control of the wearable device and associated functionality.

[0030] The foregoing, and other features and advantages of the invention, will be apparent from the following, more particular description of the preferred embodiments of the invention, the accompanying drawings, and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views and which together with the detailed description below are incorporated in and form part of the specification, serve to further illustrate various embodiments and explain various principles and advantages all in accordance with the present invention.

[0032] FIG. **1** illustrates a light therapy device lying on a user, according to some embodiments.

[0033] FIG. **2**A illustrates a font view of the light therapy device, according to some embodiments.

[0034] FIG. **2**B illustrates a back view of the light therapy device, according to some embodiments.

[0035] FIG. **3** illustrates a front view of the light therapy device coupled to a controller, according to some embodiments.

[0036] FIG. **4**A illustrates a front view of the controller, according to some embodiments.

[0037] FIG. **4**B illustrates a back view of the controller, according to some embodiments.

[0038] FIG. **5**A illustrates a top view of the controller, according to some embodiments.

[0039] FIG. **5**B illustrates a bottom view of the controller, according to some embodiments.

[0040] FIG. **6** illustrates a light therapy device lying on a user, according to some embodiments.

[0041] FIG. **7**A illustrates a front view of the light therapy device, according to some embodiments.

[0042] FIG. **7**B illustrates a back view of the light therapy device, including a controller, according to some embodiments.

[0043] FIG. **8**A illustrates a front view of the controller, according to some embodiments.

[0044] FIG. **8**B illustrates a back view of the controller, according to some embodiments.

[0045] FIG. **9**A illustrates a top view of the controller, according to some embodiments.

[0046] FIG. **9**B illustrates a bottom view of the controller, according to some embodiments.

[0047] FIG. **10** illustrates a block diagram representing a wearable light therapy device, according to some embodiments.

[0048] FIG. **11** illustrates a flowchart of operating the wearable light therapy device, according to some embodiments.

[0049] FIG. **12** illustrates a plan view of a flexible substrate assembly, according to some embodiments.

[0050] FIG. **13** illustrates a plan view of a flexible textile cable assembly, according to some embodiments.

[0051] FIG. **14** illustrates a partial view of flexible substrate assembly being coupled to a flexible textile cable assembly, according to some embodiments.

[0052] FIG. **15** illustrates a fully assembled flexible light-emitting blanket assembly, according to some embodiments.

[0053] FIG. **16** illustrates the internal wiring of an exemplary one of the anchor strips of the flexible textile cable assembly, according to some embodiments.

[0054] FIG. **17** illustrates a docking station for a controller, according to some embodiments.

DETAILED DESCRIPTION

[0055] While the specification concludes with claims defining the features of the invention that are regarded as novel, it is believed that the invention will be better understood from a consideration of the following description in conjunction with the drawing figures, in which like reference numerals are carried forward. It is to be understood that the disclosed embodiments are merely exemplary of the invention, which can be embodied in various forms.

[0056] FIG. **1** illustrates a light therapy device **100** lying on a user **102**. In some embodiments, the light therapy device **100** comprises a blanket-type article configured to lie directly on the user **102** while providing light therapy. The light therapy device **100** may also include a wearable garment, such as, but not limited to, a robe, jacket, sweatshirt, pants, shorts, or dress. As shown in FIG. **1**, the light therapy device **100** may define a length sufficient to cover a large portion of the body of the user **102**.

[0057] FIG. **2**A illustrates a front view of the light therapy device **100**, including a flexible textile material **200** and a flexible PCB assembly **202**. In some embodiments, the flexible PCB assembly **202** is electrically coupled to a plurality of LEDs **204**, and the plurality of LEDs **204** are arranged and configured to emit at least one of red light and near-infrared (NIR) light, i.e., red light and/or NIR. It should be noted that FIG. **2**A includes a dashed box around several LEDs, labeled as the plurality of LEDs **204**. The plurality of LEDs **204** can vary in number and may include every small square shown on the flexible PCB assembly **202**.

[0058] In some embodiments, the flexible textile material **200** includes a front cover **206**, as shown in FIG. **2**A. The front cover **206** may be detachably coupled to the flexible PCB assembly **202**. For example, in some embodiments, the front cover **206** includes one or multiple pockets configured to receive the flexible PCB assembly **202**. The flexible PCB assembly **202** may be coupled to the front cover **206** via other methods, such as hook and loop fastener, a plurality of snaps, a plurality of zippers, or any other similar method. In some embodiments, the front cover **206** comprises a semi-transparent material configured to diffuse at least a portion of the light emitted by the plurality of LEDs **204**. The front cover **206** may be comprised of mesh or a similar material. The light therapy device **100** may include an additional layer of material between the front cover **206** and the flexible PCB assembly **202** to provide an air gap and additional diffusing of the light emitted by the plurality of LEDs **204**.

[0059] FIG. **2**B illustrates a back view of the light therapy device **100**. As shown in FIG. **2**B, in some embodiments, the flexible textile material **200** includes a back cover **208** in addition to the front cover **206** shown in FIG. **1**. The back cover **208** may be detachably coupled to the front cover **206** via at least one attachment mechanism **210**. In some embodiments, the at least one attachment mechanism **210** is a plurality of snaps, buttons, or the like. The at least one attachment mechanism **210** may be one or multiple zippers, hook and loop fastener, or any number of similar mechanisms configured for detachable coupling.

[0060] In some embodiments, the back cover **208** is a non-translucent fabric. The back cover **208** may include at least one pocket configured to receive the flexible PCB assembly **202**, such that the flexible PCB assembly **202** may be coupled to the back cover **208** and surrounded by the front cover **206**. In some embodiments, the flexible textile material **200**, including the front cover **206** and the back cover **208**, is made of machine-washable material. The front cover **206** and the back cover **208** may be capable of diffusing heat generated by the plurality of LEDs **204**. The light therapy device **100** may include at least one designated heatsink, in addition to or instead of using a heat-dissipating flexible textile material **200**. In some embodiments, the flexible textile material **200**, combined with the flexible PCB assembly **202**, creates a non-shape-retaining blanket or similar article configured to be placed on a user to provide light therapy. FIG. **2**B also includes a product label **212** in the lower right corner of the back cover **208**. In some embodiments, the product label **212** is configured to include information such as brand name, care instructions for the flexible textile material **200**, product warnings, and the like.

[0061] FIG. **3** again illustrates a front view of the light therapy device **100** and includes a controller **300** coupled to the light therapy device **100**. In some embodiments, the controller **300** is electrically coupled to the flexible PCB assembly **202** and is configured to control emission of red light and/or NIR light emitted from the plurality of LEDs **204**. The controller **300** may include a plurality of input buttons **302**, which will be discussed further with reference to FIG. **4**A.

[0062] In some embodiments, the light therapy device **100** includes a connector **304** located on the flexible textile material **200**. The connector **304** may be electrically coupled to the flexible PCB assembly **202** and configured to receive a cable coupled to the controller **300**, in order to thereby electrically and communicatively couple the flexible PCB assembly **202** to the controller **300**. In some embodiments, the controller **300** is also coupled to an external power supply unit **306**. The external power supply unit **306** may be configured to provide power to the controller **300** and the flexible PCB assembly **202**, including the plurality of LEDs **204**. In some embodiments, the external power supply unit **306** comprises a 300 W power supply unit.

