

ABSTRACT

A vibration therapy device that includes a housing that includes a handle portion, a head portion and a module seat defined on the head portion, an electrical source, a motor positioned in the housing, a switch for activating the motor, a push rod assembly operatively connected to the motor and configured to reciprocate in response to activation of the motor, and a therapy module removably secured to the module seat. The distal end of the push rod assembly is configured to removably receive a reciprocating attachment thereon. The therapy module at least partially surrounds the distal end of the push rod assembly.

CLAIMS

What is claimed is:

1. A vibration therapy device comprising:

a housing that includes a handle portion and a head portion,

an electrical source,

a motor positioned in the housing,

a switch for activating the motor,

a push rod assembly operatively connected to the motor, wherein the push rod assembly includes an attachment member that defines the distal end of the push rod assembly, wherein the attachment member is configured to reciprocate in response to activation of the motor at a linear velocity between 0.06 m/s and 0.5 m/s, wherein the attachment member includes a first magnet,

a reciprocating attachment removably received on the attachment member, wherein the reciprocating attachment includes a second magnet that is magnetically attracted to the first magnet to secure the reciprocating attachment on the attachment member.

2. The vibration therapy device of claim 1 wherein the reciprocating attachment includes an attachment member recess defined therein, wherein the attachment member is received in the attachment member recess, wherein the attachment member defines an attachment member diameter and the attachment member recess defines an attachment member recess diameter, wherein the attachment member diameter is smaller than the attachment member recess diameter, and wherein the first and second magnets secure the reciprocating attachment on the attachment member during reciprocation.

3. The vibration therapy device of claim 2 wherein a module seat is defined on the head portion, a ring module is removably secured to the module seat, wherein the ring module includes a central opening that defines a central opening diameter, wherein the

reciprocating attachment member defines a reciprocating attachment diameter, wherein the central opening diameter is larger than the reciprocating attachment diameter, such that the reciprocating attachment is configured to reciprocate within and relative to the ring module.

4. The vibration therapy device of claim 3 wherein the ring module is in electrical communication with the electrical source, wherein the module seat includes a first electrical connector, and wherein the ring module includes a second electrical connector in electrical communication with the first electrical connector.

5. The vibration therapy device of claim 1 further comprising a flexible sleeve that includes a proximal end and a distal end, wherein the push rod assembly includes a reciprocating shaft, wherein the flexible sleeve at least partially surrounds the reciprocating shaft, wherein the distal end of the flexible sleeve is secured to the attachment member and the proximal end of the flexible sleeve is secured to the housing.

6. The vibration therapy device of claim 5 wherein the reciprocating shaft includes an opening in a distal end thereof, wherein the attachment member includes shaft that is received in the opening in the reciprocating shaft, wherein the distal end of the flexible sleeve is secured between the distal end of the reciprocating shaft and the attachment member.

7. The vibration therapy device of claim 1 wherein the attachment member is configured to reciprocate in response to activation of the motor at a linear velocity between 0.11 m/s and 0.4 m/s.

8. A therapy device comprising:

a housing that includes a handle portion, a head portion and a module seat defined on the head portion, wherein the module seat includes a first set of magnets, wherein the module seat includes a first securement protrusion extending therefrom and includes a first securement recess defined therein,

an electrical source,

a therapy module removably secured to the module seat, wherein the therapy module includes a second set of magnets that are magnetically attracted to the first set of magnets, wherein the therapy module includes a second securement protrusion extending therefrom and includes a second securement recess defined therein, wherein the first securement protrusion is received in the second securement recess, and wherein the second securement protrusion is received in the first securement recess.

9. The therapy device of claim 8 wherein one of the first securement protrusion and the second securement recess includes female electrical contacts and the other of the first securement protrusion and second securement recess includes male electrical contacts, and wherein connection of the male electrical contacts and female electrical contacts provides electrical communication between the electrical source and the therapy module.

10. The therapy device of claim 9 wherein the therapy module provides at least one of cold therapy, heat therapy, LED light therapy, microcurrent therapy, photobiomodulation therapy, radio frequency therapy, cleansing therapy or ultrasound therapy.

11. The therapy device of claim 9 further comprising:

a motor positioned in the housing,

a switch for activating the motor, and

a push rod assembly operatively connected to the motor, wherein the push rod assembly includes an attachment member that defines the distal end of the push rod assembly,

wherein the therapy module includes a central opening defined therein, and wherein the attachment member extends into the central opening.

12. The therapy device of claim 9 wherein the male electrical contacts include four prongs, wherein two of the prongs provide electrical communication and two of the prongs provide data communication.

13. A vibration therapy device comprising:

a housing that includes a handle portion and a head portion,

an electrical source,

a motor positioned in the housing,

a switch for activating the motor,

a push rod assembly operatively connected to the motor, wherein the push rod assembly includes a reciprocating shaft, wherein an attachment member is secured to a distal end of the reciprocating shaft,

a flexible sleeve that includes a proximal end and a distal end, wherein the flexible sleeve at least partially surrounds the reciprocating shaft, wherein the distal end of the flexible sleeve is secured to the attachment member and the proximal end of the flexible sleeve is secured to the housing.

14. The vibration therapy device of claim 13 wherein the reciprocating shaft includes an opening in a distal end thereof, wherein the attachment member includes shaft that is received in the opening in the reciprocating shaft, wherein the distal end of the

flexible sleeve is secured between the distal end of the reciprocating shaft and the attachment member.

15. The vibration therapy device of claim 14 wherein the housing includes a protrusive portion, wherein the proximal end of the flexible sleeve is secured by the protrusive portion.

16. The vibration therapy device of claim 15 wherein the sleeve includes an annular ridge extending therefrom that is received in a groove in the housing.

17. A vibration therapy device comprising:

a housing that includes a handle portion, a head portion and a module seat defined on the head portion, wherein the module seat includes a first set of magnets,

an electrical source,

a motor positioned in the housing,

a switch for activating the motor,

a push rod assembly operatively connected to the motor, wherein the push rod assembly includes an attachment member at a distal end thereof that is configured to reciprocate in response to activation of the motor, wherein the attachment member includes a first magnet,

a cleansing attachment removably received on the attachment member, wherein the cleansing attachment includes a second magnet that is magnetically attracted to the first magnet to secure the reciprocating attachment on the attachment member, wherein the cleansing attachment includes a second set of magnets that are magnetically attracted to the first set of magnets to removably secure the cleansing attachment to the module seat, wherein the cleansing attachment includes a central section, wherein when the attachment member reciprocates, the central section flexes.

18. The vibration therapy device of claim 17 wherein the module seat includes a first securement protrusion extending therefrom and includes a first securement recess defined therein, wherein the cleansing attachment includes a second securement protrusion extending therefrom and includes a second securement recess defined therein, wherein the first securement protrusion is received in the second securement recess, and wherein the second securement protrusion is received in the first securement recess.

VIBRATION THERAPY SYSTEM AND DEVICE

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. Patent App. No. 17/361,966, filed June 29, 2021, which claims the benefit of U.S. Provisional Application No. 63/133,530, filed January 4, 2021, U.S. Provisional Application No. 63/065,348, filed August 13, 2020, and U.S. Provisional Patent Application No. 63/045,365, filed June 29, 2020, the entireties of which are incorporated by reference herein.

FIELD OF THE INVENTION

[0002] The present invention relates generally to a vibration therapy system and device, and more particularly to a vibration therapy device with interchangeable attachments.

BACKGROUND OF THE INVENTION

[0003] As people age, devices for skin and facial care are needed. Percussive massage devices that provide reciprocating motion and provide relief to sore muscles and other parts of the body are known. For example, see U.S. Patent No. 10,857,064 and U.S. Patent No. 10,945,915, the entireties of which are incorporated by reference herein. However, many percussive massage devices may be uncomfortable if used on the face and principally target the underlying muscles. The present invention addresses the needs discussed herein.

[0004] The background description disclosed anywhere in this patent application includes information that may be useful in understanding the present invention. It is not an admission that any of the information provided herein is prior art or relevant to the presently claimed invention, or that any publication specifically or implicitly referenced is prior art.

SUMMARY OF THE PREFERRED EMBODIMENTS

In accordance with a first aspect of the present invention there is provided a vibration therapy device that includes a housing with a handle portion and a head portion, an electrical source, a motor positioned in the housing, a switch for activating the motor, a push rod assembly operatively connected to the motor, and a reciprocating attachment. The push rod assembly includes an attachment member that defines the distal end of the push rod assembly. The attachment member (or the reciprocating attachment secured to the attachment member) is configured to reciprocate in response to activation of the motor at a linear velocity between 0.06 m/s and 0.5 m/s. The attachment member includes a first magnet. The reciprocating attachment is removably received on the attachment member. The reciprocating attachment includes a second magnet that is magnetically attracted to the first magnet to secure the reciprocating attachment on the attachment member.

[0005] In a preferred embodiment, the reciprocating attachment includes an attachment member recess defined therein. The attachment member is received in the attachment member recess. The attachment member defines an attachment member diameter and the attachment member recess defines an attachment member recess diameter. The attachment member diameter is smaller than the attachment member recess diameter. The first and second magnets secure the reciprocating attachment on the attachment member during reciprocation. Preferably, a module seat is defined on the head portion and a ring module is removably secured to the module seat. The ring module includes a central opening that defines a central opening diameter. The attachment member defines an attachment member diameter. The central opening diameter is larger than the attachment member diameter, such that the reciprocating attachment is configured to reciprocate within and relative to the ring module.

[0006] In accordance with another aspect of the present invention there is provided a therapy device that includes a housing that includes a handle portion, a head portion and a module seat defined on the head portion. The module seat includes a first set of magnets associated therewith (on, in or adjacent to the module seat). The module seat includes a first securement protrusion extending therefrom and includes a first securement recess defined therein. The therapy device also includes an electrical source, and a therapy module removably secured to the module seat. The therapy module includes a second set of magnets that are magnetically attracted to the first set of magnets. The therapy module includes a second securement protrusion extending therefrom and includes a second securement recess defined therein. The first securement protrusion is received in the second securement recess. The second securement protrusion is received in the first securement recess. This type of therapy device may not include the reciprocating, vibration or percussive feature.

[0007] In a preferred embodiment, one of the first securement protrusion and the second securement recess includes female electrical contacts and the other of the first securement protrusion and second securement recess includes male electrical contacts. Connection of the male electrical contacts and female electrical contacts provides electrical communication between the electrical source and the therapy module. The therapy module may provide at least one of cold therapy, heat therapy, LED light therapy, microcurrent therapy, photobiomodulation therapy, radio frequency therapy, cleansing therapy or ultrasound therapy.

[0008] The therapy device may include a motor positioned in the housing, a switch for activating the motor, and a push rod assembly operatively connected to the motor. The push rod assembly includes an attachment member that defines the distal end of the push rod assembly. The therapy module includes a central opening defined therein, and the

attachment member extends into the central opening. In a preferred embodiment, the male electrical contacts include four prongs. Two of the prongs provide electrical communication and two of the prongs provide data communication.

[0009] In accordance with another aspect of the present invention there is provided a vibration therapy device that includes a housing that includes a handle portion and a head portion, an electrical source, a motor positioned in the housing,

[0010] a switch for activating the motor, a push rod assembly operatively connected to the motor and that includes a reciprocating shaft with an attachment member secured to its distal end, and a flexible sleeve that includes a proximal end and a distal end. The flexible sleeve at least partially surrounds the reciprocating shaft. The distal end of the flexible sleeve is secured to the attachment member and the proximal end of the flexible sleeve is secured to the housing.

[0011] The reciprocating shaft may include an opening in a distal end thereof. The attachment member may include a shaft that is received in the opening in the reciprocating shaft. The distal end of the flexible sleeve may be secured between the distal end of the reciprocating shaft and the attachment member. The housing preferably includes a protrusive portion. The proximal end of the flexible sleeve is secured by the protrusive portion. The sleeve may include an annular ridge extending therefrom that is received in a groove in the housing.

[0012] In accordance with another aspect of the present invention there is provided a vibration therapy device that includes a housing that includes a handle portion, a head portion and a module seat defined on the head portion, an electrical source,

[0013] a motor positioned in the housing, a switch for activating the motor, and a push rod assembly operatively connected to the motor. The module seat includes a first set of magnets. The push rod assembly includes an attachment member at a distal end thereof

that is configured to reciprocate in response to activation of the motor. The attachment member includes a first magnet. The vibration therapy device also includes a cleansing attachment removably received on the attachment member. The cleansing attachment includes a second magnet that is magnetically attracted to the first magnet to secure the reciprocating attachment on the attachment member. The cleansing attachment includes a second set of magnets that are magnetically attracted to the first set of magnets to removably secure the cleansing attachment to the module seat. The cleansing attachment includes a central section, such that when the attachment member reciprocates, the central section flexes. Preferably, the module seat includes a first securement protrusion extending therefrom and includes a first securement recess defined therein, the cleansing attachment includes a second securement protrusion extending therefrom and includes a second securement recess defined therein and the first securement protrusion is received in the second securement recess, and wherein the second securement protrusion is received in the first securement recess.

[0014] In accordance with another aspect of the present invention there is provided a vibration therapy device that includes a housing that includes a handle portion, a head portion and a module seat defined on the head portion, an electrical source, a motor positioned in the housing, a switch for activating the motor, a push rod assembly operatively connected to the motor and configured to reciprocate in response to activation of the motor, and a therapy module removably secured to the module seat. The distal end of the push rod assembly is configured to removably receive a reciprocating attachment thereon. The therapy module at least partially surrounds the distal end of the push rod assembly. In a preferred embodiment, the push rod assembly includes an attachment member that defines the distal end of the push rod assembly. The therapy module is coaxial with the distal end of the push rod assembly (e.g., the attachment member and/or the

magnet seat), and at least a portion of the attachment member (e.g., the magnet member) extends into the therapy module.

[0015] In a preferred embodiment, the therapy module is in electrical communication with the electrical source (so that it can be powered) and/or is in data communication with the controller/processor of the device (so that it can be operated as desired). For electrical connection, the module seat preferably includes a first electrical connector (male or female), and wherein the therapy module includes a second electrical connector (female or male) in electrical communication with the first electrical connector. In a preferred embodiment, the male electrical connector includes a plurality of prongs, two of which are used for the electrical connection or communication (positive voltage and negative voltage) and two of which are used for data or information connection or communication (control signal). The prongs are inserted into the female electrical connector, which includes four openings for receiving the four prongs. The therapy module may comprise a ring module that includes a central opening and an outer surface. When a reciprocating attachment that includes a contact surface is removably received on the distal end of the push rod assembly, the contact surface of the reciprocating attachment extends further from the module seat than the outer surface of the ring module.

[0016] The therapy module may be a ring module that includes a plurality of LED's therein or thereon. The LEDs are configured to operate at a treatment level only when the outer surface is less than a predetermined distance from an operating surface. In a preferred embodiment, the ring module further includes at least first and second proximity sensors that are positioned approximately 180° from one another within the ring module (e.g., on the PCB). The first and second proximity sensors are each configured to activate the LEDs at the treatment level when the outer surface of the ring module is less than the predetermined distance from the operating surface.

[0017] The therapy module may comprise a cap module that includes a main body portion and a rear recess and where at least a portion of the attachment member extends into the rear recess. The cap module may include an anode and a cathode and may be configured to provide micro-current therapy. The cap module may also be configured to be removably secured to the module seat and the attachment member. In this embodiment, the cap module may be removably secured to the module seat via magnets and/or one or more securement protrusions and recesses (that also help properly align the cap module).

[0018] In accordance with another aspect of the invention there is provided a vibration therapy system that includes a vibration therapy device, a ring module that includes a central opening and that is configured to be removably secured to the module seat, a cap module that includes a main body portion and a rear recess and that is configured to be removably secured to the module seat, and a reciprocating attachment that is configured to be removably received on the attachment member. When the ring module is removably secured to the module seat, the distal end of the push rod assembly extends into the central opening. When the cap module is removably secured to the module seat, the distal end of the push rod assembly extends into the rear recess. When the ring module is received on the module seat, the reciprocating attachment extends through the central opening. When the ring module is received on the module seat the attachment member can be reciprocated, and when the cap module is received on the module seat the attachment member cannot be reciprocated.

[0019] In accordance with another aspect of the invention there is provided a vibration therapy device that includes a housing that includes a handle portion and a head portion an electrical source, a motor positioned in the housing, a switch for activating the motor, a push rod assembly operatively connected to the motor and configured to reciprocate in response to activation of the motor, and a reciprocating attachment removably secured to a

distal end of the push rod assembly. The reciprocating attachment includes a contact surface, and a skin treatment member is removably secured to the reciprocating attachment such that a delivery portion at least partially covers the contact surface. In a preferred embodiment, the reciprocating attachment includes a groove defined therein and at least a portion of the skin treatment member is received in the groove. Preferably, the skin treatment member includes a main body portion that, together with the delivery portion, defines an attachment recess. At least one ridge member extends inwardly from the main body portion into the attachment recess and is received in the groove on the reciprocating attachment. In a preferred embodiment, the delivery portion includes a lotion or other formulation thereon.

[0020] Described herein is a vibration therapy device that includes interchangeable attachments that provide therapy to a user. The interchangeable attachments can include, for example, LED light therapy, micro-current, etc. Generally, the present invention is a vibration therapy device that includes LED lights thereon that can be used for skin therapy. LED skin therapy is known. For example, see U.S. Patent Nos. 6,524,329 and 6,974,224, the entireties of which are incorporated by reference herein.

[0021] The present invention is a hand-held vibration facial massager or vibration therapy device that includes different therapy attachments compatible therewith. The hand-held device, which is intended to be used on the face, but can also be used anywhere else on the body, combines vibration therapy with other facial treatment technologies, including, but not limited to, LED light therapy, micro-current treatments and radio frequency skin technology.

[0022] As discussed below, the vibration therapy treatment can be delivered by a brushless motor-drive train system with the distal end of the reciprocating output shaft including an amplitude of preferably between 2.0 mm and 8.0 mm. It will be appreciated that this small

amplitude of reciprocation is referred to herein as a vibrating movement or vibration, hence the phrase "vibration therapy device." However, the amplitude can be anywhere between 1.0 mm and 25 mm. In a preferred embodiment, the amplitude is about 3.0 mm and the device provides the ability to operate at at least three different frequencies, e.g., 1750 (percussions per minute) ppm or 29 Hz, 2100 ppm or 35 Hz and 2400 ppm or 40 Hz. However, the frequency can be anywhere between about 900 ppm or 15 Hz and about 6000 ppm or 100 Hz. The combination of the about 3.0 amplitude and the frequencies between 1750 ppm and 2400 ppm is optimized for the face. The percussive therapy provided with these specifications helps reduce minor facial muscle pain and tension, helps reduce muscle tension often associated with headaches (this includes muscles of face, neck, and head) and provides a facial massage to reduce tension and relax facial muscles.

[0023] The removable or interchangeable vibration therapy attachment on the end of the output shaft can be any type of attachment (see, e.g., the patents discussed above). In a preferred embodiment, the attachment is a foam/rubber attachment that is connected to the end of the shaft to deliver the vibration to the user's face. See, e.g., U.S. Patent No. 10,758,452, the entirety of which is incorporated by reference herein.

[0024] The present invention includes an attachment system to accommodate swappable or interchangeable rings or modules with different facial treatment technologies. For example, the module can be a blue, red, amber and/or infrared LED light therapy light ring module or can be a module that includes micro-current therapy, RF (radio frequency) therapy, heat, cold, electric stimulation and/or vibration (e.g., the therapy module can include one or more motors or the like that provide vibration, separate from the reciprocation of the reciprocating attachment). As discussed below, in a preferred embodiment, the device includes an electrical connection system to deliver electric power to the ring or module and a magnet-based system to secure the ring or module in place.

[0025] In one preferred embodiment, the magnets are programmed or polymagnets.

Polymagnets are magnetic structures that incorporate correlated patterns of magnets with alternating polarity, designed to achieve a desired behavior and deliver stronger local force. By varying the magnetic fields and strengths, different mechanical behaviors can be controlled. Correlated magnet pairs can be programmed to attract or repel with a prescribed force and engagement distance, or, to attract or repel at a certain spatial orientation. Correlated magnets can be programmed to interact only with other magnetic structures that have been coded to respond. As a result, a strong force can be used to hold the module on the device, but a fairly weak force can be used for removing the module. For example, the user can rotate the module about the module's central axis to a predetermined point where the module can be easily removed. The polymagnets in the device can even repel the polymagnets in the module at a certain rotation point, thus making removal of the module very easy. The polymagnets change properties based on the distance and position of the magnets in the ring module and the device with respect to one another. This allows the locking and unlocking forces that the user needs to apply to connect and disconnect the module from the device to be reduced compared to the use of regular magnets. For example: the magnets can repel each other when the distance between them is more than one inch but if they are brought closer than one inch they attract each other. Therefore, for example, at a first distance and a first degree of rotation, the force required to secure the module or push the module into place on the module seat (referred to herein as "attach the module") is X and at the first distance and a second degree of rotation, the force required to attach the module is Y, where Y is less than X. To detach the module or pull it off the device, the force required may be A at a first set of degrees of rotation and B at a second set of degrees of rotation, where A is less than B. For example, the first set of degrees of rotation may be 0° to 15° and the second set of degrees of rotation may be 16° to 360°.

Therefore, when the module or attachment is rotated to an angle between 0° to 15° it is easy to remove. At any other angle it is difficult for the user to remove.

[0026] In a preferred embodiment, the device and/or system also includes a software application downloadable to a portable electronic device that includes the ability to control the treatment and build different protocols via Bluetooth and the like.

[0027] In a preferred embodiment, the device and/or the therapy module includes a proximity sensor that detects the distance between the device and the user's face so that the therapy or treatment can be modified accordingly. For example, the light ring module can include one or more proximity sensors so that the LED lights can be dimmed and/or turned off when the device is pulled away from the user's skin and is not within a predetermined distance (i.e., when the ring is far enough from the user's face that no treatment is being provided). This may be done to save battery, for eye safety purposes or for other skin safety issues or concerns.

[0028] In a preferred embodiment, the handle forms an angle of about 120 degrees with the attachment arm or output shaft to avoid blocking the user's view during treatment. In a preferred embodiment, the housing includes a female charging jack for receiving a male connector and charging the battery. The device also includes one or more buttons or switches for controlling the device (e.g., on/off, speed control, change color of LEDs, etc.) and LEDs that provide indication of different functions, such as battery power or speed setting, etc.

[0029] In a preferred embodiment, the vibration therapy device includes a motor, battery, housing, and push rod assembly with a reciprocating shaft. The reciprocating shaft includes a male or female attachment member on the end thereof to which a massage or vibration attachment (that includes a corresponding female or male attachment member thereon) can be attached. In a preferred embodiment, the massage attachment is secured to the vibration

therapy device using magnets. When the device is used with a ring module or attachment vibration attachment extends through the center of the ring. Any type of attaching or securing arrangement between the massage attachment and the vibration therapy device is within the scope of the invention. In a preferred embodiment, the amplitude is between about 2 mm and about 8 mm, which is smaller than many percussive massage devices. However, in another embodiment, the amplitude can be greater and between 1 mm and 26 mm or more.

[0030] In a preferred embodiment, the motor converts power from the power source into motion. In some embodiments, the motor is an electric motor. The electric motor may be any type of electric motor known in the art, including, but not limited to, a brushed motor, a brushless motor, a direct current (DC) motor, an alternating current (AC) motor, a mechanical-commutator motor, an electronic commutator motor, or an externally commutated motor. In a preferred embodiment, the motor is a brushless direct-current (BLDC) motor. Preferably, the percussive massage device includes a voltage-sensing resistor electrically coupled to the BLDC motor and a controller.

[0031] In a preferred embodiment, the vibration therapy device includes a removable light ring therapy module that surrounds the massage or reciprocating attachment. In a preferred embodiment, the light ring module includes a plurality of lights (e.g., LED's). Preferably, the light ring module is electrically connected to the vibration therapy device when it is attached thereto so that the battery powers the lights. The light ring module includes a central opening that at least partially surrounds the reciprocating attachment.

[0032] In a preferred embodiment, a plurality of different ring modules are included either separately or sold as a kit with the vibration therapy device. For example, separate ring modules can include lights with different wavelengths (e.g., red LEDs on one ring and blue LEDs on another). In another embodiment, lights with different wavelengths can be

included on the same ring (e.g., blue and red LEDs on the same ring). The rings are interchangeable. The rings can be different sizes. Each of the ring modules can provide different functions or features. Some of the features can be used in conjunction with the vibration therapy massage attachment and others can be used with a massage attachment attached to the device. For example, the ring modules can include (either individually or in combination) heat, vibrations, electrodes for electrolysis and/or emitting electromagnetic pulses. As a result, the main device acts as a power source for powering all of the different ring modules and the therapy modules that cover the attachment member where the reciprocating attachment is seated. Therefore, the connected ring module can be used in conjunction with the reciprocating attachment or without the reciprocating attachment (e.g., with the attachment removed), so the outer surface of the ring module can be placed against the user's skin, if necessary for the type of treatment being administered.

[0033] In another embodiment, the LEDs and/or one or more of any of the other treatments or discussed herein (e.g., micro-current, temperature, cleansing, etc.) can be part of the vibration therapy device and not removable. In a preferred embodiment, the control center or user interface includes an up button, a down button and a select button, which can be used for scrolling or toggling through various modes, going up or down in intensity or mode and selecting the modes or modules or turning different functions (vibration, light, micro-current, etc.) on or off.

[0034] It will be appreciated that the vibration therapy device together with the therapy module and reciprocating attachment may be referred to herein as a vibration therapy system.

[0035] In a preferred embodiment, the light ring module (or other ring module) includes alignment or securement recesses defined in a rear side thereof that receive the securement protrusions. Magnet members are positioned in the ring and adjacent the securement

recesses. It will be appreciated that the magnet members associated with the securement recesses are magnetically attracted to the securement protrusions.

[0036] In a preferred embodiment, the motor is preferably attached to a motor mount bracket that secures the motor to the housing. Preferably, the motor mount bracket includes a middle member having first and second opposite sides. The motor is positioned on the first side and the eccentric weight is positioned on the second side of the middle member. The push rod assembly comprises an L-shaped or curved connector or push rod (connected to the eccentric weight) and the reciprocating shaft (with pivotal connections therebetween). The middle member includes a shaft opening defined therein. The motor includes a rotatable motor shaft extending therefrom that extends from the first side of the middle member, through the shaft opening and to the second side of the middle member. In a preferred embodiment, the motor mount bracket includes a battery bracket portion extending therefrom that secures the battery in place.

[0037] Generally, when the therapy module is attached, the head portion of the vibration therapy device includes two concentric attachment rings, the inner one for the reciprocation or massage attachment (e.g., silicone vibration head) and the outer one for the therapy modules (e.g., LED, Micro-current etc.). In a preferred embodiment, the male attachment also includes magnets for attachment (or similar attachment mechanism) and can also include an electrical connection similar to the outer ring. Therefore, a single attachment that covers both the outer and inner part can be used that attaches to male attachment and securement protrusions, for example to accommodate more LEDs.

[0038] In another preferred embodiment, the reciprocating attachment can include hooks for securing a microfiber material on the reciprocating attachment that can be used on the user's face or other body part for the vibration therapy treatment. The microfiber material is secured on both sides and under the reciprocating attachment and stretches across the top

contact surface of the reciprocating attachment. The microfiber material can include lotion therein for treating the persons' skin.

[0039] It will be appreciated that different types of massage or reciprocating attachments can be used on the vibration therapy device. As discussed herein, one or more of the reciprocating attachments can include a groove extending therearound for attachment of a treatment member (for treating the user's skin). Another massage attachment can include a cone portion or be cone shaped. Another massage attachment can include a soft portion and a harder portion that are connected by velcro. Another massage attachment can include a plurality of spikes or needles that provide a microneedling type treatment.

[0040] The present invention is a handheld device that helps to reduce tension, relax facial muscles, and achieve healthier-looking skin by gently stimulating the face. The system includes microcurrent, blue, red, and red+infrared light LED, and cleansing treatments, allowing a user to customize their facial therapy in one easy-to-use versatile device. The variety of treatment rings can be used to help lift, tone, rejuvenate, and deep clean.

[0041] It will be appreciated by those of skill in the art that percussive therapy is the rapid and repetitive application of pressure perpendicular to the body. The percussive stimulus of the device causes the targeted tissues to experience both pressure and vibration stimuli simultaneously. We know that these stimuli have therapeutic benefits related to reduced tension, pain relief, and increased circulation. The percussive therapy of the present invention has been optimized for the face through a reduced amplitude (compared to the prior art).

[0042] Photobiomodulation (PBM), also referred to as “phototherapy” or “light therapy”, utilizes non-ionizing forms of light sources including LASERS, LEDs, and broadband light, in the visible and near-infrared spectrum. This non-thermal process (no heat) allows light energy to penetrate the skin leading to changes at the molecular, cellular, and tissue

levels of the body. LED (light emitting diode) therapy is a skincare treatment for several conditions that uses varying wavelengths of light, including red and blue, to stimulate the skin and tissue beneath. In a preferred embodiment, the red light has a wavelength of $633\text{nm} \pm 10\text{nm}$ and a power density of $78 \pm 5\%$. Red light is intended to reduce periorbital wrinkles (the wrinkles around the eyes). In a preferred embodiment, the blue light has a wavelength of $415\text{nm} \pm 10\text{nm}$ and a power density of $50 \pm 5\%$. Blue Light is intended to reduce mild to moderate acne. In a preferred embodiment, the red + infrared light has wavelengths of $633 \pm 10 \text{ nm} / 830\text{nm} \pm 10\text{nm}$ and power densities of $78 \pm 5\% / 55 \pm 5\%$. Red + infrared light therapy is intended to provide therapeutic warming to temporarily reduce pain and discomfort and is intended to reduce periorbital wrinkles (the wrinkles around the eyes).

[0043] Microcurrent therapy utilizes low-level electrical voltage to stimulate muscles, primarily of the face. This stimulation acts as a workout that often results in the temporary tightening, toning, or contouring of the targeted muscles which often leads to the appearance of reduced wrinkles, especially on the forehead region. In a preferred embodiment, the present invention provides microcurrent with a pulsed biphasic waveform, a pulse frequency of 8 Hz and settings of $11\mu\text{A}$, $300\mu\text{A}$, $500\mu\text{A}$. In use, the microcurrent firms and tightens the skin and improves muscle tone and contour in the face/neck. The microcurrent therapy module can be used with a conductive gel.

[0044] Cryotherapy or cold therapy, is a process where the body is exposed to low temperatures for therapeutic purposes, resulting in the reduction of blood flow to a particular area leading to decreased local tissue temperatures, and/or the regulation of gene expression. While this is commonly done through the use of liquid nitrogen or ice for full body cryotherapy, local cryotherapy is able to be achieved through a battery-powered device via a process called thermoelectric cooling. In a preferred embodiment, the cold

ring or cryotherapy may be provided at three different temperatures (i.e., the user can toggle between temperatures using controls). Preferably, the temperatures are 26°C / 78°F, 22°C / 71°F and 18°C / 65°F. Cold therapy is intended to decrease pain, decreases muscle spasms, and decrease inflammation.

[0045] Thermotherapy or heat therapy, is a process where the body is exposed to high temperatures for therapeutic purposes, resulting in increased blood flow to a particular area leading to increased local tissue temperatures. Local thermotherapy is able to be achieved through a battery-powered device via a process called thermoelectric heating. In a preferred embodiment, the heat ring or thermotherapy may be provided at three different temperatures (i.e., the user can toggle between temperatures using controls). Preferably, the temperatures are 35°C / 95°F, 39°C / 102°F, 43°C / 109°F. Heat therapy is intended to decrease pain, decrease muscle spasms, decreases tension, and increases blood flow.

[0046] The inventive device and system may provide any or all of the treatment discussed herein, such as percussive or vibration therapy, PBM, light therapy, microcurrent therapy, cryotherapy and/or thermotherapy.

[0047] In a preferred embodiment, the massage attachment is secured to the vibration therapy device via magnets. Preferably, a magnet is included in the massage attachment and a complementary magnet is included in the attachment member. It will be appreciated that the low amplitude of about 3.0 mm allows the magnetic connection between the magnet in the attachment member on the end of the push rod assembly to remain secured in place during reciprocation and use of the device. With a higher amplitude (or linear velocity), the massage attachment may disconnect during use. The amplitude combined with the frequencies or speeds discussed herein allows for magnetic securement of the attachment member. Therefore, it will be appreciated by those of ordinary skill in the art that the about 3.0 mm amplitude coupled with the frequencies of 1750 ppm, 2100 ppm and

2400 ppm provides beneficial results when used on the face, as described herein, and allows the magnetically connected attachment member to be secured to the end of the push rod assembly.

[0048] An amplitude as low as 0.5 mm provides a vibrating stimulus when used on the face. The inventors have determined that 3.0 mm provides beneficial results. This amplitude, combined with the different attachments (shape and density), was found to be comfortable, but also provides a relative intensity for the face. Therefore, this percussive force is optimized for use on the delicate features of the face.

[0049] In a preferred embodiment, the present invention provides dual therapies simultaneously, the first being percussion and the other being LED light therapy, hot or cold therapy or others discussed herein. It will be appreciated that the percussion therapy can also be varied based on the type of massage attachment (e.g., micropoint) that is secured to the end of the push rod assembly.

[0050] In a preferred embodiment, the vibration therapy device includes a waterproofing feature for preventing moisture from getting in through where the push rod assembly extends outside of the housing. Preferably, a sleeve (e.g., a silicone sleeve) surrounds the portion of the reciprocating shaft that extends outside of the housing so that it is not exposed. The sleeve is secured within the attachment member at one end and inside the protrusive portion of the housing on the other end. The sleeve is secured at both ends and can flex or move as the reciprocating shaft reciprocates. This provides water resistance to the device.

[0051] Other therapy modules are within the scope of the present invention. For example, one type of therapy modules may include an LED module that is a cap module and does not include a central opening for percussion. Another therapy module may include one or more skin scanning sensors that can be used for oil detection and/or moisture detection

associated with the user's skin. Other therapy modules may include ultrasound or ultrasonic facial treatment or radio frequency treatment for facial rejuvenation. The radio frequency module can be used to help with skin tightness and wrinkles. The ultrasonic module can be used to help with lymphatic drainage, blood flow and muscle toning. The scanning module can be used to detect moisture and oil levels and to personalize protocols and track progress. All of these modules can be either ring modules or cap modules and can be configured the same as or similar to any of the other therapy modules disclosed herein.

[0052] It will be appreciated that all components and feature on the different embodiments shown herein are interchangeable with the components and features of any of the other embodiments discloses herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0053] FIG. 1 is a perspective view of a vibration therapy system and device in accordance with a preferred embodiment of the present invention;

[0054] FIG. 2 is a perspective view of the vibration therapy device with the therapy module and reciprocating attachment exploded therefrom;

[0055] FIG. 3 is an exploded view of the vibration therapy device;

[0056] FIG. 4 is a cross-sectional view of the vibration therapy device;

[0057] FIG. 5 is a cross-sectional view of a portion of the vibration therapy device taken along 5--5 of FIG. 4;

[0058] FIG. 6 is a cross-sectional view of a portion of the vibration therapy device showing the securement protrusions and securement recesses with the electrical connection and magnetic connection;

[0059] FIG. 7 is a rear perspective view of the light ring module;

[0060] FIG. 8 is an exploded perspective view of the light ring module;

- [0061] FIG. 9 is a perspective view of the vibration therapy device with the micro-current cap module thereon;
- [0062] FIG. 10 is a perspective view of the vibration therapy device with the micro-current cap module exploded therefrom;
- [0063] FIG. 11 is a rear perspective view of a micro-current cap module;
- [0064] FIG. 12 is a perspective view of the cleansing attachment;
- [0065] FIG. 13 is a perspective view of the vibration therapy device with a treatment member exploded therefrom;
- [0066] FIG. 14 is a perspective view of the therapy member;
- [0067] FIG. 15 is a cross-sectional view of the therapy member on the reciprocating attachment;
- [0068] FIG. 16 is a perspective view of the therapy member in packaging with the lid partially peeled back;
- [0069] FIG. 17A is a view showing the user interface and display with the light ring module symbol and vibration symbol illuminated;
- [0070] FIG. 17B is a view showing the user interface and display with the heat ring module symbol and battery symbol illuminated;
- [0071] FIG. 17C is a view showing the user interface and display with the micro-current cap module symbol illuminated;
- [0072] FIG. 18 is an exploded view of a vibration therapy device in accordance with a preferred embodiment of the present invention;
- [0073] FIG. 19 is a cross-section of a portion of the vibration therapy device of FIG. 18 with a reciprocating attachment exploded therefrom;
- [0074] FIG. 20 is perspective view of a portion of the vibration therapy device showing the flexible sleeve that provides water resistance;

[0075] FIG. 21 is a bottom perspective view of the cleansing attachment; and

[0076] FIG. 22 is a cross-section of the cleansing attachment.

[0077] Like numerals refer to like parts throughout the several views of the drawings.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0078] The following description and drawings are illustrative and are not to be construed as limiting. Numerous specific details are described to provide a thorough understanding of the disclosure. However, in certain instances, well-known or conventional details are not described in order to avoid obscuring the description. References to one or an embodiment in the present disclosure can be, but not necessarily are references to the same embodiment; and, such references mean at least one of the embodiments. If a component is not shown in a drawing then this provides support for a negative limitation in the claims stating that that component is "not" present. However, the above statement is not limiting and in another embodiment, the missing component can be included in a claimed embodiment.

[0079] Reference in this specification to "one embodiment," "an embodiment," "a preferred embodiment" or any other phrase mentioning the word "embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the-disclosure and also means that any particular feature, structure, or characteristic described in connection with one embodiment can be included in any embodiment or can be omitted or excluded from any embodiment. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment, nor are separate or alternative embodiments mutually exclusive of other embodiments. Moreover, various features are described which may be exhibited by some embodiments and not by others and may be omitted from any embodiment. Furthermore, any particular feature, structure, or

characteristic described herein may be optional. Similarly, various requirements are described which may be requirements for some embodiments but not other embodiments. Where appropriate any of the features discussed herein in relation to one aspect or embodiment of the invention may be applied to another aspect or embodiment of the invention. Similarly, where appropriate any of the features discussed herein in relation to one aspect or embodiment of the invention may be optional with respect to and/or omitted from that aspect or embodiment of the invention or any other aspect or embodiment of the invention discussed or disclosed herein.

[0080] The terms used in this specification generally have their ordinary meanings in the art, within the context of the disclosure, and in the specific context where each term is used. Certain terms that are used to describe the disclosure are discussed below, or elsewhere in the specification, to provide additional guidance to the practitioner regarding the description of the disclosure. For convenience, certain terms may be highlighted, for example using italics and/or quotation marks: The use of highlighting has no influence on the scope and meaning of a term; the scope and meaning of a term is the same, in the same context, whether or not it is highlighted.