[0063] FIG. **3** also includes a plurality of flexible PCBs **308**. In some embodiments, the flexible PCB assembly **202** comprises a plurality of flexible PCBs **308**. As illustrated in FIG. **3**, the light therapy device **100** may include a total of nine flexible PCBs in the plurality of flexible PCBs **308**. Each flexible PCB of the plurality of flexible PCBs **308** may define a length of about **610** millimeters and a width of about **200** millimeters. In some embodiments, the light therapy device **100** includes a connector coupling each flexible PCB of the plurality of flexible PCBs **308** to one another. Once connected, the plurality of flexible PCBs **308** may be configured to operate as a unit-the flexible PCB assembly **202**. The invention is in no way limited to nine flexible PCBs and can include more or less than nine. Similarly, the invention is in no way limited to dimensions of **610** millimeters for the length and/or **200** millimeters for the width and can be of dimensions that are larger or smaller than these exemplary numbers.

[0064] FIGS. **4**A and **4**B show front and back views, respectively, of the controller **300**. In some embodiments, the controller **300** includes a screen **400**, as illustrated in FIG. **4**A. The screen **400** may be a display screen configured to show the treatment start/stop status **404**, the countdown time **406**, the local area network pairing status **408**, among other possible information, such as the selected light mode **410** and treatment time **412**, as shown in FIG. **4**A. In some embodiments, the screen **400** comprises a touch screen configured to receive input from a user. The screen **400** may be configured to receive input and display information. In some embodiments, the screen **400** comprises a color LCD display. The screen **400** may be an OLED display.

[0065] As shown in FIG. **3**, the controller **300** may include a plurality of input buttons **302**. In some embodiments, as shown in FIG. **4**A, the plurality of input buttons **302** includes a mode button **402***a*, a play/pause button **402***b*, and a time button **402***c*. The mode button **402***a* may be configured to select a light emission mode of the plurality of LEDs **204**, the play/pause button **402***b* may be configured to start and stop emission of red light and/or NIR light from the plurality of LEDs **204**, and the time button **402***c* may be configured to select a treatment time. In some embodiments, the plurality of input buttons **302** correspond with the information displayed on the screen **400**. For example, pressing the mode button **402***a* changes the selected light mode **410** shown on the screen **400**. Similarly, whether a treatment session is running or paused, as selected by the play/pause button **402***b*, may be indicated by the treatment start/stop status **404** on the screen **400**.

[0066] In some embodiments, pressing the time button **402***c* increases the treatment time **412**, as displayed on the screen **400**, by 1 minute increments, beginning at a 1 minute treatment session and ranging up to a 30 minute treatment session. If the time button **402***c* is pressed again after reaching a maximum 30 minute treatment session, the treatment time will go back to 1 minute. A default treatment time of 10 minutes may be selected upon turning on the light therapy device **100**. The countdown time **406** on the screen **400** may be configured to show the time remaining in a treatment session. For example, the treatment session demonstrated in FIG. **4**A comprises a 10 minute session with 8 minutes and 43 seconds remaining.

[0067] In some embodiments, the light emission mode selected by the mode button **402** comprises one of red light emission only (as indicated by the selected light mode **410** in FIG. **4**A), NIR light emission only, red and NIR light emission, and a recovery mode, which may also be called a "Recovery Plus Mode." Pressing the mode button **402** may cycle through these four light emission mode options, as reflected by the selected light mode **410** on the screen **400**. When the light therapy device **100** is arranged and configured to operate in the Recovery Plus Mode, the plurality of LEDs **204** may be configured to emit pulsed infrared light. In some embodiments, the plurality of LEDs **204** is configured to emit substantially continuous red light in the Recovery Plus Mode. The pulsed infrared light may be emitted at a single frequency. In some embodiments, the infrared light is pulsed at varying frequencies throughout the duration of the Recovery Plus Mode. "Varying" frequencies may comprise frequencies between 0 and 100 Hz, emitted at different duty cycle percentages. For example, the Recovery Plus Mode may include pulsing infrared light at 25 Hz and at 50% brightness for two minutes, increasing the frequency to 50 Hz at 75% brightness for two minutes, then reducing the frequency to 35 Hz and 40% brightness for two minutes.

[0068] The Recovery Plus Mode may comprise any combination of frequency and brightness per duty cycle. The infrared light may be pulsed for a certain amount of time; for example, the infrared light may be emitted for two seconds every five seconds. The infrared light may be pulsed for a shorter or longer duration than two seconds. In some embodiments, the Recovery Plus Mode comprises pulsing red light and substantially continuous infrared light. The Recovery Plus Mode may include pulsed or continuous emission of infrared and/or near-infrared light. The duration of a treatment session using Recovery Plus Mode may be selected by a user of the light therapy device **100** via the controller **300**. The Recovery Plus Mode may help facilitate cellular recovery by encouraging the removal of waste products from cells during a "quench period" in the cellular recovery process. The light therapy device **100** may be configured to automatically shut off at the end of a Recovery Plus Mode session. A user may manually shut off the light therapy device **100**. FIG. **4**B shows a back view of the controller **300**. In some embodiments, the controller **300** includes a recessed area **414**, indicated by the dashed box in FIG. **4**B. The recessed area **414** may be configured to receive a label with product information such as branding, use instructions, product warnings, and the like. The controller **300** may also include a plurality of screws **416** to hold the housing of the controller **300** together. In some embodiments, the housing of the controller **300** is made of ABS plastic and has an ingress protection (IP) **22** rating.

[0069] FIGS. **5**A and **5**B show top and bottom views, respectively, of the controller **300**. In some embodiments, as shown in FIG. **5**A, the controller **300** includes a power button **500** configured to turn the light therapy device **100** off or on, depending on the current state. The controller **300** may also include a pairing button **502** configured to enable a user to pair (or unpair) the light therapy device **100** with a third-party device via a local area network, such as Bluetooth®. In some embodiments, the light therapy device **100** is compatible with a mobile application configured to run on a third-party device such as a smartphone or tablet. The mobile application may operate similarly to the controller **300** in terms of starting or stopping a treatment session and/or selecting treatment time and/or light emission mode. The pairing button **502** may also turn on and/or off pairing for the light therapy device **100**. For example, a single press of the pairing button **502** may turn on/off pairing by turning on or off access to the LAN. A press and hold of the pairing button **502** may initiate the pairing process, allowing the light therapy device **100** to "search" for a nearby third-party device for connection. In some embodiments, whether the light therapy device **100** is paired or not is reflected by the presence of an icon in the LAN pairing status **408** on the screen **400**, as shown in FIG. **4**A.

[0070] The controller **300** may also include a first input port **504**, a second input port **506**, and a third input port **508**, as shown in FIGS. **5**A and **5**B. In some embodiments, the first input port **504** comprises a light device input port and is configured to receive the cable coupled to the connector **304** in the flexible textile material **200**, as discussed with reference to FIG. **3**. The second input port **506** may comprise a Mini-USB port for downloading and/or uploading firmware to the controller **300**. In some embodiments, the third input port **508** comprises a power input, such as a 24V DC power input, to connect the controller **300** to the external power supply unit **306** shown in FIG. **3**.

[0071] FIG. **6** illustrates a light therapy device **600** laying on a user **602**. Similar to the light therapy device **100**, in some embodiments, the light therapy device **600** comprises a blanket-type article configured to lay directly on the user **602** while providing light therapy. The light therapy device **600** may also comprise a wearable garment, such as, but not limited to, a robe, jacket, sweatshirt, pants, shorts, or dress. As compared to the light therapy device **100**, the light therapy device **600** may define a length sufficient to cover a smaller portion of the body of the user **602**.

[0072] FIG. **7**A shows a front view of the light therapy device **600**, including a flexible textile material **700** and a flexible PCB assembly **702**. In some embodiments, the light therapy device **600** is similar to the light therapy device **100**, but with scaled-down dimensions. For example, the flexible textile material **200** of the light therapy device **100** may define a length of about **1840** millimeters and a width of about **915** millimeters, whereas the flexible textile material **700** of the light therapy device **600** may define a length of about **620** millimeters and a width of about **220** millimeters. In addition, where flexible PCB assembly **202** of the light therapy device **100** comprises a plurality of flexible PCBs **308**, the flexible PCB assembly **702** of the light therapy device **600** may comprise a single flexible PCB, rather than multiple. The flexible PCB assembly **702** of the light therapy device **600** may be electrically coupled to a plurality of LEDs **704** configured to emit at least one of red light and NIR light, similar to the plurality of LEDs **204** of the light therapy device **100**.