[0081] It will be appreciated that the same thing can be said in more than one way. Consequently, alternative language and synonyms may be used for any one or more of the terms discussed herein. No special significance is to be placed upon whether or not a term is elaborated or discussed herein. Synonyms for certain terms are provided. A recital of one or more synonyms does not exclude the use of other synonyms. The use of examples anywhere in this specification including examples of any terms discussed herein is illustrative only, and is not intended to further limit the scope and meaning of the disclosure or of any exemplified term. Likewise, the disclosure is not limited to various embodiments given in this specification.

[0082] Without intent to further limit the scope of the disclosure, examples of instruments, apparatus, methods and their related results according to the embodiments of the present disclosure are given below. Note that titles or subtitles may be used in the examples for convenience of a reader, which in no way should limit the scope of the disclosure. Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure pertains. In the case of conflict, the present document, including definitions, will control.

[0083] It will be appreciated that terms such as "front," "back," "top," "bottom," "side," "short," "long," "up," "down," "aft," "forward," "inboard," "outboard" and "below" used herein are merely for ease of description and refer to the orientation of the components as shown in the figures. It should be understood that any orientation of the components described herein is within the scope of the present invention.

[0084] Referring now to the drawings, which are for purposes of illustrating the present invention and not for purposes of limiting the same, the drawings show a vibration therapy system 10 that includes a vibration therapy device 12, one or more reciprocating attachments 19 and one or more therapy modules 11. The reciprocating attachments can have different shapes. The therapy modules 11 can have different shapes and include different types of therapy, such as light, micro-current, heat, cold, vibration, etc.

[0085] As shown in FIGS. 1-3, generally the vibration therapy device includes a housing 13 (two housing halves 13a and 13b are shown in FIG. 3), a handle portion 14, a head portion 15 and a switch 16 for activating the motor 17. FIGS. 1-8 show the vibration therapy device 12 with a therapy module 11 that is referred to herein as a ring module 18 (due to its shape with a central opening 18a) and a reciprocating attachment 19. As shown in FIG. 3, in a preferred embodiment, the vibration therapy device 12 includes an electrical source, such as a battery 20, positioned in the handle portion 14, the motor 17 positioned in the

head portion 15, and a push rod assembly 21 operatively connected to the motor 17 and configured to reciprocate in response to activation of the motor 17.

[0086] In a preferred embodiment, the rotation of the motor shaft 22 is converted to reciprocating motion of the push rod assembly 21. It will be appreciated that the push rod assembly includes any set of components for converting the rotation motion of the motor to reciprocating motion of the massage or reciprocating attachment. As shown in FIGS. 3-5, in a preferred embodiment, the push rod assembly 21 includes a push rod 23 that is pivotably connected to a reciprocating shaft 24 (see pivot pin 25), and an attachment member 26 that is operatively connected to the reciprocating shaft 24. In a preferred embodiment, the shaft 26a of the attachment member extends into and is connected within (via threads, friction fit, interference fit, etc.) an opening 24a defined in the reciprocating shaft 24. The distal end of the attachment member 26 (which is also the distal end of the push rod assembly 21) removably receives the reciprocating attachment 19. It will be appreciated that the term push rod assembly used herein includes any of the drive train components discussed herein or combinations thereof, e.g., push rod 23, reciprocating shaft 24 and attachment member 26 or the like that provide reciprocating motion and include the reciprocating attachment on the distal end thereof. The push rod assembly also includes the attachment member 26 (and any related components, such as the magnet described below) or any other connector at the end of the reciprocating components that allows connection of a reciprocating attachment to be used for massage or therapy.

[0087] Preferably, the drive train also includes a counterweight member 28 between the motor shaft 22 and the push rod 23. The motor shaft 22 is received in an opening in the counterweight member 28 and an offset shaft 29 extends from the counterweight member 28 and is received in an opening in the push rod 23. The reciprocating shaft 24 extends through the bush 31 and bush holding structure 33.

[0088] In a preferred embodiment, the motor 17 is secured to a motor mount 30 that includes a plurality of feet 32 that are secured to the housing 13 via threaded fasteners or the like that extend through openings in the feet 32. Dampening rings 34 and dampening washers can also be included. All dampening components herein are made of rubber, silicone or the like and are provided to prevent plastic to plastic or plastic to metal contact and to reduce noise and vibration.

[0089] In a preferred embodiment, the attachment member 26 includes the shaft 26a and a magnet seat 26b. The magnet seat 26b includes a magnet 27 received therein or otherwise operatively associated therewith. As shown in FIG. 3, the housing 13 includes a cap portion 35 that includes the module seat 50 and a protrusive portion 36. The attachment member 26 extends through an opening in the cap portion such that the magnet seat 26b is located outside of the housing 13, and particularly, the protrusive portion 36 of the housing 13. As described above, The distal end of the attachment member 26 (the magnet seat 26b) removably receives the reciprocating attachment 19. In a preferred embodiment, the magnet 27 in the attachment member is magnetically attracted to a magnet 27 in the reciprocating attachment 19 or other component placed on the attachment member 26. FIG. 3 shows an exemplary reciprocating attachment 19 including the main body portion 19a, inner support portion 19b and magnet 27.

[0090] As shown in FIG. 2, in a preferred embodiment, the head portion 15 includes a module seat 50 that removably receives the therapy modules 11. As shown in FIG. 6, the vibration therapy system 10 includes an attachment system 44 for properly aligning or mounting and attaching or securing the various therapy modules 11 on the module seat 50, as well as providing electrical connection or communication (if needed) between the therapy modules 11 and the vibration therapy device 12. In a preferred embodiment, the attachment system 44 includes magnetic attraction between the module seat 50 and therapy

module 11 and includes one or more complementary securement protrusions 48 and securement recesses 54 extending or protruding from the module seat 50 and/or the back of the therapy module 11. The securement protrusions are received in the securement recesses. The attachment system 44 provides the ability to accommodate the swappable or interchangeable therapy modules 11 (e.g., ring module 18) with different facial treatment technologies. FIG. 6 also shows the central opening diameter D1 of the central opening 18a of the ring module 18 and the reciprocating attachment diameter D2 of the reciprocating attachment 19. As shown, the central opening diameter D1 is larger than the reciprocating attachment diameter D2, such that the reciprocating attachment 19 is configured to reciprocate within and relative to the ring module 18.

[0091] As shown in FIGS. 6-7, in a preferred embodiment, one securement protrusion 48 extends from the back of the therapy module 11 and one securement recess 54 is defined in the module seat 50. Also, one securement recess 54 is defined in the back of the therapy module 11 and one securement protrusion extends from the module seat 50. In a preferred embodiment, at least one of the securement protrusions and at least one of the securement recess include one or more magnet members 52 associated therewith that are magnetically attracted to one another, that help secure the ring module 18 (or other therapy module 11) onto the module seat 50 and the vibration therapy device 12. One, two or more magnet members can be included. The magnet members 52 are located within the housing of the therapy module (see, e.g., FIGS. 5 and 2) and within the housing of the head portion and adjacent to or below the module seat 50 (see, e.g., FIGS. 5 and 19). Sets of complementary magnets 52 may be positioned around the base of the therapy module 11 and the module seat 50. For example, in a preferred embodiment, the module seat 50 includes a first set of six magnets 52 associated therewith and each therapy module 11 includes a second set of magnets 52 associated therewith that are magnetically attracted to the first set of magnets

in or associated with the module seat 50. A set can be any number of magnets between 1-25.

[0092] In a preferred embodiment, the system includes an electrical connection system 58 between the vibration therapy device 12 and the therapy module 11. In a preferred embodiment, the therapy module 11 includes male electrical contacts 60 extending therefrom (see FIGS. 6 and 10) and the module seat 50 includes complementary female electrical contacts 62. Power is supplied from the battery 20, through the male and female electrical contacts and to the LEDs or other powered components. It will be appreciated that the male and female electrical contacts can be reversed. In a preferred embodiment, the male or female electrical contacts are associated with one of the securement recesses 54 and one of the securement protrusions 48. In the embodiment shown in the drawings, the securement protrusion 48 that extends from the back of the therapy module 11 is a magnetic securement protrusion and the securement recess 54 that is defined in the module seat 50 is a magnetic securement recess. Furthermore, the securement recess 54 that is defined in the back of the therapy module 11 is an electrical securement recess (and includes male electrical contacts) and the securement protrusion 48 that extends from the module seat 50 is an electrical securement protrusion (and includes female electrical contacts).

[0093] As shown in FIG. 1, in a preferred embodiment, the handle portion 14 forms an angle of about 120 degrees with the reciprocating shaft 24 to avoid blocking the user's view during treatment. Anywhere between 90 degrees and 180 degrees is within the scope of the invention. In another embodiment, the head portion can be rotatable and/or pivotable and/or swivelable with respect to the handle portion 14.

[0094] FIG. 8 shows the components of the light ring module 18 including the printed circuit board 37 including the LEDs 38 and proximity sensors 39. In a preferred

embodiment, the proximity sensors 39 are positioned approximately 180° from another. With respect to 180°, approximately means within 10°. However, they can be positioned anywhere around the ring. The proximity sensors 39 are provided so that LED lights in the light module only turn on (or go from dimmed to "treatment level" or off to "treatment level") when they are less than a predetermined distance from or the lens is in contact with the user's face or skin. In a preferred embodiment, one proximity sensor 39 is located at about twelve o'clock on the PCB and the other is located at about six o'clock. In use, after activating the light ring module, the lights remain off or in a dimmed state until the front surface of the module is placed within a predetermined distance of the user's face, at which point the lights brighten to a treatment level (where the lights will be effective for the desired treatment – e.g., red LED treatment, blue LED treatment or infrared). Preferably, the proximity sensors are programmed such that they only determine the proximity at intervals or at a predetermined frequency (e.g., every one second) so that the lights are not turning on and off every time the device is pulled away from the face or angled during use on the face such that the proximity sensor is out of range. Any type of proximity sensor can be used. In a preferred embodiment, the proximity sensor emits a beam that is reflected by the user's face. The sensor determines the distance with the face based on the time (or frequency) for the beam returning from the user's skin after reflection. It will be appreciated that by having two proximity sensors 180° apart, as long as one is within the predetermined range of distance from the skin (operating surface), the lights will not dim or turn off (or go to a point that is less than the desired treatment level or intensity of the lights).

[0095] As shown in FIG. 8, in a preferred embodiment, the light ring module includes a housing portion 40, PCB 37, cover or lens 41 and a light direction member 42 that includes a plurality of openings 43 defined therein. The openings 43 are each aligned with an LED

38 and provide a tunnel so that the light beams emitted from each of the LEDs are directed generally parallel to one another and, therefore, generally perpendicular to the cover 41 and the user's skin as the device is used. This helps prevent the light from shining outwardly and into the user's eyes during use. The ring module includes the central opening 18a and an outer surface 41a. As shown in FIG. 5, in a preferred embodiment, the contact surface 19c of the reciprocating attachment 19 extends further from the module seat 50 than the outer surface 41a of the ring module 18. Other types of ring modules with other therapies are in the scope of the present invention.

[0096] FIGS. 9-11 show another type of therapy module 11 referred to generally herein as a cap module and more specifically (for this particular module) as a micro-current cap module 118 that covers the magnet seat 26b of the attachment member 26. The micro-current cap module 118 includes a main body portion 70 and a rear recess 72 defined therein that receives the attachment member 26 when the micro-current cap module 118 is fitted on the module seat 50. The rear recess 72 may also be referred to herein as the central opening because regardless of the type of therapy module (cap or ring) that is received on the module seat, the attachment member 26 extends into the central opening (or rear recess). The micro-current cap module 118 shown in FIGS. 9-11 includes micro-current therapy. However, different cap modules can include other therapies. Micro-current therapy can also be included in a ring module. The micro-current cap module 118 includes first and second terminals or an anode and cathode 120. This module includes an electrical connection and magnetic attraction just like the ring module 18 described above. As will be appreciated by those of ordinary skill in the art, when the anode and cathode 120 are placed against a user's skin, an electrical connection is created and micro-current is transmitted into the user's skin to provide micro-current treatment.

[0097] FIGS. 12, 21 and 22 shows another type of cap module referred to herein as a cleansing cap module or cleansing attachment 74 that includes a plurality of bristles 76 thereon. The cleansing attachment 74 includes a main body portion 70 and recess that receives the attachment member 26 when the cleansing attachment 74 is fitted on the module seat 50. The cleansing attachment 74 may also include (but preferably does not include) an electrical connection just like the ring module 18 described above. The cleansing attachment 74 preferably also includes a magnet 27 therein that is magnetically attracted to and connects to the magnet 27 in the attachment member 26. In a preferred embodiment, the main body portion 70 preferably includes the complementary securement protrusion 48 and recess 54, like the other therapy modules 11, that mate with the securement protrusion 48 and recess 54 on the module seat 50. Therefore, the cleansing cap module is configured to be removably secured to both the attachment member 26 (e.g., via magnets) and to the module seat 50 (e.g., via the complementary securement protrusions and recesses and set of magnets 52).

[0098] In a preferred embodiment, the cleansing attachment 74 includes a central section 76 that is flexible (for example, it may be made of silicone, rubber or other flexible material). Therefore, during use, when the attachment member 26 reciprocates, the central section 78 flexes. In other words, because the magnets 52 are holding the base of the main body portion 70 on and against the module seat 50, the central section 78 flexes and moves with each stroke of the attachment member 26. Therefore, the base of the main body portion 70 remains magnetically secured to the module seat 50 while the attachment member 26 reciprocates against the central section 78, therefore moving or percussing the central section 78 and the bristles 76 thereof against the user's skin. Essentially, the central section 78 is a flexible membrane that moves with the reciprocating attachment member 26. As shown in FIG. 22, the cleansing attachment 74 includes a groove 80 between the inner

bristles 76 associated with the central section 78 and the outer bristles 76 that are located radially outwardly from the central section 78. The inner bristles move with the central section 146 and the outer generally bristles remain stationary during reciprocation. A cleansing formulation can be placed on the bristles 76 during use.

[0099] In another embodiment, the magnets 52 around the base can be omitted and the entire cleansing attachment 74 can reciprocate. The complementary securement protrusions and recesses can also be omitted since connection is made between the central magnet 27 and the magnet in the attachment member 26.

[00100] FIGS. 13-16 show a preferred embodiment system for attaching a component with microfiber material thereon (referred to herein as a skin treatment member 88) to the reciprocating attachment 19. In a preferred embodiment, the skin treatment member 88 includes lotion or some type of skin treatment ointment or fluid thereon and, therefore, is packaged in a pod member 90 that includes a container portion 92 and a lid 94. In a preferred embodiment, the skin treatment member 88 includes a generally ring shaped main body portion 96 and a delivery portion 98 that is preferably made of microfiber and includes the lotion thereon.

[00101] In a preferred embodiment, the skin treatment member 88 is attachable or securable to the reciprocating attachment 19. Preferably, the main body portion 96 includes one or more ridge members 100 on the inside surface thereof and extending inwardly that are received in one or more grooves 102 defined in the outer surface of the reciprocating attachment 19. The skin treatment member 88 preferably also includes a handle or tab 106 extending from the main body portion 96 that aids with attachment and removal of the skin treatment member 88 from the reciprocating attachment 19. In use, the skin treatment member 88 is removed from the pod member 90 (by peeling back the lid 94) and the treatment member is placed or seated on the reciprocating attachment 19. It will be

appreciated that the main body portion 96 is made of a flexible material (such as plastic) so the ridge members 100 flex over the reciprocating attachment 19 and snap into the groove 102 on the outer surface of the reciprocating attachment. The delivery portion stretches across or spans the top or outer contact surface of the reciprocating attachment 19. The delivery portion 98 is then placed against the user's face and the device is activated such that the reciprocating attachment 19 (also referred to herein as a mallet) with the treatment member 88 thereon vibrates or percusses against the user's skin. After user, the use can pull on the tab 106 to separate the treatment member 88 from the mallet 19. As shown in FIG. 11, the skin treatment member 88 can be placed on the mallet 19 when the ring module 18 is on the device. Therefore, the LED light therapy can be used simultaneously with the vibration therapy and the treatment member therapy. The groove 102 is preferably located further from the module seat 50 than the outer surface 41a or outside of the ring module so that the skin treatment member 88 secured in the groove can reciprocate outside of the ring module.

[00102] FIGS. 17A-17C show a control center 108 (or user interface – UI) that includes a display screen 110 and one or more buttons and/or switches that can be used for controlling the device 12 and the various therapy modules 11. The buttons can control different modes, different intensities, etc. In a preferred embodiment, the control center includes display screen 110, motor toggle button 126 (for toggling through different frequencies or speeds for the attachment member 26 and any reciprocating attachment thereon), module toggle button 128 (for toggling through different intensities or options for the therapy modules electrically connected to the device) and a power switch 16. FIG. 17A shows the display screen 110 with the motor speed level 112 at the top and the therapy module level 114 (with the light ring module symbol thereon) at the bottom. FIG. 17B shows the display screen 110 with the battery level 116 at the top and the therapy module

level 114 (with the heat ring module symbol thereon) at the bottom. FIG. 17C shows the display screen 110 with nothing on the top and the therapy module level 114 (with the micro-current symbol thereon) at the bottom. Other symbols and the like that can be shown in the display screen include Bluetooth. It will be appreciated that the control center 108 is in data communication with the controller and associated components for controlling the device 12. Preferably, the device can recognize, sense or determine what type of therapy module has been seated on and electrically connected to the device. The information or data regarding the type of module is preferably communicated through the two prongs allocated for data communication. This allows the module toggle button 128 to toggle through the modes of the proper module and for the proper therapy module level to be displayed on display 110. Furthermore, in use, when a cap module (e.g., micro-current module 118) is seated on the module seat and electrically connected to the device, the motor is not activated (to reciprocate the attachment member) because the attachment member and magnet seat is located inside the cap module. This prevents the attachment member 26 from reciprocating within the cap module. When a ring module is seated on the device, the motor can be activated so that the reciprocating attachment can reciprocate within the central opening of the ring module.

[00103] It will be appreciated that all or some of the components discussed herein can be contained, sold or distributed in a kit. In other words, the vibration therapy system can be provided to users as a kit (e.g., within a case, box, bag or the like). The kit can include the vibration therapy device, one or more reciprocating attachments and one or more therapy modules. For example, an exemplary kit includes the device, the light ring module, the micro-current cap module, the reciprocating attachment with the groove therearound and charger all within a case or container.

[00104] FIGS. 18-20 show another preferred embodiment of the vibration therapy device 12. All disclosure related to other embodiments herein is also relevant to the embodiment shown in FIGS. 18-20. As shown in FIG. 19, in a preferred embodiment, the reciprocating attachment 19 includes an attachment member recess 130 defined therein. The attachment member 26 is received in the attachment member recess 130. The attachment member 26 defines an attachment member diameter D3 and the attachment member recess 130 defines an attachment member recess diameter D4. The attachment member diameter D3 is smaller than the attachment member recess diameter D4, which allows the reciprocating attachment 19 to be received on the attachment member 26. Also, the first and second magnets 27 in the attachment member and the reciprocating attachment 19 secure the reciprocating attachment 19 on the attachment member 26. The first and second magnets 27 are strong enough to hold the reciprocating attachment 19 on the attachment member 26 during reciprocation, and, in particular, with the reciprocation occurring in the any of the frequency and amplitude ranges discussed herein. In particular, the magnets prevent the reciprocating attachment 19 from disconnecting from the attachment member 26 during reciprocation. In a preferred embodiment, the amplitude range is between 1.0 mm and 5.0 mm and in a more preferred embodiment, the amplitude range is between 2 mm and 4 mm. In a most preferred embodiment, the amplitude range is between 2.9 mm and 3.1 mm. Preferably, the frequency is between 25 Hz and 45 Hz when operating at any of the amplitudes (or strokes) discussed herein. These figures can also be framed in terms of linear velocity, which depends on the distance traveled by an object with respect to time taken. The linear equation or the linear velocity formula is given by $v = x/t$, where, v = linear velocity, x = distance covered and t = time taken to cover the distance(x). Linear velocity is often measured using SI unit meter per second or m/s. It will be appreciated that, in a preferred embodiment, at speeds or frequencies between 1700 rpm/28.3 Hz, 1750

rpm/29.2 Hz, 2100 rpm/35 Hz, 2400 rpm/40 Hz and 3000 rpm/50 Hz and an amplitude of between 1.0 mm and 5.0 mm, the linear velocity is between between 0.06 m/s and 0.5 m/s. In a more preferred embodiment, the linear velocity is between 0.11 m/s and 0.4 m/s.

[00105] In a preferred embodiment, the vibration therapy device 12 includes a flexible sleeve 132 that includes a sleeve portion 134, an annular flange 136, a central opening 138, an annular ridge 140 and proximal and distal ends 132a and 132b respectively. As shown in FIG. 19, the flexible sleeve 132 surrounds the distal end of the reciprocating shaft 24. In a preferred embodiment, the distal end of the flexible sleeve 132b is secured to the attachment member 26 and the proximal end of the flexible sleeve 132a is secured to and/or within the housing 13 or a component thereof. The flexible sleeve 132 provides water resistance and helps prevent moisture from getting into the housing interior.

[00106] As discussed above, the reciprocating shaft 24 includes an opening 24a that receives the shaft 26a of the attachment member 26. In the embodiment shown in FIG. 19, the interior of opening 24a and the exterior of shaft 26a include complementary threading to secure the shaft 26a within the opening 24a. In a preferred embodiment, the distal end of the flexible sleeve 132b is secured between the distal end of the reciprocating shaft and the attachment member 26, and, more particularly, the distal end of the flexible sleeve 132b extends into opening 24a and is secured between the inner surface of the opening 24a and the outer surface of shaft 26a. As discussed above, the housing includes a protrusive portion 36 that is part of cap 35. Each of the housing halves 13a and 13b include part of a nose portion 142 that includes an annular groove 144 defined therein. The annular groove 144 receives the annular ridge 140 that extends downwardly from the annular flange 136 of the flexible sleeve 132, as is best shown in FIG. 19. the housing includes a protrusive portion, wherein the proximal end of the flexible sleeve is secured by the protrusive portion. As shown in FIG. 19, the proximal end of the flexible sleeve 132a (which is part

of the annular flange 136) is sandwiched between the protrusive portion 36 and the nose portion 142.

[00107] Unless the context clearly requires otherwise, throughout the description and the claims, the words "comprise," "comprising," and the like are to be construed in an inclusive sense, as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to." As used herein, the terms "connected," "coupled," or any variant thereof, means any connection or coupling, either direct or indirect, between two or more elements; the coupling of connection between the elements can be physical, logical, or a combination thereof. Additionally, the words "herein," "above," "below," and words of similar import, when used in this application, shall refer to this application as a whole and not to any particular portions of this application. Where the context permits, words in the above Detailed Description of the Preferred Embodiments using the singular or plural number may also include the plural or singular number respectively. The word "or" in reference to a list of two or more items, covers all of the following interpretations of the word: any of the items in the list, all of the items in the list, and any combination of the items in the list.

[00108] The above-detailed description of embodiments of the disclosure is not intended to be exhaustive or to limit the teachings to the precise form disclosed above. While specific embodiments of and examples for the disclosure are described above for illustrative purposes, various equivalent modifications are possible within the scope of the disclosure, as those skilled in the relevant art will recognize. Further, any specific numbers noted herein are only examples: alternative implementations may employ differing values, measurements or ranges.

[00109] Although the operations of any method(s) disclosed or described herein either explicitly or implicitly are shown and described in a particular order, the order of the

operations of each method may be altered so that certain operations may be performed in an inverse order or so that certain operations may be performed, at least in part, concurrently with other operations. In another embodiment, instructions or sub-operations of distinct operations may be implemented in an intermittent and/or alternating manner.

[00110] The teachings of the disclosure provided herein can be applied to other systems, not necessarily the system described above. The elements and acts of the various embodiments described above can be combined to provide further embodiments. Any measurements or dimensions described or used herein are merely exemplary and not a limitation on the present invention. Other measurements or dimensions are within the scope of the invention.

[00111] Any patents and applications and other references noted above, including any that may be listed in accompanying filing papers, are incorporated herein by reference in their entirety. Aspects of the disclosure can be modified, if necessary, to employ the systems, functions, and concepts of the various references described above to provide yet further embodiments of the disclosure.

[00112] These and other changes can be made to the disclosure in light of the above Detailed Description of the Preferred Embodiments. While the above description describes certain embodiments of the disclosure, and describes the best mode contemplated, no matter how detailed the above appears in text, the teachings can be practiced in many ways. Details of the system may vary considerably in its implementation details, while still being encompassed by the subject matter disclosed herein. As noted above, particular terminology used when describing certain features or aspects of the disclosure should not be taken to imply that the terminology is being redefined herein to be restricted to any specific characteristics, features or aspects of the disclosure with which that terminology is associated. In general, the terms used in the following claims should not be construed to

limit the disclosures to the specific embodiments disclosed in the specification unless the above Detailed Description of the Preferred Embodiments section explicitly defines such terms. Accordingly, the actual scope of the disclosure encompasses not only the disclosed embodiments, but also all equivalent ways of practicing or implementing the disclosure under the claims.

[00113] While certain aspects of the disclosure are presented below in certain claim forms, the inventors contemplate the various aspects of the disclosure in any number of claim forms. For example, while only one aspect of the disclosure is recited as a means-plus-function claim under 35 U.S.C. § 112, ¶6, other aspects may likewise be embodied as a means-plus-function claim, or in other forms, such as being embodied in a computer-readable medium. (Any claims intended to be treated under 35 U.S.C. § 112, ¶6 will include the words "means for"). Accordingly, the applicant reserves the right to add additional claims after filing the application to pursue such additional claim forms for other aspects of the disclosure.

[00114] Accordingly, although exemplary embodiments of the invention have been shown and described, it is to be understood that all the terms used herein are descriptive rather than limiting, and that many changes, modifications, and substitutions may be made by one having ordinary skill in the art without departing from the spirit and scope of the invention.

IN THE PATENT AND TRADEMARK OFFICE

In re patent application of: WERSLAND, Jason Serial No. Filed: March 25, 2021 VIBRATION THERAPY SYSTEM AND DEVICE	Confirmation No. tbd Group Art Unit: not yet assigned Examiner: not yet assigned Customer No. 24574 Docket No. 76840-5199
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Commissioner For Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR § 1.97(b)

Sir/Madam:

In accordance with applicant's duty to disclose information that may be material to the examination of this application, 37 CFR § 1.56, attached hereto is an Information Disclosure Statement.

The submission of any document herewith is not intended as an admission that such document constitutes prior art against the claims of the present application. Applicant does not waive any rights to take any action that would be appropriate to antedate or otherwise remove as a competent reference any document that is determined to be a prima facie prior art reference against the claims of the present application.

Applicant respectfully requests that the attached Information Disclosure Statement and references be considered by the Examiner and be made of record in the present

application and that a copy of the initialed, signed, and dated e-IDS form be returned in accordance with MPEP §609.07.

It is believed that no additional fee is due for submitting this response. However, in the event a fee is required, the Commissioner is authorized to charge any amounts due or credit any overpayments in connection with this matter to Deposit Account No. 10-0440.

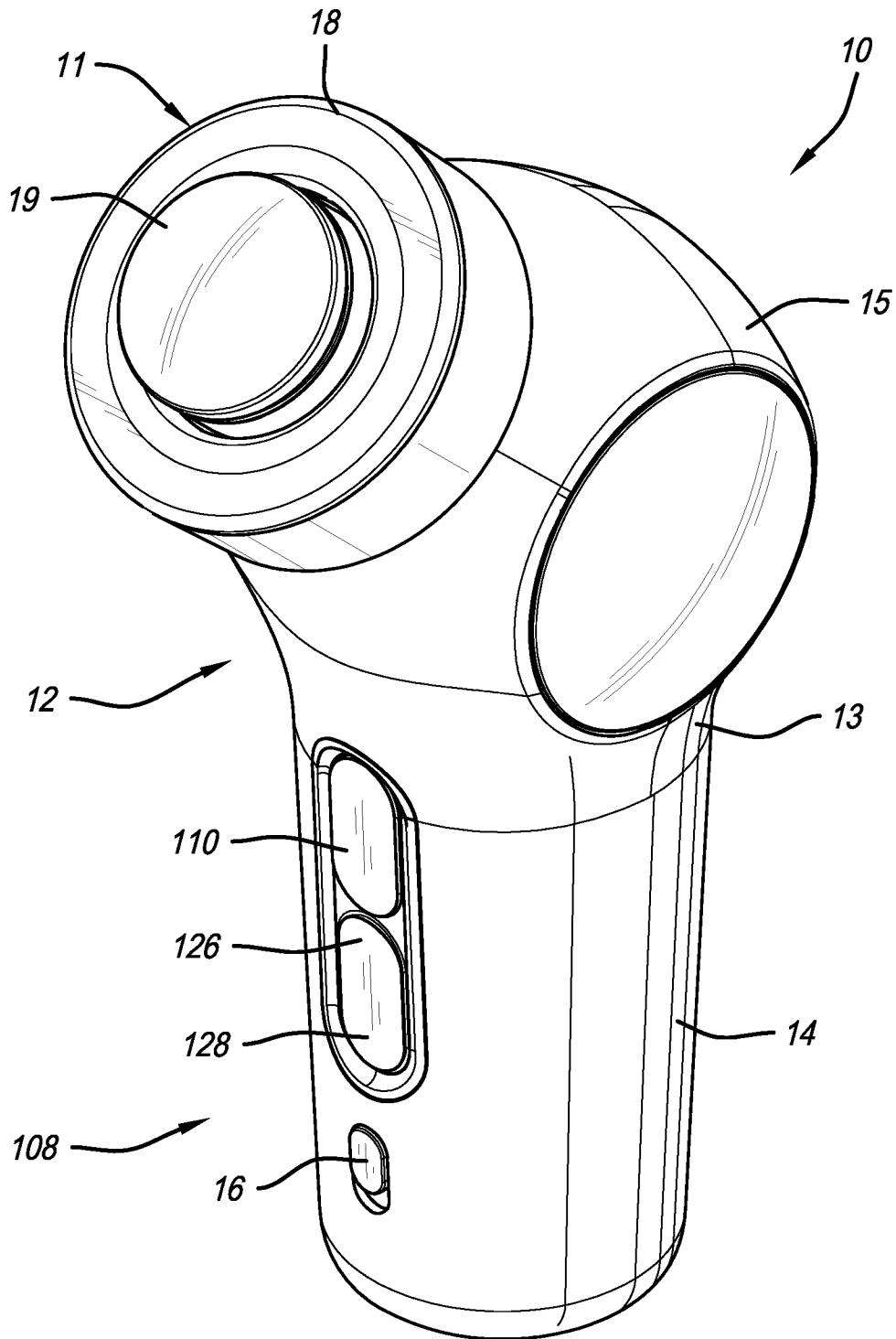
Date: March 25, 2022

/Brennan C. Swain/

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Los Angeles, CA 90067
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Customer No. 24574

CUSTOMER NUMBER

24574

**FIG. 1**

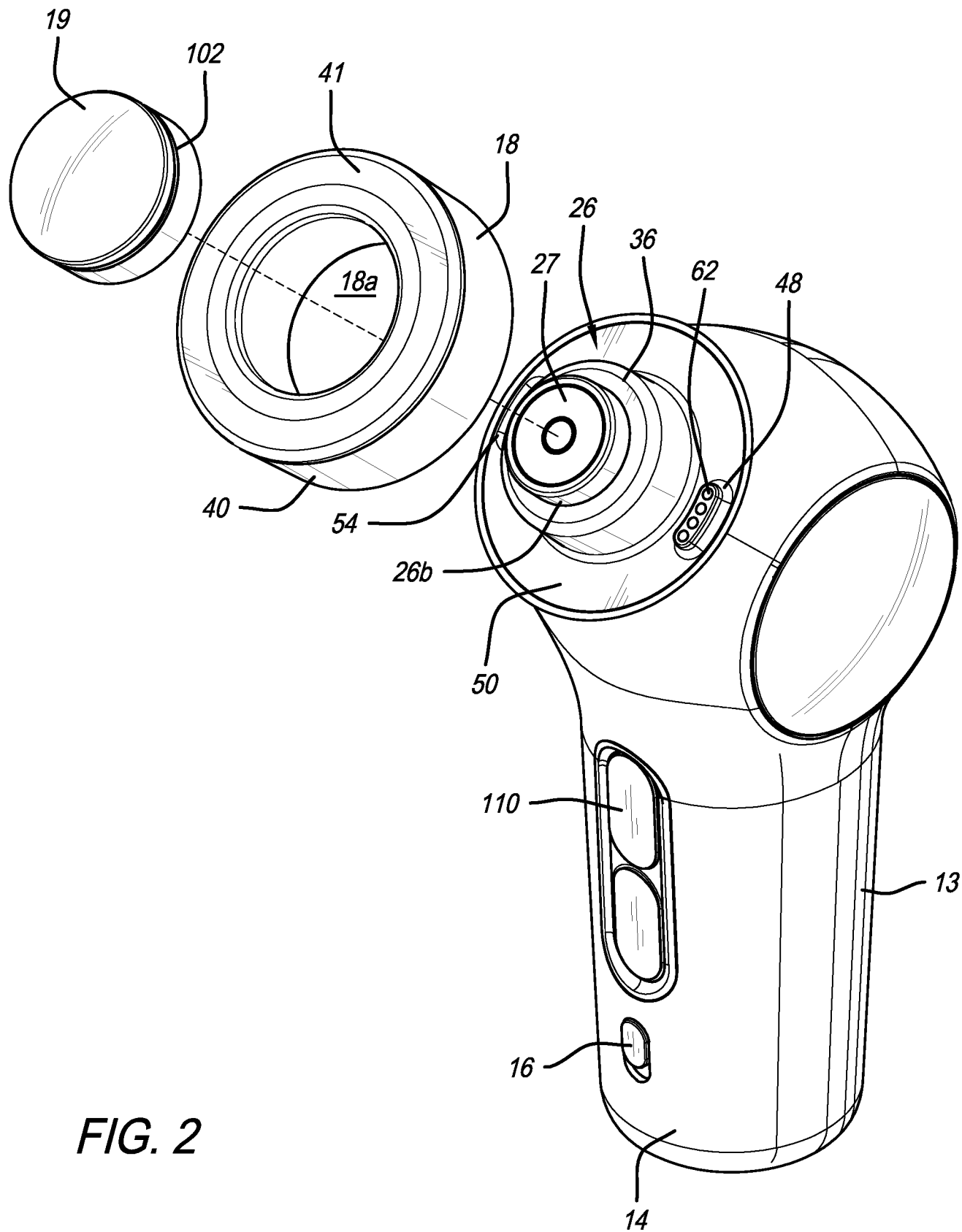


FIG. 2

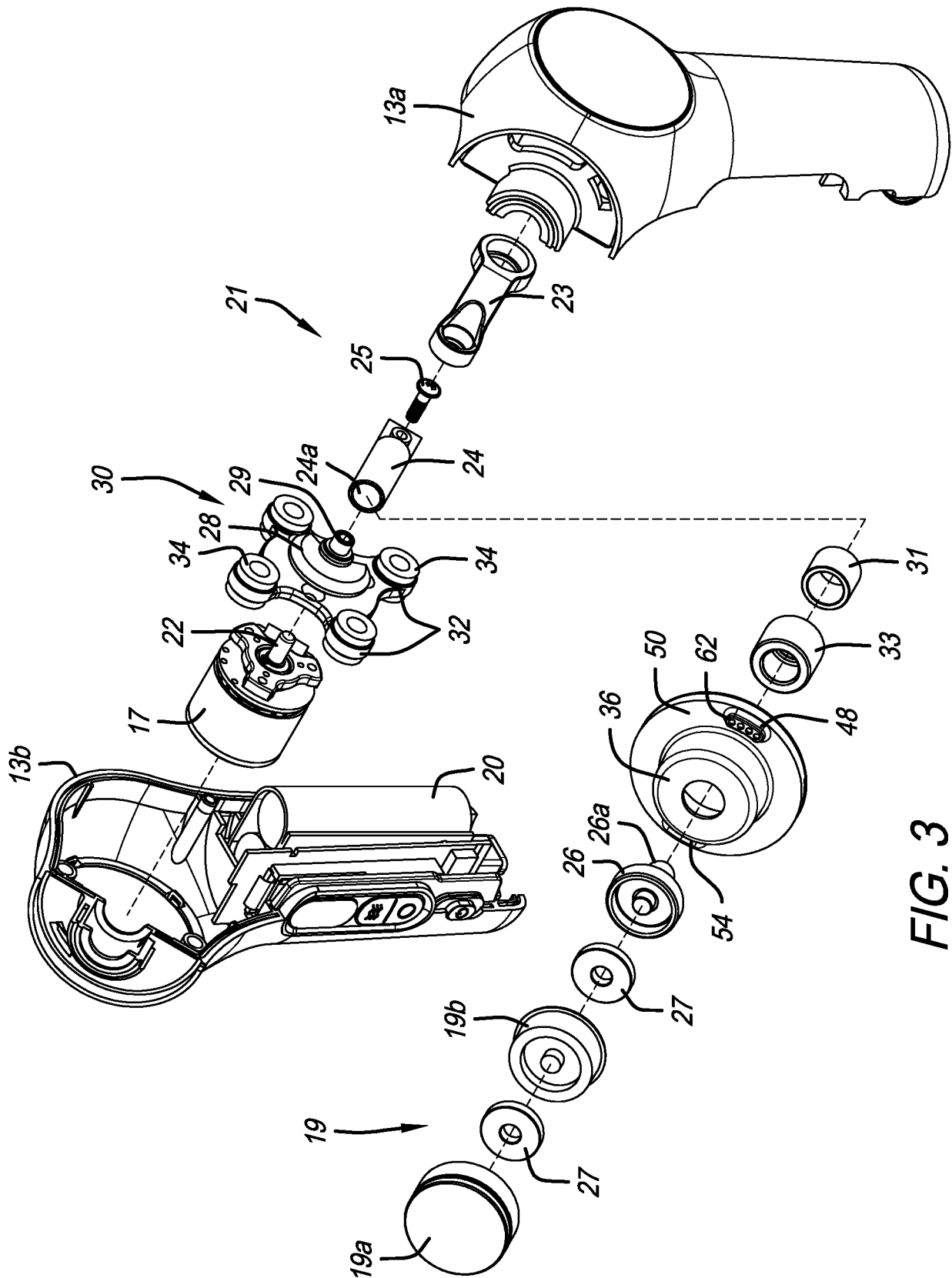
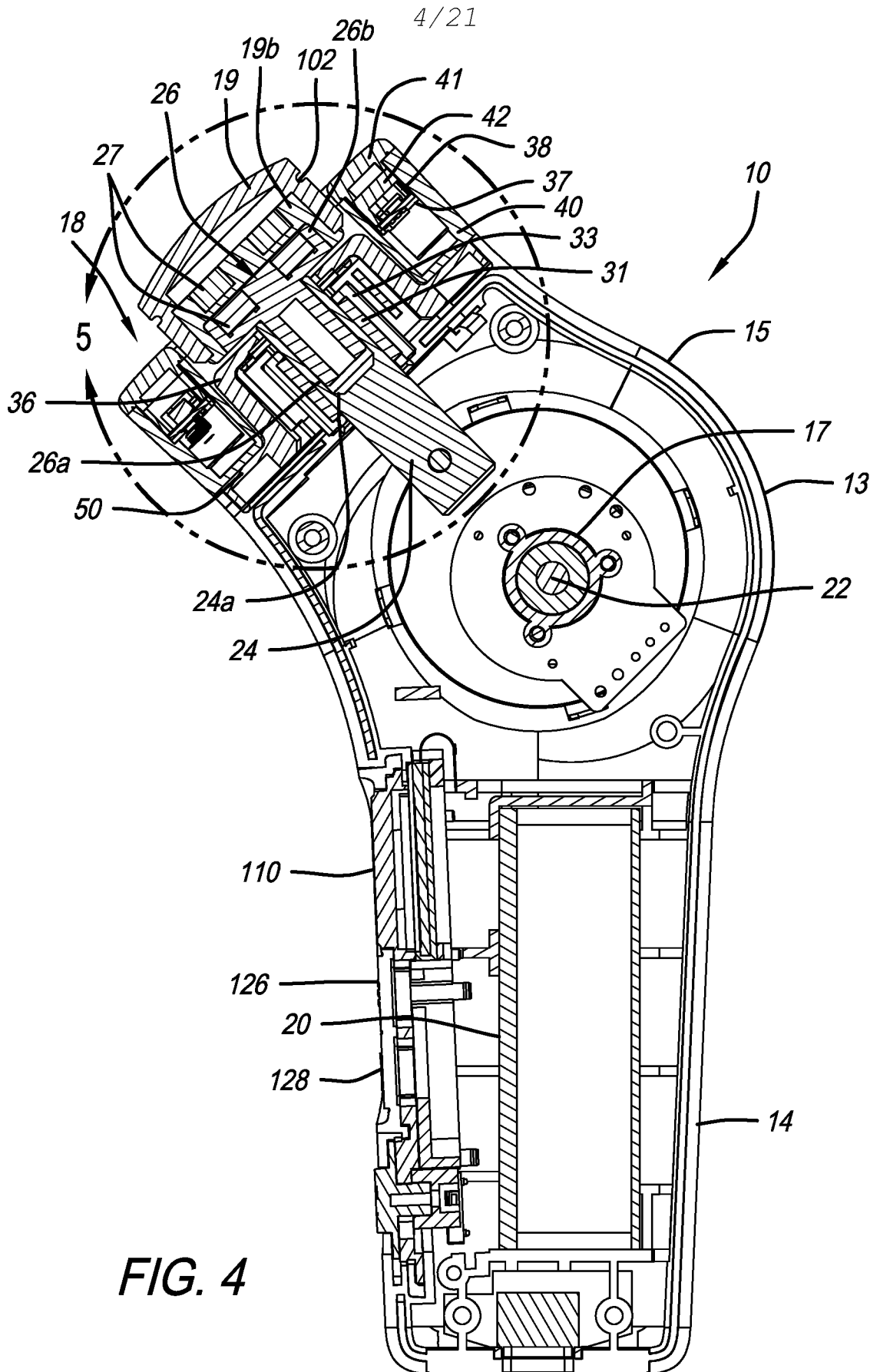


FIG. 3



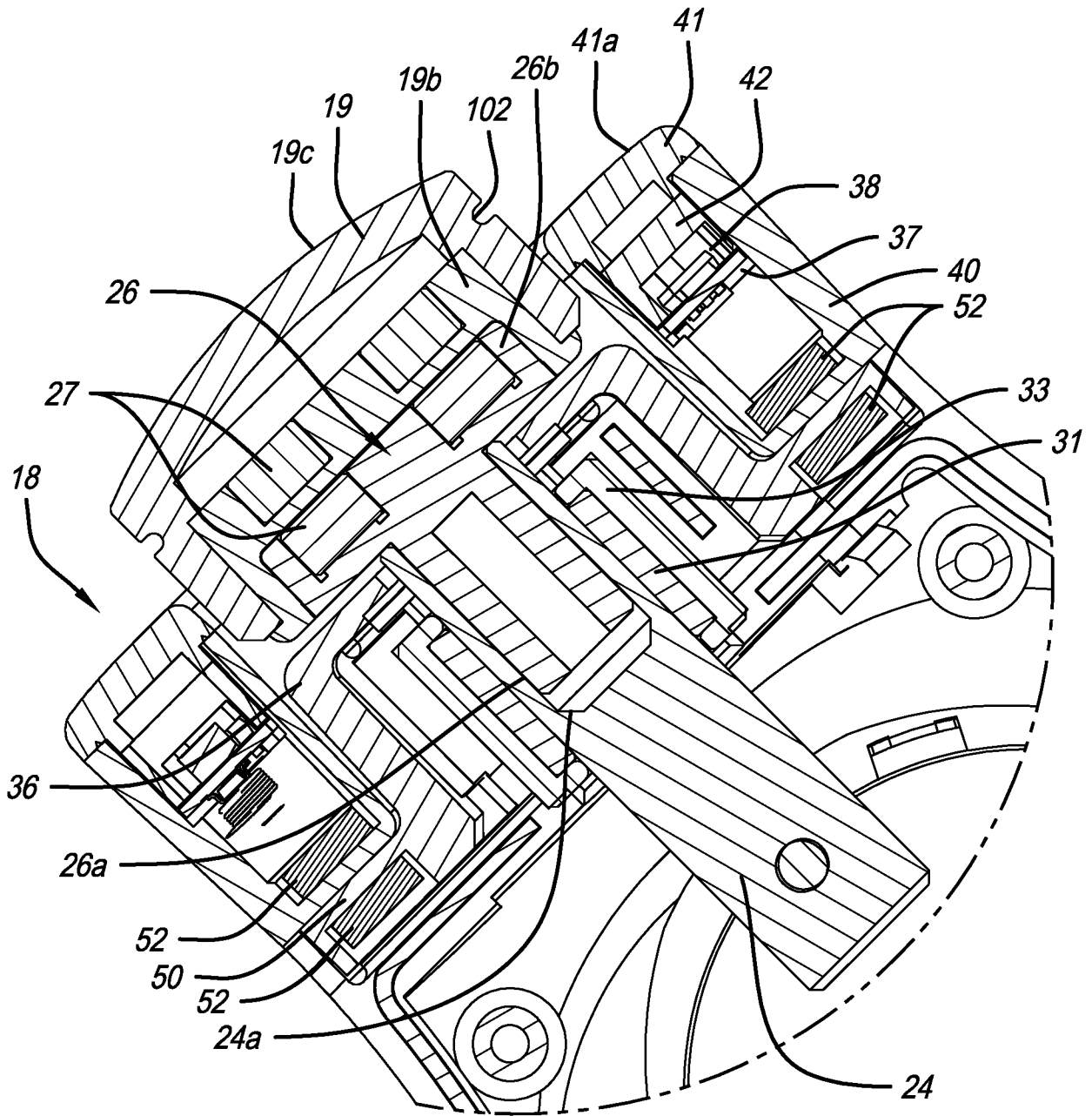
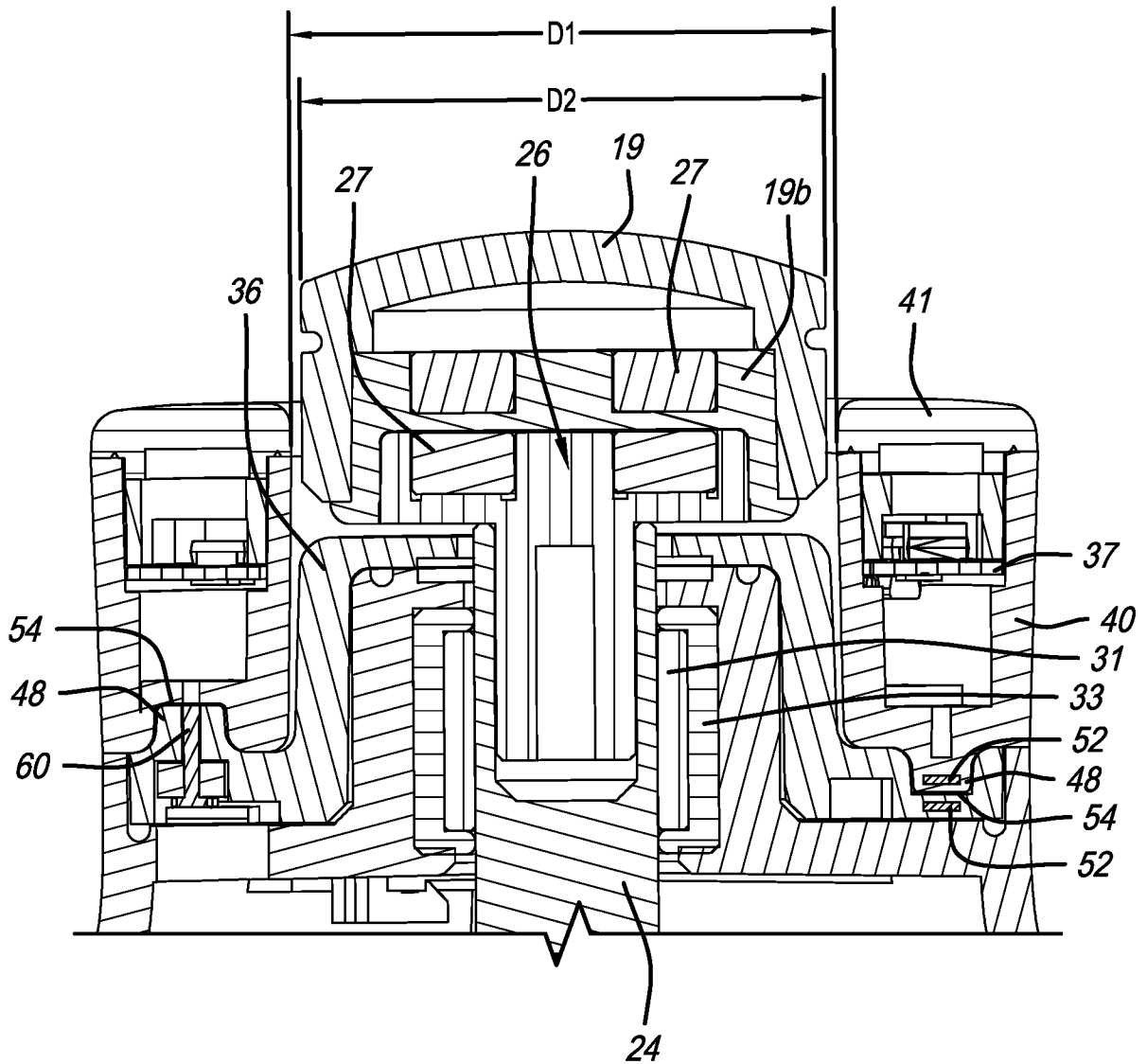