[0073] In some embodiments, the flexible textile material **700** includes a front cover **706**, as shown in FIG. **7**A. The front cover **706** may be detachably coupled to the flexible PCB assembly **702**. For example, in some embodiments, the front cover **706** includes one or multiple pockets configured to receive the flexible PCB assembly **702**. The flexible PCB assembly **702** may be coupled to the front cover **706** via other methods, such as hook and loop fastener, a plurality of snaps, a plurality of zippers, or any other similar method. In some embodiments, the front cover **706** comprises a semi-transparent material configured to diffuse at least a portion of the light emitted by the plurality of LEDs **704**. The front cover **706** may be comprised of mesh or a similar material. The light therapy device **600** may include an additional layer of material between the front cover **706** and the flexible PCB assembly **702** to provide an air gap and additional diffusing of the light emitted by the plurality of LEDs **704**.

[0074] FIG. **7**B illustrates a back view of the light therapy device **600**. As shown in FIG. **7**B, in some embodiments, the flexible textile material **700** includes a back cover **710** in addition to the front cover **706** shown in FIG. **7**A. The back cover **710** may be detachably coupled to the front cover **706** via at least one attachment mechanism **712**. In some embodiments, the at least one attachment mechanism **712** comprises a plurality of snaps, buttons, or the like. The at least one attachment mechanism **712** may comprise one or multiple zippers, hook and loop fastener, or any number of similar mechanisms configured for detachable coupling.

[0075] In some embodiments, the back cover **710** comprises non-translucent fabric. The back cover **710** may include at least one pocket configured to receive the flexible PCB assembly **702**, such that the flexible PCB assembly **702** may be coupled to the back cover **710** and surrounded by the front cover **706**. In some embodiments, the flexible textile material **700**, including the front cover **706** and the back cover **710**, is comprised of machine-washable material. The front cover **706** and the back cover **710** may be capable of diffusing heat generated by the plurality of LEDs **704**. The light therapy device **600** may include at least one designated heatsink, in addition to or instead of using a heat-dissipating flexible textile material **700**. In some embodiments, the flexible textile material **700**, combined with the flexible PCB assembly **702**, creates a non-shape-retaining blanket or similar article configured to be placed on a user to provide light therapy. FIG. **7**B also includes a product label **714** in the lower right corner of the back cover **710**. In some embodiments, the product label **714** indicates a label configured to include information such as brand name, care instructions for the flexible textile material **700**, product warnings, and the like.

[0076] FIG. **7**B also includes a controller **708**. In some embodiments, the controller **708** is detachably coupled to the back cover **710** of the light therapy device **600** and is electrically coupled to the flexible PCB assembly **702**. The controller **708** may be configured to control emission of the at least one of red light and NIR light from the plurality of LEDs **704**. Coupling of the controller **708** to the back cover **710** may allow for wireless use of the light therapy device **600**.

[0077] FIGS. **8**A and **8**B illustrate front and back views, respectively, of the controller **708**. In some embodiments, the controller **708** comprises a built-in rechargeable battery **800** configured to provide power to the light therapy device **600**. Though the battery **800** is indicated in FIG. **8**A as a dashed box, it should be noted that the battery **800** may define a different shape or be larger or smaller than represented by the box. In some embodiments, the battery **800** comprises a lithium-ion battery. The battery **800** may comprise any suitable type of rechargeable battery. The controller **708** may also include an indicator LED **802** configured to indicate the status of the charge level of the battery **800**. For example, the indicator LED **802** may be configured to emit different light colors based on the charge level of the battery **800** (e.g., green for a full charge, yellow for a medium charge, and red or orange for no or low charge).

[0078] The front of the controller **708** may also include a power indicator **810** in the form of a logo or other symbol, indicated by the "J" in FIG. **8**A. In some embodiments, the power indicator **810** comprises at least one LED and is configured to illuminate to indicate that the light therapy device **600** is powered on. For example, the power indicator **810** may glow red (or any other color) to indicate that the light therapy device **600** is powered on.

[0079] FIG. **8**B shows the back of the controller **708**, including a connector **804**. In some embodiments, the connector **804** is a power connector and is configured to receive a cable, plug, or similar mechanism to electrically couple the controller **708** to the flexible PCB assembly **702**. Coupling the controller **708** to the flexible PCB assembly **702** also couples the battery **800** to the flexible PCB assembly **702**. It should be noted that the light therapy device **600**, including the controller **708**, may be configured to receive power from an AC or DC power source, rather than the battery **800**. The AC or DC power source may also be used to charge the battery **800**. Accordingly, the connector **804** may be configured to receive a connection to charge the battery **800**, rather than coupling to the flexible PCB assembly **702**. In some embodiments, the controller **708** includes at least one recessed area **808**, indicated by the dashed boxes in FIG. **8**B. The at least one recessed area **808** may be configured to receive a label(s) with product information such as branding, use instructions, product warnings, and the like. The controller **708** may also include a plurality of screws **806** to hold the housing of the controller **708** together. In some embodiments, the housing of the controller **708** is made of ABS plastic and has an ingress protection (IP) **22** rating.

[0080] FIGS. **9**A and **9**B show top and bottom views, respectively, of the controller **708**. In some embodiments, the controller **708** includes a plurality of input buttons **900**, as shown in FIG. **9**A. The plurality of input buttons **900** may include any of the following: a power button **902**, a pairing button **904**, a start/stop button **906**, a mode button **908**, and a time button **910**. In some embodiments, the power button **902** is configured to move the light therapy device **600** into or out of a standby state.

[0081] The pairing button **904** may be configured to enable a user to pair (or unpair) the light therapy device **600** with a third-party device via a local area network (LAN), such as Bluetooth®. In some embodiments, the light therapy device **600** is compatible with a mobile application configured to run on a third-party device such as a smartphone or tablet. The mobile application may operate similarly to the controller **708** in terms of starting or stopping a treatment session and/or selecting treatment time and/or light emission mode. The pairing button **904** may also turn on and/or off pairing for the light therapy device **600**. For example, a single press of the pairing button **904** may turn on/off pairing by turning on or off access to the LAN. A press and hold of the pairing button **904** may initiate the pairing process, allowing the light therapy device **600** to "search" for a nearby third-party device for connection. In some embodiments, the controller **708** includes a pairing indicator LED **912** configured to show, via solid light, flashing light, or no light, whether the light therapy device **600** is paired, in the process of pairing, or not paired, respectively, to a third-party device. The pairing indicator LED **912** may be configured to emit blue light.

[0082] In some embodiments, the start/stop button **906** is configured to start or stop a light therapy session once the light therapy device **600** is powered on, via the power button **902**, out of the standby state. Accordingly, the start/stop button **906** may be configured to start and stop emission of the at least one of red light and NIR light from the plurality of LEDs **704**.

[0083] The mode button **908** may be configured to select a light emission mode of the plurality of LEDs **704**. In some embodiments, the light emission mode selected by the mode button **908** comprises one of red light emission only, NIR light emission only, red and NIR light emission, and a recovery mode, which may also be called a "Recovery Plus Mode." The light emission modes, including

[0084] Recovery Plus Mode, may be the same light emission modes as described with reference to the light therapy device **100**. In some embodiments, the controller **708** includes mode indicator LEDs **914**, which comprise amber-colored LEDs configured to indicate which light emission mode has been selected. For example, each LED of the mode indicator LEDs **914** may correspond to a different light emission mode, and a user of the light therapy device **600** may be able to cycle through the four options and select a light emission mode by pressing the mode button **908** multiple times.

[0085] In some embodiments, the time button **910** is configured to select a treatment time. As shown in FIG. **9**A, the controller **708** may include time indicator LEDs **916**, where each LED of the time indicator LEDs **916** corresponds to a different predetermined treatment time. The time indicator LEDs **916** may comprise amber-colored LEDs configured to illuminate to indicate the treatment time selected. For example, the time indicator LEDs **916** may correspond to 10, 20, or 30 minute treatment sessions. A user of the light therapy device **600** may be able to cycle through the treatment time options by pressing the time button **910** multiple times.

[0086] FIG. **9**B shows the bottom of the controller **708**, according to some embodiments. As illustrated, the controller **708** may include a first input port **918** and a second input port **920**. In some embodiments, the first input port **918** comprises a power input, such as a 24V DC power input. Accordingly, the first input port **918** may be configured to receive a cable to couple the controller **708**, including the battery **800**, to a DC power source. The first input port **918** may be configured to provide power to the controller **708** to power the flexible PCB assembly **702** and/or to charge the battery **800**. The second input port **920** may comprise a Mini-USB port for downloading and/or uploading firmware to the controller **708**.

[0087] In some embodiments, both the light therapy device **100** and the light therapy device **600** include an auto-shutoff feature. The auto-shutoff may activate following a predetermined time of use, such as 30 minutes. In some embodiments, the auto-shutoff feature is a safety feature designed to protect users in the event that a user falls asleep or otherwise loses track of time while using either the light therapy device **100** or the light therapy device **600**. In addition, both the light therapy device **100** and the light therapy device **600** may be configured to be rolled or folded in a specific manner to prevent damage to the flexible PCB assembly **202** and/or the flexible PCB assembly **702**.

[0088] FIG. **10** is a block diagram illustrating aspects of the wearable system disclosed herein. Wearable X**2** includes one or more array(s) X**4** of light-emitting diodes (LEDs) that produce light in one or more therapeutic wavelengths, such as red light therapy wavelengths. Sensor system X**6** is representative of one or more sensors, placed in various locations, on wearable X**2** that may be used to monitor a variety of parameters such as wearable temperature, wearable power output, etc. In other embodiments, sensor system X**6** detects parameters such as blood pressure, heart rate, etc. Controller X**8** may control the functionality of arrays X**4** as well as sensor system X**6**. In some embodiments, this control may be carried out in connection with wireless connectivity, such as by using radio frequency (RF) communication. Controller X**8** may be coupled to transceiver X**10** via a body area network (BAN). Controller X**8** may contain one or more processors or microcontrollers X**9**. This coupling may be accomplished via a wireless or wired connection between controller X**8** and transceiver X**10** (hence, the dashed line between the two). In some embodiments, controller X**8** may be in communication with transceiver X**10** through a paired connection using Bluetooth®, Bluetooth Low Energy (Bluetooth LE), or other local area or wireless personal area network. Transceiver X**10** may be, for instance, a mobile device such as a smartphone or tablet. Further, transceiver X**10** may transmit and receive information through a terrestrial network or satellite-based network, represented as cloud X**12**. In some embodiments, transceiver X**10** may be implemented as a combined transmitter and receiver unit or as a transmitter and a receiver separate from one another. Data and control information may be received through the cloud X**12** by station X**14**. Station X**14**, which may have one or more processors (not shown), may serve to monitor information received remotely from the location of wearable X**2**. In some embodiments, station X**14** may both monitor and control functions on wearable X**2**. This may include controlling the light wavelengths delivered by the arrays X**4** of LEDs, power delivered to the LEDs, intensity of individual LEDs, etc. Information received by monitoring station X**14** may be saved in storage X**16**. Consequently, a schedule may be developed and provided in connection with therapeutic treatment using arrays X**4**.

[0089] In some embodiments, LEDs within arrays X**4** may provide light at wavelengths between approximately 610 and approximately 850 nanometers (nm). These may include red light at around 660 nm, near-infrared (NIR) light at around 850 nm and light delivered continuously or via pulses using combinations of NIR and red light. In other embodiments, LEDs within arrays X**4** may provide a mix of wavelengths, some of which may be considered in the red light spectrum while others are in may be in other spectrum. In other embodiments, some of the LEDs within arrays X**4** may be infrared light-emitting diodes (IR LEDs) that emit light in the infrared wavelength range of approximately 700 nm to 1 millimeter (mm).

[0090] The wearable system disclosed herein may include a wearable in the form of a garment. For instance, wearable X**2** may take to the form of a sweater, vest, cap or band.

[0091] The system discloses herein and shown in FIG. **10** may be further described in connection with FIG. **11**. FIG. **11** illustrates a flow chart noting the steps that may be implemented with software, firmware, or other programming in connection with a processor, microcomputer, microcontroller, and the like. With reference to FIG. **11**, after the Start step, operating instructions may be received, by a controller, received through merely a keypad, received remotely, or received via a programmed in a device. The wearable including LED functionality and associated sensors may be controlled according to the received instructions. Data may be forwarded, for instance, wirelessly, to a remote location. The data may be used to control functionality on wearable from the remote location. The wearable and associated functionality may be turned off in connection with receiving therapy termination instructions from the remote location or locally at an on-site controller.

[0092] The processor(s) noted herein may serve to provide inputs for and or may be used to train artificial intelligence (AI) bots in connection with developing therapies to be carried out on the wearable and its associated functions.

[0093] The processor(s) X**9** within controller X**8** may be used to implement transfer learning in an AI model. Consequently, a specific therapy may be devised for a particular user of wearable X**2**.

EXAMPLE

[0094] The operating instructions, received and referenced with respect to FIG. **11**, by processor(s) X**9**, may contain information developed pursuant to an AI model that may be developed remotely. The remotely developed AI model may take into a number of inputs that may be received from sensor system X**6** or past user operating data that may be recorded and uploaded to cloud X**12**, such as user body temperature, past therapy application times, desired therapy application times, heart rate, oximeter readings (in embodiments where sensor X**6** includes/implements a pulse oximeter), etc.

[0095] Transfer learning may be implemented to train an AI model pre-trained through Cloud X**12** of FIG. **10** and carried out by processor(s) X**9** in order to deliver therapies through wearable X**2**.

[0096] Sensor inputs from sensor X**6** may be used to further train the AI model carried out by processor(s) X**9**.

[0097] Some of the components listed herein use the same number from figure to figure. It should be appreciated these components use the same numbers solely for ease of reference and to facilitate comprehension for the reader. While these components may use the same numbers, differences may be present in these components as illustrated in the various figures in which they appear and as described in the specification herein.

[0098] None of the steps described herein is essential or indispensable. Any of the steps can be adjusted or modified. Other or additional steps can be used. Any portion of any of the steps, processes, structures, and/or devices disclosed or illustrated in one embodiment, flowchart, or example in this specification can be combined or used with or instead of any other portion of any of the steps, processes, structures, and/or devices disclosed or illustrated in a different embodiment, flowchart, or example. The embodiments and examples provided herein are not intended to be discrete and separate from each other.