FIG. 5

**FIG. 6**

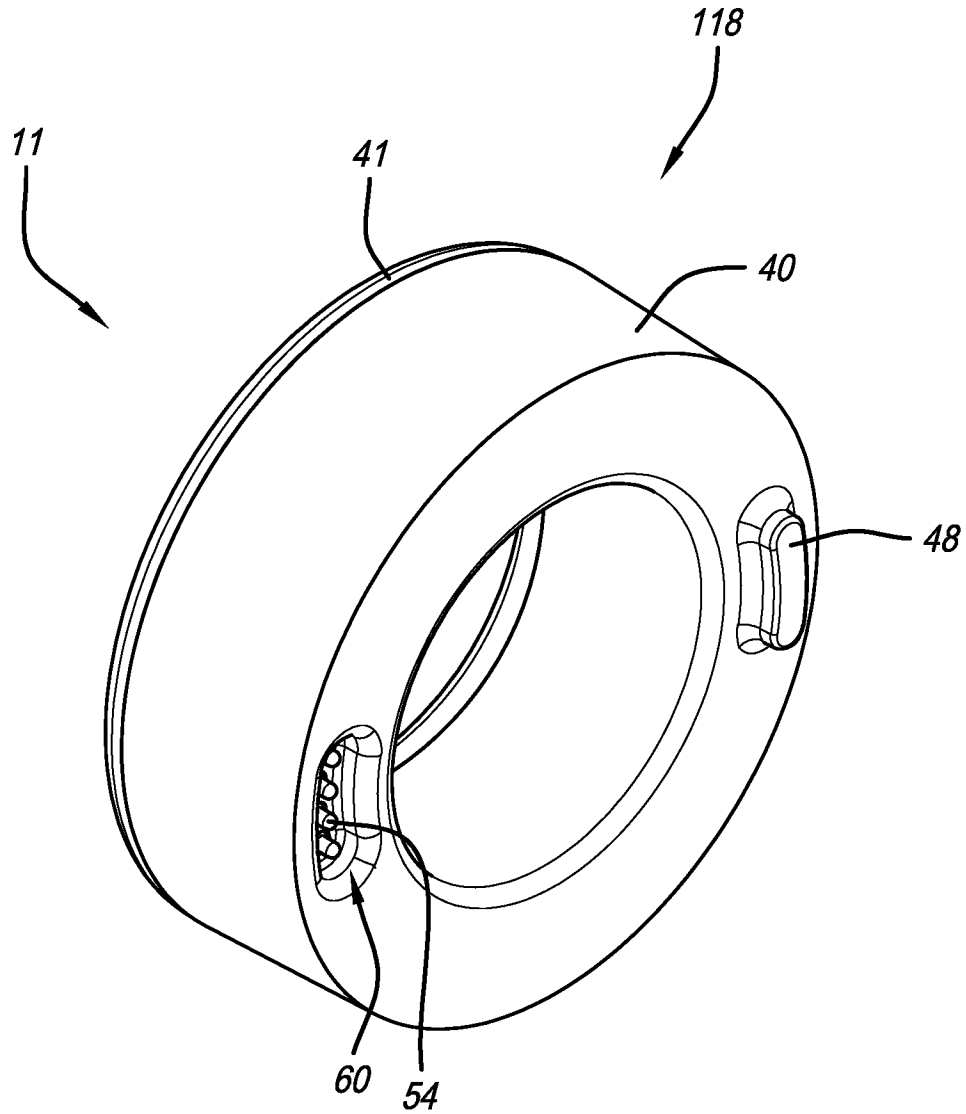


FIG. 7

8/21

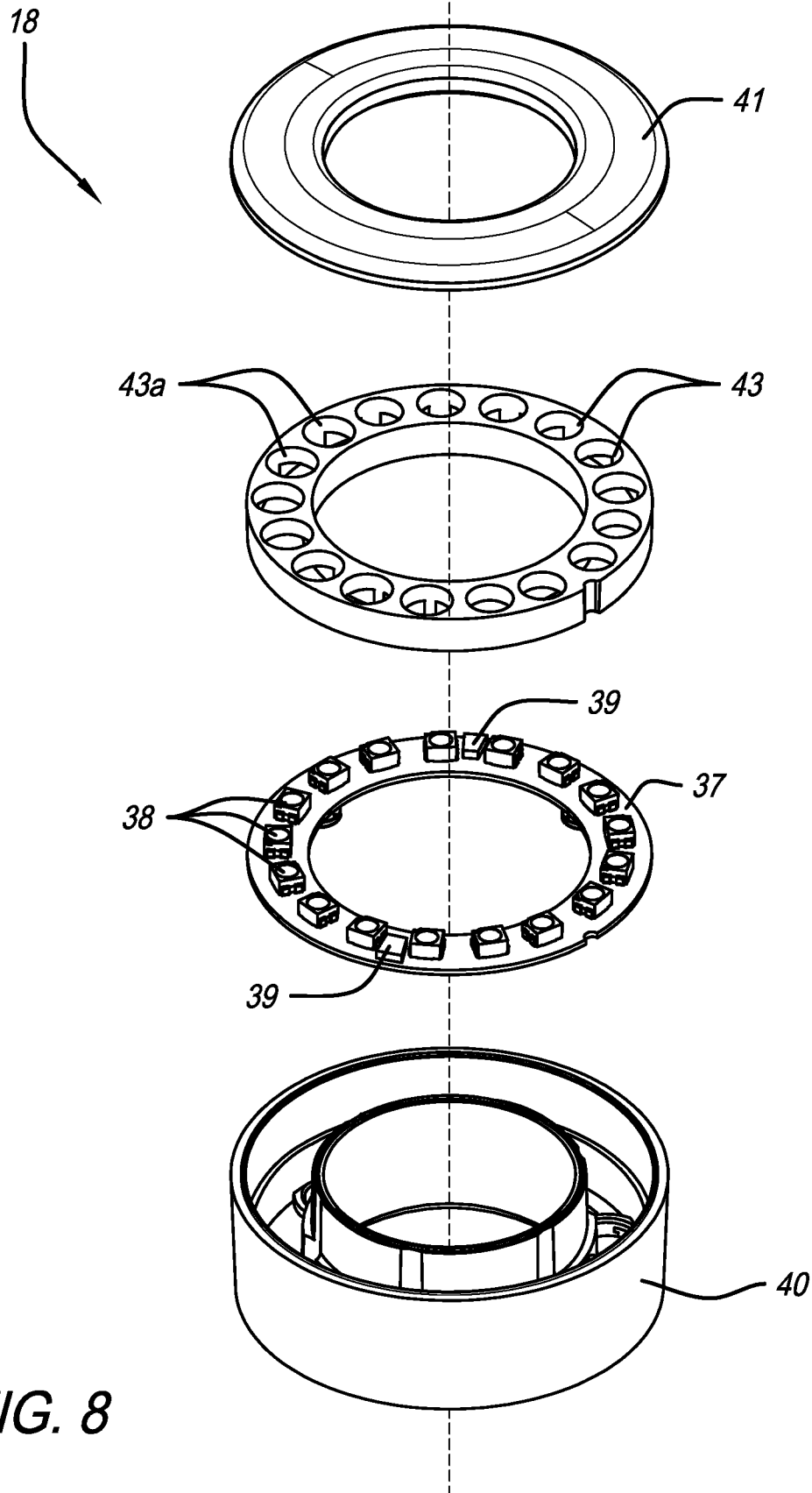


FIG. 8

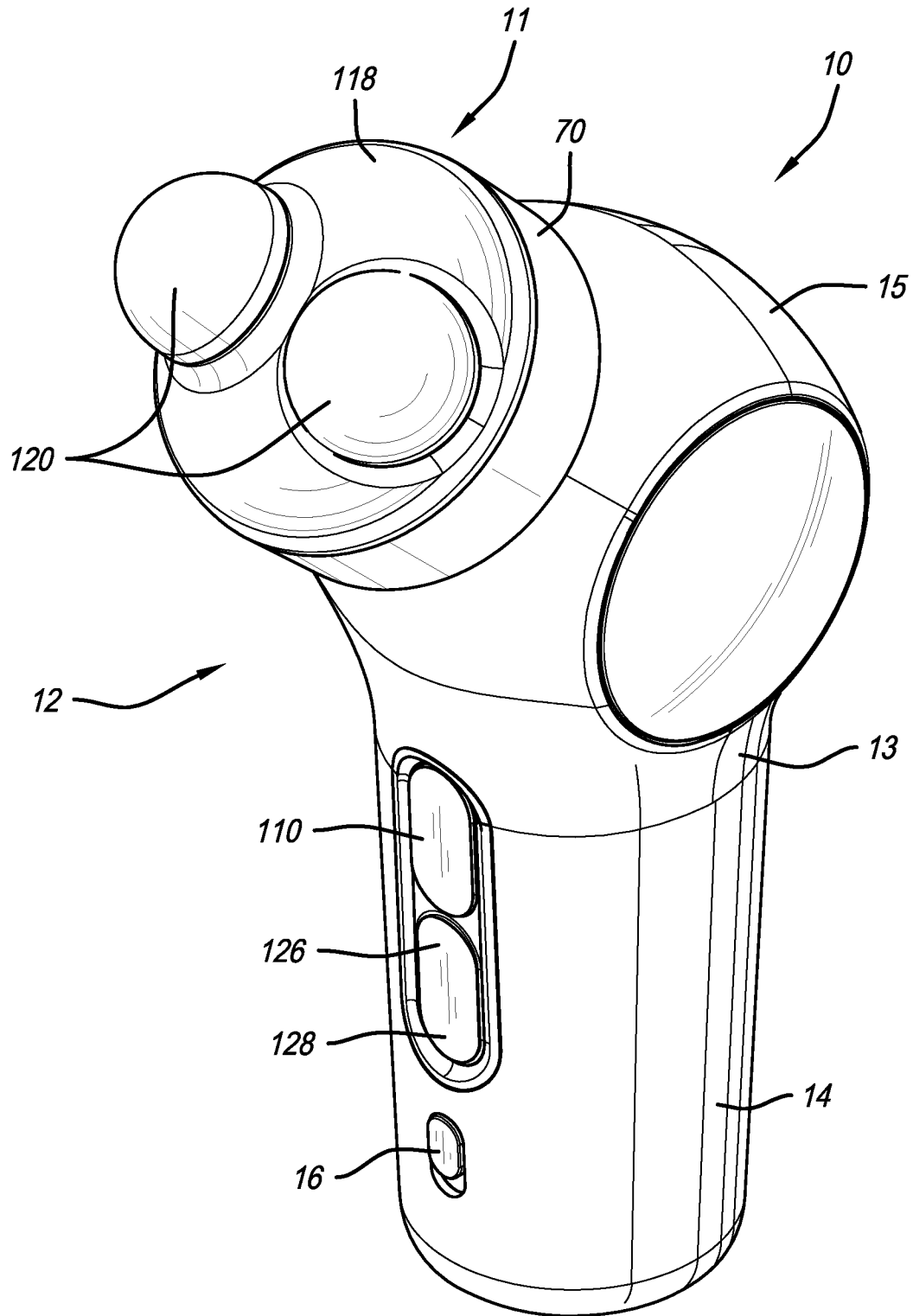


FIG. 9

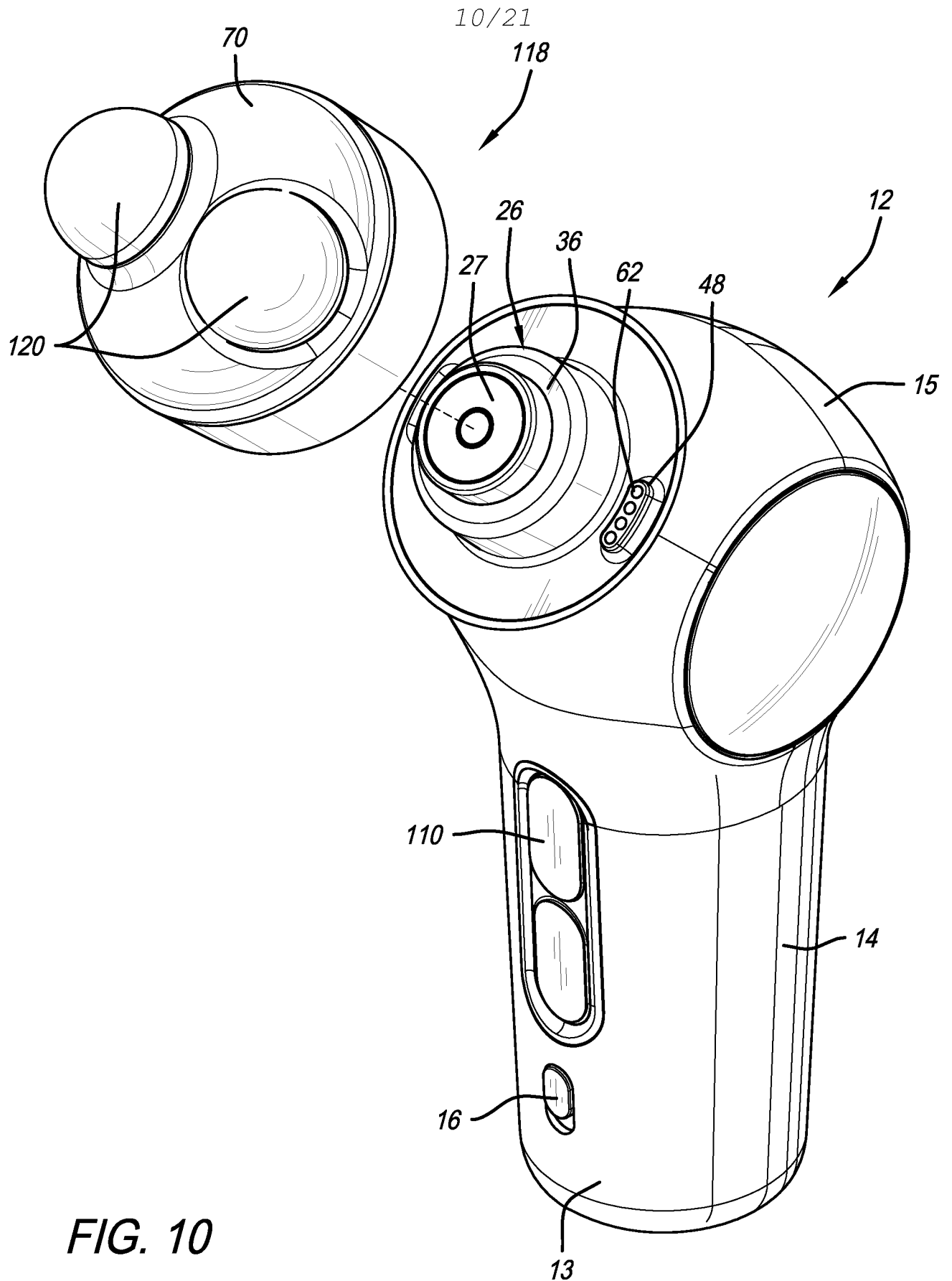


FIG. 10

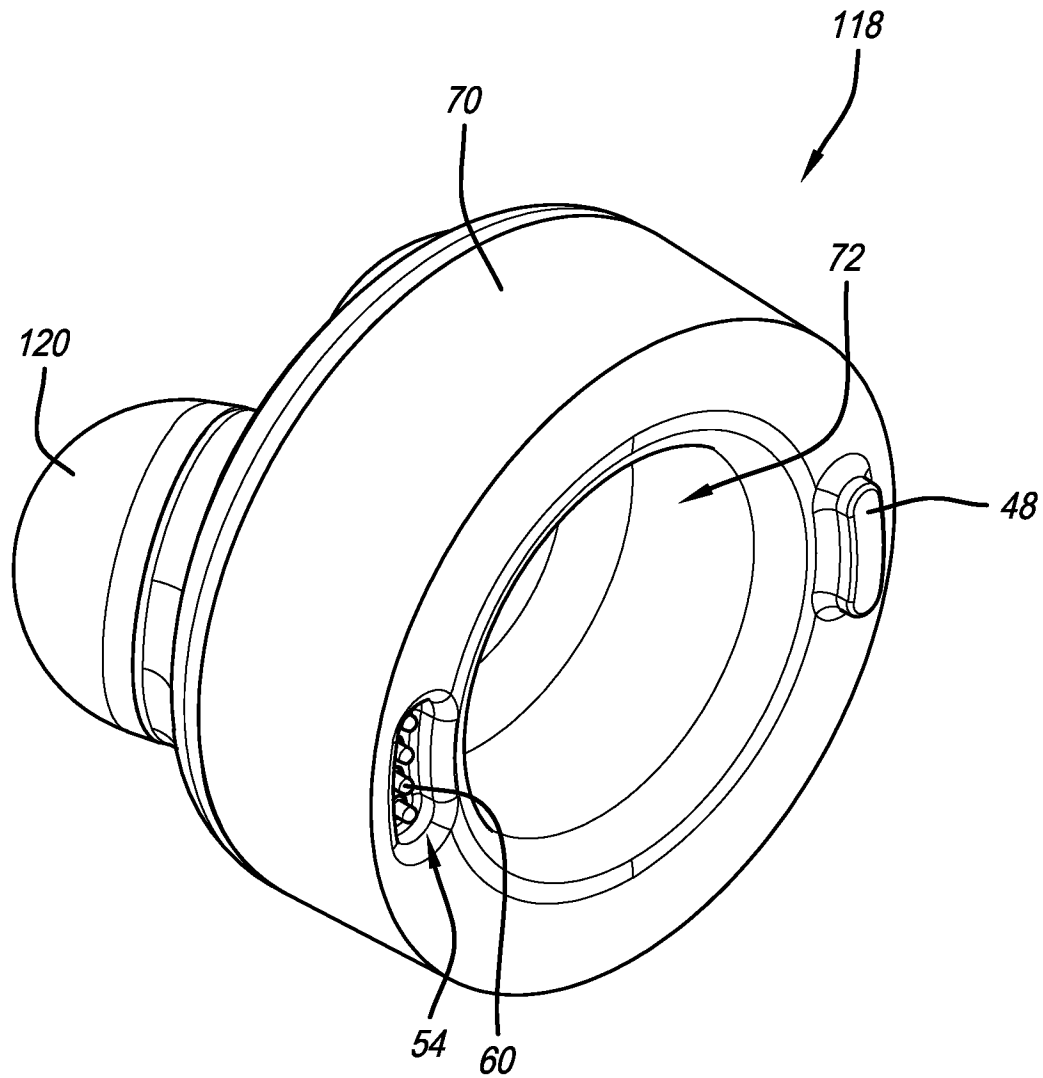


FIG. 11

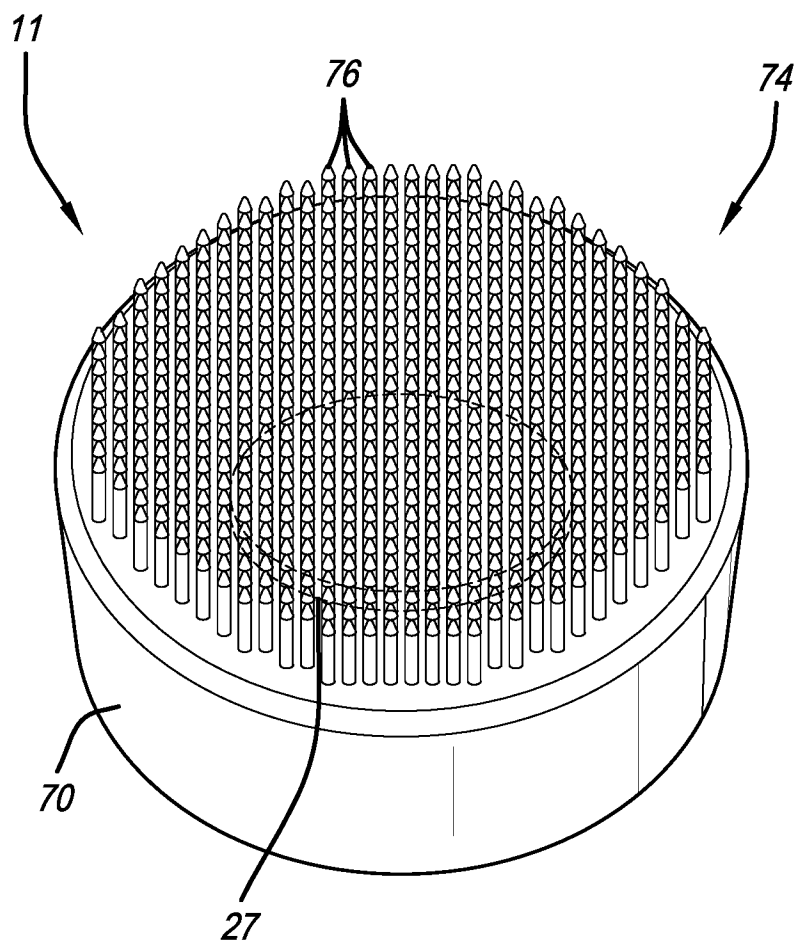


FIG. 12

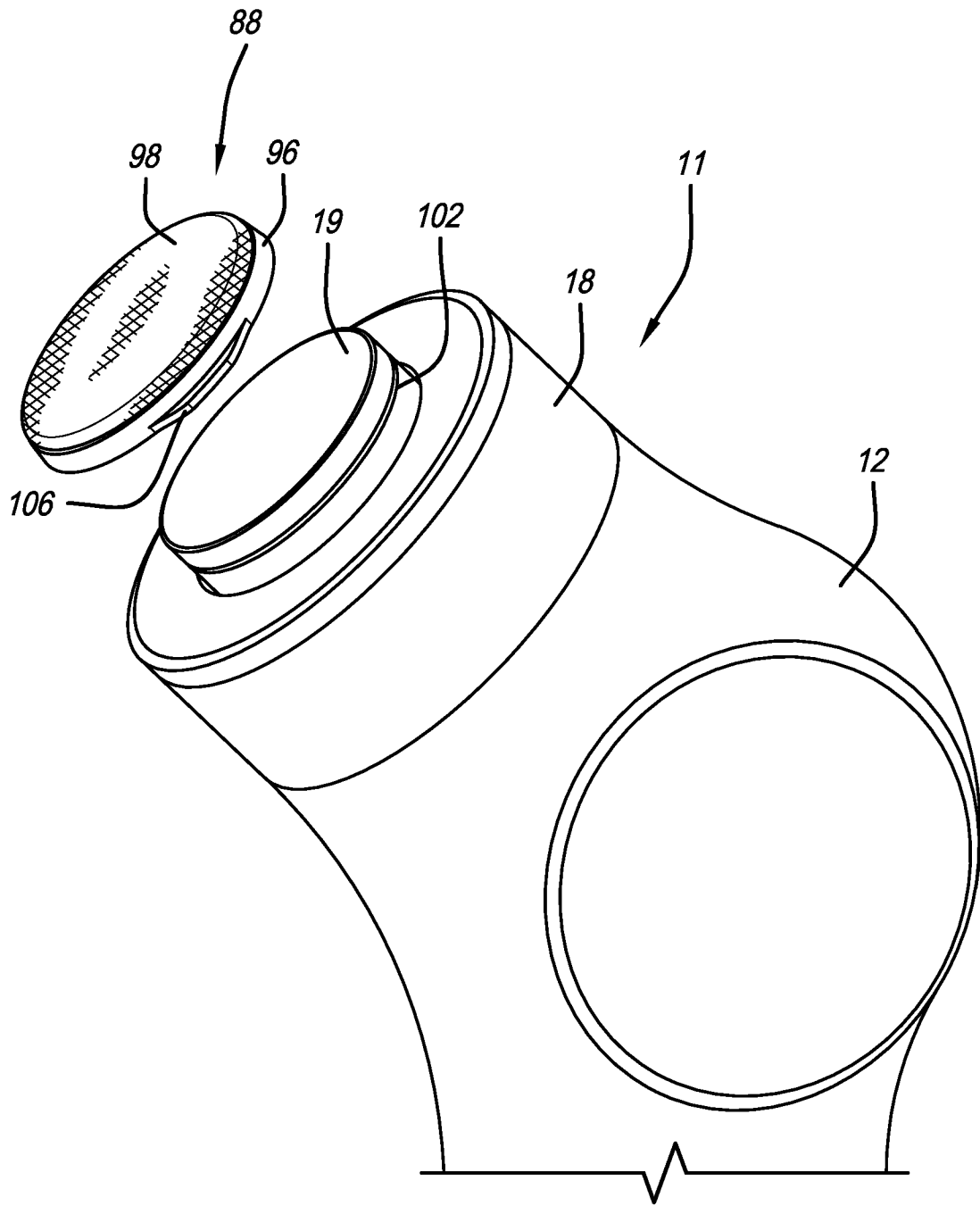


FIG. 13

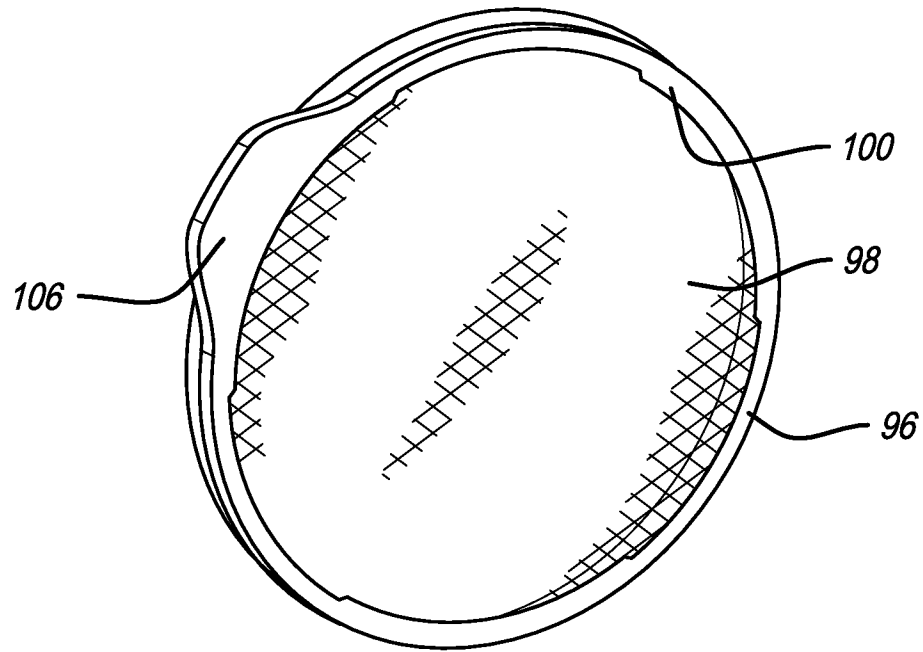


FIG. 14

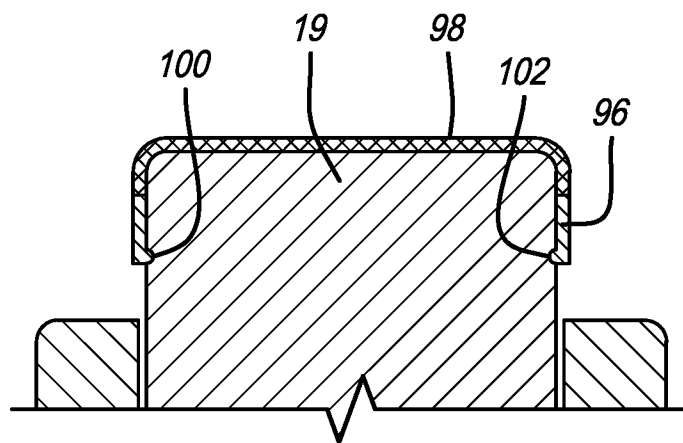


FIG. 15

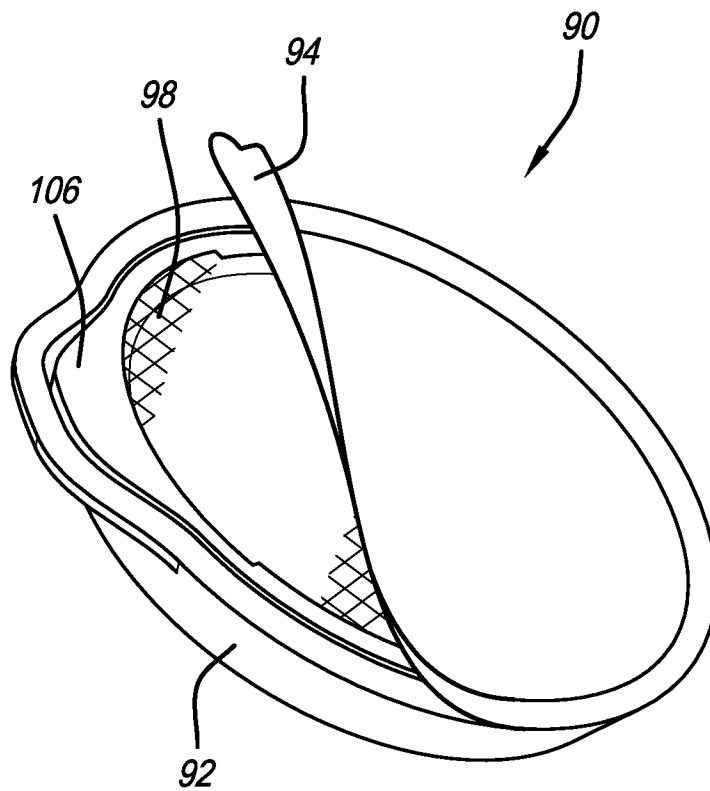


FIG. 16

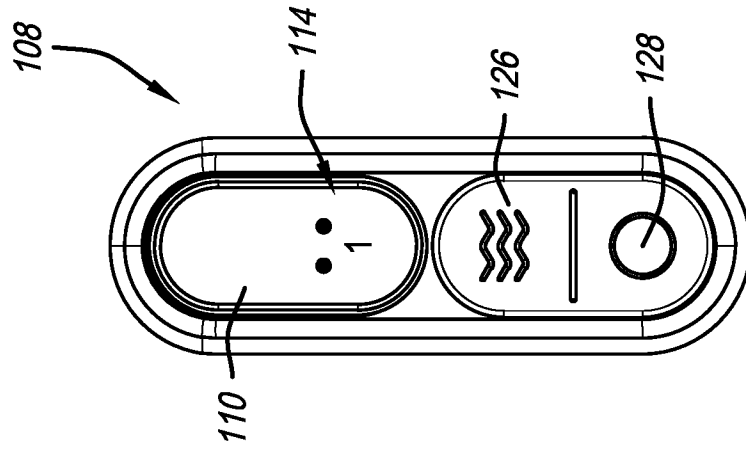


FIG. 17C

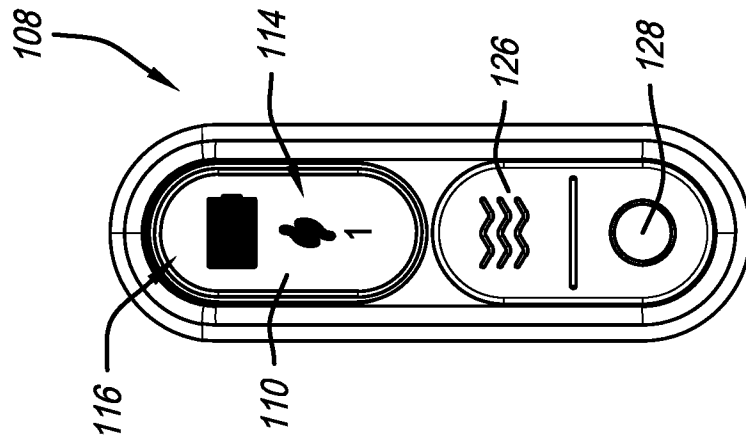


FIG. 17B

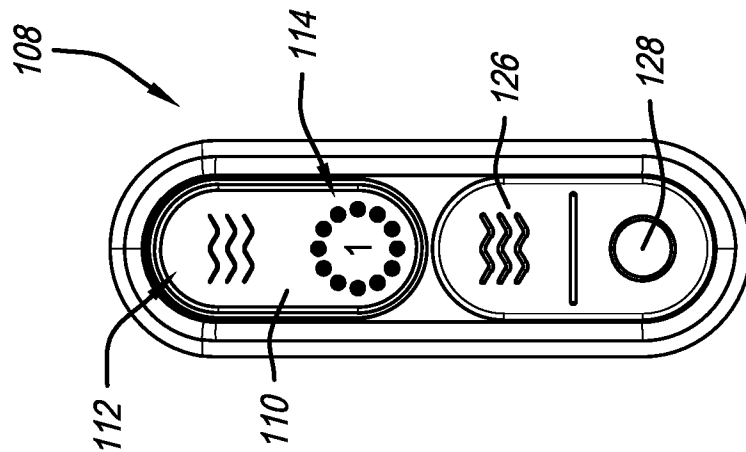


FIG. 17A

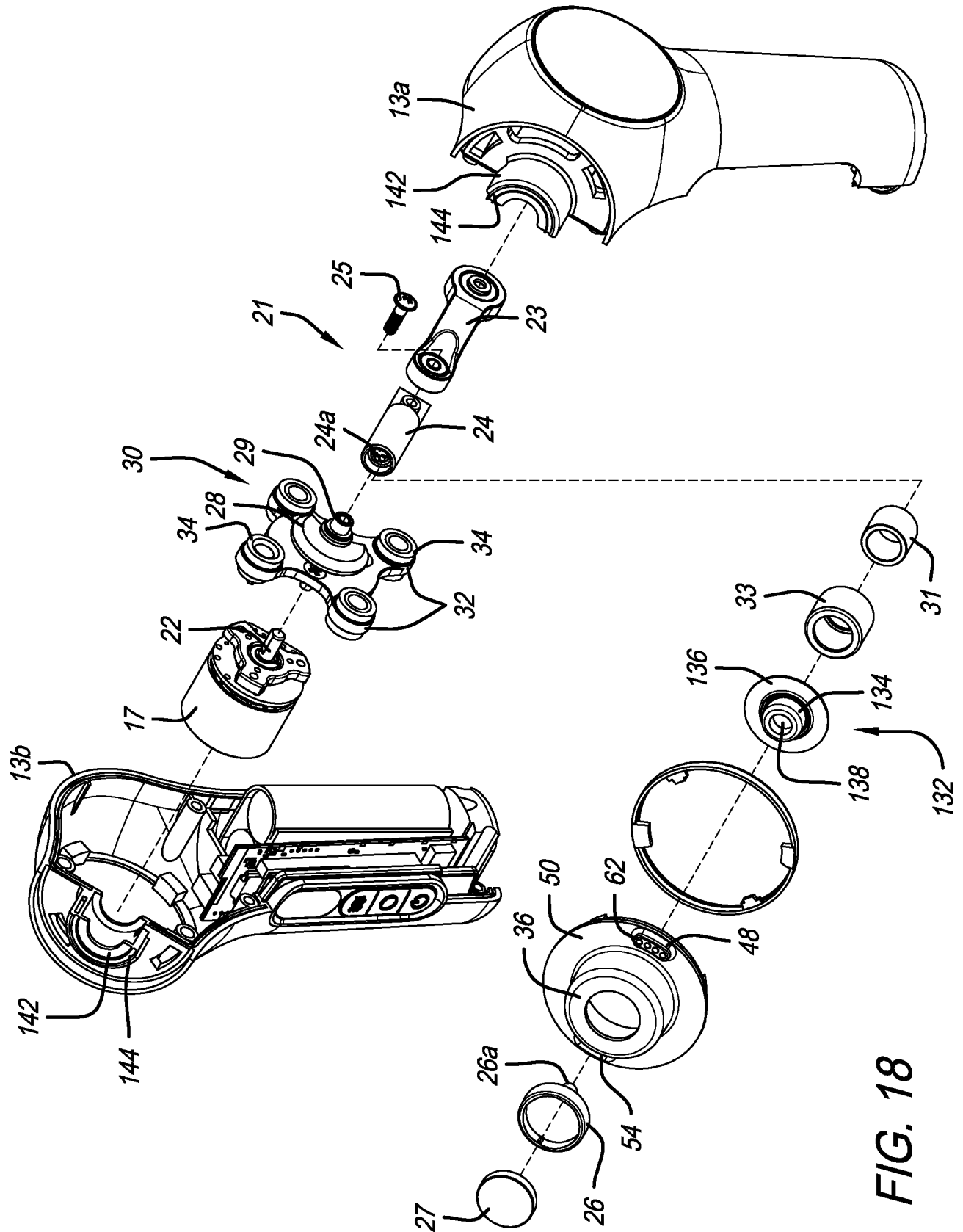


FIG. 18

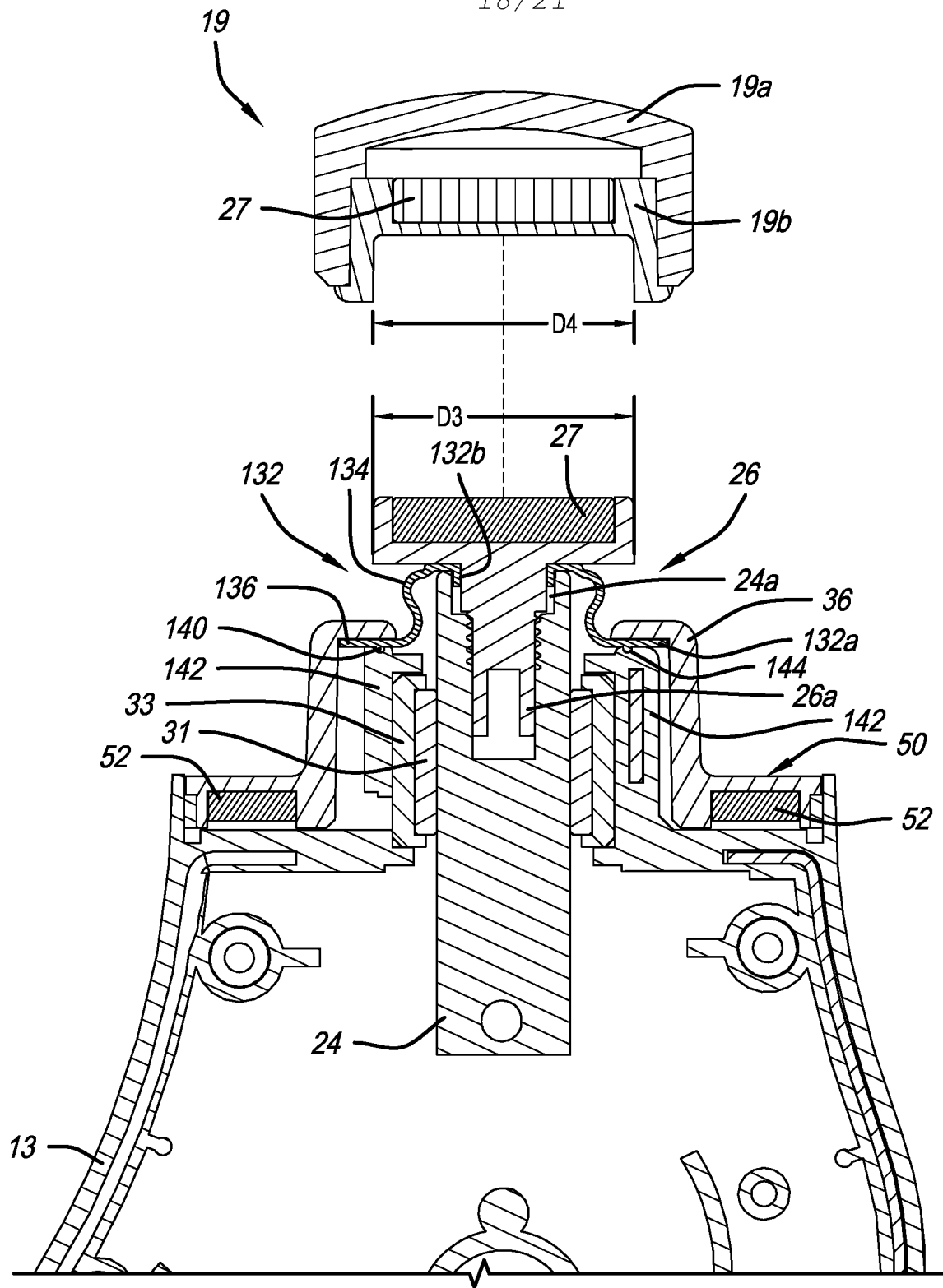


FIG. 19

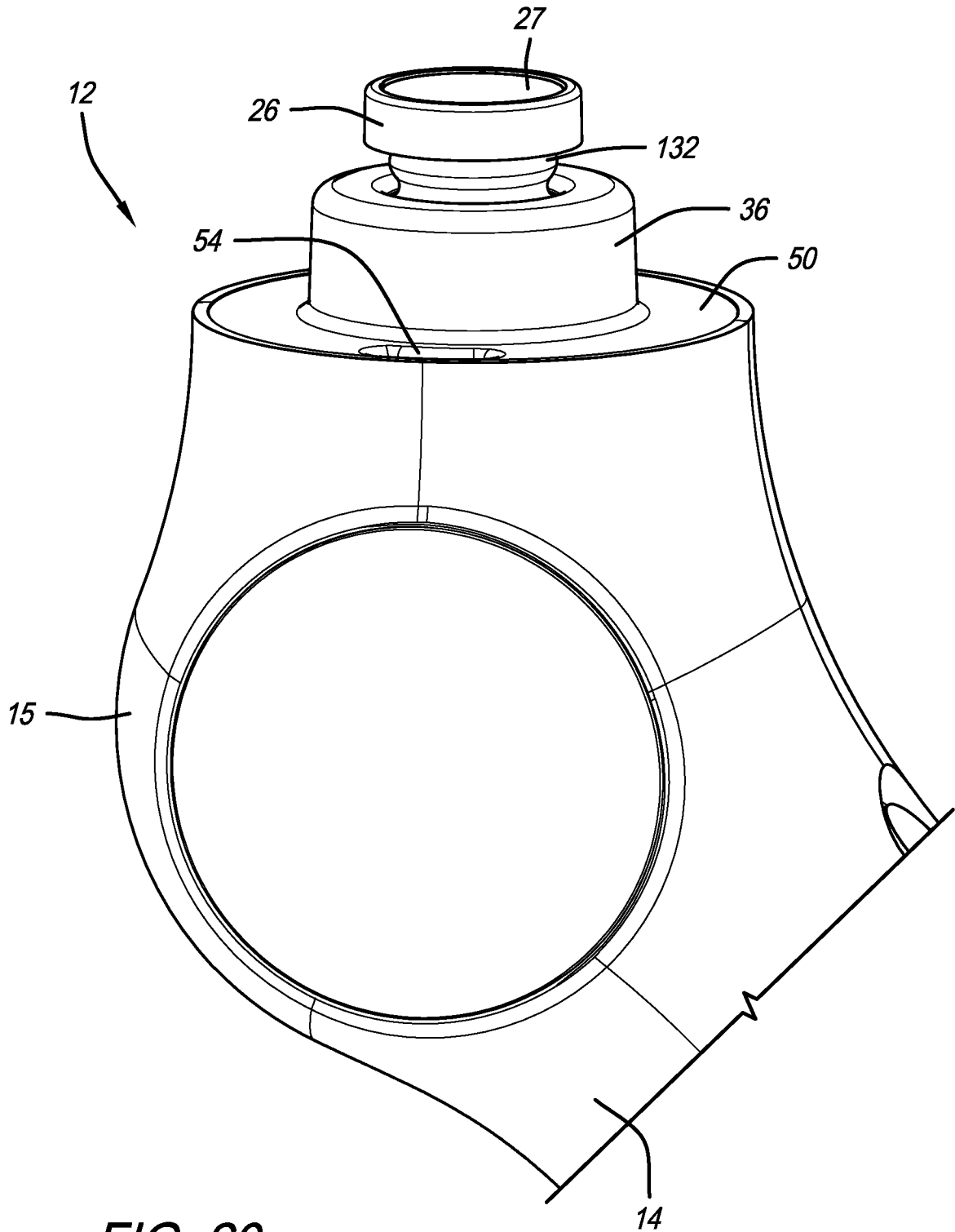


FIG. 20

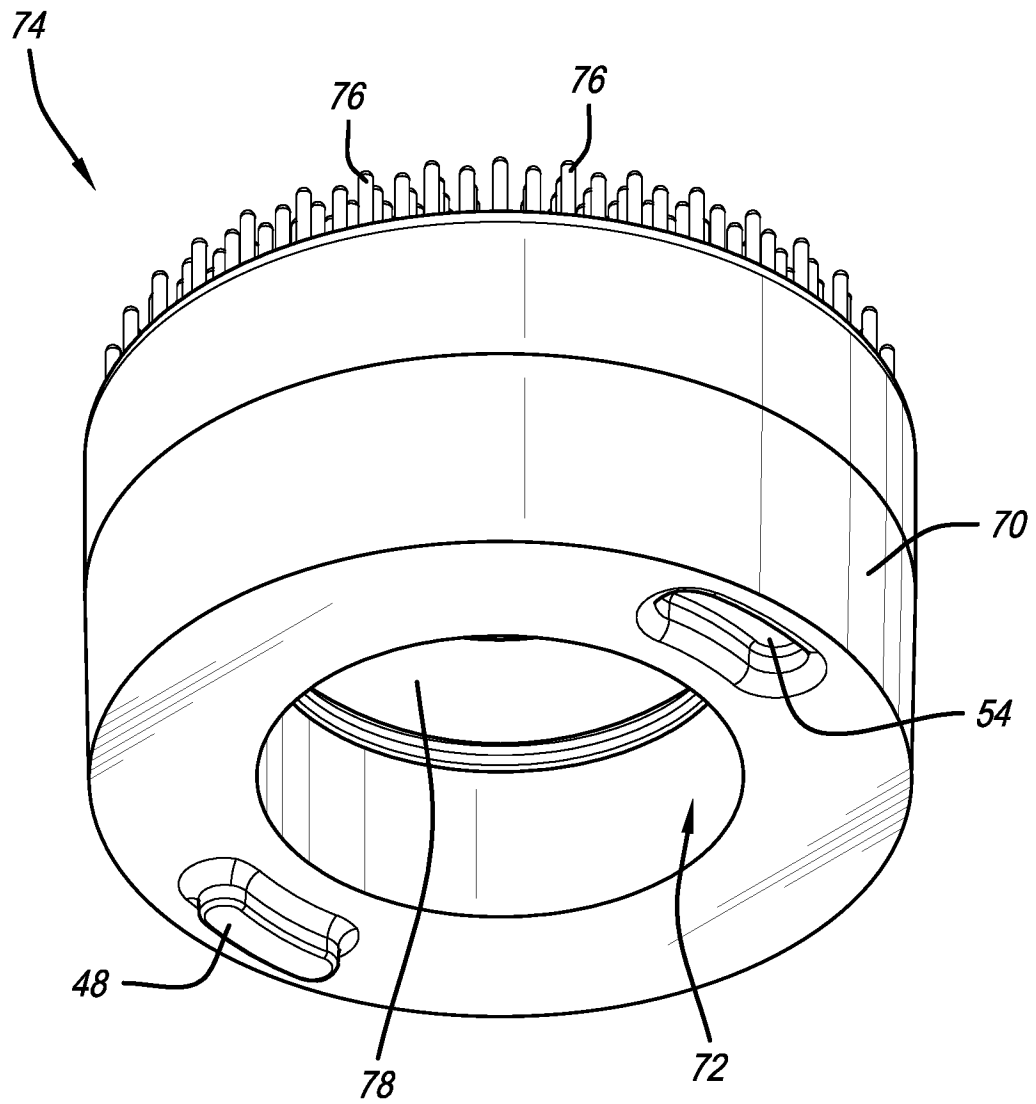


FIG. 21

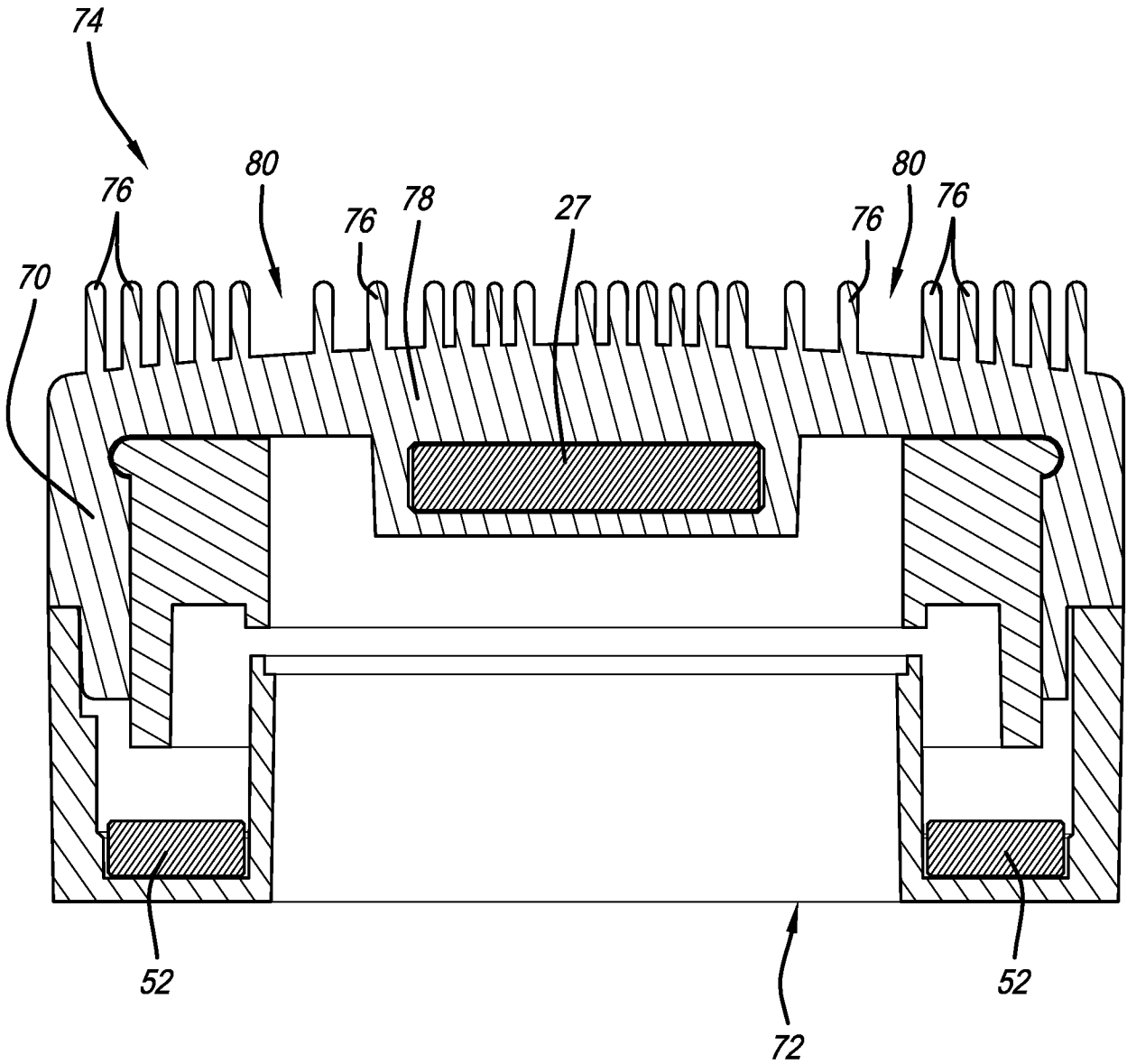


FIG. 22

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	76840-5199
		Application Number	
Title of Invention	VIBRATING THERAPY SYSTEM AND DEVICE		
<p>The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.</p> <p>This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.</p>			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor	1				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Jason		Wersland		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Los Angeles	State/Province	CA	Country of Residence	US

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Address 1	6100 Wilshire Blvd., Suite 200				
Address 2					
City	Los Angeles	State/Province	CA		
Postal Code	90048	Country	US		

Inventor	2				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Benjamin		Nazarian		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Los Angeles	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	6100 Wilshire Blvd., Suite 200				
Address 2					
City	Los Angeles	State/Province	CA		
Postal Code	90048	Country	US		

Inventor	3				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Jaime	Sanchez	Solana		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	76840-5199
		Application Number	
Title of Invention	VIBRATING THERAPY SYSTEM AND DEVICE		

City	Los Angeles	State/Province	CA	Country of Residence	US
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Mailing Address of Inventor:

Address 1	6100 Wilshire Blvd., Suite 200				
Address 2					
City	Los Angeles	State/Province	CA		
Postal Code	90048	Country	US		
Inventor	4				Remove
Legal Name					

Prefix	Given Name	Middle Name	Family Name	Suffix	
	Eduardo		Merino		
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service					
City	Los Angeles	State/Province	CA	Country of Residence	US

Mailing Address of Inventor:

Address 1	6100 Wilshire Blvd., Suite 200				
Address 2					
City	Los Angeles	State/Province	CA		
Postal Code	90048	Country	US		
Inventor	5				Remove
Legal Name					

Prefix	Given Name	Middle Name	Family Name	Suffix
	Bill		Webb	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				
City	San Francisco	Country of Residence		US

Mailing Address of Inventor:

Address 1	1082 Howard St.				
Address 2					
City	San Francisco	State/Province	CA		
Postal Code	94103	Country	US		
Inventor	6				Remove
Legal Name					

Prefix	Given Name	Middle Name	Family Name	Suffix
	Alex		Zhu	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	76840-5199
		Application Number	
Title of Invention	VIBRATING THERAPY SYSTEM AND DEVICE		

City	Xiamen City	Country of Residence ⁱ	CN
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Address 1	Unit 305, 3rd Floor 1702# Gangzhong Road		
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City	Xiamen City, Fujian Province	State/Province	
Postal Code	361011	Country ⁱ	CN
Inventor	7	<button>Remove</button>	
Legal Name			

Prefix	Given Name	Middle Name	Family Name	Suffix
	Richard		Tang	
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service				
City	Shenzhen	State/Province		Country of Residence ⁱ CN

Mailing Address of Inventor:

Address 1	6100 Wilshire Blvd., Suite 200		
Address 2			
City	Los Angeles	State/Province	CA
Postal Code	90048	Country ⁱ	US
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. <button>Add</button>			

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).	
☐ An Address is being provided for the correspondence Information of this application.	
Customer Number	24574
Email Address	patentdocket@jmbm.com <button>Add Email</button> <button>Remove Email</button>

Application Information:

Title of the Invention	VIBRATING THERAPY SYSTEM AND DEVICE		
Attorney Docket Number	76840-5199	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	21	Suggested Figure for Publication (if any)	1

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	76840-5199
		Application Number	
Title of Invention	VIBRATING THERAPY SYSTEM AND DEVICE		

Filing By Reference:

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

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

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

Publication Information:

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

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

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	24574		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation in part of	17/361966	2021-06-29

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	76840-5199
		Application Number	
Title of Invention	VIBRATING THERAPY SYSTEM AND DEVICE		

Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
17/361966	Claims benefit of provisional	63/133530	2021-01-04
Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
17/361966	Claims benefit of provisional	63/065348	2020-08-13
Prior Application Status	Expired	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
17/361966	Claims benefit of provisional	63/045365	2020-06-29
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)	Remove
Additional Foreign Priority Data may be generated within this form by selecting the Add button.				Add

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

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	76840-5199
		Application Number	
Title of Invention	VIBRATING THERAPY SYSTEM AND DEVICE		

Authorization or Opt-Out of Authorization to Permit Access:

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

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

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

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

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

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

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

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

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

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

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	76840-5199
		Application Number	
Title of Invention	VIBRATING THERAPY SYSTEM AND DEVICE		

Applicant Information:

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

Applicant	1	Remove
------------------	---	------------------------

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

[Clear](#)

Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
----------	--	----------------

● Person to whom the inventor is obligated to assign. Person who shows sufficient proprietary interest

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

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. ☒

Organization Name

Mailing Address Information For Applicant:

Address 1	6100 Wilshire Blvd., Suite 200		
Address 2			
City	Los Angeles	State/Province	CA
Country	US	Postal Code	90048
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. [Add](#)

Assignee Information including Non-Applicant Assignee Information:

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

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	76840-5199
		Application Number	
Title of Invention	VIBRATING THERAPY SYSTEM AND DEVICE		

Assignee	1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
Remove				
If the Assignee or Non-Applicant Assignee is an Organization check here. ☐				
Prefix	Given Name	Middle Name	Family Name	Suffix
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1		<input type="text"/>		
Address 2		<input type="text"/>		
City	<input type="text"/>	State/Province	<input type="text"/>	
Country ⁱ	<input type="text"/>	Postal Code	<input type="text"/>	
Phone Number	<input type="text"/>	Fax Number	<input type="text"/>	
Email Address	<input type="text"/>			
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add				

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NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Brennan C. Swain/		Date (YYYY-MM-DD)	2022-03-25	
First Name	Brennan	Last Name	Swain	Registration Number	43175
Additional Signature may be generated within this form by selecting the Add button. Add					

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	76840-5199
		Application Number	
Title of Invention	VIBRATING THERAPY SYSTEM AND DEVICE		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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

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

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

**CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION
UNDER 37 CFR 1.102(e) (Page 1 of 1)**

First Named Inventor:	Jason Wersland	Nonprovisional Application Number (if known):	
Title of Invention:	VIBRATING THERAPY SYSTEM AND DEVICE		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently \$0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.
2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.
3. The applicable box is checked below:

I. ☒ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

- i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.
---OR---
(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.
- ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, or the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

- i. A request for continued examination has been filed with, or prior to, this form.
- ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
- iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
- iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
- v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature <u>/Brennan C. Swain/</u>	Date <u>2021-03-25</u>
Name (Print/Typed) <u>Brennan C. Swain</u>	Practitioner Registration Number <u>43175</u>

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

☒ *Total of 1 forms are submitted.

Privacy Act Statement

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

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

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

Electronic Acknowledgement Receipt

EFS ID:	45326088
Application Number:	17705300
International Application Number:	
Confirmation Number:	2416
Title of Invention:	VIBRATION THERAPY SYSTEM AND DEVICE
First Named Inventor/Applicant Name:	Jason Wersland
Customer Number:	24574
Filer:	Brennan C. Swain/Sharon Duncan
Filer Authorized By:	Brennan C. Swain
Attorney Docket Number:	76840-5199
Receipt Date:	26-MAR-2022
Filing Date:	
Time Stamp:	16:24:36
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$6640
RAM confirmation Number	E20223PG25482240
Deposit Account	100440
Authorized User	Sharon Duncan

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Track One Request	76840_5199_Req_Prioritized_Exam.pdf	114562	no	2
			1a01d5af7e14a698edfc21fda654e708e0ad13a7		
Warnings:					
Information:					
2	Application Data Sheet	76840_5199_ADS.pdf	1778149	no	10
			8be25045f99620e941e38febe5c86e01d20eeb76		
Warnings:					
Information:					
3	Specification	76840_5199_Specification.pdf	312383	no	45
			9e3832d2acc38191acc1629c3fdbcb6dc31f45fd		
Warnings:					
Information:					
4	Drawings-only black and white line drawings	76840_5199_Drawings.pdf	768574	no	21
			a64a5d556b6a17e483afa3d18f5ff32477efdfaef		
Warnings:					
Information:					
5	Transmittal Letter	76840_5199_IDS_Transmittal.pdf	141578	no	2
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Warnings:					
Information:					
6	Information Disclosure Statement (IDS) Form (SB08)	76840_5199_IDS.pdf	1669034	no	20
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Warnings:					
Information:					

7	Non Patent Literature	Int_Search_Written_Opinion_1 0132021.pdf	909459	no	12
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Warnings:					
Information:					
8	Foreign Reference	WO2019097291.pdf	3230366	no	67
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9	Foreign Reference	WO2019150887.pdf	2174580	no	72
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Information:					
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Information:					
11	Foreign Reference	WO2020028329.pdf	2574727	no	61
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14	Foreign Reference	WO2020163738.pdf	2066563 be94c3bafdb3f74083da308bb3a92cfb1ac49b40	no	42
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Information:					
15	Foreign Reference	WO2020252440.pdf	1753470 d72002581388944a58a0154112536097b7419a48	no	34
Warnings:					
Information:					
16	Fee Worksheet (SB06)	fee-info.pdf	53298 69c3a49612913bde8d6e0574b89c842cf9645bdd	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			21359346		
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		VIBRATION THERAPY SYSTEM AND DEVICE		
First Named Inventor/Applicant Name:		Jason Wersland		
Filer:		Brennan C. Swain/Sharon Duncan		
Attorney Docket Number:		76840-5199		
Filed as Large Entity				
Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	320	320
UTILITY SEARCH FEE	1111	1	700	700
UTILITY EXAMINATION FEE	1311	1	800	800
REQUEST FOR PRIORITIZED EXAMINATION	1817	1	4200	4200
Pages:				
Claims:				
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	1	480	480
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				6640



(51) International Patent Classification:

A61H 23/02 (2006.01) A61F 7/00 (2006.01)
A61N 5/06 (2006.01)

(21) International Application Number:

PCT/IB2018/001427

(22) International Filing Date:

14 November 2018 (14.11.2018)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/586,994 16 November 2017 (16.11.2017) US
16/175,260 30 October 2018 (30.10.2018) US

(72) Inventor; and

(71) Applicant: **SEDIC, Filip** [CN/CN]; 75 South Wanping
Road, Room 1711-1720, Shanghai, 200032 (CN).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available):

AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,

SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available):

ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(54) Title: SKINCARE DEVICES AND METHODS OF USE

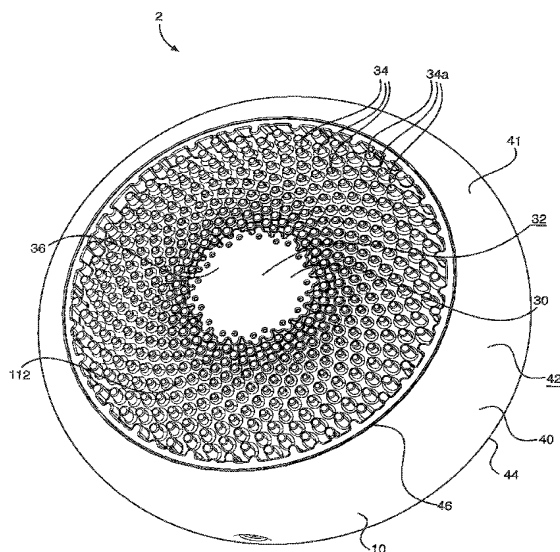


FIG. 1

(57) **Abstract:** An example skincare device includes a main body (10) having a first side(20), a second side(30), an intermediate portion(40), a groove(24), a light source(100), a motor(80), a temperature control unit(10), and a user control(72) configured to control one or more of the light source, motor, and temperature control unit. The skincare device can provide heat, cool, light, and/or vibrational therapy to a user's skin.

WO 2019/097291 A1

SKINCARE DEVICES AND METHODS OF USE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 62/586,994, filed November 16, 2017, and U.S. Patent Application No. 16/175,260, filed October 30, 2018, which are incorporated into this disclosure in their entirety.

FIELD

[0002] The disclosure relates generally to the field of skincare devices and methods of use. More particularly, the disclosure relates to skincare devices suitable for use on the human face and body and various methods of using the same.

BACKGROUND

[0003] Skin health and appearance is an important aspect of many beauty regimens. As a person ages, his or her skin tends to develop wrinkles, sag, become rough, and/or develop various spots or marks. It is known that stimulating skin cells through various means such as through light therapy, vibration therapy, and/or through heat and cool therapy can produce positive effects on the skin. Such positive effects, for example, may include one or more of: increased collagen production, reduction of skin inflammation, reduction of acne, improvement of blood flow, tightening of the skin, and/or the destruction of bacteria.

[0004] Several devices exist which may provide light therapy, vibration therapy, heat therapy, or cool therapy to the skin. Such devices, however, typically provide only one type of therapy. Furthermore, these devices are often located in medical or cosmetic offices and use of such devices requires the assistance of another person to administer the desired treatment. In many instances, an administrator of the therapy must be licensed by a state or federal board (such as a medical or cosmetology board) or receive a certification to use such devices. Additionally, the use of such devices is often time-consuming.

[0005] A need exists, therefore, for improved skincare devices and methods of use that provide multiple forms of therapy (i.e., one or more of light, vibration, heat, and/or cool therapy), may be used quickly and easily by an individual outside of the confines of a medical or cosmetology office, and may be used without assistance.

BRIEF SUMMARY OF SELECTED EXAMPLES

[0006] Various example skincare devices and methods of use are described.

[0007] An example skincare device configured to treat the skin of a user comprises a main body having a first side having a first surface, a second side substantially opposite the first side having a second surface, and an intermediate portion extending from the first side to the second side having a third surface, a light source disposed within the main body and configured to emit light to treat said skin, the light source configured to emit the light adjacent the first side, a motor disposed within the main body and configured to produce pulsations of said skincare device, a temperature control unit disposed within the main body, the temperature control unit configured to generate heat to treat said skin and transfer the heat to the first side, and a user control disposed on the intermediate portion, the user control configured to operate the light source, the motor, and the temperature control unit.

[0008] Another example skincare device configured to treat the skin of a user comprises a main body having a first side having a first surface, a second side substantially opposite the first side having a second surface, and an intermediate portion extending from the first side to the second side and having a third surface, the first side and the intermediate portion cooperatively defining a groove extending toward the second side, the second surface defining a set of protrusions, the third surface comprising silicone, a light source disposed within the main body and configured to emit light to treat said skin, the light source configured to emit the light adjacent the first side, the light source comprising an LED light, a motor disposed within the main body and configured to produce pulsations of said skincare device, a temperature control unit disposed within the main body, the temperature control unit configured to generate heat to treat said skin and to transfer the heat to the first side, a removeable locking mechanism configured to be inserted into the groove, the removeable locking mechanism comprising plastic and being substantially transparent, and a user control disposed on the intermediate portion, the user control configured to operate the light source, the motor, and the temperature control unit.

[0009] Another example skincare device configured to treat the skin of a user comprises a main body having a first side having a first surface, a second side substantially opposite the first side having a second surface, and an intermediate portion extending from the first side to the second side and having a third surface, the first side and the intermediate portion defining an annular groove extending toward the second side, the second surface defining a set of protrusions comprised of metal, the third surface comprising silicone, a light source disposed within the main body and configured to emit light to treat said skin, the light source

configured to emit the light adjacent the first side, the light source comprising an LED light, a motor disposed within the main body configured to produce pulsations of said skincare device, a temperature control unit disposed within the main body, the temperature control unit configured to generate heat to treat said skin and to transfer the heat to the first side to treat said skin, the temperature control unit configured to cool the first side of the main body in order to treat said skin, a removeable locking mechanism configured to be inserted into the groove, the removeable locking mechanism comprising plastic and being substantially transparent, a controller disposed within the main body and an interface operatively connected to the controller, the interface being configured to transmit information, and a user control disposed on the intermediate portion, the user control configured to operate the light source, the motor, and the temperature control unit.