[0099] FIG. **12** provides a plan view of a flexible substrate assembly **1200** that fits within the flexible textile material **700** and provides the circuitry to illuminate the plurality of LEDs **704** (not shown in this figure). The flexible substrate assembly **1200** includes a first plurality of red-light traces **1206***a*-**1206***n*, where "a" equals one and "n" equals any number greater than one. The first plurality of red-light traces **1206***a*-**1206***n* is energized by a red-light connector pad **1204***a* that is coupled to a conductor **1202***a*. The red-light connector pad **1204***a*, in accordance with one embodiment, is a have of a snap-type connector, where the two halves provide a compression coupling that retain one another once connected. On the opposing end of the first plurality of red-light traces **1206***a*-**1206***n* is a corresponding conductor **1210***a* coupled to a connector pad **1211***a*. The connector pad **1211***a* can also be a half of another snap pair. Each of the red-light contact pad **1204***a*, conductor **1202***a*, the first plurality of red-light traces **1206***a*-**1206***n*, the conductor **1210***a*, and red-light contact pad **1211***a* are made of electrically conductive material. Each of the contact pad **1204***a*, conductor **1202***a*, the first plurality of red-light traces **1206***a*-**1206***n*, the conductor **1210***a*, and contact pad **1211***a* have small electrically insulating gaps between them. The contact pad **1204***a*, conductor **1202***a*, the first plurality of red-light traces **1206***a*-**1206***n*, the conductor **1210***a*, and contact pad **1211***a* comprise a first trace group **1201***a*.

[0100] A first plurality of infrared-light traces **1208***a*-**1208***n* runs parallel to and in close proximity to the first plurality of red-light traces **1206***a*-**1206***n*. The first plurality of infrared-light traces **1208***a*-**1208***n* is energized by an infrared-light connector pad **1203***a* that is coupled to a conductor **1202***b*. On the other end of the first plurality of infrared-light traces **1208***a*-**1208***n* is a corresponding conductor **1213***a* coupled to an infrared-light connector pad **1212***a*. Each of the contact pad **1203***a*, conductor **1205***a*, the first plurality of infrared-light traces **1208***a*-**1208***n*, the conductor **1210***b*, and contact pad **1211***b* are also made of electrically conductive material. Each of the contact pads **1203***a*, conductor **1202***a*, the first plurality of red-light traces **1206***a*-**1206***n*, the conductor **1210***a*, and contact pad **1211***a* have small electrically insulating gaps between them. The contact pad **1203***a*, the conductor **1205***a*, the first plurality of infrared-light traces **1208***a*-**1208***n*, the conductor **1210***b*, and contact pad **1211***b* comprise a second trace **1201***b* group.

[0101] The flexible substrate assembly **1200** shown in FIG. **12** includes a plurality of additional groups of red-light traces and infrared-light traces **1201***c*-*n* to create an entire array of conductive rows that can be used to energize an array of LED lights. In FIG. **12**, the first red-light trace group **1201***a*-*n* can be energized by placing an electric potential between contacts **1204***a*-**1204***n* on the one side and corresponding contacts **1211***a*-**1211***n* on the other. Similarly, each infrared-light trace group **1201***b*-*n* can be energized by placing an electric potential between contacts **1203***a*-**1203***n* on one side and corresponding contacts **1212***a*-**1212***n* on the other. When the LEDs **704** are placed across the gaps between the traces **1206***a-n* and in conductive contact with the traces **1206***a-n* on either side of the LEDs **704**, current is able to pass from one trace **1206** to another and illuminate the LEDs **704**. This configuration creates a standard LED circuit, as is well known to those of ordinary skill in the art, but the instant circuit is in a novel flexible format. In one embodiment, the flexible substrate assembly **1200** is made of a nonwoven coated substrate material. The coating protects and insulates the trace groups **1201** and corresponding contact pads.

[0102] FIG. **13** shows a flexible textile cable assembly **1300** that provides power to the flexible substrate assembly **1200**. The flexible textile cable assembly **1300** includes a first anchor strip **1301** and a second anchor strip **1303**. The first anchor strip **1301** features a first plurality of conductive red-light snaps **1302***a-n* that each are configured to mate with a corresponding one of the red-light connector pads **1204***a-n* shown in FIG. **12**. The second anchor strip **1303** features a second plurality of conductive red-light snaps **1318***a-n* that each are configured to mate with a corresponding one of the opposing red-light connector pads **1211***a-n* shown in FIG. **12**. Similarly, the first anchor strip **1301** features a first plurality of conductive infrared-light snaps **1304***a-n* that are each configured to mate with a corresponding one of the infrared-light connector pads **1203***a-n* shown in FIG. **12**. The second anchor strip **1303** features a second plurality of conductive infrared-light snaps **1316***a-n* that each are configured to mate with a corresponding one of the opposing infrared-light connector pads **1212***a-n* shown in FIG. **12**.

[0103] The term "snap" or "snaps," as used herein, is intended to indicate any type of connector that electrically couples two conductive materials to one another. One specific embodiment is a metallic snap, such as those used on clothing, but the invention is in no way limited to any specific embodiment and can include other connectors as well.

[0104] Each of the first plurality of conductive red-light snaps **1302***a-n* is coupled to and energized by a corresponding one of a plurality of non-illustrated conductive wires that, for example, provides a positive potential to the first plurality of conductive red-light snaps **1302***a-n*. Each of the second plurality of conductive red-light snaps **1318***a-n* is coupled to a corresponding one of a plurality of non-illustrated conductive wires that, for example, provides a negative potential to the second plurality of conductive red-light snaps **1318***a-n*.

[0105] Similarly, each of the first plurality of conductive infrared-light snaps **1304***a-n* is coupled to and energized by a corresponding one of a plurality of non-illustrated conductive wires that, for example, provide a positive potential to the first plurality of conductive infrared-light snaps **1304***a-n*. Each of the second plurality of conductive infrared-light snaps **1316***a-n* is coupled to a corresponding one of a plurality of non-illustrated conductive wires that, for example, provides a negative potential to the second plurality of conductive infrared-light snaps **1316***a-n*.

[0106] The first anchor strip **1301** features a first plurality of non-conductive snaps **1306***a-n* and the second anchor strip **1303** features a second plurality of conductive non-conductive snaps **1320***a-n*. The first plurality of non-conductive snaps **1306***a-n* and the second plurality of conductive non-conductive snaps **1320***a-n* are used to secure an electrically insulating cover of the flexible textile cable assembly **1300**.

[0107] A connector strip **1305** physically connects the first anchor strip **1301** to the second anchor strip **1303**. The connector strip **1305** couples to the first anchor strip **1301** via a first group of snaps **1308***a-n* and couples to the second anchor strip **1303** via a second group of snaps **1314***a-n*. The connector strip **1305** has along its length a plurality of non-conductive snaps **1312***a-n*. Along with non-conductive snaps **1306***a-n* and **1320***a-n*, non-conductive snaps **1312***a-n* provide secure anchors to couple a cover **1402** (shown in FIG. **14**) to the flexible textile cable assembly **1300**. Not only does the cover **1402** physically protect the flexible textile cable assembly **1300**, it also provides an electrically insulating barrier between a user of the device and the electrically charged connector pads **1302***a-n*, **1304***a-n*, **1316***a-n*, and **1318***a-n*.

[0108] FIG. **14** provides a perspective partial view of the flexible textile cable assembly **1300** partially coupled to the flexible substrate assembly **1200**. In this view, connector strip **1305** is attached to a flexible bottom cover **1401**, e.g., by snap connectors or by sewing the connector strip **1305** to the flexible bottom cover **1401**. The flexible substrate assembly **1200** is positioned upon the flexible bottom cover so that the trace groups **1201***a-n* run longitudinally parallel to the longitudinal direction of the connector strip **1305**.

[0109] The second anchor strip **1303** is shown having a portion of its red-light snaps **1318***a-n* coupled to a corresponding portion of the red-light connector pads **1211***a-n* of the flexible substrate assembly **1200**. Likewise, the second anchor strip **1303** is shown having a portion of its infrared-light snaps **1316***a-n* coupled to a corresponding portion of the infrared-light connector pads **1212***a-n* of the flexible substrate assembly **1200**.