[0010] Additional understanding of claimed devices and methods may be obtained by reviewing the detailed description of selected examples, below, with reference to the appended drawings.

DESCRIPTION OF FIGURES

- [0011] FIG. 1 is a perspective view of a first example skincare device.
- [0012] FIG. 2 is an exploded view of the skincare device illustrated in FIG. 1.
- [0013] FIG. 3 is an end view of the skincare device illustrated in FIG. 1.
- [0014] FIG. 3A is an end view of the skincare device illustrated in FIG. 3 in which the skincare device has been rotated slightly.
- [0015] FIG. 4 is a sectional view of the skincare device illustrated in FIG. 3A, taken along line 4-4.
- [0016] FIG. 5 is another end view of the skincare device illustrated in FIG. 1.
- [0017] FIG. 6 is a side view of the skincare device illustrated in FIG. 1.
- [0018] FIG. 7 is another side view of the skincare device illustrated in FIG. 1.
- [0019] FIG. 8 is a top view of the skincare device illustrated in FIG. 1.
- [0020] FIG. 9 is a bottom view of the skincare device illustrated in FIG. 1.
- [0021] FIG. 9A is a bottom view of an alternative skincare device.
- [0022] FIG. 10 is a diagram illustrating components of a networked skincare device in an example embodiment.
- [0023] FIG. 11A is a top view of an example beauty accessory.
- [0024] FIG. 11B is a perspective view of the beauty accessory illustrated in FIG. 11A.

[0025] FIG. 12A is a perspective view of the beauty accessory illustrated in FIG. 11A and the skincare device illustrated in FIG. 1, with the locking mechanism of the skincare device removed and aligned with the beauty accessory over the first side of the skincare device.

[0026] FIG. 12B is a perspective view of the beauty accessory and skincare device illustrated in FIG. 12A, with the beauty accessory placed in contact with the first side of the skincare device and the locking mechanism aligned with, but not in contact with, the first side of the skincare device.

[0027] FIG. 12C is a top view of the beauty accessory and skincare device illustrated in FIG. 12A, with the facial mask secured to the first side of the skincare device via the locking mechanism.

[0028] FIG. 12D is a perspective view of the beauty accessory and skincare device illustrated in FIG. 12C.

[0029] FIG. 13 is a perspective view of a second example skincare device.

[0030] FIG. 14 is an exploded view of the skincare device illustrated in FIG. 13.

[0031] FIG. 15 is an end view of the skincare device illustrated in FIG. 13.

[0032] FIG. 15A is an end view of the skincare device illustrated in FIG. 13 in which the skincare device has been rotated slightly.

[0033] FIG. 16 is a sectional view of the skincare device illustrated in FIG. 15A, taken along line 16-16.

[0034] FIG. 17 is another end view of the skincare device illustrated in FIG. 13.

[0035] FIG. 18 is a side view of the skincare device illustrated in FIG. 13.

[0036] FIG. 19 is another side view of the skincare device illustrated in FIG. 13.

[0037] FIG. 20 is a top view of the skincare device illustrated in FIG. 13.

[0038] FIG. 21 is a bottom view of the skincare device illustrated in FIG. 13.

[0039] FIG. 22 is a perspective view of a third example skincare device.

[0040] FIG. 23 is an end view of the skincare device illustrated in FIG. 22.

[0041] FIG. 24 is another end view of the skincare device illustrated in FIG. 22.

[0042] FIG. 25 is a side view of the skincare device illustrated in FIG. 22.

[0043] FIG. 26 is another side view of the skincare device illustrated in FIG. 22.

[0044] FIG. 27 is a top view of the skincare device illustrated in FIG. 22.

[0045] FIG. 28 is a bottom view of the skincare device illustrated in FIG. 22.

[0046] FIG. 29 is a flowchart representation of an example method of using a skincare device and a beauty accessory.

[0047] FIG. 30 is a flowchart representation of an example method of verifying authenticity of a skincare device.

[0048] The figures depict various embodiments of the present invention for purposes of illustration only. One skilled in the art will readily recognize from the following discussion that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the invention described herein.

DETAILED DESCRIPTION OF SELECTED EXAMPLES

[0049] The following detailed description and the appended drawings describe and illustrate various skincare devices and methods of use. The description and drawings are provided to enable one skilled in the art to make and use one or more example skincare devices. They are not intended to limit the scope of the claims in any manner.

[0050] As used herein, the terms “heat therapy” and “heating therapy” refer to providing therapy to a user’s skin via said skin’s contact with a portion of a skincare device having a temperature that is above room temperature due to the functionality of said skincare device.

[0051] As used herein, the terms “cool therapy” and “cooling therapy” refer to providing therapy to a user’s skin via said skin’s contact with a portion of a skincare device having a temperature that is below room temperature due to the functionality of said skincare device and/or is lower in temperature than the same portion of the skincare device when that portion provides heat/heating therapy.

[0052] FIGS. 1, 2, 3, 3A, 4, 5, 6, 7, 8, and 9 illustrate an example skincare device 2. The skincare device 2 comprises a main body 10 that includes a number of components (described below). The main body 10 includes at least a first side 20, a second side 30, an intermediate portion 40 extending from the first side 20 to the second side 30, and a support member 14. It also includes a light source 100, a motor 80, and a temperature control unit 110, among other components.

[0053] The first side 20 is comprised of at least a portion of a panel 62 (described in greater detail below). More specifically, it is comprised of an upper portion 66 of the panel 62 designed to contact or be adjacent the face of a user. The upper portion 66 may contact the user directly or indirectly in order to provide treatment to the user. It is understood, thus, that references to the first side 20 necessarily reference the panel 62. In the illustrated embodiment, the panel 62 is comprised of a suitable material and provides at least some structural support for the skincare device 2 and its various components. The upper portion 66 is comprised of metal in this embodiment; consequently, the first side 20 is comprised, at

least in part, of a metal in this embodiment. The first side 20 also defines a surface 22, which is substantially circular in shape and is defined by the upper portion 66 of the panel 62. The surface 22 provides heat and/or cool therapy to a user when the skincare device 2 is in use. It can also transmit vibrational therapy to a user.

[0054] The second side 30 is comprised of at least a portion of a temperature exchange component 112 (described in greater detail below). More specifically, it is comprised of a portion of the temperature exchange component 112 designed to be contacted by a user. It is understood, thus, that references to the second side 30 necessarily reference the temperature exchange component 112. In the illustrated embodiment, the temperature exchange component 112 defines a surface 32 that is comprised of a suitable metal. The temperature exchange component 112 provides structural support for the skincare device 2 and its various components, as well. As such, the second side 30 is comprised, at least in part, of a metal in this embodiment. The portion of the temperature exchange component 112 that does not comprise the surface 32 may be comprised of plastic or any other suitable material. The portion comprised of plastic may include its proximal end 31, which is disposed substantially opposite the surface 32. The proximal end 31 can attach to or connect with the support member 14 and be secured to the same, as described below.

[0055] The intermediate portion 40 is comprised of an annular member 41, which is disposed between the first side 20 and the second side 30. More specifically, the intermediate portion 40 is comprised of a portion of the annular member 41 designed to be held by a user when the skincare device 2 is in use. In such instances, the first side 20 (or, in some embodiments, the second side 30) is adjacent to or in contact with a user's skin while the annular member 41 is held by a user. It is understood, thus, that references to the intermediate portion 40 reference the annular member 41. In the illustrated embodiment, the annular member 41 is disposed adjacent the first side 20 and the second side 30 and comprised of a material that may directly contact the skin. In this embodiment, the surface 42 of the annular member 41 (and, thus, intermediate portion 40) that will contact a user is comprised of silicone and disposed adjacent and in contact with the support member 14. In various embodiments, the annular member may be attached to the support member via an adhesive or one or more mechanical attachments. In some embodiments, the silicone may be medical-grade and/or a specially formulated, ultra-hygienic silicone. In different embodiments, the annular member may have any suitable shape and may not be annular.

[0056] The main body 100 also includes a support member 14 having a proximal end 15 and a distal end 16, the distal end 16 being disposed nearer the temperature exchange

component 112 than is the proximal end 15. The support member 14 is substantially disc-shaped and may be comprised of any suitable material, including plastic. The support member 14 is configured to attach and/or connect with the proximal end 31 of the temperature exchange component 112 and contact the annular member 41. The support member 14 and temperature exchange component 112 cooperatively provide support to the various components disposed within the skincare device 2 and aid in giving the skincare device 2 its shape. In various embodiments, the support member may attach to or connect with the temperature exchange component via a snap-fit structure, an adhesive, or a mechanical attachment. The support member and temperature exchange component also may cooperatively define a passageway through which a portion of the controller may pass in some embodiments. One or both of the temperature exchange component and/or support member may attach to or connect with one or both of the frame and/or panel in other embodiments, as well.

[0057] A skilled artisan will be able to select suitable shapes, sizes, and materials for the various portions of the main body and skincare device according to a particular example based on various considerations, including the desired functionality of the device and the portion of the body the device is designed to treat. In one example, the entire main body and/or various portions thereof may be comprised of plastic, aluminum, silicone, and/or any other suitable material(s). In another example one or more of the first side, second side, and/or intermediate portion may have any suitable shape, including that of a ring, sphere, circle, square, rectangle, cylinder, cone, and pyramid. In another embodiment, the first side may be comprised of any suitable material, including aluminum, an aluminum alloy, a zinc alloy, stainless steel, copper, ceramic, and other materials configured for thermal conduction. In a different embodiment, the second side may be comprised of any of suitable material, including aluminum, a zinc alloy, an aluminum alloy, stainless steel, copper, ceramic, and other materials configured for thermal conduction. In other embodiments, the intermediate portion may be comprised of any suitable material, including silicone compounds, plastic, rubber, and other similar materials. In various embodiments, the annular member may be comprised of any suitable material, including plastic and/or metal. The first side, the second side, the intermediate portion, and the annular member may have any suitable shape, as well. Furthermore, the annular member or the relevant portion of the temperature exchange component may be disposed at any position on the skincare device, including adjacent one or more of the first side, second side, or the intermediate portion in various embodiments. The portions of the skincare device may have varying sizes in different embodiments, as well. For

example, in various embodiments the first side may have a diameter between about 2 centimeters (“cm”) and about 20 cm, between about 4 cm and about 15 cm, and between about 6 cm and about 10 cm. In other embodiments the second side may have a diameter between about 2 cm and about 20 cm, between about 4 cm and about 15 cm, and between about 6 cm and about 10 cm. In different embodiments, the intermediate portion may have a height (extending from the first side to the second side) between about 2 cm and about 20 cm, between about 4 cm and about 15 cm, and between about 6 cm and about 10 cm.

[0058] The first side 20 and the intermediate portion 40 cooperatively define a groove 24 that extends toward the second side 30. The groove 24 is adjacent the proximal end 15 of the support member 14. The groove 24 surrounds a flat, interior portion 23 of the first side 20 and is defined at its base by the annular member 41 and frame 82. The groove 24 includes an upper opening 26 adjacent the surface 22. The upper opening 26 is substantially circular in the illustrated embodiment. Accordingly, the groove 24 defined by the first side 20 is substantially annular, though it does about a cutout 29 cooperatively defined by the first side 20 and the intermediate portion 40 which extends away from the interior portion 23. The groove 24 is configured to house and lock into place a locking mechanism 50 within the groove 24. Additionally, the groove 24 is disposed such that a light source 100 disposed distal to the surface 22 is able to emit light into and through the groove 24. A skilled artisan will be able to determine how to suitably configure the groove according to a particular example based on various considerations, including the desired shapes and sizes of the groove and locking mechanism and whether a light source is included in the device. In other embodiments, the groove and/or its opening may be triangular, square, rectangular, pentagonal, or have any other shape. In other embodiments, one or both of the first side and intermediate portion may, alone or in cooperation with one another, form zero, one two, three or more than three grooves. In various embodiments the groove may have a diameter between about .1 cm and about 5 cm, between about .5 cm and about 4 cm, and between about 1 cm and about 3 cm. In different embodiments, the groove may have a height between about .1 cm and about 5 cm, between about .5 cm and about 4 cm, and between about 1 cm and about 3 cm.

[0059] The light source 100 is disposed within a cavity 12 (described below) defined by the main body 10; specifically, it is attached to the controller 70 (described in greater detail below) and comprises of a number of lights 102 (including individual lights 102a, 102b, 102c, 102d). Each of the lights 102 extends from the controller 70 towards the first side 20. The light source 100 is disposed adjacent the groove 24 and beneath the surface 22 such that,

when activated, the lights 102 of the light source 100 emit light into the groove 24 and onto any material or body part adjacent the first side 20. In the illustrated embodiment, the light source 100 comprises a number of light-emitting diode lights (hereinafter, “LED lights”) that are configured to emit one or more of blue light, red light, and/or green light. As noted above, the emission of these various types of light onto human skin has known benefits. Blue LED light, for example, is known to aid in the destruction of bacteria. Red LED light is known to improve skin texture and tone, stimulate collagen, and accelerate the healing of the skin. Green LED light is known to help reduce skin discoloration and tighten the skin. These and other lights have other known benefits, as well. A skilled artisan will be able to select a suitable light source for a particular skincare device according to a particular example based on various considerations, including the size and shape of the device and the type(s) of light to be emitted by the light source. In another example, the light source may only emit one or more of blue, red, or green light. In an alternative example, the light source may also emit one or more of white, black, yellow, purple, pink, cyan, and orange light. In other embodiments, the light source may be comprised of any type of light, rather than an LED light. In various embodiments, the light source may comprise one, two, three, four, five, six, seven, eight, or more than eight individual lights. In different embodiments, the light source may be attached to the controller or any other component via a physical attachment or an adhesive; alternatively, various lights may be disposed on multiple other components via any suitable mechanism. In some embodiments, an individual light may only emit a single color; in other embodiments, an individual light may emit one, two, three, four, or more than four colors. Additionally, the lights may have different shapes in different embodiments, including box, cylinder, pyramid, sphere, and other suitable shapes.

[0060] As noted above, the locking mechanism 50 is configured to be inserted into and housed within the groove 24. The locking mechanism 50 is substantially annular and is substantially transparent such that light emitted by the light source 100 travels through the locking mechanism 50 and onto a material or a user adjacent the first side 20. Indeed, the locking mechanism 50 is sufficiently transparent such that it does not prevent a user’s skin from obtaining the benefits of LED light, which can be received through the locking mechanism 50. When the locking mechanism 50 is disposed within the groove 24, its first side 54 is disposed closer to the surface 22 than is its opposite second side 56, which is disposed nearer the base of the groove 24.

[0061] The locking mechanism 50 is specifically configured to be repeatedly inserted into and removed from the groove 24; accordingly, it can be inserted and removed from the

groove 24 as frequently as a user of the skincare device 2 sees fit. The locking mechanism 50 does not require the assistance of a further mechanism or device in order to be securely housed within the groove 24. Additionally, the locking mechanism 50 includes an extension 52 extending away from its center configured to be disposed over the cutout 29 defined by the skincare device 2 when the locking mechanism 50 is placed within the groove 24. The extension 52 is disposed over the cutout 29 in order to allow a user to readily remove the locking mechanism 50 from the skincare device 2 by grasping the extension 52. The locking mechanism 50 is also configured such that when a beauty accessory (described below) is inserted within the groove 24, the locking mechanism 50 may still be securely inserted into the groove 24 over a portion of the beauty accessory and hold the beauty accessory in place. A skilled artisan will be able to select a suitable a locking mechanism according to a particular example based on various considerations, including the shape and size of the groove and the beauty accessory to be locked into place. In other embodiments, the locking mechanism may be comprised of any material, including plastic, silicone or any other transparent, firm material. In different embodiments, the locking mechanism may not include an extension or may include two, three, or more than three extensions. In various other embodiments, the locking mechanism may have any shape, including conical, cylindrical, pyramidal, triangular, rectangular, and square. In alternative embodiments, an adhesive or mechanical component may be used to secure the locking mechanism within the skincare device.

[0062] The surface 32 of the second side 30 defines a set of protrusions 34 which extend away from the surface 32. Each protrusion of the set of protrusions 34 is integrally formed with the second side 30 (and, thus, the temperature exchange component) in the illustrated embodiment. Each protrusion of the set of protrusions 34 is comprised of the same material as the surface 32 in the illustrated embodiment, as well. However, in other embodiments, the set of protrusions may be attached to the second side via any mechanical attachment and/or via the use of an adhesive. Alternatively, some protrusions of the set of protrusions may be integrally formed with the second side and others may be attached to the second side in other embodiments.

[0063] Each protrusion of the set of protrusions 34 includes an upper surface 34a having a diameter. In the illustrated embodiment, the diameters of the various upper surfaces 34a are not uniform. Generally, the upper surfaces 34a of the protrusions of the set of protrusions 34 nearer the center portion 36 of the surface 32 of the second side 30 have smaller diameters than do the upper surfaces 34a of the protrusions of the set of protrusions 34 further from the

center portion 36 and nearer to the lower portion 46 of the intermediate portion 40. Additionally, the center portion 36 of the second side 30 does not include protrusions. The protrusions of the set of protrusions 34 help to increase the surface area of the second side 30, which allows the skincare device 2 to more efficiently and quickly transfer heat away from the skincare device 2 as needed. In various embodiments, however, the set of protrusions may be comprised of any material and may have any alignment. A skilled artisan will be able to select suitable protrusion material(s) and alignments according to a particular example based on various considerations, including the size and shape of the second side and the desired functionality of the device. In various embodiments, the protrusions and/or surface of the second side may be comprised of any suitable metal, including a zinc alloy, an aluminum alloy, stainless steel, copper, ceramic, and other materials configured for thermal conduction. In other embodiments, the protrusions may be coated with gold, nickel, platinum, and/or another similar material. In different embodiments, some protrusions may be comprised of a first material, while other protrusions are comprised of a second material. In various other embodiments, any portion of the second side may include protrusions, including between about 5% and about 90% of the surface of the second side, between about 25% and about 70% of the surface of the second side, and between about 40% and about 55% of the surface of the second side. Additionally, in another embodiment, the center may include protrusions or, if it does not include protrusions, may include a logo or symbol. In various embodiments, one or more protrusion of the set of protrusions may have a height between about 0.1 millimeters (“mm”) and about 6 cm, a height between about 2 mm and about 3 cm, and a height between about 5 mm and about 1 cm. In various embodiments, one or more protrusion of the set of protrusions may have a diameter between about 0.01 mm and about 5 cm, a diameter between about 0.1 mm and about 2.5 cm, and a diameter between about .5 mm and about 1 cm. In another embodiment, each protrusion of the set of protrusions may be comprised of silicone, which may additionally comprise all or part of the second side. In other embodiments, the second surface may define ridges, waves, pyramidal protrusions, elliptical protrusions, and other suitable components.

[0064] In an alternative skincare device 2', illustrated in FIG. 9A, the surface 32' of the second side 30' includes a set of waves 34' of varying length which extend away from the surface 32'. The waves of the set of waves 34' are comprised of metal, such as a zinc alloy, and are configured to transfer heat from the second side 30' away from the first side (not illustrated in the Figures) quickly and efficiently as needed; the increased surface area provided by the set of waves 34' helps to do so. Alternatively, the waves of the set of waves

34' may be comprised of ceramic. The set of waves 34' is configured to ensure that a wave-free center 36' is formed in the middle of the second surface 32'. A logo or symbol may be placed on the center 36'. In the illustrated embodiment, the waves of the set of waves vary in length; however, in other embodiments, each wave may have the same length. The number of waves of the set of waves may also vary according to different embodiments. A skilled artisan will be able to select suitable wave materials and alignment according to a particular example based on various considerations, including the size and shape of the second side and the functionality of the device. In various embodiments, the waves may be comprised of a zinc alloy, aluminum, an aluminum alloy, copper, stainless steel, ceramic, or any other suitable material. In other embodiments, the waves may be coated with gold, nickel, copper, or any other suitable material. In different embodiments, some waves may be comprised of a first material, while other waves are comprised of a second material. In various other embodiments, any portion of the second side may include waves, including between about 5% and about 90% of the surface of the second side, between about 25% and about 70% of the surface of the second side, and between about 40% and about 55% of the surface of the second side. Additionally, in another embodiment, the center may include waves.

[0065] As noted above, the main body 10 defines a cavity 12 configured to house various components. The cavity 12 is cooperatively defined by the various components defining the first side 20, the second side 30, and the intermediate portion 40, including the panel 62, the temperature exchange component 112, frame 82, and support member 14.

[0066] One component housed within the cavity 12 of the main body 10 is a power source 60. The power source 60 is operatively connected to and provides power to the various components of the skincare device 2 (such as the light source 100 and others described below) so that they may function efficiently and properly. The power source 60 comprises a rechargeable lithium-ion battery in the illustrated embodiment and may be charged through a charging port, such as DC jack 68 best shown in FIG. 5. The power source 60 is housed within a panel 62 defining a slot 64 into which the battery 60 is stored. The panel 62 aids in conducting and/or removing heat from the temperature control unit (described below) to one or both of the first side 20 and second side 30. The panel 62 also secures the power source 60 in place within the skincare device 2. Additionally, the panel 62 includes an upper portion 66 which defines at least a portion of the first side 20, including the surface 22, as described above. A skilled artisan will be able to select a suitable power source and panel according to a particular example based on various considerations, including the various components housed within the skincare device and the desired dimensions of the skincare device. In other

embodiments, the power source may comprise one, two, three, or more than three replaceable dry cell batteries. In different embodiments, the power source may comprise a lithium polymer battery or batteries. In various embodiments, the panel may be comprised of any suitable material(s), including aluminum, an aluminum alloy, a zinc alloy, copper, stainless steel, gold, silver, ceramic, and other suitable materials. In additional embodiments, the light source may emit one or more of red, blue, pink, and/or green light to show that the power source is successfully charging and/or holds a full charge; in one such example, the light source emits white light that rotates through the groove in a circular motion to show the device is charging and a solid purple light emitted from the device shows that the device is fully charged. In other embodiments, a portion of the panel may be coated with a thermal film or paste which helps to protect the power source from the heat generated by the skincare device when in use. In various embodiments, the upper portion and/or surface of the panel may have a diameter between about 2 cm and about 15 cm, between about 4 cm and about 12 cm, and between about 6 cm and about 9 cm.

[0067] The power source 60 provides power to the controller 70, which is also housed within cavity 12 defined by the main body 10. The controller 70 is operatively connected to each of the light source 100, motor 80, and temperature control unit 110 and provides instructions to each of these components. The controller 70 is activated by the user control 72, which is disposed on the intermediate portion 40 and operatively connected to the controller 70. The controller 70 in the illustrated embodiment includes a printed circuit board assembly (“PCBA”) and related circuitry; however, in other embodiments, the controller may comprise any device suitable to control the skincare device’s components, such as a printed circuit board (“PCB”) or any other suitable computer or mechanism for communicating information. Additionally, the controller 70 may be operatively connected to an interface 90, allowing it to communicate with a second device (described in greater detail, below).

[0068] The user control 72 comprises a button which, when pressed, activates the skincare device 2. Repeated and/or a specific type of use of the user control 72 allows for a user to cycle through various modes of operation of the skincare device 2 (described in greater detail, below). Potential vibration modes that may be activated by the user control 72, for example, may include low frequency mode, high frequency mode, stochastic mode, and alternating frequency mode. Additionally, various patterns of light emissions, heating patterns, and cooling patterns may be selected by the user via the user control 72. A skilled artisan will be able to suitably place the user control on the device and configure the same according to a particular example based on various considerations, including the number of

desired modes and the materials comprising the main body. In other embodiments, the user control may be disposed on any side of the main body. In a different embodiment, the skincare device may comprise zero, two, three, or more than three user controls. In additional embodiments, the user control may include separate user controls configured to control individual components and/or actions.

[0069] The motor 80 is disposed within the main body 10 and is operatively connected to the power source 60 and the controller 70. The motor 80 is disposed within in a frame 82 within the main body 10. The frame 82 is configured to support the motor 80 and keep the motor 80 secured at a particular location inside the main body 10, as well as provide general structural support to the skincare device 2. Specifically, the frame 82 includes an arm 84 that defines a slot 86 into which the motor 80 is disposed. The arm 84 (and slot 86) extends away from the main body 83 of the frame 82 towards the second side 30 and allows the inner surface (not illustrated in the Figures) of the arm 84 to secure the motor 80 and hold it in place. The motor 80 is disposed substantially adjacent the first side 20 so its vibrations may be efficiently transmitted to the user via the first side 20. At least a portion of the frame 82, including its proximal end 88, is comprised of a substantially transparent plastic. Accordingly, the proximal end 88 of the frame 82 allows for light generated by the light source 100 to pass through the proximal end 88 and surface 89 of the frame 82 relatively unhindered.

[0070] The controller 70 provides instructions to the motor 80, which is powered by the power source 60. A high or low-frequency motor 80 may be used to create pulsations that vibrate the skincare device in various embodiments. The motor 80 in this embodiment is configured to produce a range of frequencies that may provide beneficial treatment of the skin. When the skincare device 2, and the first side 20 in particular, is applied to the body, such as the face or neck, the motor 80 provides vibrations to the skin. A skilled artisan will be able to select suitable motors, frames, and vibration ranges based on various considerations, including the size and shape of the skincare device and the desired vibration strength of the device. Examples of suitable ranges for vibration frequencies includes vibration frequencies between about 80 Hertz ("Hz") and about 200 Hz, vibration frequencies between about 100 Hz and about 180 Hz, and vibration frequencies between about 120 Hz and about 150 Hz. In another embodiment, the skincare device may include two or more motors. In another embodiment, a motor may be stochastic. In other embodiments, the frame may be omitted. In different embodiments, the frame may not include a slot or arm, but may instead house the device entirely within its main body. In some embodiments, there may be more than one

motor; in embodiments containing multiple motors, the motors may vary from one another in frequency output.

[0071] The controller 70 also controls an interface 90 that is a component of the controller 70. The interface 90 allows the skincare device 2 to communicate with a second device, such as a personal computer, tablet, mobile telephone, or other electronic device (not illustrated in the Figures). Using the interface 90, the skincare device 2 can send information to other devices so that the other device(s) may collect data pertaining to the use of the skincare device 2. Additionally, the skincare device 2 may receive control signals from another device that can indicate that the skincare device 2 should turn on or off, increase or decrease speed, switch to a different vibration, lighting, heating or cooling pattern, and/or switch to a pre-set pattern desired by the user or recommended by the other device, among other instructions. The interface 90 can be a wired or a wireless interface, such as a wireless transceiver that transmits control signals between the skincare device 2 and the second device. A skilled artisan will be able to select a suitable interface based on various considerations, including the device with which the skincare device will communicate and the size and shape of the main body. In some embodiments, the interface is a radio-frequency (“RF”) transceiver used to transmit and receive RF signals between the skincare device and other devices. One example of an RF transceiver that could be used is a low power 2.4 GHz RF transceiver. In various embodiments, the skincare device may also include antennas for transmitting and receiving signals between the skincare device and other devices. In such examples, the interface can use BLUETOOTH®, Wi-Fi, infrared, laser light, visible light, acoustic energy, or one of a number of other methods to transmit information wirelessly between the skincare device and another device. In another embodiment, the controller can specifically communicate with another device to confirm the skincare device’s authenticity, as more fully described below and illustrated in FIG. 30.

[0072] In some embodiments, the skincare device is connected to a network via the second device. In other embodiments, the skincare device is directly connected to a wireless router or cellular phone network and may connect with the second device in any of said manners. Accordingly, the skincare device can be controlled via personal computer, tablet, mobile phone, or other suitable electronic devices a user using the personal computer, tablet, phone, or other device. FIG. 10 illustrates one example of such a design.

[0073] FIG. 10 is a diagram illustrating components of a networked skincare device, such as skincare device 2, in accordance with an example embodiment. In this embodiment, the skincare device includes a controller, such as controller 70, a motor, such as motor 80, a light

source, such as light source 100, a temperature control unit, such as temperature control unit 110, and an interface, such as interface 90. As explained above, the skincare device can be connected to a network via a personal computer, tablet, mobile telephone, or other electronic device or can be directly connected to a wireless router or cellular phone network. Thus, the skincare device can be controlled by, transmit data to, and/or receive data from the personal computer, tablet, mobile telephone, or other electronic device via the aforementioned mechanisms. The interface may be wired or wireless and may include any of those described above. A skilled artisan will be able to determine how to suitably connect the skincare device with other devices based on various considerations, including the desirability of doing so and the devices to which connection would be beneficial. In some embodiments, the skincare device may not include an interface and, thus, may not communicate with other devices. In different embodiments, the skincare device may only transmit data to other devices; it may not receive any data and cannot be controlled via said other devices in this embodiment.

[0074] Example data that the skincare device may communicate to one or more of a personal computer, tablet, mobile telephone, or other electronic device may include the number of uses of the skincare device, the durations of the various uses of the skincare device, the user's preferred skincare device settings, and various other types of information related to the use of the device.

[0075] As noted above, the skincare device 2 also includes a temperature control unit 110, which is operatively connected to each of the power source 60 and the controller 70 in the illustrated embodiment. The temperature control unit 110, thus, receives power from the power source 60 and operation instructions from the controller 70. In various embodiments, any suitable material(s) and/or component(s) may comprise the temperature control unit. Examples of suitable materials that may comprise the temperature control unit include copper alloy(s), polyimide(s), ceramic, and other suitable materials. The temperature control unit may comprise a positive temperature coefficient thermistor in some embodiments.

[0076] The temperature control unit 110 is substantially box-shaped and is disposed adjacent a temperature exchange component 112 within the cavity 12 of the main body 10. The temperature exchange component 112 helps to secure the temperature control unit 110 in a desired position within the skincare device 2. The temperature control unit 110 is also disposed sufficiently adjacent the first side 20 such that its heat absorption and/or release may easily flow towards and/or away from the upper portion 66 of the panel 62. In the illustrated embodiment, the temperature exchange component 112 can act as a heatsink that is configured to aid in preventing the skincare device 2 from overheating; in other

embodiments, however, any suitable unit or component may comprise the temperature exchange component. A skilled artisan will be able to select a suitable temperature control unit and a suitable temperature exchange component according to a particular example based on various considerations, including the materials comprising the first and second sides of the main body and the desired functionality of the skincare device. In different embodiments, one or more heatsinks can be used along with the temperature exchange component. In various embodiments, the temperature exchange component may be comprised of any suitable material, including copper, a copper alloy, aluminum, an aluminum alloy, diamond, stainless steel, ceramic, and other suitable materials. In various other embodiments, each of the temperature control unit and temperature exchange component and its various parts may have any suitable shape, including sphere, box, ovoid, pyramid, circular, triangular, rectangular, and/or round.

[0077] The temperature control unit 110 is configured such that it is capable of absorbing heat from and/or releasing heat toward the first side 20 and second side 30 of the skincare device 2 after instruction by the controller 70. The temperature control unit 110 includes different types of conductors, which allows it to absorb and/or release heat on each end of the device, as instructed by the controller 70 based on the various electric signals sent and/or electric field generated by the various components of the skincare device 2. This allows the portions of the temperature control unit nearer the first end 20 and second end 30 to absorb and/or release heat as per the controller's 70 instruction based on the direction of the current provided by the various components of the skincare device 2.

[0078] In operation, the power source 60 and controller 70 provides current, power, and direction to the temperature control unit 110 via circuitry connecting the power source 60, the controller 70, and the temperature control unit 110. Once the instructions and power are received, the temperature control 110 unit can absorb heat from its distal end 109 and release it towards the first side 20 via its proximal end 108, which allows the first side 20 to be heated relative to when the skincare device 2 is not in operation. Such a release provides heat therapy to a user. The temperature control unit 110 can also absorb heat via its proximal end 108 and transfer it away from the first side 20 via its distal end 109 and, specifically, via the temperature exchange component 112. This allows the first side 20 to be cooled relative to when the skincare device 2 is not in operation (or, in some embodiments, when heat is released through the first end to provide heat therapy). Doing so provides cool therapy to a user.

[0079] In greater detail, when a user desires heat therapy the temperature control unit 110 absorbs heat via its distal end 109 and releases said heat via its proximal end 108 toward the panel 62 to which it is adjacent, which then conducts and transfers the heat to the surface of the first side 20. Conversely, when a user desires cool therapy the temperature control unit 110 absorbs heat via its proximal end 108 and releases said heat via its distal end 109 toward the temperature exchange component 112 to which it is adjacent. This transfers heat away the first side 20, cooling it relative to when the skincare device 2 is not in use (and/or is providing heat therapy). In either instance, the first side 20 may be contacted by a user either directly or indirectly via the use of a beauty accessory as an intermediary between the skin and the skincare device 2.

[0080] In various embodiments, the temperature control unit may heat the surface of the first side to temperatures between about 70 degrees Fahrenheit (“°F”) and about 150°F, between about 75°F and about 125°F, and between about 80°F and about 100°F. In other embodiments, the temperature control unit may cool the surface of the first side to temperatures between about 30°F and about 80°F, between about 40°F and about 70°F, and between about 50°F and about 60°F. In an alternative embodiment, the temperature control unit may be in direct contact with or directly adjacent the first side and/or panel. In some embodiments, the temperature control unit may include one or both of an N-type semiconductor and a P-type semiconductor, which may comprise the mechanism through which heat is absorbed and/or released by the proximal and distal ends of the temperature control unit; such components are commercially available.

[0081] The temperature exchange component 112 is configured to safely and properly dispose of excess heat generated by the temperature control unit 110 when the skincare device 2 provides heating and cooling therapy. One way it can do so is by transferring the heat generated by the temperature control unit 110 to the surface 32 of the second side 30, which, as stated above, includes a portion of the temperature exchange component 112. As previously stated, the set of protrusions 34 of the second side 30 provide additional surface area (relative to a flat surface) to more quickly and efficiently transfer said heat away from the first side 20 in the form of air or a fluid. This can be done when providing cooling therapy, for example.

[0082] A skilled artisan will be able to select a suitable temperature control unit according to a particular example based on various considerations, including the side of the device to which heating or cooling therapy is desired and the shape and size of the device. In other embodiments, the temperature control unit may be configured to heat the second side of

the main body for use on human skin, rather than the first side. In a different embodiment, the temperature control unit may transfer heat away from the main body via its first side, rather than the second side. In various other embodiments, the temperature control unit may disperse heat to the intermediate portion.

[0083] In an alternative embodiment, the skincare device may only cool the first side of the skincare device and only heat the second side of the skincare device. In such an embodiment, both sides of the device may be configured to provide therapy to human skin directly or indirectly. Additionally, in another embodiment, first side may only be heated and the second side may only be cooled. In another alternative, the temperature control unit may heat and cool the first side and/or may heat and cool the second side, depending on the mode the skincare device is in and the instructions the temperature control unit receives from the controller. In another embodiment, the temperature control unit may simply emit heat in one or several directions; it may not be capable of cooling any side in such an embodiment.

[0084] A first temperature sensor 120 and a second temperature sensor 122 (collectively, the “sensors 120, 122”) are also disposed within the main body 10. The sensors 120, 122 are substantially pill-shaped and include tails 120a, 122a, respectively. The sensors 120, 122 are operatively connected to each of the power source 60 and controller 70 and are configured to measure the temperature of the skincare device 2 and report said temperature to the controller 70. If one of the sensors 120, 122 detects that the temperature of the skincare device 2 passes a certain threshold, it will transmit said information to the controller 70 and the controller 70 will initiate a “shut down” of the device in order to protect its user from the potential effects of an overheated device (such as burning the skin, for example). In such instances, the skincare device 2 will cease operating; such a cessation of operation may be permanent or temporary. Two sensors 120, 122 are included to ensure that, in the event that the first sensor 120 or the second sensor 122 malfunctions, the skincare device 2 will still have a working sensor to detect its temperature and shut down, if necessary. In the illustrated embodiment, each of the first and second sensors 120, 122 comprises a negative temperature coefficient thermistor; however, in other embodiments, the first and second sensors may be comprised of any suitable component. A skilled artisan will be able to select suitable first and second sensors according to a particular example based on various considerations, including the specific temperature control unit used and the size and shape of the device. In different embodiments, the sensors may be comprised of any suitable material, including various semiconductors, copper, and other suitable materials. In yet other embodiments, the skincare device may include zero, one, three, or more than three sensors. In various examples, one or

both of the sensors may instruct the controller to cease operation of the device when the sensor detects a temperature that exceeds about 120°F, about 150°F, and about 180°F. Alternatively, a thermal fuse may be used in place of one or both of the sensors. A skilled artisan will be able to determine where to position the sensors within the main body.

[0085] Various beauty accessories may be used in conjunction with the skincare device 2. Example beauty accessories include one or more facial masks 200, best illustrated in FIGS. 11A and 11B. In other embodiments, however, other types of beauty accessories may be used. A facial mask, such as facial mask 200, is a cosmetic that is designed to be coated, filled, or layered with various serums, liquids, compounds, and similar items. Facial masks are known in the beauty industry, primarily in the form of masks which nearly cover the user's entire face. They are left on the user so that the materials and/or serums or cosmetics are in contact with the face for an extended period of time and may be absorbed by the user's skin. The illustrated facial mask 200, on the other hand, only contacts a portion of the user's face and it will only be in contact with the same for a short period of time; namely, when the skincare device 2 is in use.

[0086] The heating, cooling, vibrations, and/or light generated by the skincare device 2 help the contents of the facial mask 200 to be absorbed more quickly by the skin than are the contents of a traditional mask that is placed on the face for an extended period of time. In various examples, the facial mask may be comprised of cloth, mesh, various microfibers, silicone, a combination of one or more of these, and/or any other suitable material. In additional examples, the facial masks may be coated in, comprised of, include, or otherwise incorporate one or more the following materials and/or compounds, either alone or in combination: water, glycerin, butylene glycol, dipropylene glycol, caprylic/capric triglyceride, cetyl ethylhexanoate, diglycerin decyl cocoate, hydroxyacetophenone, panthenol, allantoin, cetearyl olivate, sorbitan olivate, tromethamine, caprylic/capric glycerides, niacinamide, carbomer, various acrylates, caprylyl glycol, dipotassium glycyrrhizate, tocopheryl acetate, ethylhexyglycerin, tremella fuciformis sporocarp extract, xanthan gum, simmondsia chinensis seed oil, frangrange, portulaca oleracea extract, xylitylglucoside, anhydroxylitol, 3-o-ethyl ascorbic acid, glucose, 1,2-hexanediol, pearl extract, portulaca oleracea extract, hydrogenated lecithin, ceramide 3, butylene glycol, decyl cocoate, glycereth-26, shea butter, PEG-100 stearate, polysorbate 60, tromethamine, carnosine, hydrolyzed collagen, palmitoyl tripeptide-5, and other suitable compounds.

[0087] The facial mask 200 is configured such that it can be placed on the surface 22 of the first side 20 and locked into place on the skincare device 2 through use of the locking

mechanism 50, which is placed over the facial mask 200 once it is positioned on the skincare device 2. The facial mask 200 is relatively circular in shape and thin. The facial mask 200 also includes a protrusion 202 extending away from the body of the facial mask 200, which allows the user to easily grasp the facial mask 200. The locking mechanism 50 locks one facial mask 200 at a time in place by securing a portion of a facial mask 200 within the groove 24 and securing another portion of a mask 200 atop the interior portion 23 of the first side 20 when the locking mechanism 50 is secured to the skincare device 2.

[0088] FIGS. 12A, 12B, 12C, 12D each illustrates a facial mask, such as facial mask 200, and the skincare device 2. FIG. 12A illustrates the skincare device 2 with the locking mechanism 50 removed from the groove 24 and the facial mask 200 disposed adjacent, but not in contact with the first side 20 of the skincare device 2. FIG. 12B illustrates the facial mask 200 in contact with the first side 20 and adjacent the groove 24 and the locking mechanism 50 disposed above, but not in contact with, the first side 20. FIGS. 12C and 12D each illustrates the facial mask 200 in contact with the first side 20, disposed partially within the groove 24, and being secured to the first side 20 by the locking mechanism 50, which itself is partially disposed within the groove 24.

[0089] In use, a user may place a mask, such as mask 200, in contact with the first side 20 and lock the mask into place via the locking mechanism 50, as is illustrated in FIGS. 12A, 12B, 12C, and 12D. The user then presses or holds the user control 72 of the skincare device 2 to activate the device. The skincare device 2 then signals to the user that the device is ready to be used. One such manner of signaling that the skincare device 2 is ready to be used is through the emission of light from the light source 100. The light source 100 can be configured such that it emits light for a certain period of time (one second, two seconds, three seconds etc.) to indicate that it is ready for use; it could also emit a certain color or sequence of colors to indicate that it is ready for use. In various other embodiments, the light source could emit light in a rotating fashion such that a certain light or lights follow a path to indicate that the device is ready for use. Optionally, once the device has been activated, a user may press and/or hold the user control 72 for a certain period of time to ensure that the skincare device 2 is able to communicate with a second device such as a mobile phone. An example of such a communication would be a series of flashing lights after a user presses and holds the user control for three seconds. Confirmation that the skincare device 2 is in communication with a second device could come in the form of another emission of light by the light source 100.

[0090] In one example, after activation of the device the user may select a certain mode, program, or treatment that the skincare device is configured to perform. The user may press the user control a number of times, which allows the skincare device to cycle through possible treatments which are communicated to the user via the light source. In an example embodiment, pressing the user control after activation could cycle result in the device emitting green, red, and/or blue light in some order. Other colors of light may also be emitted at this juncture. In such an embodiment, the user could press the user control again (or cease pressing the control) when the device emits a particular light which corresponds to the treatment the user prefers the device to perform (the user could find this information in a manual or through trial and error). The device would then perform the selected treatment pattern. In another embodiment, a particular treatment can be selected via additional buttons placed on the skincare device that allow the user to cycle through various treatments. In a different embodiment, a particular treatment method can be selected via the use of a second device that is configured to communicate with and transmit information to the skincare device, such as a mobile phone. In other embodiments, the speeds and/or rotational patterns of the light emitted by the light source could indicate various treatments to-be-selected by the user.

[0091] Once a particular treatment has been selected by a user, the skincare device will do one or more of providing heat or cold therapy, emitting various types of light, and/or vibrating. The skincare device may perform these treatments in any order, for any duration, and through contact with or placement near the skin via various portions of the device and as described above. Additionally, these treatments may be applied to the skin with or without the aid of a beauty accessory.

[0092] Various example treatment patterns are included, below. The following treatment patterns described are merely illustrative in nature and are not designed in any way to limit the contents of the disclosure. The following treatment patterns may include the use of a mask in conjunction with the device; accordingly, it is assumed that any mask used is secured on or partially within the skincare device in each treatment pattern prior to selection of a treatment pattern. Other examples exist in which masks are not used, however. Moreover, various skincare devices may perform a number of other treatment patterns that are not described below.

[0093] In each example treatment pattern, a user presses a user control of a skincare device, such as user control of skincare device. This activates the skincare device. Optionally, the user may then press and hold the user control for approximately three seconds; doing so

will confirm that the skincare device is capable of communicating with a second device via approximately three seconds of flashing lights emitted by a light source, such as light source. The user then selects the first example treatment pattern, as described above, by pressing the user control at an appropriate time or in an appropriate manner. At this point, the user will place the skincare device adjacent or in contact with his or her skin, as the example treatment has been initiated. The various example treatment patterns, accordingly, will treat the skin of a user via the following patterns of heating, cooling, light emission, and/or vibration.

[0094] After selection of the first treatment pattern, the light source will first simultaneously emit red light and heat the first side of the skincare device. This will occur for approximately thirty seconds. Next, the skincare device will simultaneously heat the first side, emit red light, and vibrate for approximately sixty seconds. Thereafter, the skincare device will simultaneously vibrate and emit red light for approximately thirty seconds. This may be repeated for a number of cycles; in various treatment patterns, one, two, three, four, five, or more than five cycles may be used. The skincare device will then deactivate, as evidenced by three pulsations of the motor just prior to its deactivation. Deactivation of the skincare device may occur automatically at the end of a treatment pattern or via manipulation of the user control.

[0095] In various embodiments, the first example treatment pattern may comprise any number of actions which may be performed in any order. For example, the light source may emit any of green, blue, pink, or red light and may constantly emit said light; it may also emit light in any suitable interval, including intervals of one, two, three, five, ten, fifteen, twenty, thirty, sixty, or any other suitable number of seconds. Additionally, a first treatment may include a period in which the device does not emit light, heat, cool, or vibration. Various example first treatments may include any suitable number of cycles, as well. Moreover, in other example first treatments, the motor may produce vibrations and/or pulsations at any frequency and for any suitable length of time, including between about 5 and about 180 seconds, between about 30 and about 150 seconds, and between about 60 and about 120 seconds.

[0096] A second example treatment pattern also may be selected via the user control, as described above. After selection of the second treatment pattern, the skincare device will simultaneously emit red light and heat the first side of the skincare device. This will occur for approximately thirty seconds. Next, the skincare device will simultaneously heat the first side, emit red light, and vibrate or pulsate for approximately sixty seconds. Thereafter, the device shall emit green light and vibrate simultaneously for approximately thirty seconds.

The skincare device will then deactivate, as evidenced by three pulsations of the motor just prior to cessation of function. Deactivation of the skincare device may occur automatically at the end of a treatment pattern or via manipulation of the user control. Optionally, the motor may then be reactivated and produce vibrations and/or pulsations of the skincare device for an additional thirty seconds; the strength of the vibrations and/or pulsations may decrease as this time passes.

[0097] In various embodiments, the second example treatment pattern may comprise any number of actions which may be performed in any order. For example, the light source may emit any of green, blue, pink, or red light and may constantly emit said light; it may also emit light in any suitable interval, including intervals of one, two, three, five, ten, fifteen, twenty, thirty, sixty, or any other suitable number of seconds. Additionally, a second treatment may include a period in which the device does not emit light, heat, cool, or vibrate. Various example second treatments may include any suitable number of cycles, as well. Moreover, in other example second treatments, the motor may produce vibrations and/or pulsations at any frequency and for any suitable length of time, including between about 5 and about 180 seconds, between about 30 and about 150 seconds, and between about 60 and about 120 seconds.

[0098] A third example treatment pattern also may be selected via the user control, as described above. After selection of the third treatment pattern, the skincare device will simultaneously emit blue light and heat the first side of the skincare device. This will occur for approximately sixty seconds. Next, the skincare device will simultaneously cool the first side, emit blue light, and emit vibrations for approximately thirty seconds. Finally, the skincare device will simultaneously cool the first side, emit red and blue light, and vibrate for approximately thirty seconds. Deactivation of the skincare device may occur automatically at the end of a treatment pattern or via manipulation of the user control. Optionally, the motor may then be reactivated and produce vibrations and/or pulsations of the skincare device for an additional thirty seconds.

[0099] In various embodiments, the third example treatment pattern may comprise any number of actions which may be performed in any order. For example, the light source may emit any of green, blue, pink, or red light and may constantly emit said light; it may also emit light in any suitable interval, including intervals of one, two, three, five, ten, fifteen, twenty, thirty, sixty, or any other suitable number of seconds. Additionally, a third treatment may include a period in which the device does not emit light, heat, cool, or vibrate. Various example third treatments may include any suitable number of cycles, as well. Moreover, in

other example third treatments, the motor may produce vibrations and/or pulsations at any frequency and for any suitable length of time, including between about 5 and about 180 seconds, between about 30 and about 150 seconds, and between about 60 and about 120 seconds.

[00100] A fourth example treatment pattern also may be selected via the user control, as described above. After selection of the fourth treatment pattern, the light source will first simultaneously emit red light, cool, and emit vibrations to the first side of the skincare device. This will occur for approximately thirty seconds. Next, the skincare device will simultaneously emit red light, cool, and emit vibrations to the first side for approximately thirty seconds. The motor will vibrate at a low frequency at this time. After this, the skincare device will simultaneously emit blue light, cool, and emit vibrations to the first side for approximately thirty seconds. The skincare device will then deactivate, as evidenced by three pulsations of the motor just prior to cessation of function. Deactivation of the skincare device may occur automatically at the end of a treatment pattern or via manipulation of the user control. Optionally, the motor may then be reactivated and produce vibrations and/or pulsations of the skincare device for an additional thirty seconds.

[00101] In various embodiments, the fourth example treatment pattern may comprise any number of actions which may be performed in any order. For example, the light source may emit any of green, blue, pink, or red light and may constantly emit said light; it may also emit light in any suitable interval, including intervals of one, two, three, five, ten, fifteen, twenty, thirty, sixty, or any other suitable number of seconds. Additionally, a fourth treatment may include a period in which the device does not emit light, heat, cool, or vibrate. Various example fourth treatments may include any suitable number of cycles, as well. Moreover, in other example fourth treatments, the motor may produce vibrations and/or pulsations at any frequency and for any suitable length of time, including between about 5 and about 180 seconds, between about 30 and about 150 seconds, and between about 60 and about 120 seconds.

[00102] A fifth example treatment pattern also may be selected via the user control, as described above. After selection of the fifth treatment pattern, the skincare device will simultaneously emit red light, heat the first side of the skincare device, and pulsate at a high frequency. This will occur for approximately thirty seconds. The skincare device will then simultaneously heat the first side, emit red light, and vibrate or pulsate for approximately sixty seconds. The motor shall vibrate at a low frequency for this time period. Next, the skincare device will then produce vibrations for thirty seconds that gradually decrease in

strength during said time period. The skincare device will then deactivate, as evidenced by three pulsations of the motor just prior to cessation of function. Deactivation of the skincare device may occur automatically at the end of a treatment pattern or via manipulation of the user control.

[00103] In various embodiments, the fifth example treatment pattern may comprise any number of actions which may be performed in any order. For example, the light source may emit any of green, blue, pink, or red light and may constantly emit said light; it may also emit light in any suitable interval, including intervals of one, two, three, five, ten, fifteen, twenty, thirty, sixty, or any other suitable number of seconds. Additionally, a fifth treatment may include a period in which the device does not emit light, heat, cool, or vibrate. Various example second treatments may include any suitable number of cycles, as well. Moreover, in other example fifth treatments, the motor may produce vibrations and/or pulsations at any frequency and for any suitable length of time, including between about 5 and about 180 seconds, between about 30 and about 150 seconds, and between about 60 and about 120 seconds.

[00104] A sixth example treatment pattern also may be selected via the user control, as described above. After selection of the sixth treatment pattern, the skincare device will simultaneously emit red light and heat the first side of the skincare device. This will occur for approximately thirty seconds. Next, the skincare device will simultaneously heat the first side, vibrate and emit red light for approximately thirty seconds. After this, the skincare device will simultaneously emit green light and vibrate for approximately thirty seconds. Next, the skincare device will then produce vibrations for thirty seconds that gradually decrease in strength across said time period. The skincare device will then deactivate, as evidenced by three pulsations of the motor just prior to cessation of function. Deactivation of the skincare device may occur automatically at the end of a treatment pattern or via manipulation of the user control.

[00105] In various embodiments, the sixth example treatment pattern may comprise any number of actions which may be performed in any order. For example, the light source may emit any of green, blue, pink, or red light and may constantly emit said light; it may also emit light in any suitable interval, including intervals of one, two, three, five, ten, fifteen, twenty, thirty, sixty, or any other suitable number of seconds. Additionally, a sixth treatment may include a period in which the device does not emit light, heat, cool, or vibrate. Various example second treatments may include any suitable number of cycles, as well. Moreover, in other example sixth treatments, the motor may produce vibrations and/or pulsations at any

frequency and for any suitable length of time, including between about 5 and about 180 seconds, between about 30 and about 150 seconds, and between about 60 and about 120 seconds.

[00106] Various other example treatment patterns exist. In such patterns, various skincare devices may emit light, heat and/or cool, and vibration/pulsate for any duration, in any order, and at any strength.

[00107] FIGS. 13, 14, 15, 15A, 16, 17, 18, 19, 20, and 21 illustrate another example skincare device 4. This skincare device is similar to the skincare device 2 shown in FIGS. 1 through 9, except as described below. Thus, the skincare device 4 comprises at least a main body 300, a first side 302, a second side 304, an intermediate portion 306, a controller 307, a light source 308, a power source 309, a motor 310, a temperature control unit 312, a temperature exchange component 313, a user control 314, a frame 315, a charging port 316, first and second temperature sensors 317, 318, and a locking mechanism 319.

[00108] In the illustrated embodiment, the first side 302 includes contact piece 320 having a surface 322 that a user will contact when the skincare device 4 is in use. The contact piece 320 is comprised of metal in the illustrated embodiment and is configured to transmit heat therapy and/or cool therapy to a user. The portion of the skincare device 4 that a user contacts to receive such therapies is not a portion of the panel 324 that houses a power source 326; this differs from the skincare device 2 described above, in which the upper portion 66 of the panel 62 defines a surface 22 of the first side 20 that a user contacts to receive heat and/or cool therapy. To be clear, though the contact piece 320 may be disposed substantially adjacent the panel 324 in the illustrated embodiment, these components are not integrally formed. A skilled artisan will be able to select a suitable contact piece according to a particular example based on various configurations, including the sizes and shapes of the components housed within the skincare device. In various embodiments, the contact piece may comprise any suitable material(s), including one or more of aluminum, an aluminum alloy, a zinc alloy, copper, stainless steel, gold, silver, ceramic, and other suitable materials. In other embodiments, a portion of the contact piece may be coated with a thermal film or paste. In different embodiments, the surface of the contact piece may have a diameter between about 1 cm and about 15 cm, between about 2 cm and about 10 cm, and between about 3 and about 6 cm.

[00109] The contact piece 320 also includes first and second legs 328, 330 at a distal end 332 of the contact piece 320 opposite its surface 322 that is contacted by a user. The first and second legs 328, 330 form a cavity 334 into which the temperature control unit 312 may be

placed. Placing the temperature control unit 312 within the cavity 334 allows for the temperature control unit 312 to be disposed directly adjacent the surface 322 a user contacts to receive heat therapy and/or cool therapy. Such placement allows for the efficient and effective transmission of heat therapy and/or cool therapy to the user via the surface 322 because the contact piece 320 is so near the surface 322. A skilled artisan will be able to select a suitable contact piece based on various considerations, including the shape and size of the temperature control unit. In other embodiments, an intermediary may be placed between the contact piece and the temperature control unit. In different embodiments, the contact piece may include zero, one, three, or more than three legs. In alternative embodiments, the contact piece may not define a cavity and the temperature control unit may be secured to the contact piece via an adhesive, a mechanical attachment, or some other mechanism.

[00110] Finally, the temperature exchange component 313 directly attaches to or connects with the frame 315 in the illustrated embodiment. This embodiment does not include a support member, as was included in skincare device 2.

[00111] FIGS. 22, 23, 24, 25, 26, 27, and 28 illustrate another example skincare device 6. This skincare device 6 is similar to the skincare device 4 shown in FIGS. 13 through 21, except as described below. Thus, the skincare device 6 comprises at least a main body 400 having a first side 402, a second side 404, an intermediate portion 406, a light source (not illustrated in the Figures), a motor (not illustrated in the Figures), temperature control unit (not illustrated in the Figures), a user control 410, a charging port 411, and a locking mechanism 412.

[00112] In this embodiment, the skincare device 6 is partially covered by a silicone cover 414. More specifically, the silicone cover 414 extends such that it that forms a portion of the second side 404 and the intermediate portion 406. The exterior surface 418 of the silicone cover 414 comprises a least a portion of the surfaces of the second side 404 and intermediate portion 406. The silicone cover 414 is a unitary piece in the illustrated embodiment.

[00113] The silicone cover 414 also defines a cutout 415 about the center portion 424 of the second side 404. The cutout 415 is substantially circular in shape. The center portion 424 is substantially circular in shape and allows for the temperature exchange component 416 to be touched by a user; in particular, a second exterior surface 422 of the second side 404 comprises a portion of the temperature exchange component 416 that may be contacted by a user. The temperature exchange component 416 may be comprised of any material that may

comprise the temperature exchange component 112 described above. The temperature exchange 416 component may also display a logo or symbol.

[00114] The exterior surface 418 of the silicone cover 414 that comprises a portion of the second side 404 defines a set of protrusions 426 which extend away from the first side 402. Each protrusion of the set of protrusions 426 is integrally formed with the second side 404 (and, thus, the silicone cover 414) in the illustrated embodiment. Each protrusion of the set of protrusions 426 is comprised of the same material as the exterior surface 418 in the illustrated embodiment, as well. However, in other embodiments, the set of protrusions may be attached to the second side and/or silicone covering via any mechanical attachment and/or via the use of an adhesive. Alternatively, some protrusions of the set of protrusions may be integrally formed with the second side and/or silicone covering and others may be attached to the second side and/or silicone covering in other embodiments.

[00115] Each protrusion of the set of protrusions 426 includes an upper surface 426a, which defines a diameter. In the illustrated embodiment, the diameters of the various upper surfaces 426a are not uniform. Generally, upper surfaces 426a of the protrusions of the set of protrusions 426 nearer the center portion 424 have smaller diameters than do the upper surfaces 426a of the protrusions of the set of protrusions 426 further from the center portion 424. In various embodiments, however, the set of protrusions may be comprised of any material and may have any alignment. A skilled artisan will be able to select suitable protrusion material(s) and alignment according to a particular example based on various considerations, including the size and shape of the second side and the functionality of the device. In various embodiments, the protrusions may be comprised of any suitable material. In other embodiments, the protrusions may be coated with gold, nickel, platinum, and/or another similar material. In different embodiments, some protrusions may be comprised of a first material, while other protrusions are comprised of a second material. In various other embodiments, any portion of the second side may include protrusions, including between about 5% and about 90% of the surface of the second side, between about 25% and about 70% of the surface of the second side, and between about 40% and about 55% of the surface of the second side. In various embodiments, one or more protrusion of the set of protrusions may have a height between about 0.1 mm and about 6 cm, a height between about 2 mm and about 3 cm, and a height between about 5 mm and about 1 cm. In various embodiments, one or more protrusion of the set of protrusions may have a diameter between about 0.01 mm and about 5 cm, a diameter between about 0.1 mm and about 2.5 cm, and a diameter between about .5 mm and about 1 cm.

[00116] In addition, the skincare device 6 illustrated in FIGS. 22 through 28 includes a temperature control unit that is not capable of providing cool therapy. Indeed, in the illustrated embodiment, the temperature control unit is merely capable of heating the first side 402 of the device via releasing heat towards the same and cannot reduce its temperature. The skincare device 6, however, is still capable of emitting vibrations via the motor and a number of different colors of light (including red, green, and blue) from the light source. In a different embodiment, however, the temperature control unit may be capable of reducing the temperature of the first side 402 and providing cooling therapy via the same.

[00117] FIG. 29 is a flowchart representation of an example method 500 of using a skincare device and a mask. Performance of this method results in the treatment of the user's body, such as the face and/or neck, by a skincare device and a beauty accessory. This method can be used for treating any portion of a human body.

[00118] An initial step 502 comprises placing a beauty accessory, such as facial mask 200, in contact with the first side of a skincare device, such as the first side 20 of skincare device 2. In various other methods, any suitable beauty accessory and/or skincare device may be selected, including skincare device 4 and/or skincare device 6. In different methods, one or more beauty accessories may be placed in contact with the first side simultaneously.

[00119] Another step 504 comprises securing the facial mask 200 on the first side 20 of the skincare device 2 via a locking mechanism, such as locking mechanism 50. The locking mechanism 50 is placed over the facial mask 200 and is inserted, along with a portion of the mask 200, within a groove, such as groove 24. In various other embodiments, the facial mask may be secured to the skincare device 2 via any physical mechanism or via an adhesive.

[00120] Another step 506 comprises activating the skincare device 2 by pressing a user control, such as user control 72, in order to ready the skincare device 2 for use.

[00121] Another step 508 comprises selecting a suitable treatment pattern, such as any of treatment patterns one, two, three, four, five, or six described above, or any other suitable treatment pattern. A treatment pattern may be selected via the user control 72. Selection of a particular treatment pattern may be communicated to a user via a light source, such as light source 100, which may emit different patterns, colors, or flashes of light to indicate the various treatment patterns.

[00122] Another step 510 comprises placing the skincare device 2 in contact with or adjacent the user's skin. Doing so allows the skincare device 2 to treat the skin via the light emitted by the light source 100, vibrations and/or pulsations emitted by a motor, such as

motor 80, and/or heating and/or cooling generated by a temperature control unit, such as temperature control unit 110.

[00123] Another step 512 comprises deactivating the skincare device 2. The skincare device 2 will indicate that deactivation has been initiated by pulsating a number of times, for a certain duration, or in particular pattern or by emitting light a certain number of times, for a certain duration, in a particular pattern, or by the emission of light of one or more particular colors. Deactivation of the skincare device 2 may occur automatically at the end of a treatment pattern or via manipulation of the user control 72.

[00124] It is noted that it is advantageous to complete this method 500 in the order illustrated and described. However, any order is considered suitable.

[00125] FIG. 30 is a flowchart representation of an example method 600 of verifying authenticity of a skincare device. Performance of the method results in the confirmation or denial of a particular skincare device's authenticity.

[00126] An initial step 602 comprises operatively connecting a skincare device having a controller, such as skincare device 2 having controller 70, with a second device such as a personal computer, tablet, server, and/or mobile phone, for example. Any suitable skincare device and/or controller may be used, however, in other embodiments, including skincare device 4 and/or skincare device 6. The connection may be made wirelessly or via a wired connection.

[00127] Another step 604 comprises the second device selecting a particular test for the skincare device to perform. Such tests may include one or more of: a motor test, a battery test, a temperature control unit test, and/or a light source test in various embodiments. Any suitable test may be performed, though, in other embodiments.

[00128] Another step 606 comprises performing the test and/or test(s) selected in step 604.

[00129] Another step 608 comprises determining that the skincare device and/or its controller has failed the test(s) performed in step 606. In such an instance, the skincare device will be prevented from sending information pertaining to the skincare device to the second device. In other embodiments, the skincare device may be temporarily or permanently disabled after failure to perform the test(s).

[00130] Another step 610 comprises determining that the skincare device and/or its controller has passed the test(s) performed in step 606.

[00131] Another step 612 comprises transmitting data from the skincare device to the second device. The data transmitted generally contains information pertaining to the skincare device and may include one or more of the following: the skincare device's Chip ID,

Information pertaining to the battery of the skincare device, the Media Access Control (“MAC”) Address of the skincare device, and/or the serial number of the skincare device. Any pertinent information may be passed to the second device, however, in various embodiments.

[00132] Optionally, another step 614 comprises transmitting data from the second device to an additional device. The additional device may include one or more of: a personal computer, tablet, mobile phone, database, server, and/or other suitable devices.

[00133] It is noted that it is advantageous to complete this method 600 in the order illustrated and described. However, any order is considered suitable.

[00134] In all examples, a skincare device and its various components may be formed of any suitable material, including presently known and later-developed materials. A skilled artisan will be able to select appropriate materials for an example skincare device based on various considerations, including the size and shape of the skincare device, the motor housed within the skincare device, the light source housed within the skincare device, and the particular temperature control unit used.

[00135] Those with ordinary skill in the art will appreciate that various modifications and alternatives for the described and illustrated embodiments can be developed in light of the overall teachings of the disclosure. Accordingly, the particular arrangements disclosed are intended to be illustrative only and not limiting as to the scope of the invention, which is to be given the full breadth of the appended claims and any and all equivalents thereof.

What is claimed is:

1. A skincare device configured to treat the skin of a user, comprising:
 - a main body having a first side having a first surface, a second side substantially opposite the first side having a second surface, and an intermediate portion extending from the first side to the second side and having a third surface;
 - a light source disposed within the main body and configured to emit light to treat said skin, the light source configured to emit the light adjacent the first side;
 - a motor disposed within the main body and configured to produce pulsations of said skincare device;
 - a temperature control unit disposed within the main body, the temperature control unit configured to generate heat to treat said skin and transfer the heat to the first side; and
 - a user control disposed on the intermediate portion, the user control configured to operate the light source, the motor, and the temperature control unit.
2. The skincare device of claim 1, wherein the light source comprises light-emitting diode (“LED”) lights.
3. The skincare device of claim 2, wherein the light source is configured to emit red light.
4. The skincare device of claim 3, wherein the light source is configured to emit green light.
5. The skincare device of claim 4, wherein the light source is configured to emit blue light.
6. The skincare device of claim 1, wherein the second surface defines a set of protrusions.
7. The skincare device of claim 1, further comprising a sensor disposed within the main body configured to detect the temperature of the skincare device and shut down the skincare device in the event that it overheats.
8. The skincare device of claim 1, wherein the first side and the intermediate portion cooperatively define a groove extending toward the second side; and
 - wherein the light source emits the light into the groove.
9. The skincare device of claim 8, further comprising a removeable locking mechanism configured to be inserted into the groove.

10. The skincare device of claim 9, wherein the locking mechanism is substantially transparent and comprised of plastic.
11. The skincare device of claim 10, further comprising a facial mask secured in place on the first side by the locking mechanism.
12. The skincare device of claim 1, further comprising a controller disposed within the main body and an interface operatively connected to the controller, the interface being configured to transmit information to a mobile phone.
13. The skincare device of claim 1, wherein the third surface is comprised of silicone.
14. A skincare device configured to treat the skin of a user, comprising:
 - a main body having a first side having a first surface, a second side substantially opposite the first side having a second surface, and an intermediate portion extending from the first side to the second side and having a third surface, the first side and the intermediate portion cooperatively defining a groove extending toward the second side, the second surface defining a set of protrusions, the third surface comprising silicone;
 - a light source disposed within the main body and configured to emit light to treat said skin, the light source configured to emit the light adjacent the first side, the light source comprising an LED light;
 - a motor disposed within the main body and configured to produce pulsations of said skincare device;
 - a temperature control unit disposed within the main body, the temperature control unit configured to generate heat to treat said skin and to transfer the heat to the first side;
 - a removeable locking mechanism configured to be inserted into the groove, the removeable locking mechanism comprising plastic and being substantially transparent; and
 - a user control disposed on the intermediate portion, the user control configured to operate the light source, the motor, and the temperature control unit.
15. The skincare device of claim 14, wherein the light source is configured to emit red, green, and blue light.

16. The skincare device of claim 15, further comprising a facial mask disposed on the first side and secured in place on the first side by the locking mechanism.

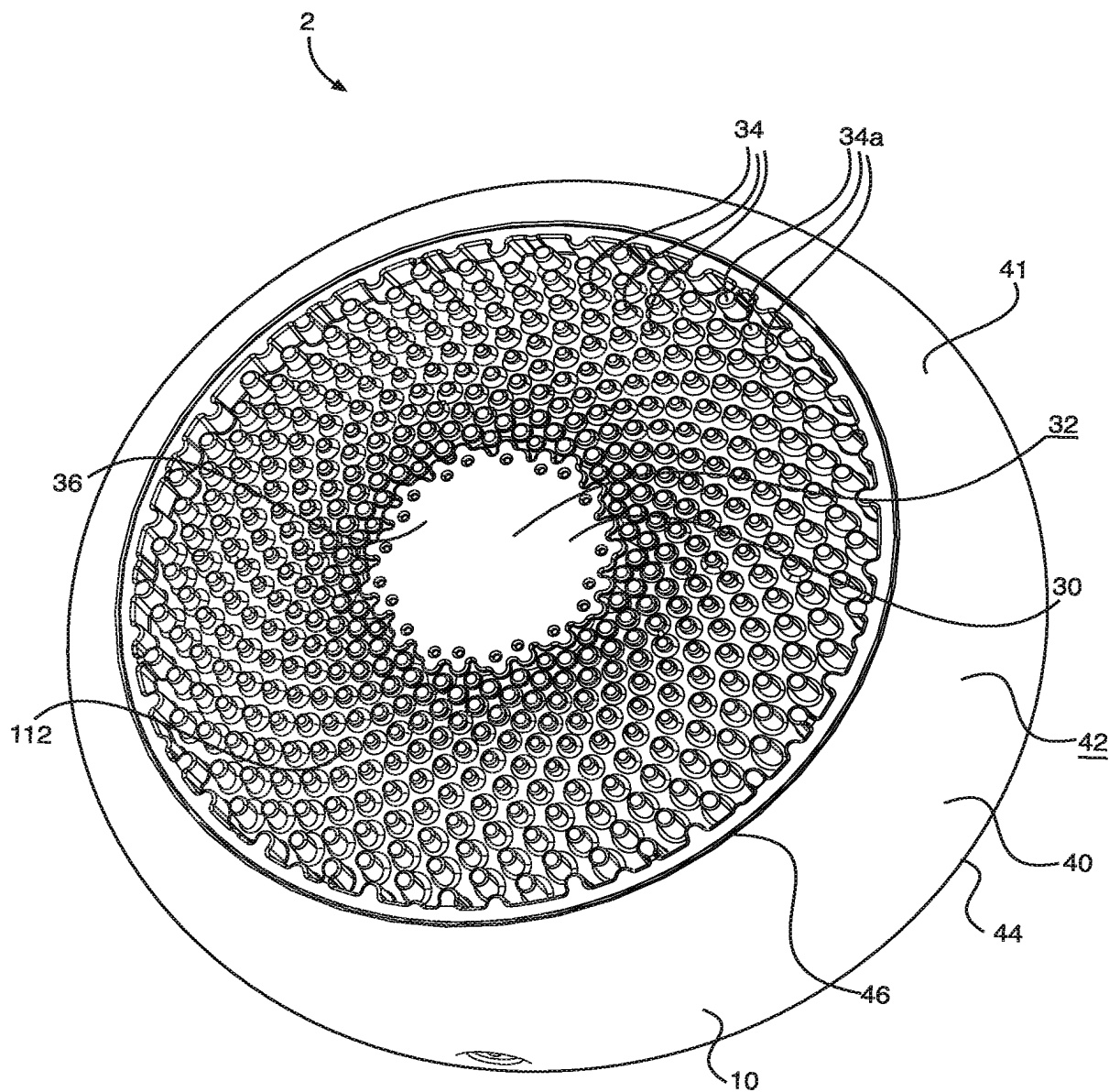
17. The skincare device of claim 16, further comprising a controller disposed within the main body and an interface operatively connected to the controller, the interface being configured to transmit information to a mobile phone.

18. The skincare device of claim 14, further comprising first and second sensors disposed within the main body configured to detect the temperature of the skincare device and shut down the skincare device in the event that it overheats.

19. A skincare device configured to treat the skin of a user, comprising:

- a main body having a first side having a first surface, a second side substantially opposite the first side having a second surface, and an intermediate portion extending from the first side to the second side and having a third surface, the first side and the intermediate portion defining an annular groove extending toward the second side, the second surface defining a set of protrusions comprised of metal, the third surface comprising silicone;
- a light source disposed within the main body and configured to emit light to treat said skin, the light source configured to emit the light adjacent the first side, the light source comprising an LED light;
- a motor disposed within the main body configured to produce pulsations of said skincare device;
- a temperature control unit disposed within the main body, the temperature control unit configured to generate heat to treat said skin and to transfer the heat to the first side to treat said skin, the temperature control unit configured to cool the first side of the main body in order to treat said skin;
- a removeable locking mechanism configured to be inserted into the groove, the removeable locking mechanism comprising plastic and being substantially transparent;
- a controller disposed within the main body and an interface operatively connected to the controller, the interface being configured to transmit information;
- and
- a user control disposed on the intermediate portion, the user control configured to operate the light source, the motor, and the temperature control unit.