[0110] FIG. **14** shows that a portion of the second anchor strip **1303** is not yet attached to the remaining portion of the flexible substrate assembly **1200**. This part of the figure shows the snap halves that form the physical connection between the electrically conducting contacts. Specifically, five red-light connector pads **1211***a-e* are shown and are spaced to mate with five (only four can be seen in this view) corresponding snap couples **1318***a*-e. Similarly, five infrared light connector pads **1212***a-e* are shown and are spaced to mate with five (only four can be seen in this view) corresponding snap couples **1316***a-e*.

[0111] Each snap **1316***a-n* and **1318***a-n* is a terminal end of a non-illustrated wire that runs through the anchor strip **1303**. Similarly, each snap **1302***a-n* and **1304***a-n* is a terminal end of a non-illustrated wire that runs through anchor strip **1301**. When an electrical potential is applied across the corresponding snap pairs, the electric potential energizes each trace group **1201**. For example, if a wire having a positive charge is coupled to snap **1302***a*, that charge is transferred to contact pad **1204***a*. If a wire having a negative charge, or ground, is coupled to snap **1318***a*, that charge, or ground connection, is applied to snap **1318***a*. Through these wires and charges, electric current can be applied to trace group **1201***a*. If an LED is coupled between each one of the plurality of light traces **1206***a-n*, the current will energize each of the LEDs. FIG. **14** shows a plurality of LEDs **1404***a-n* coupled in such a manner between the plurality of traces **1206***a-n*.

[0112] A second and different electrical potential can be applied between connectors pads **1203***a* and **1212***a* through snaps **1304***a* and **1316***a*. Through these wires and charges, electric current can be applied to trace group **1201***b*. If an LED is coupled between each one of the plurality of light traces **1206***a-n*, the current will energize each of the LEDs. FIG. **14** shows a plurality of LEDs **1404***a-n* coupled in such a manner between the plurality of traces **1206***a-n*. By placing a different electric potential across trace group **1201***a* than **1201***b*, the LEDs **1404***a-n* can be made to radiate different colors, specifically, red light and infrared light. When the entire flexible substrate assembly **1200** is populated with LEDs **1404**, a panel of LEDs is provided that produces a user-selectable output of light.

[0113] The connector strip **1305** electrically couples to the second anchor strip **1303** when the snap halves **1314***a-d* on the connector strip **1305** are fixedly mechanically coupled to the corresponding snap halves **1402***a-d* on the anchor strip **1303**. This connection allows the current to return, via connector strip **1305**, to the power source (discussed below).

[0114] The anchor strips **1301** and **1303** and the connector strip **1305** are, in one embodiment, made of a cloth material that provides flexibility to the overall assembly as well as electrical insulation for/from all elements carrying a charge. Once all the above-described snap connectors are coupled to one another, the only thing exposed to view and to the touch of the user of the device are the LEDs **1404**.

[0115] FIG. **13** shows a power source **1310** that powers the connectors **1302***a-n* and **1304***a-n* through one of its terminals and connectors **1316***a-n* and **1318***a-n* through the other of its two terminals. The power source **1310** can be any conventional source of electric power, including battery or wall-supplied power. Preferably, the power source **1310** is a direct current (DC) power source that provides direct current to the plurality of LEDs **1404**.

[0116] FIG. **15** shows a fully assembled flexible light-emitting blanket assembly **1500**. It includes a flexible textile material cover **1504** that is made of a back cover portion **1502** and a front cover portion **1506**. The use of the terms “front” and “back” is intended to differentiate two portions of the flexible textile material **1504** and is not intended to indicate that one necessarily has to be above, below, in front of, or behind the other, with reference to any other object. In one embodiment, the front portion **1506** of the flexible textile material **1504** is an opaque material that allows light emitted from the plurality of LEDs **1404***a-n* to pass through the front cover portion **1506** of the flexible textile material cover **1504**. The front cover portion **1506** of the flexible textile material cover **1504** can be made of a textile material that wicks away sweat from the user and provides some isolation of heat between the plurality of LEDs **1404***a-n* and the user upon whose skin the flexible light-emitting blanket assembly **1500** is placed. In accordance with one embodiment, the back cover portion **1502** of the flexible textile material cover **1504** is made of a material with metallic materials, e.g., aluminum, allowing it to dissipate heat in an efficient manner, acting as a type of heat sink.

[0117] In one embodiment, the flexible textile material **1504** of the flexible light-emitting blanket assembly **1500** has a length and width large enough to cover the torso of an average human. For example, it is estimated that the average height of a man is 5.6 ft and the average height of a woman is 5.2 ft. Thus, the flexible textile material **1504** would be approximately 3.5 ft in length and 2.5 ft in width. Within the flexible light-emitting blanket assembly **1500**, there are no structures that will prevent the flexible light-emitting blanket assembly **1500** from flexing across the length and width of the flexible textile material to conform to the shape of the torso of the average human.

[0118] Advantageously, the flexible textile material cover **1504** can be removed for cleaning. Regular cleaning may be desired because, in use, portions of the flexible light-emitting blanket assembly **1500** rest against the user’s skin and sweat will transfer to those portions. For this reason, the cover **1504** is conveniently removable via the non-conductive snaps **1306***a-n*, **1312***a-n*, and **1320***a-n*, all shown in FIG. **15**. The entire cover **1504** or portions of the cover **1504**, e.g., upper portion **1506**, can be made of any flexible textile material that is strong enough to secure the flexible substrate assembly **1200** and the flexible textile cable assembly **1300** and also easily launders clean.

[0119] FIG. **16** shows the internal wiring of an exemplary one of the anchor strips **1301** or **1303**. In one embodiment, each anchor strip is made of a pair of fabric layers that obscure wire pairs **1602**, **1604** and **1606**, **1608**. In FIG. **16**, one of the fabric layers has been removed to expose the wire pairs **1602**, **1604** and **1606**, **1608**. A first wire pair **1602** and **1604** are electrically coupled to each of the red-light snaps **1318***a-n*. Similarly, the second wire pair **1606** and **1608** are electrically coupled to each of the infrared-light snaps **1316***a-n*. The wire pairs **1602**, **1604** and **1606**, **1608** allow an electrical potential to be selectively applied to the red-light snaps **1318***a-n* and the infrared-light snaps **1316***a-n*.

[0120] FIG. **17** shows a docking station **1700** that is configured to physically receive and communicatively interface with the controller **300**. The docking station **1700** has a cradle portion **1702** that mates with and holds the controller **300**. The docking station **1700** has a cable **1704** with a docking station connector **1706** that communicatively couples with the nonwoven coated substrate assembly **1200**. When the connector **1706** is coupled to the substrate assembly **1200** and the controller **300** is in the cradle portion **1702**, the controller **300** controls the flexible light-emitting blanket assembly **1500** in the way described above (where the flexible light-emitting blanket assembly **1500** is more generally referred to as “the light therapy device **100**”). Advantageously, the docking station **1700** allows the controller **300** to be removed for charging in a separate base. In this way, a battery (or batteries) within the controller **300** can be charged at a separate charging device and then returned to the cradle portion **1702** to power and control the flexible light-emitting blanket assembly **1500**. The docking station **1700** also includes a power button **1708** configured to enter and exit a standby state and a pairing button **1710** configured to turn on and off a local area network pairing function that allows it to connect to a third-party device.

[0121] Advantageously, the present invention introduces the first fully flexible light-emitting blanket assembly that is entirely free of any interior structure which might inhibit its ability to conform to the unique contours of a user’s body. As a result, the light-emitting blanket not only offers superior adaptability and comfort by conforming to the body’s curves, but it also maintains its functional integrity without sacrificing flexibility. This breakthrough addresses a significant shortcoming in the existing art, marking a pivotal advancement in the design and utility of light-emitting blanket assemblies.