20. The skincare device of claim 19, wherein light source is configured to emit red, green, and blue light.

**FIG. 1**

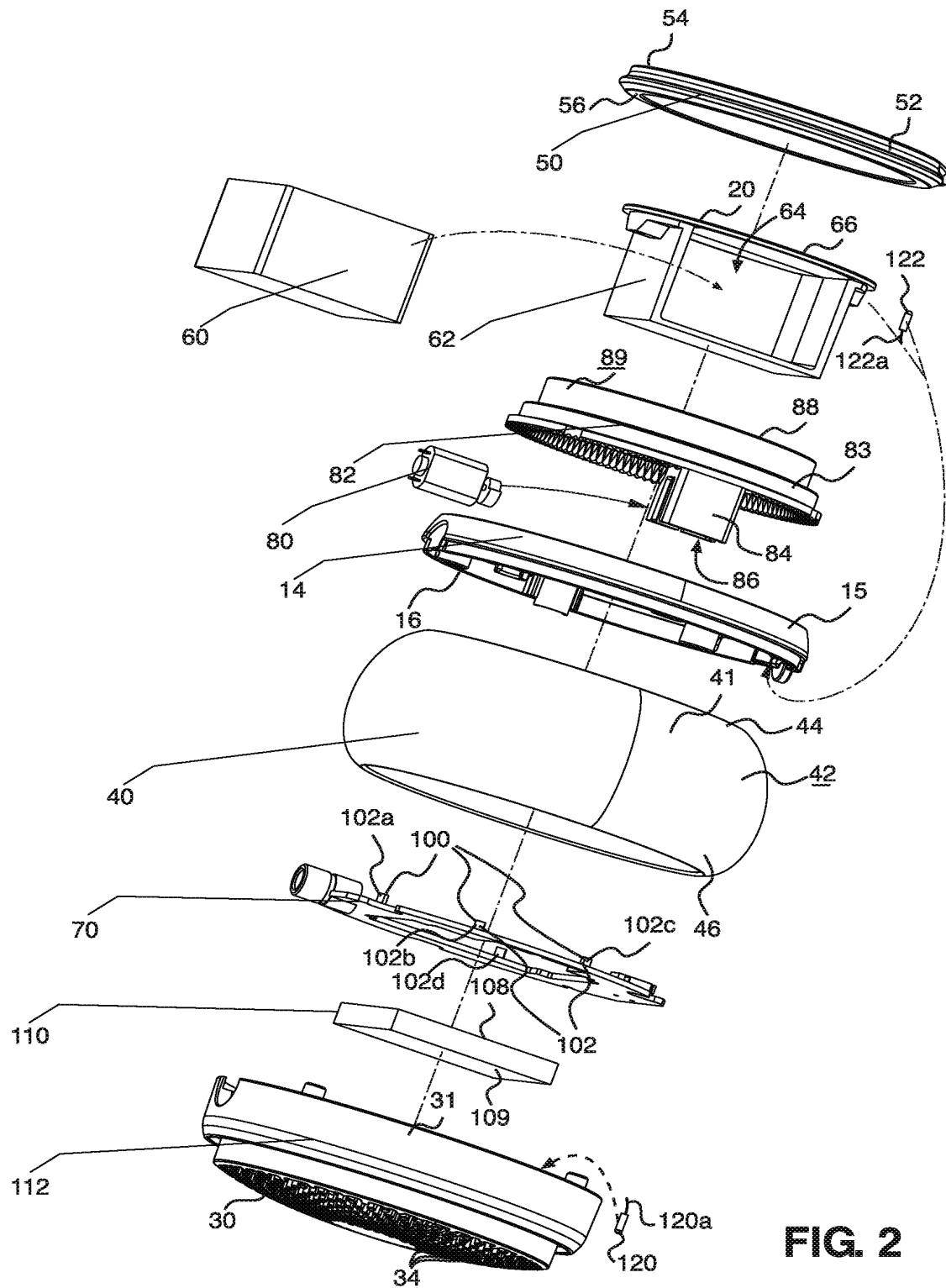


FIG. 2

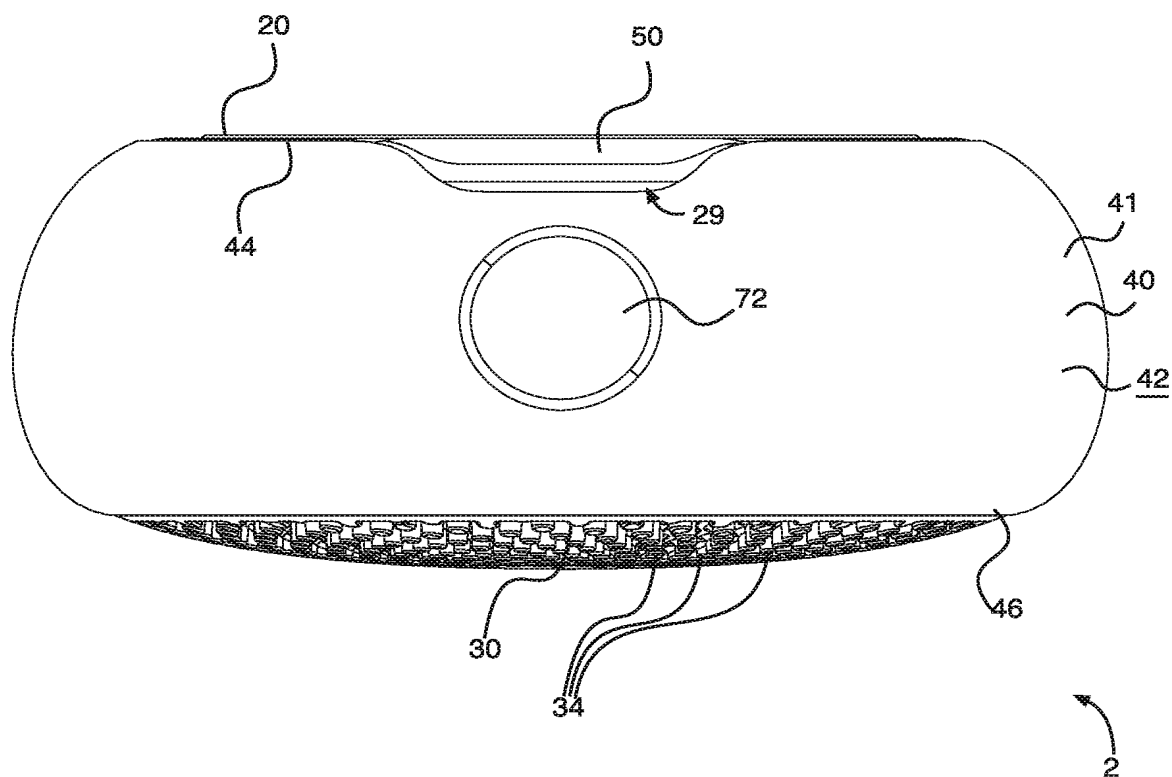
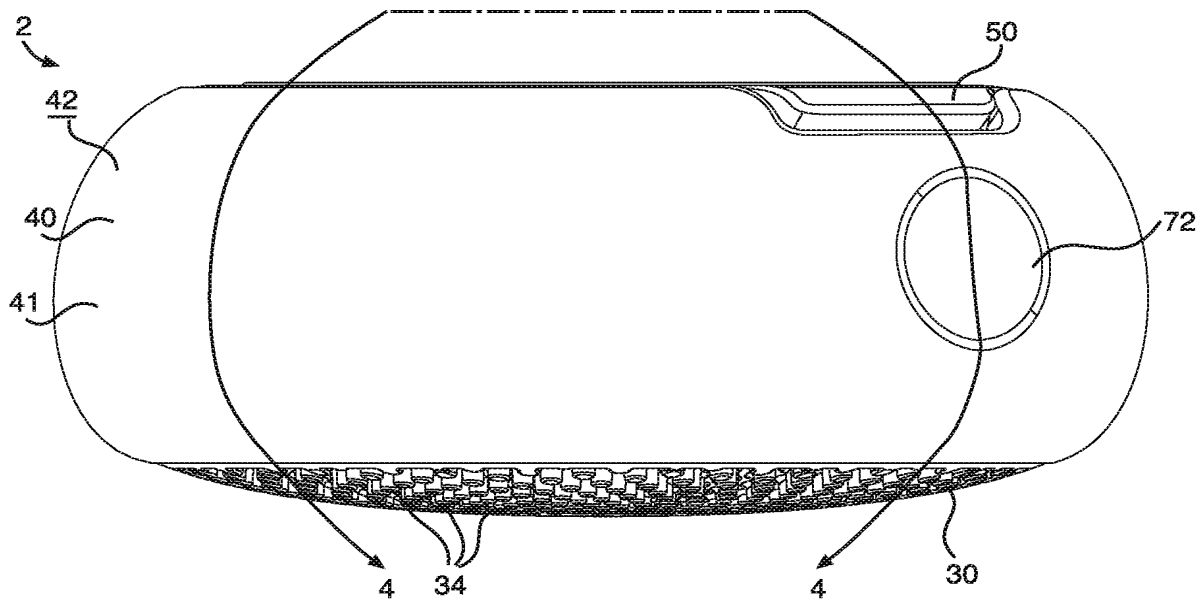
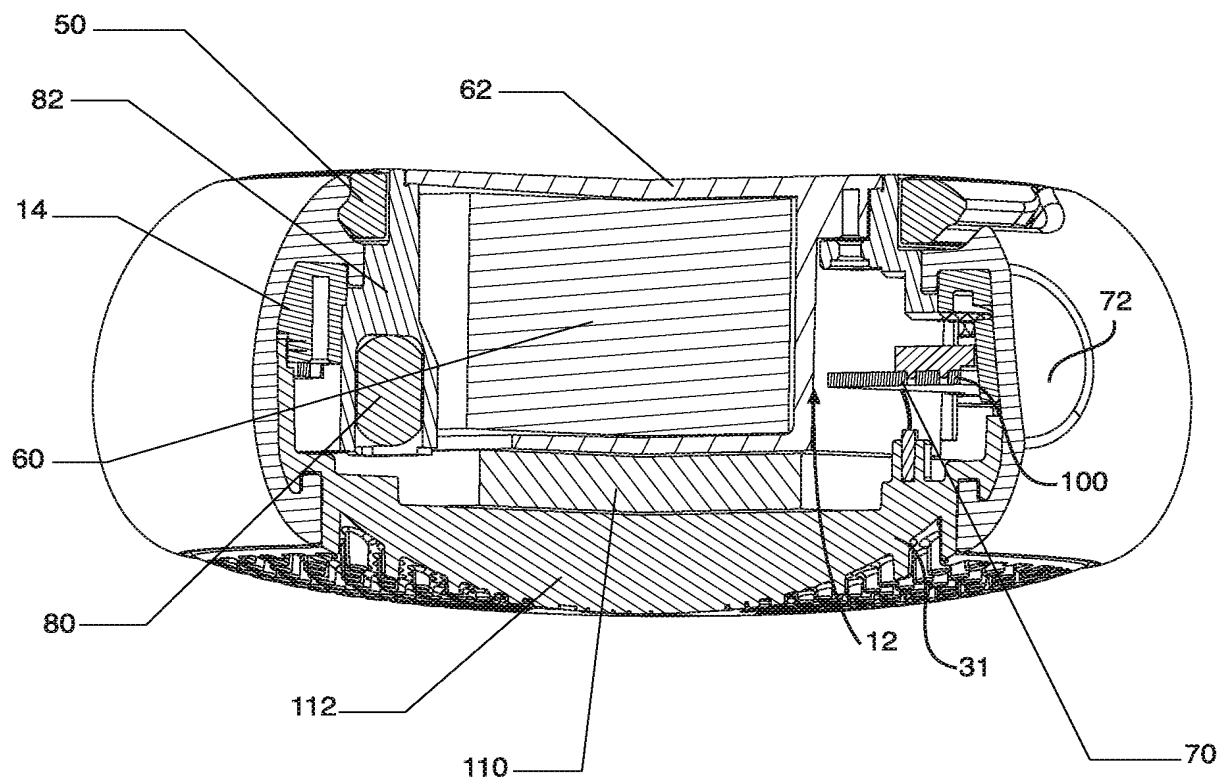


FIG. 3

**FIG. 3A**

**FIG. 4**

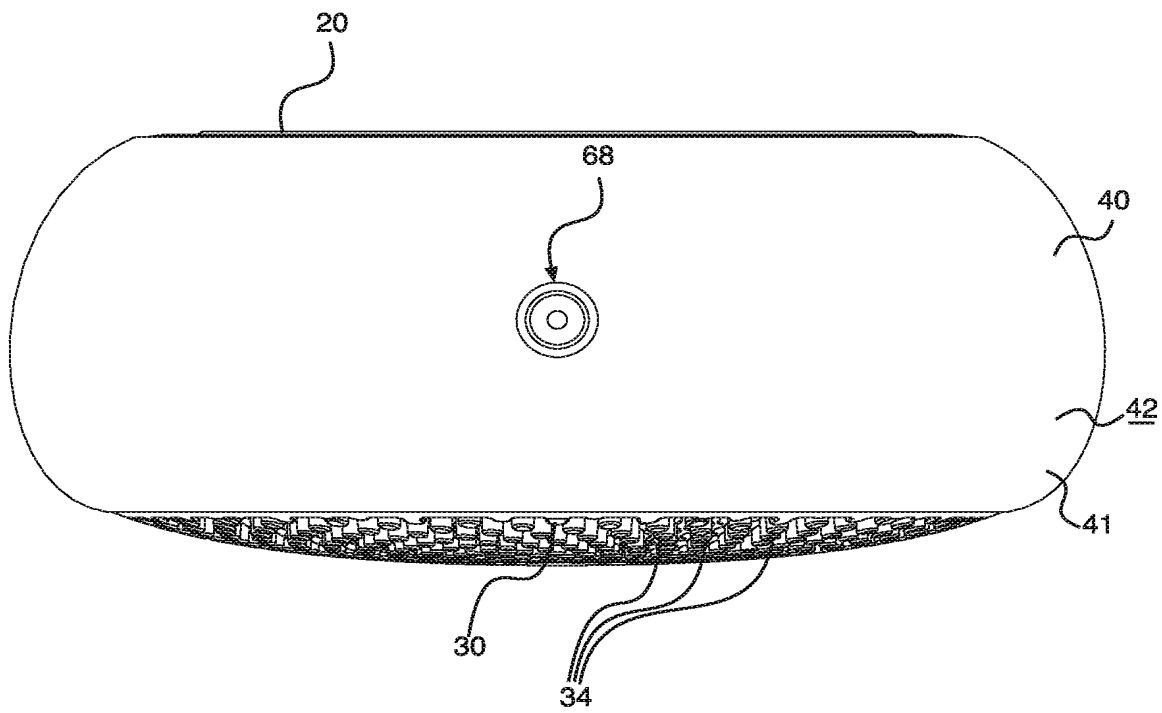


FIG. 5

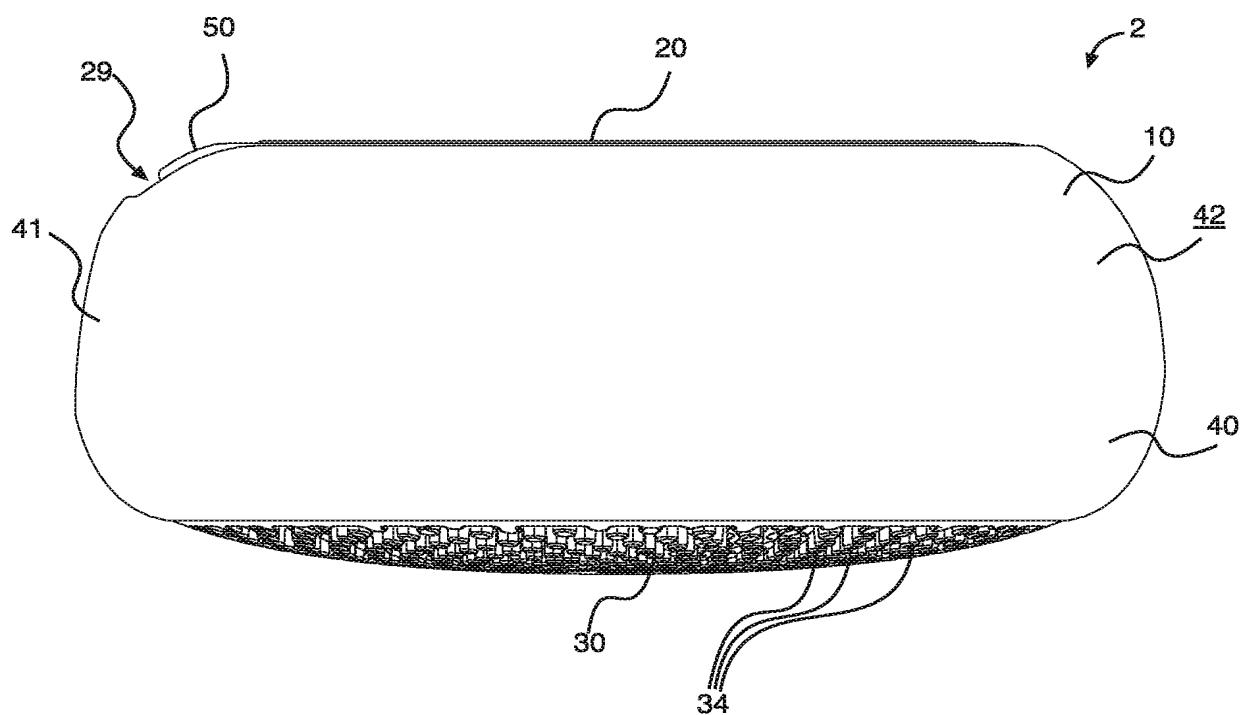
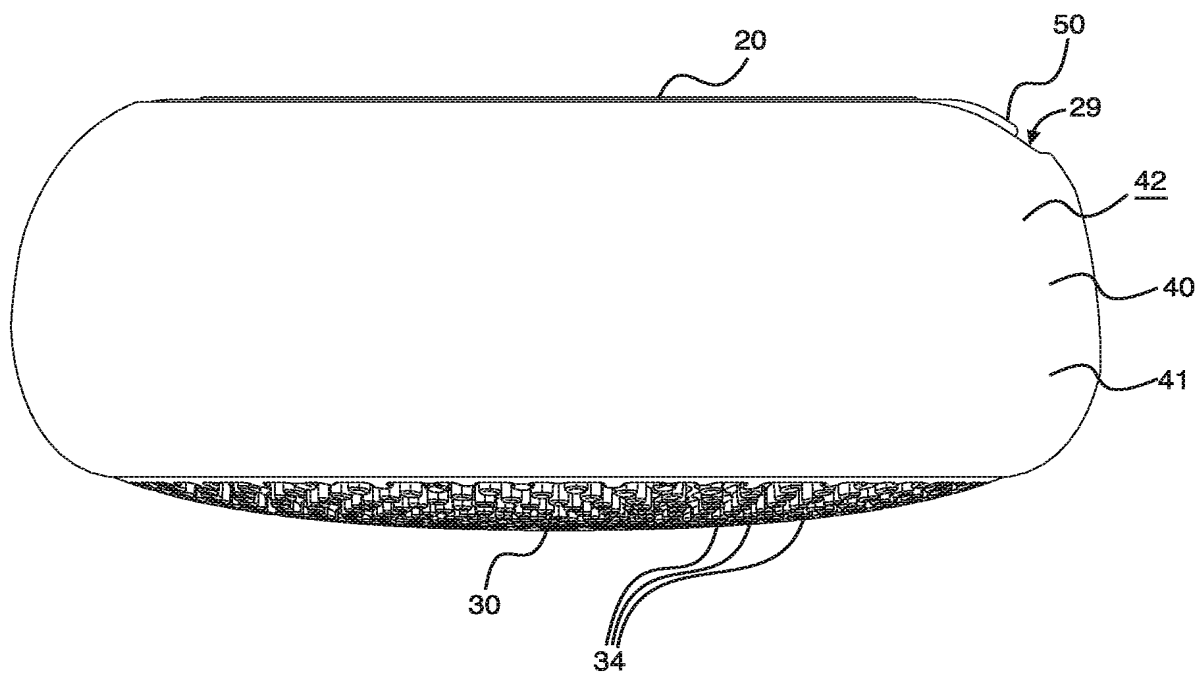


FIG. 6

**FIG. 7**

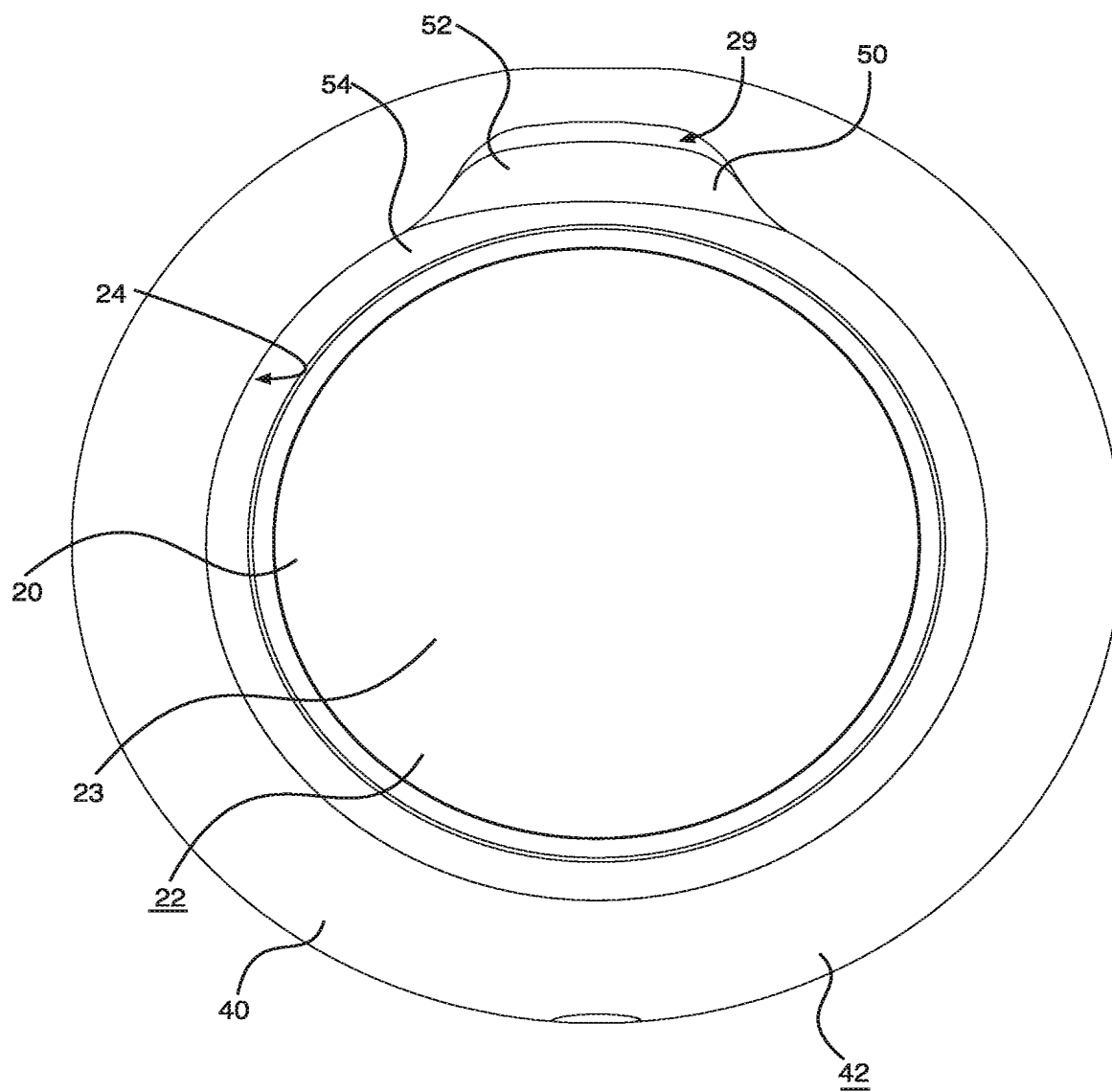


FIG. 8

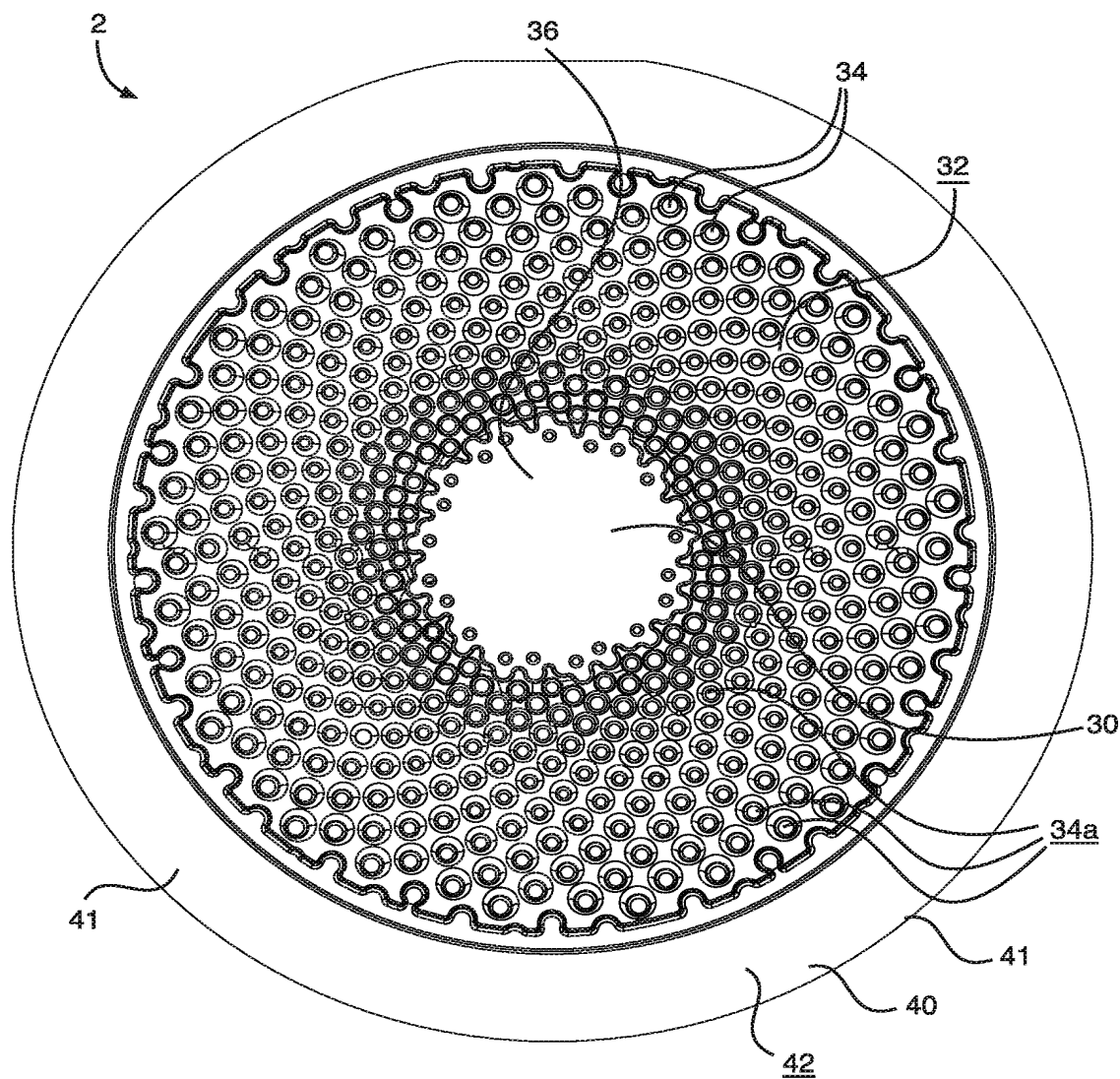
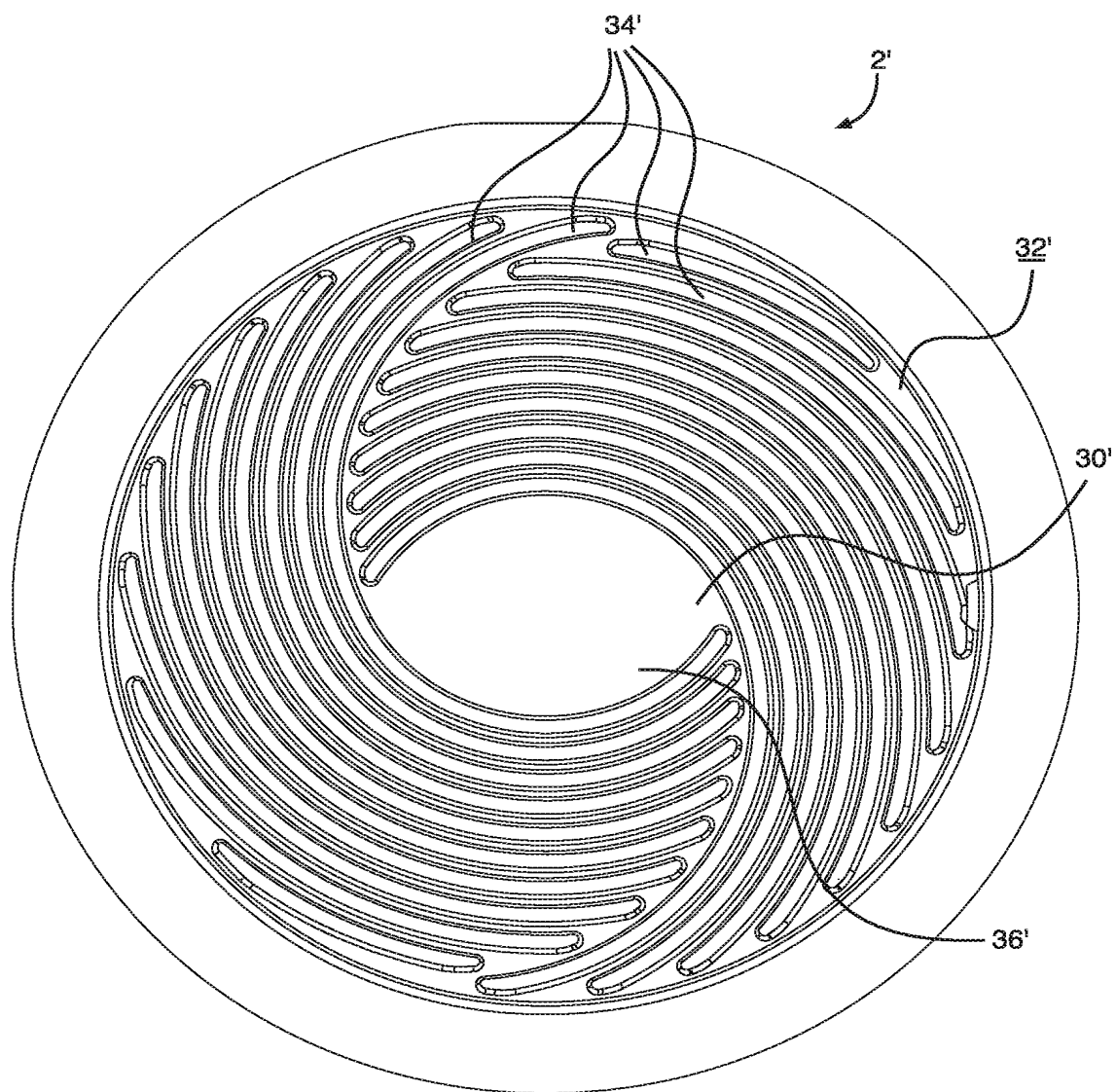
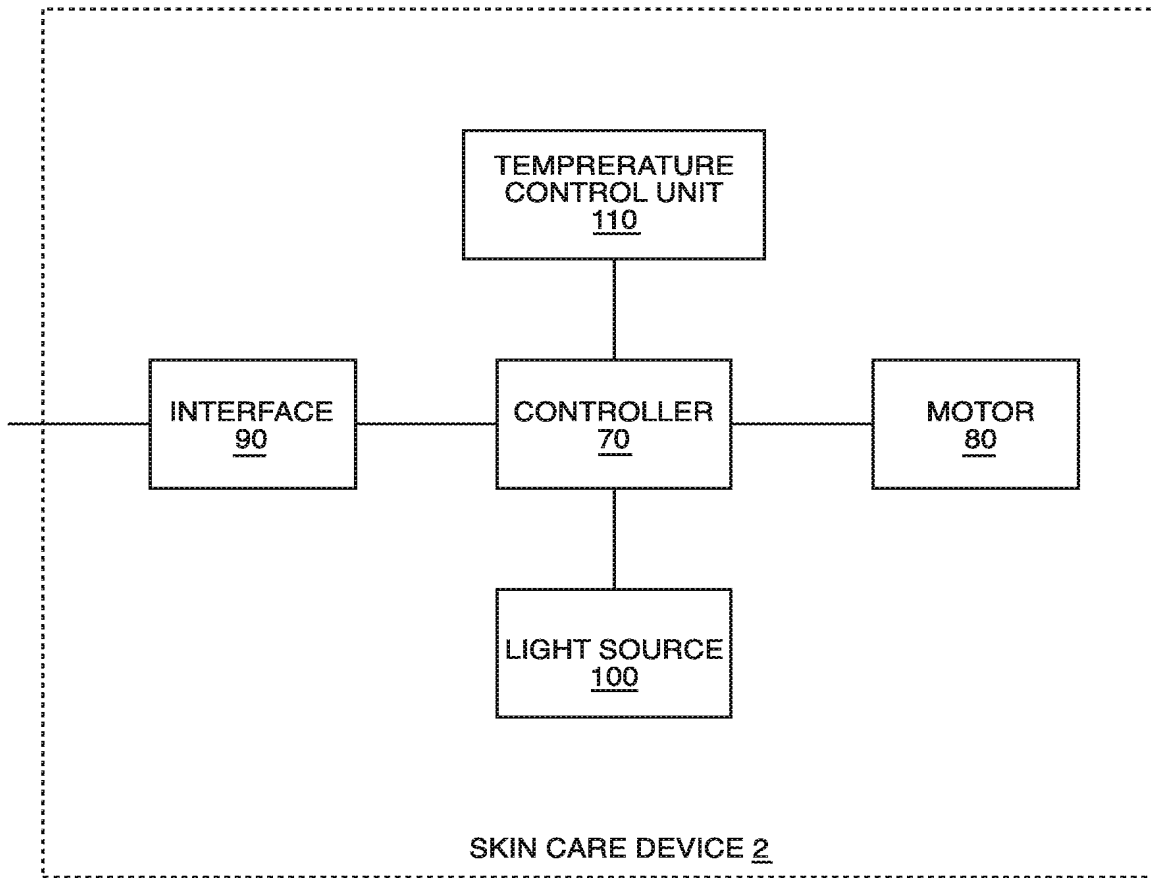