[0122] The section headings and subheadings provided herein are nonlimiting. The section headings and subheadings do not represent or limit the full scope of the embodiments described in the sections to which the headings and subheadings pertain. For example, a section titled "Topic 1" may include embodiments that do not pertain to Topic 1 and embodiments described in other sections may apply to and be combined with embodiments described within the "Topic 1" section. The various features and processes described above may be used independently of one another, or may be combined in various ways. All possible combinations and subcombinations are intended to fall within the scope of this disclosure. In addition, certain method, event, state, or process blocks may be omitted in some implementations. The methods, steps, and processes described herein are also not limited to any particular sequence, and the blocks, steps, or states relating thereto can be performed in other sequences that are appropriate. For example, described tasks or events may be performed in an order other than the order specifically disclosed. Multiple steps may be combined in a single block or state. The example tasks or events may be performed in serial, in parallel, or in some other manner. Tasks or events may be added to or removed from the disclosed example embodiments. The example systems and components described herein may be configured differently than described. For example, elements may be added to, removed from, or rearranged compared to the disclosed example embodiments.

[0123] Conditional language used herein, such as, among others, "can," "could," "might," "may," "e.g.," and the like, unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments include, while other embodiments do not include, certain features, elements and/or steps. Thus, such conditional language is not generally intended to imply that features, elements and/or steps are in any way required for one or more embodiments or that one or more embodiments necessarily include logic for deciding, with or without author input or prompting, whether these features, elements and/or steps are included or are to be performed in any particular embodiment. The terms "comprising," "including," "having," and the like are synonymous and are used inclusively, in an open-ended fashion, and do not exclude additional elements, features, acts, operations and so forth. Also, the term "or" is used in its inclusive sense (and not in its exclusive sense) so that when used, for example, to connect a list of elements, the term "or" means one, some, or all of the elements in the list. Conjunctive language such as the phrase "at least one of X, Y, and Z," unless specifically stated otherwise, is otherwise understood with the context as used in general to convey that an item, term, etc. may be either X, Y, or Z. Thus, such conjunctive language is not generally intended to imply that certain embodiments require at least one of X, at least one of Y, and at least one of Z to each be present.

[0124] The term "and/or" means that "and" applies to some embodiments and "or" applies to some embodiments. Thus, A, B, and/or C can be replaced with A, B, and C written in one sentence and A, B, or C written in another sentence. A, B, and/or C means that some embodiments can include A and B, some embodiments can include A and C, some embodiments can include B and C, some embodiments can only include A, some embodiments can include only B, some embodiments can include only C, and some embodiments can include A, B, and C. The term "and/or" is used to avoid unnecessary redundancy.

[0125] The foregoing may be accomplished through software code running in one or more processors on a communication device in conjunction with a processor in a server running complementary software code.

[0126] Some of the devices, systems, embodiments, and processes use computers. Each of the routines, processes, methods, and algorithms described in the preceding sections may be embodied in, and fully or partially automated by, code modules executed by one or more computers, computer processors, or machines configured to execute computer instructions. The code modules may be stored on any type of non-transitory computer-readable storage medium or tangible computer storage device, such as hard drives, solid state memory, flash memory, optical disc, and/or the like. The processes and algorithms may be implemented partially or wholly in application-specific circuitry. The results of the disclosed processes and process steps may be stored, persistently or otherwise, in any type of non-transitory computer storage such as, e.g., volatile or non-volatile storage.

[0127] It is appreciated that in order to practice the method of the foregoing as described above, it is not necessary that the processors and/or the memories of the processing machine be physically located in the same geographical place. That is, each of the processors and the memory (or memories) used by the processing machine may be located in geographically distinct locations and connected so as to communicate in any suitable manner. Additionally, it is appreciated that each of the processor and/or the memory may be composed of different physical pieces of equipment. Accordingly, it is not necessary that the processor be one single piece of equipment in one location and that the memory be another single piece of equipment in another location. That is, it is contemplated that the processor may be two pieces of equipment in two different physical locations. The two distinct pieces of equipment may be connected in any suitable manner. Additionally, the memory may include two or more portions of memory in two or more physical locations.

[0128] To explain further, processing, as described above, is performed by various components and various memories. However, it is appreciated that the processing performed by two distinct components as described above may, in accordance with a further embodiment of the foregoing, be performed by a single component. Further, the processing performed by one distinct component as described above may be performed by two distinct components. In a similar manner, the memory storage performed by two distinct memory portions, as described above, may, in accordance with a further embodiment of the foregoing, be performed by a single memory portion. Further, the memory storage, performed by one distinct memory portion, as described above, may be performed by two memory portions.

[0129] Further, various technologies may be used to provide communication between the various processors and/or memories, as well as to allow the processors and/or the memories of the foregoing to communicate with any other entity, i.e., so as to obtain further instructions or to access and use remote memory stores, for example. Such technologies used to provide such communication might include a network, the Internet, Intranet, Extranet, LAN, an Ethernet, wireless communication via cell tower or satellite, or any client server system that provides communication, for example. Such communications technologies may use any suitable protocol such as TCP/IP, UDP, or OSI, for example.

[0130] As described above, a set of instructions may be used in the processing of the foregoing. The set of instructions may be in the form of a program or software. The software may be in the form of system software or application software, for example. The software might also be in the form of a collection of separate programs, a program module within a larger program, or a portion of a program module, for example. The software used might also include modular programming in the form of object-oriented programming. The software may instruct the processing machine what to do with the data being processed.

[0131] Further, it is appreciated that the instructions or set of instructions used in the implementation and operation of the foregoing may be in a suitable form such that the processing machine may read the instructions. For example, the instructions that form a program may be in the form of a suitable programming language, which is converted to machine language or object code to allow the processor or processors to read the instructions. That is, written lines of programming code or source code, in a particular programming language, are converted to machine language using a compiler, assembler or interpreter. The machine language is binary coded machine instructions that are specific to a particular type of processing machine, i.e., to a particular type of computer, for example. The computer understands the machine language.

[0132] Any suitable programming language may be used in accordance with the various embodiments of the foregoing. Illustratively, the programming language used may include assembly language, Ada, APL, Basic, C, C++, COBOL, dBase, Forth, Fortran, Java, Modula-2, Pascal, Prolog, Python, REXX, Visual Basic, and/or JavaScript, for example. Further, it is not necessary that a single type of instruction or single programming language be utilized in conjunction with the operation of the system and method of the foregoing. Rather, any number of different programming languages may be utilized as is necessary and/or desirable.

[0133] Also, the instructions and/or data used in the practice of the foregoing may utilize any compression or encryption technique or algorithm, as may be desired. An encryption module might be used to encrypt data. Further, files or other data may be decrypted using a suitable decryption module, for example.

[0134] As described above, the foregoing may illustratively be embodied in the form of a processing machine, including a computer or computer system, for example, that includes at least one memory. It is to be appreciated that the set of instructions, i.e., the software for example, that enables the computer operating system to perform the operations described above may be contained on any of a wide variety of media or medium, as desired. Further, the data that is processed by the set of instructions might also be contained on any of a wide variety of media or medium. That is, the particular medium, i.e., the memory in the processing machine, utilized to hold the set of instructions and/or the data used in the foregoing may take on any of a variety of physical forms or transmissions, for example. Illustratively, the medium may be in the form of paper, paper transparencies, a compact disk, a DVD, an integrated circuit, a hard disk, a floppy disk, an optical disk, a magnetic tape, a RAM, a ROM, a PROM, an EPROM, a wire, a cable, a fiber, a communications channel, a satellite transmission, a memory card, a SIM card, or other remote transmission, as well as any other medium or source of data that may be read by the processors of the foregoing.

[0135] Further, the memory or memories used in the processing machine that implements the foregoing may be in any of a wide variety of forms to allow the memory to hold instructions, data, or other information, as is desired. Thus, the memory might be in the form of a database to hold data. The database might use any desired arrangement of files such as a flat file arrangement or a relational database arrangement, for example.

[0136] In the system and method of the foregoing, a variety of "user interfaces" may be utilized to allow a user to interface with the processing machine or machines that are used to implement the foregoing. As used herein, a user interface includes any hardware, software, or combination of hardware and software used by the processing machine that allows a user to interact with the processing machine. A user interface may be in the form of a dialogue screen for example. A user interface may also include any of a mouse, touch screen, keyboard, keypad, voice reader, voice recognizer, dialogue screen, menu box, list, checkbox, toggle switch, a pushbutton or any other device that allows a user to receive information regarding the operation of the processing machine as it processes a set of instructions and/or provides the processing machine with information. Accordingly, the user interface is any device that provides communication between a user and a processing machine. The information provided by the user to the processing machine through the user interface may be in the form of a command, a selection of data, or some other input, for example.

[0137] As discussed above, a user interface is utilized by the processing machine that performs a set of instructions such that the processing machine processes data for a user. The user interface is typically used by the processing machine for interacting with a user either to convey information or receive information from the user. However, it should be appreciated that in accordance with some embodiments of the system and method of the foregoing, it is not necessary that a human user actually interact with a user interface used by the processing machine of the foregoing. Rather, it is also contemplated that the user interface of the foregoing might interact, i.e., convey and receive information, with another processing machine, rather than a human user. Accordingly, the other processing machine might be characterized as a user. Further, it is contemplated that a user interface utilized in the system and method of the foregoing may interact partially with another processing

[0138] machine or processing machines, while also interacting partially with a human user. While certain example embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions disclosed herein. Thus, nothing in the foregoing description is intended to imply that any particular feature, characteristic, step, module, or block is necessary or indispensable. Indeed, the novel methods and systems described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions, and changes in the form of the methods and systems described herein may be made without departing from the spirit of the inventions disclosed herein

[0139] The claims appended hereto are meant to cover all modifications and changes within the scope and spirit of the present invention.

What is claimed is:

1. A light therapy device, comprising:

a flexible textile material having a length and width large enough to cover a torso of an average human;

a flexible substrate assembly coupled to and interior of the flexible textile material;

a flexible textile cable assembly coupled to an interior of the flexible textile material; and

a plurality of light emitting diodes (LEDs) electrically coupled to the flexible substrate assembly, wherein the plurality of LEDs is arranged and configured to emit at least one of red light and near-infrared light,

wherein the light therapy device is void of structures that prevent the light therapy device from flexing across the length and width of the flexible textile material to conform to the shape of the torso of the average human.

2. The light therapy device of claim **1**, wherein the flexible textile material comprises:

at least one attachment mechanism removably coupling the flexible substrate assembly and the flexible textile cable assembly to the interior of the flexible textile material.

3. The light therapy device of claim **2**, wherein the at least one attachment mechanism is a non-conductive snap structure.

4. The light therapy device of claim **1**, wherein the flexible textile material comprises:

a front cover of a semi-transparent material configured to diffuse at least a portion of the at least one of red light and near-infrared light emitted by the plurality of LEDs.

5. The light therapy device of claim **1**, wherein the flexible textile material is at least partially metallic and is capable of diffusing heat generated by the plurality of LEDs.

6. The light therapy device of claim **1**, further comprising:

a controller electrically coupled to the flexible textile cable assembly and the flexible substrate assembly, configured to control emission of the at least one of red light and near-infrared light from the plurality of LEDs, the controller having:

a select mode button configured to select a light emission mode of the plurality of LEDs;

a help button configured to open up help menus;

a settings button configured to open up a settings menu;

a play button configured to start/stop/pause emission mode of the plurality of LEDs; and

a time button configured to select a treatment time.

7. The light therapy device of claim **6**, wherein the light emission mode comprises preset modes and a custom mode selection, wherein the preset modes include red and near-infrared light in continuous and pulsed waveform at preset time durations and where the custom mode selection includes red and near-infrared light in continuous and pulsed waveform at customizable time durations.

8. The light therapy device of claim **7**, wherein the recovery mode comprises:

substantially continuous red-light emission with pulsed near-infrared light emission.

9. The light therapy device of claim **7**, wherein the controller comprises:

a power button configured to at least one of enter and exit a standby state; and

a pairing button configured to at least one of turn on and off local area network pairing with a third-party device.

10. The light therapy device of claim **1**, further comprising:

a connector coupled to the flexible textile material and the textile cable assembly, wherein the textile cable assembly is electrically coupled to the substrate assembly and the connector is configured to receive a cable coupled to a controller docking station, thereby electrically coupling the controller docking station to the nonwoven coated substrate assembly.

11. The light therapy device of claim **1**, further comprising:

a controller electrically coupled to the flexible textile cable assembly and the flexible substrate assembly, configured to control emission of the at least one of red light and near-infrared light from the plurality of LEDs, the controller having a display screen configured to display information indicating at least one of treatment time, light emission mode, local area network pairing status, and treatment start/stop status.

12. The light therapy device of claim **1**, wherein the flexible PCB assembly comprises:

a nonwoven coated substrate;

a plurality of flexible printed circuit boards (PCBs) on the nonwoven coated substrate; and

a plurality of electrically conductive connectors each attached to one of the plurality of flexible PCBs.

13. The light therapy device of claim **1**, further comprising:

a controller electrically coupled to the flexible textile cable assembly and the flexible substrate assembly, configured to control emission of the at least one of red light and near- infrared light from the plurality of LEDs and having a built-in rechargeable battery configured to provide power to the light therapy device.

14. A wearable LED treatment system comprising:

a flexible substrate assembly;

a flexible textile cable assembly physically and electrically coupled to the flexible substrate assembly and having a length and width large enough to cover a torso of an average human;

a plurality of light emitting diodes (LEDs) physically and electrically coupled to the flexible substrate assembly, wherein the plurality of LEDs is arranged and configured to emit at least one of red light and near-infrared light;

a power source electrically coupled to the flexible textile cable assembly; and

a flexible textile cover including:

a front panel having a semi-transparent portion configured to diffuse at least a portion of the at least one of red light and near-infrared light emitted by the plurality of LEDs; and

a back panel with fasteners configured to removably couple and decouple the flexible textile cable assembly to the flexible textile cover,

wherein the wearable LED treatment system is void of structures that prevent the light therapy device from flexing across the length and width of the flexible textile material to conform to the shape of the torso of the average human.

15. The wearable LED treatment system of claim **14**, wherein the back panel is made of a metallic material and is capable of diffusing heat generated by the plurality of LEDs

16. The wearable LED treatment system of claim **14**, wherein the fasteners are non-conductive snap structures.

17. The wearable LED treatment system of claim **14**, further comprising:

a controller electrically coupled to the flexible textile cable assembly and the flexible substrate assembly, configured to control emission of the at least one of red light and near-infrared light from the plurality of LEDs

18. The wearable LED treatment system of claim **17**, further comprising:

a transceiver configured to couple the controller to a wireless network.

19. The wearable LED treatment system of claim **18**, wherein the transceiver is included in a smartphone or a tablet.

20. The wearable LED treatment system of claim **14**, wherein ones of the plurality of LEDs are operable to produce light at wavelengths selected from the group consisting of light at a wavelength of between about 630 nanometers and 660 nanometers, light at a wavelength of between about 800 nanometers and 900 nanometers, light at a wavelength of between about 600 nanometers and 750 nanometers, light at a wavelength of between about 900 nanometers and 1 millimeter and a combination thereof.

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