FIG. 9

**FIG. 9A**

**FIG. 10**

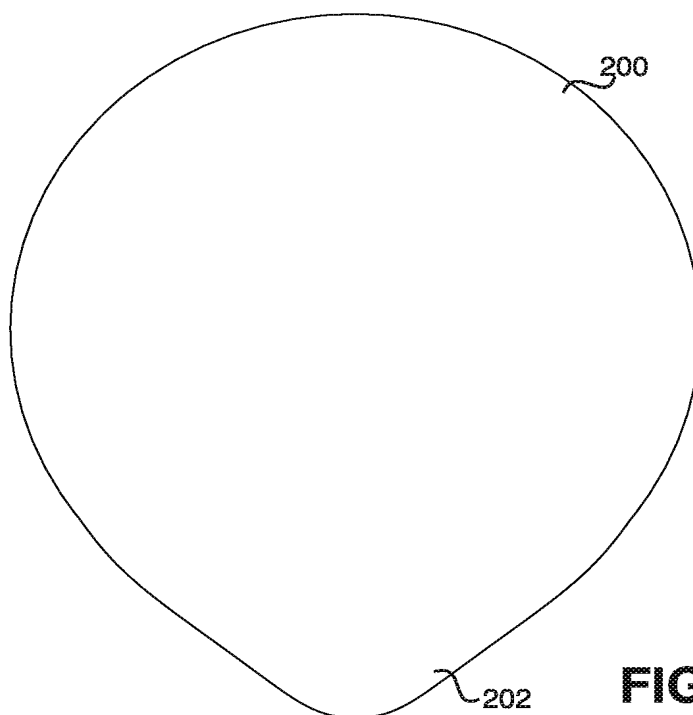


FIG. 11A

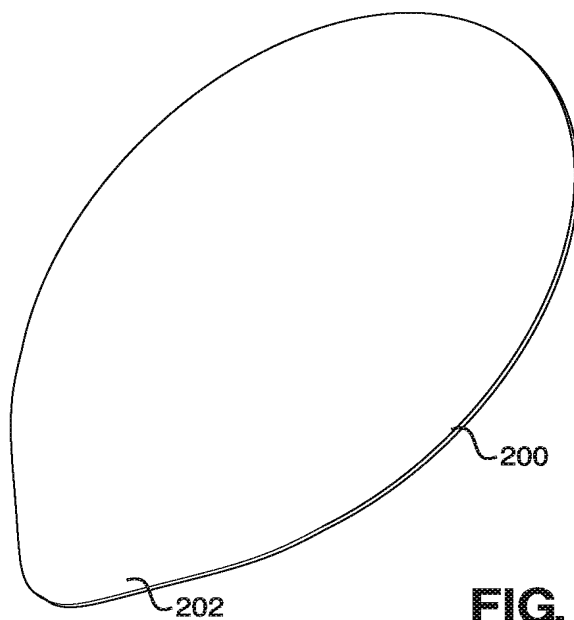


FIG. 11B

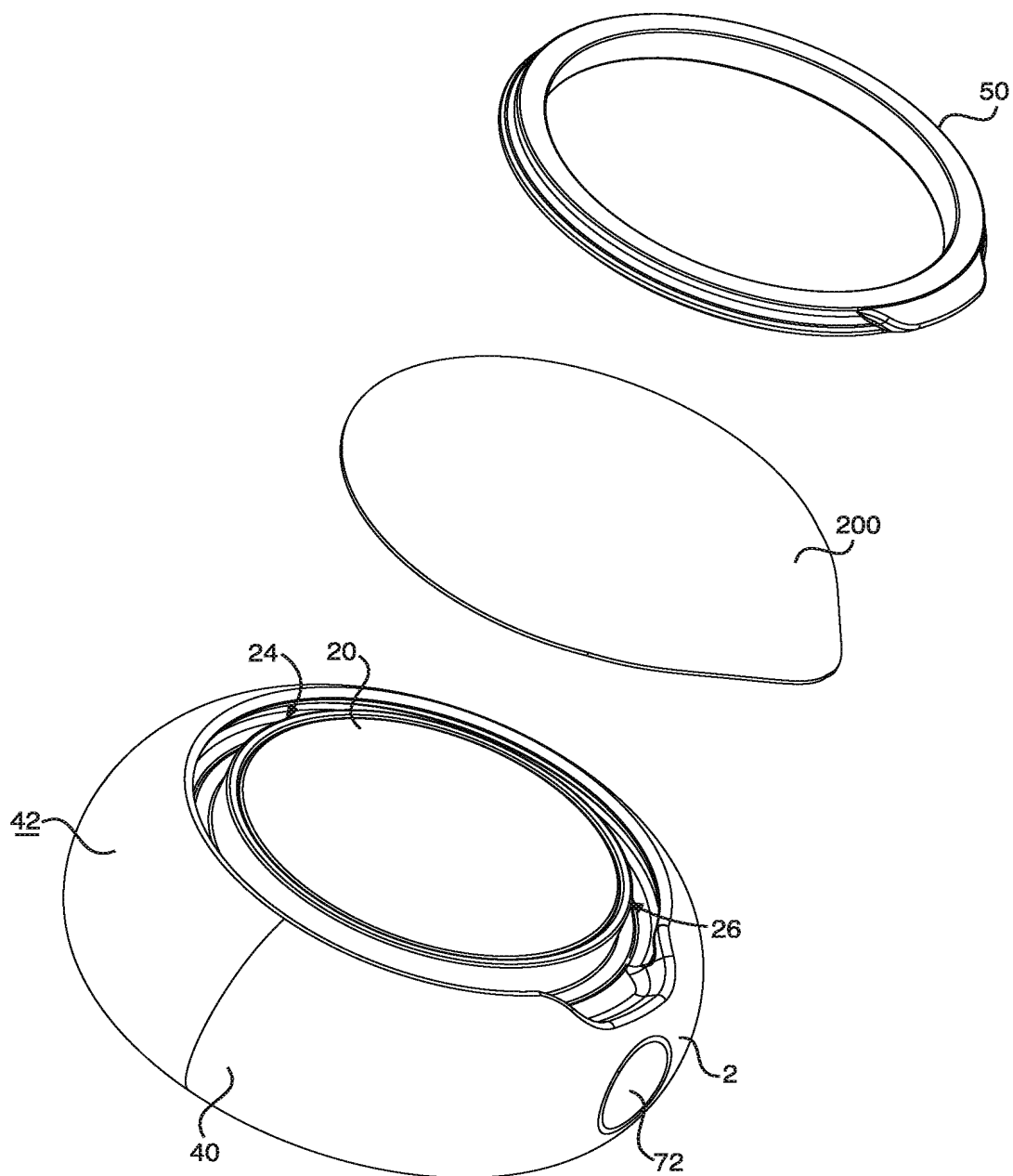


FIG. 12A

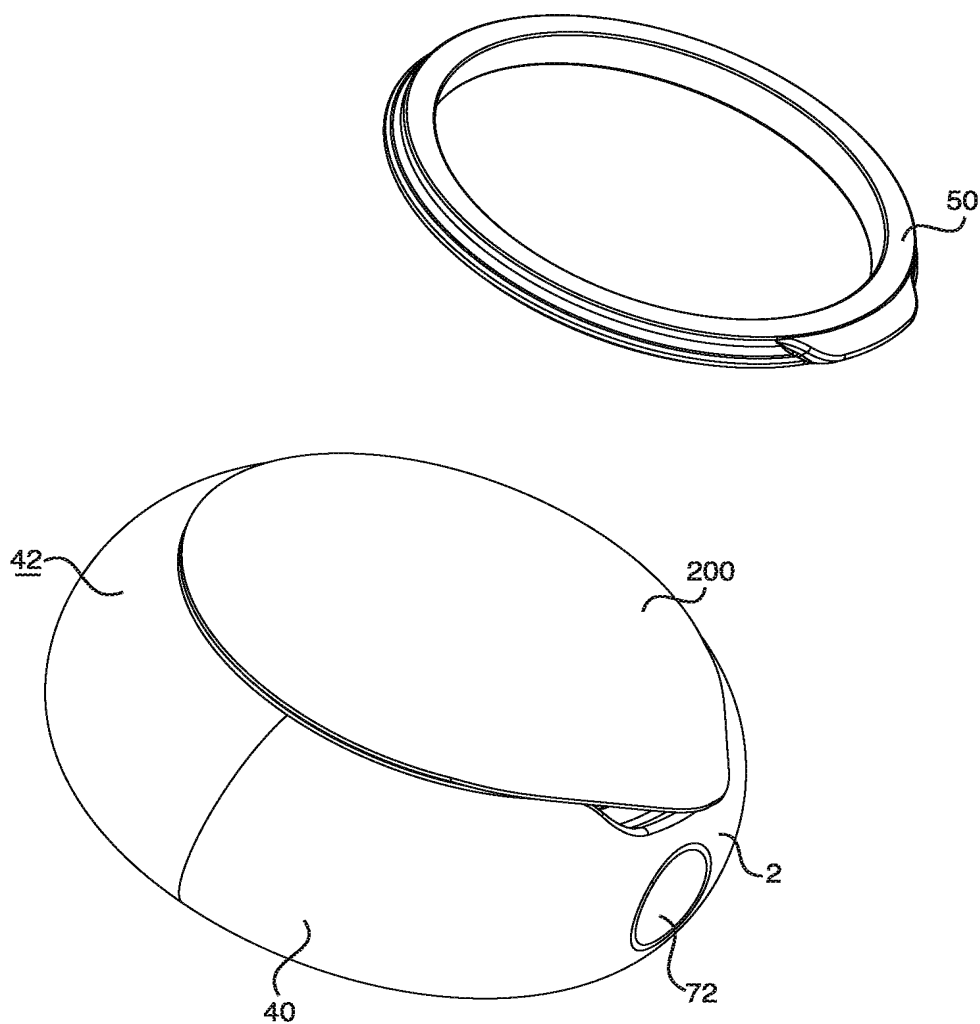


FIG. 12B

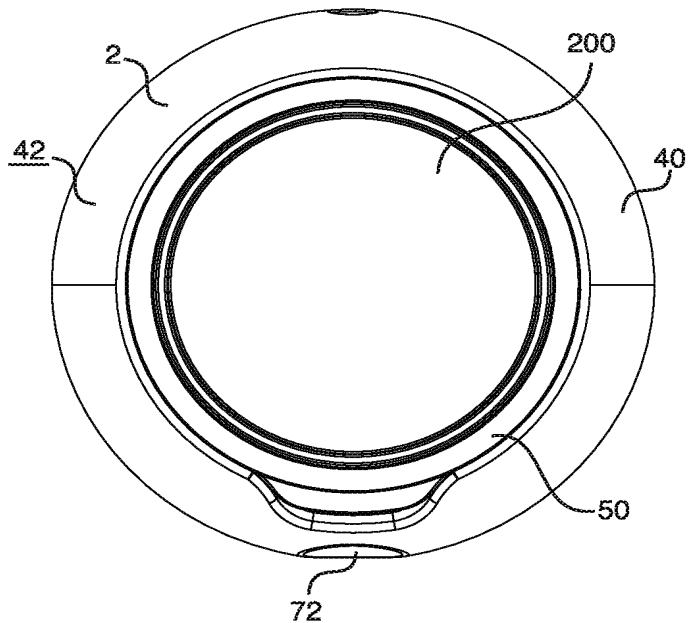


FIG. 12C

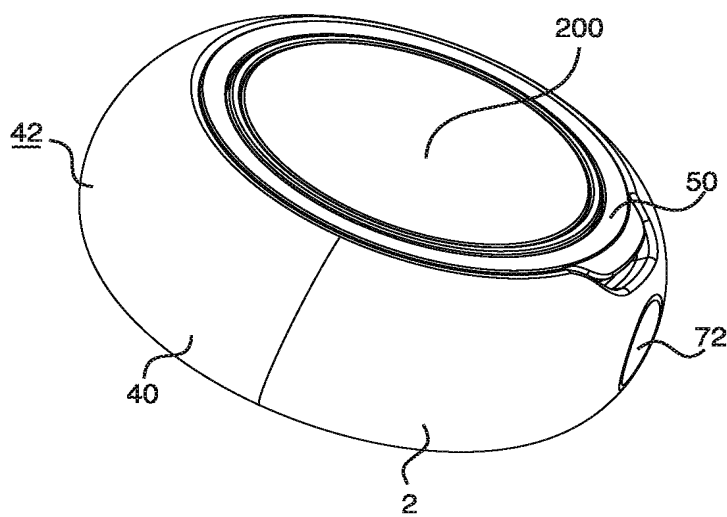


FIG. 12D

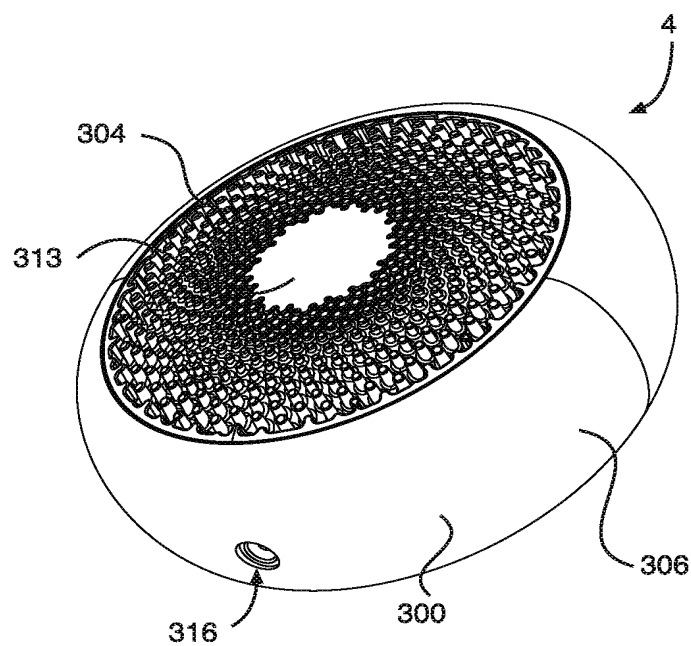


FIG. 13

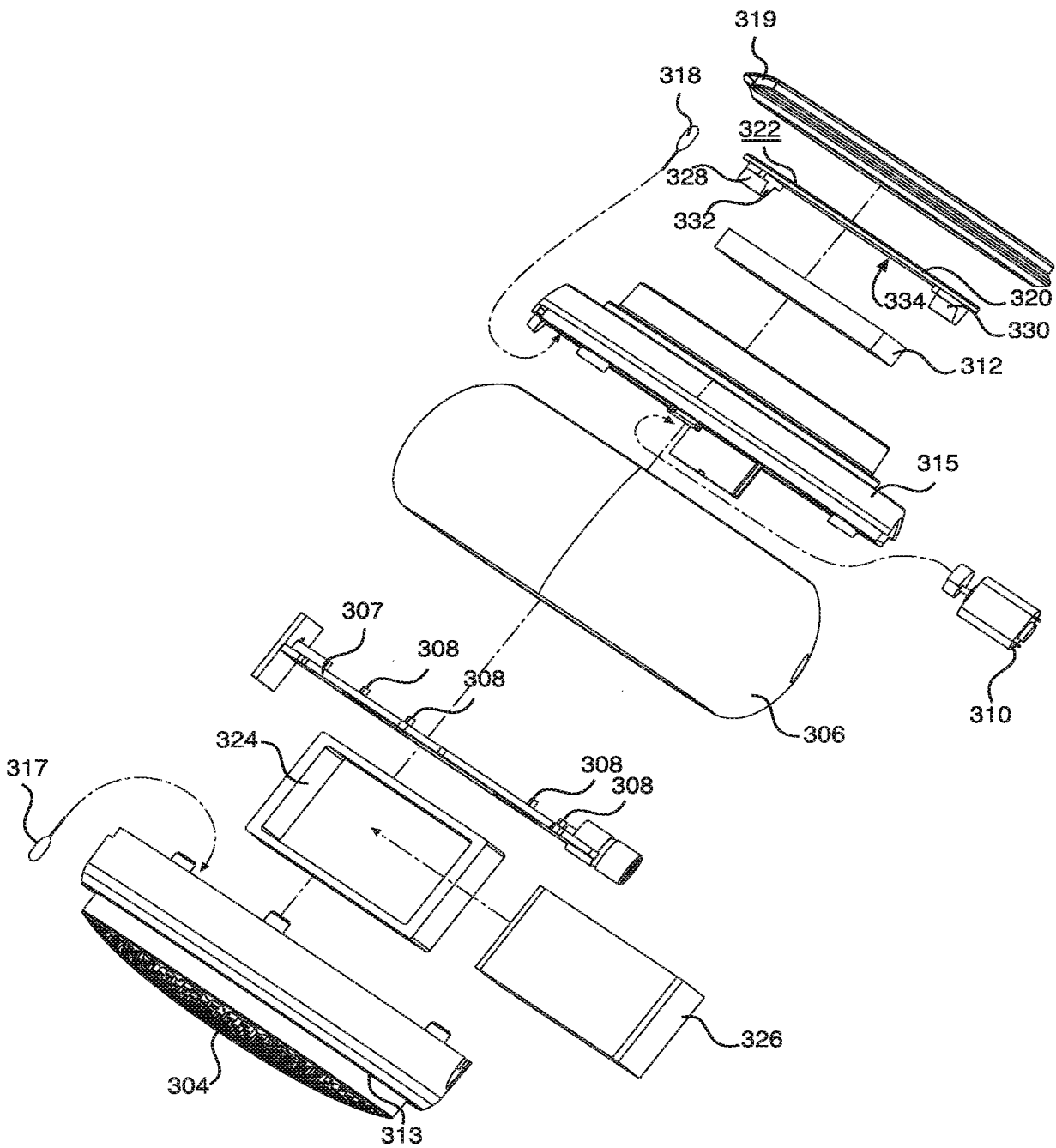


FIG. 14

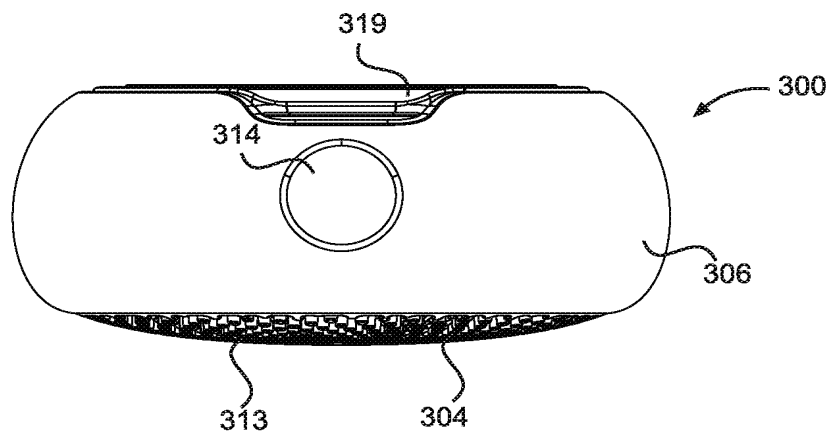


FIG. 15

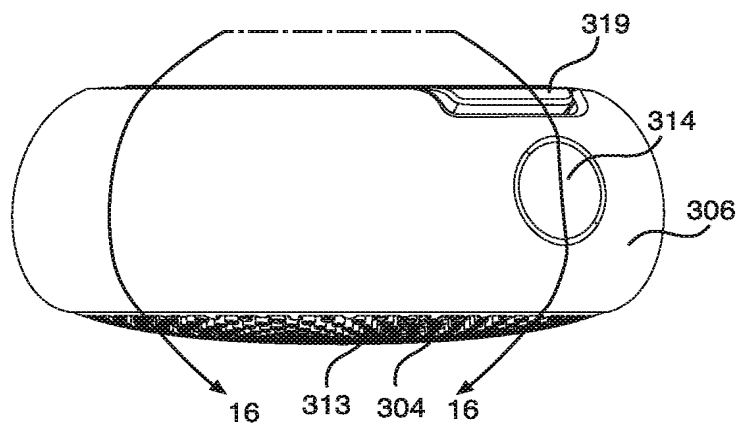


FIG. 15A

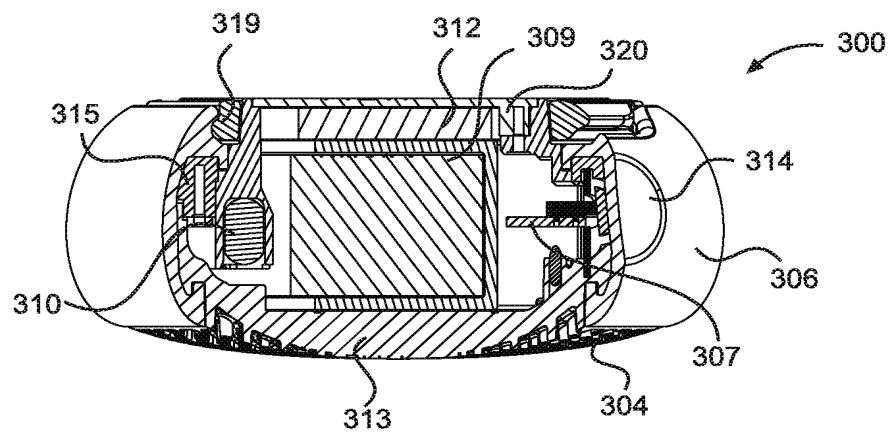


FIG. 16

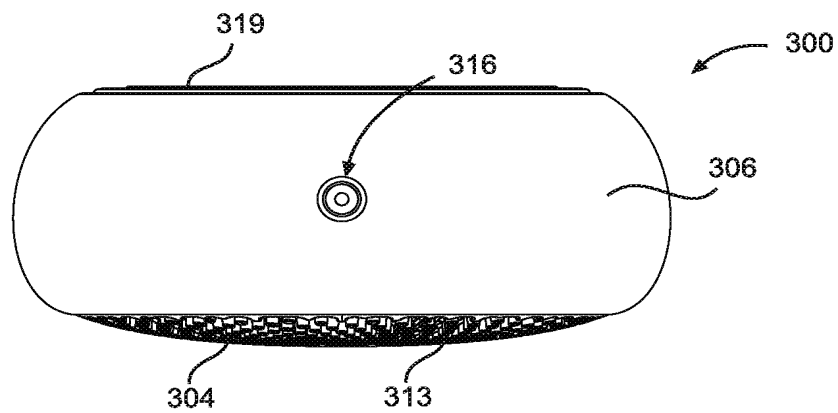


FIG. 17

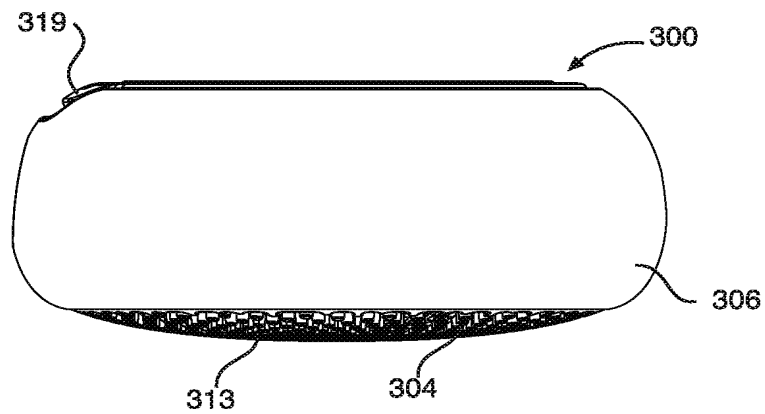


FIG. 18

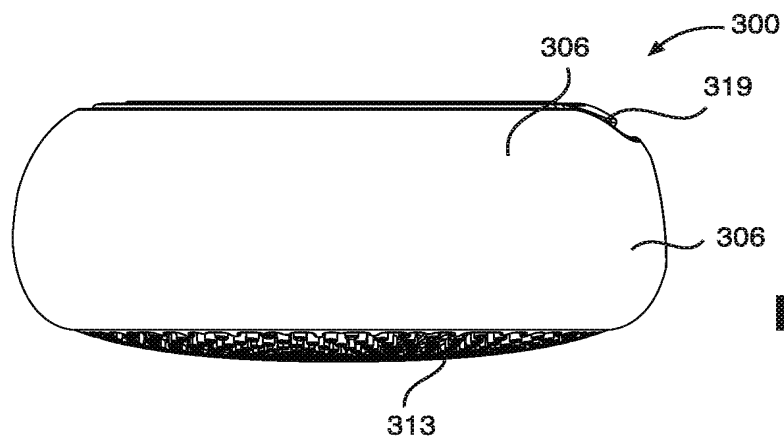


FIG. 19

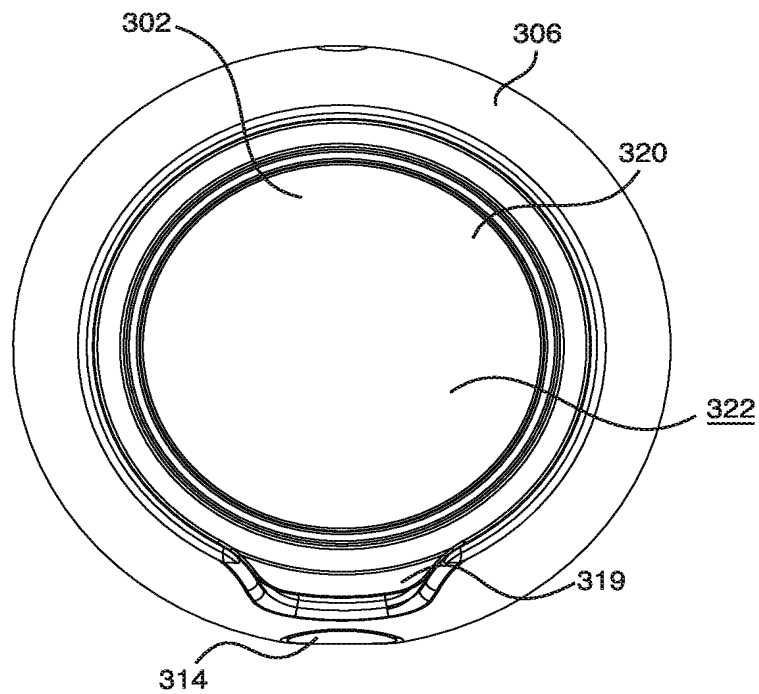


FIG. 20

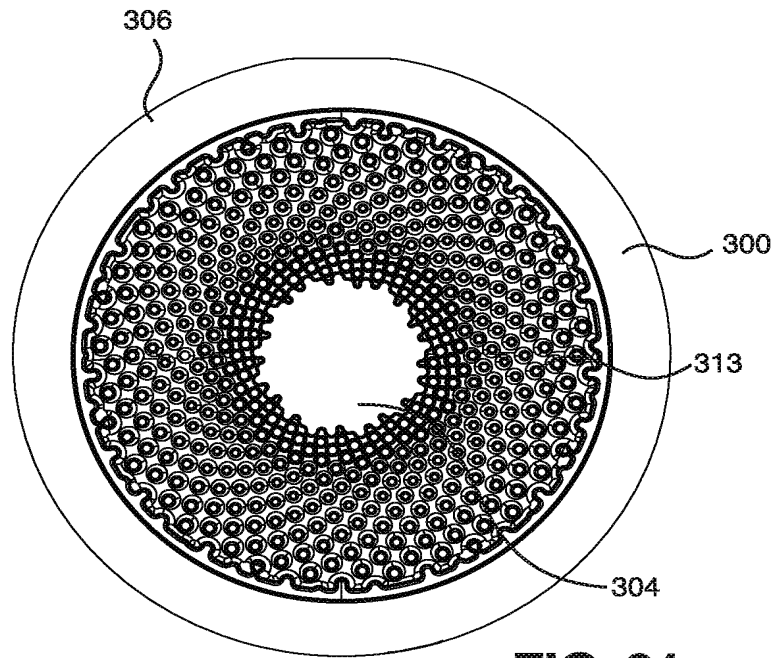


FIG. 21

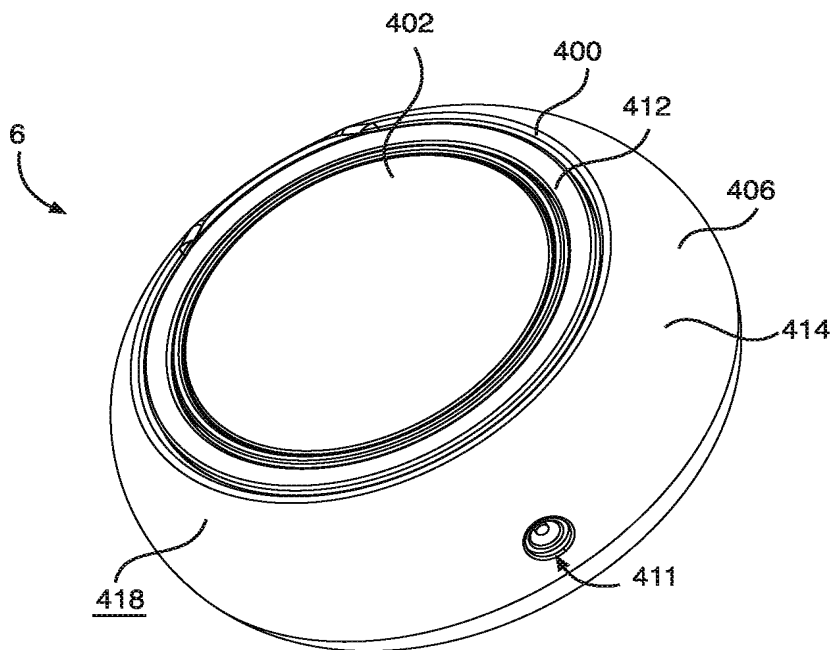


FIG. 22

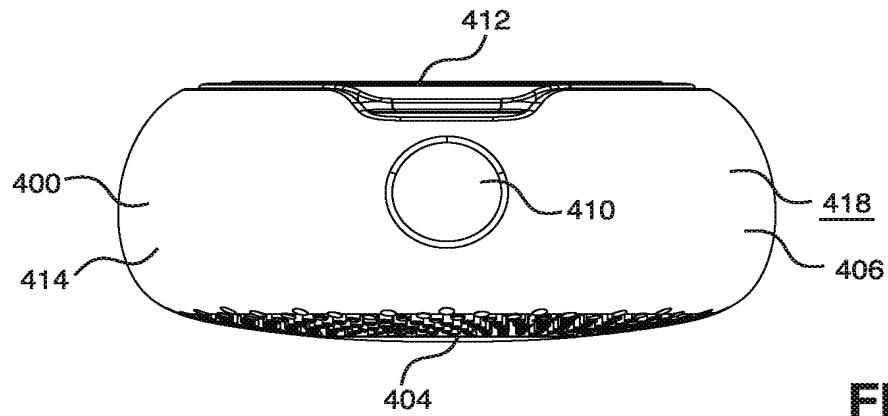


FIG. 23

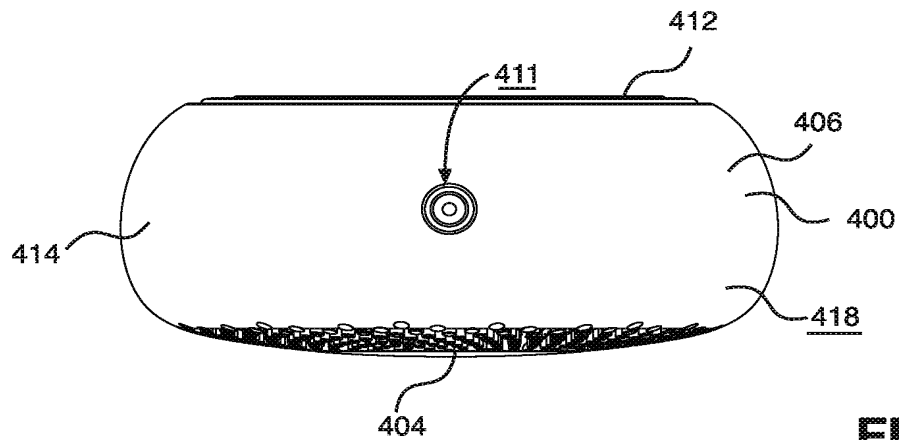


FIG. 24

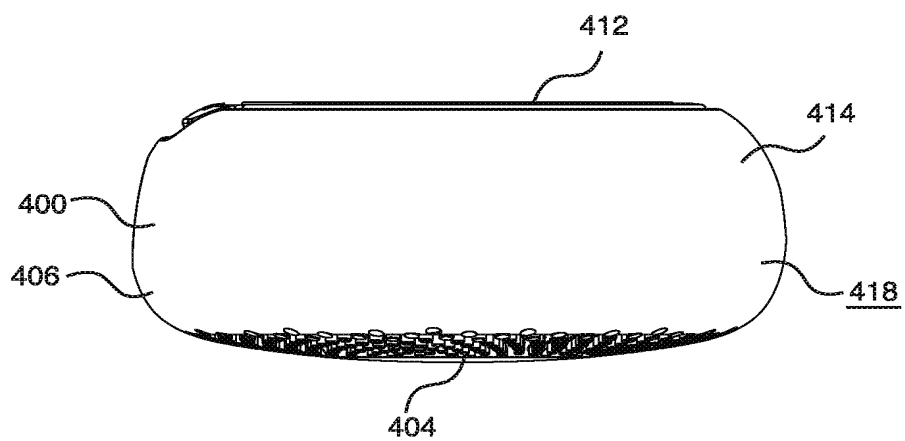


FIG. 25

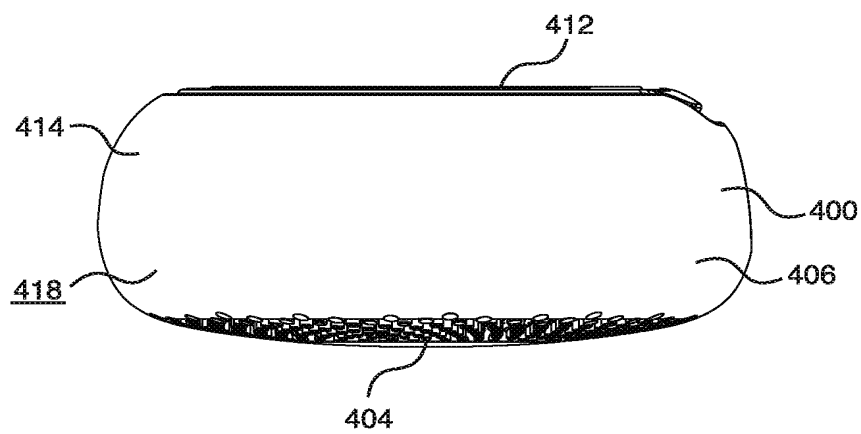
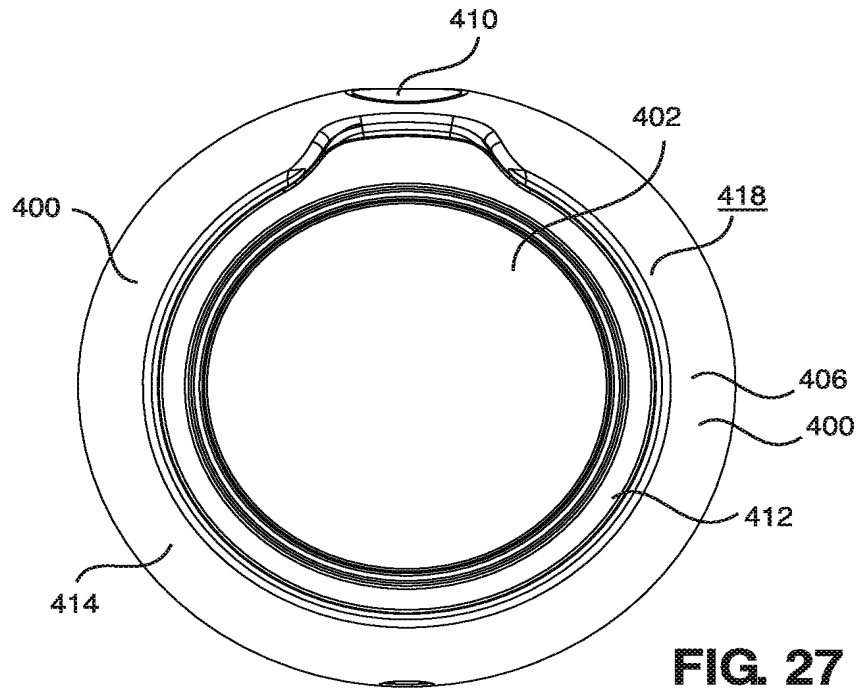
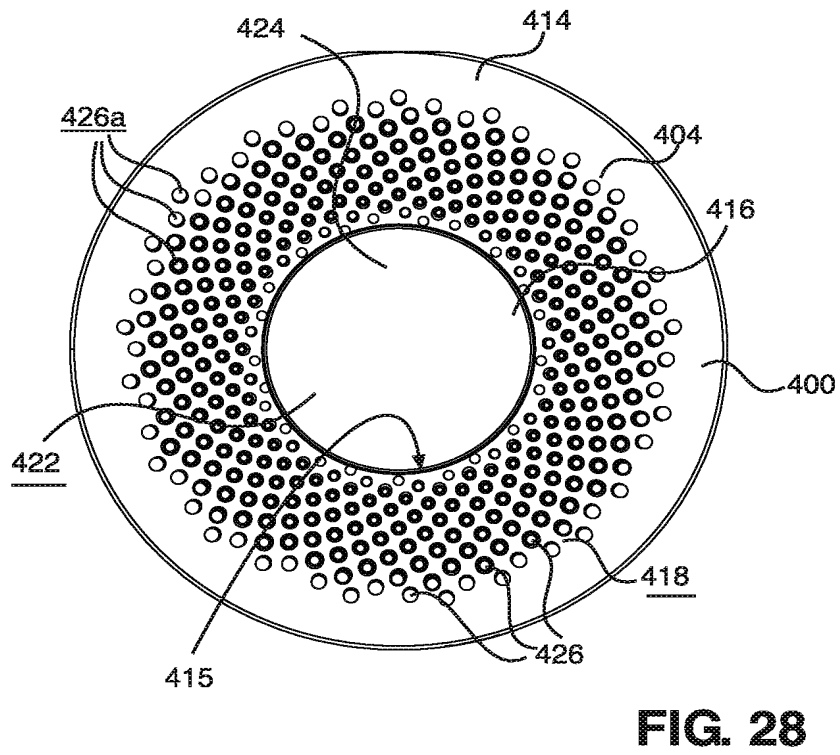
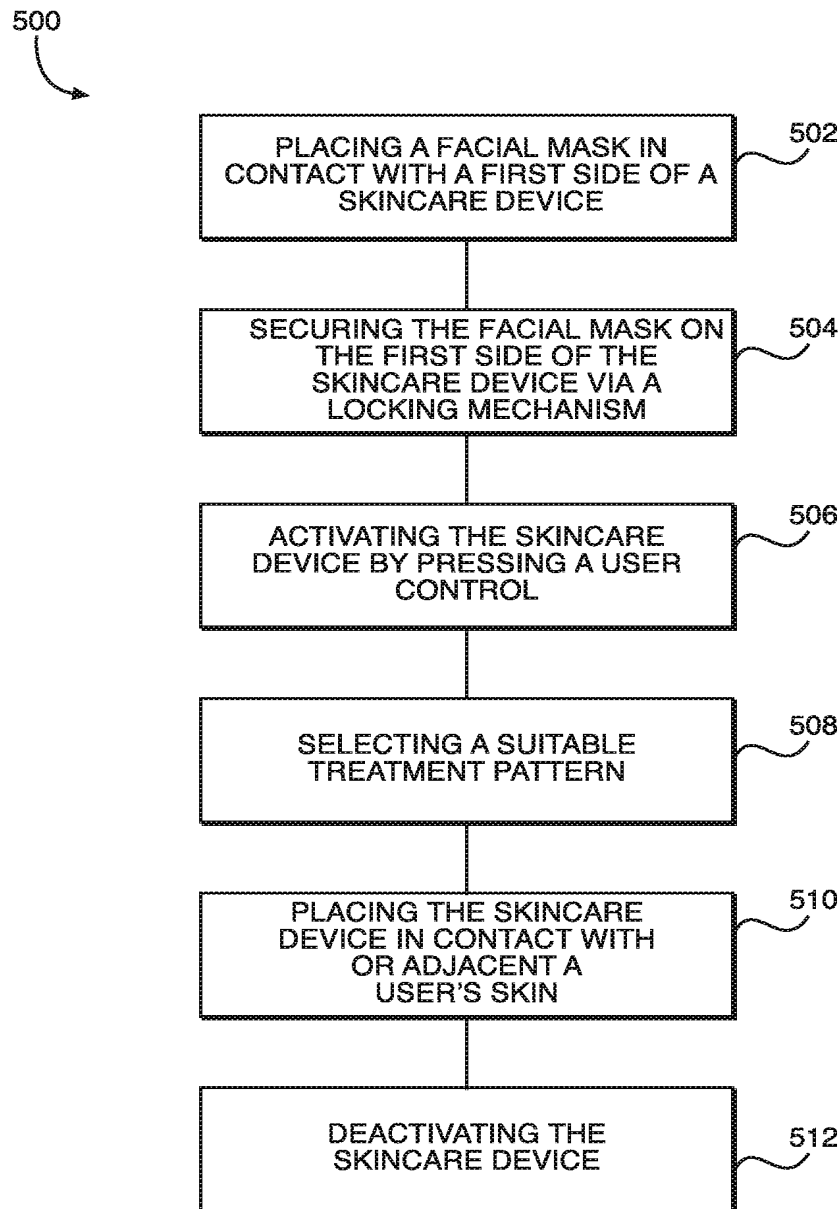
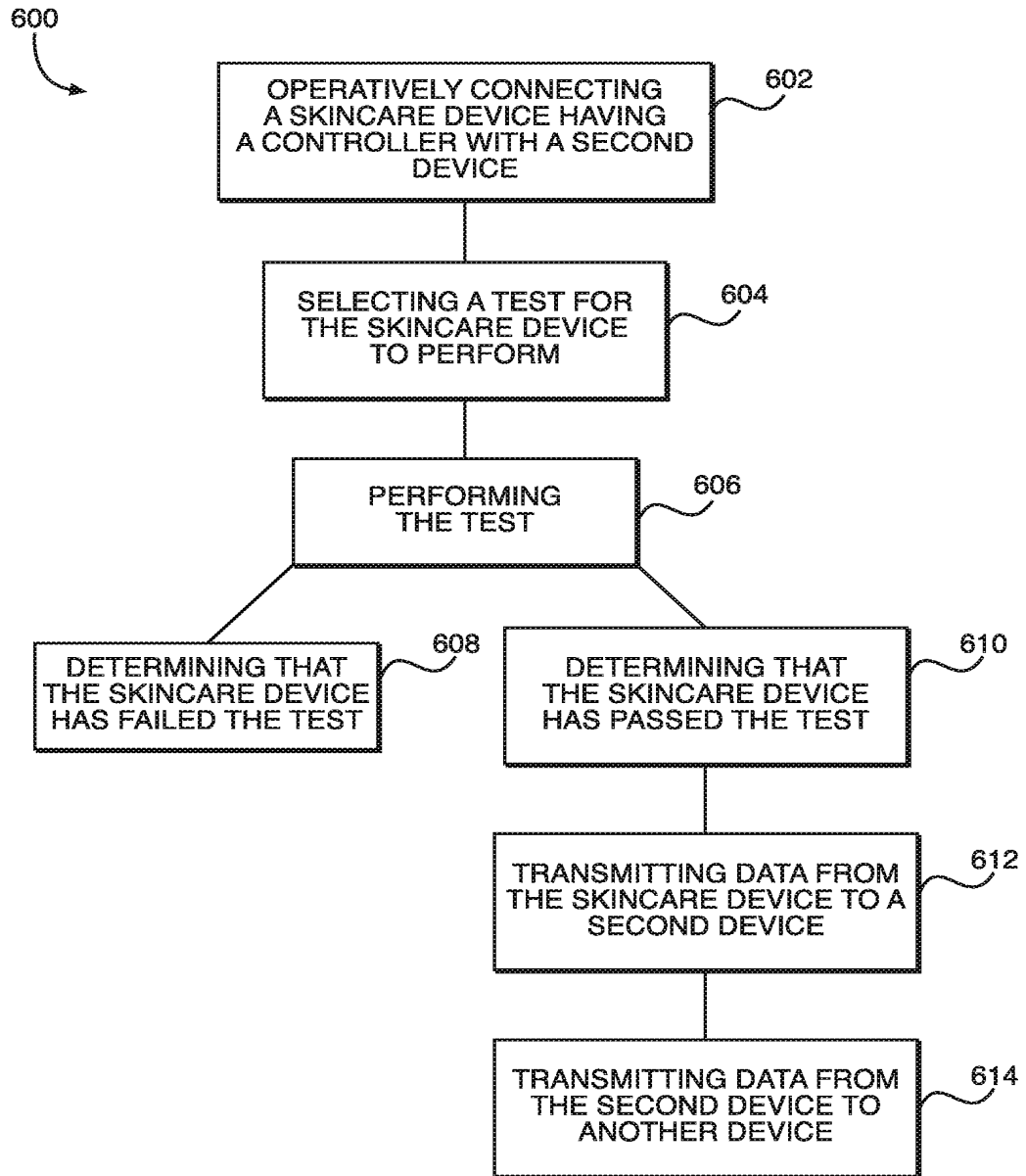


FIG. 26



**FIG. 29**

**FIG. 30**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2018/001427

A. CLASSIFICATION OF SUBJECT MATTER

A61H 23/02(2006.01)i; A61N 5/06(2006.01)i; A61F 7/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61H; A61N; A61F

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

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

VEN, CNABS, PATENTICS, CNTXT, WOTXT, USTXT, EPTXT, ISI WEB OF KNOWLEDGE, CNKI: PHILIP SADIC, mask, heat, skin, temperature, therm+, light, led?, phototherapy, colo?r, fac+, skincare, vibrat+, pulsation?, beauty instrument

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 20130109835 A (NSP) 08 October 2013 (2013-10-08) description, paragraphs 6, 1-12 and figures 1-2	1-7, 12-13
X	CN 201085727 Y (XIAMEN XINGXING CRAFTWORK CO. LTD.) 16 July 2008 (2008-07-16) example 2 and figures 4-6	1-7, 12-13
A	CN 105126257 A (SUZHOU SEVEN ELECTRONIC TECHNOLOGY CO.) 09 December 2015 (2015-12-09) the whole document	1-20
A	CN 205758949 U (MIDEA GROUP CO. LTD.) 07 December 2016 (2016-12-07) the whole document	1-20
A	CN 206621528 U (YISIXIU BEAUTY TECHNOLOGY SUZHOU CO. LTD.) 10 November 2017 (2017-11-10) the whole document	1-20
A	CN 206167649 U (SHENZHEN XINHANGXIANG TECHNOLOGY CO. LTD.) 17 May 2017 (2017-05-17) the whole document	1-20

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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“&” document member of the same patent family

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International application No.

PCT/IB2018/001427

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 20170108530 A (LEE, Y.S.) 27 September 2017 (2017-09-27) the whole document	1-20

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
KR	20130109835	A	08 October 2013	KR	101367893	B1	27 February 2014
CN	201085727	Y	16 July 2008	None			
CN	105126257	A	09 December 2015	CN	105126257	B	08 August 2017
CN	205758949	U	07 December 2016	None			
CN	206621528	U	10 November 2017	None			
CN	206167649	U	17 May 2017	None			
KR	20170108530	A	27 September 2017	None			

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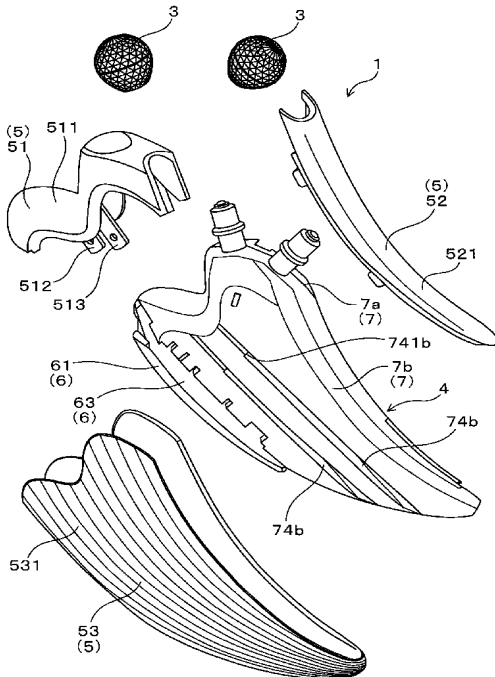
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(54) Title: COSMETIC DEVICE

(54) 発明の名称: 美容器



(57) Abstract: Provided is a cosmetic device that facilitates repair operations. This cosmetic device (1) comprises: a core part (4) provided with a power unit (41) for generating a current for improving the skin; and a shell part (5) detachably attached to the core part (4) and covering the core part (4). The shell part (5) comprises: first electrodes (511, 521) which are electrically connected to the power unit (41) and are pressed against the skin and moved to provide a massage; and a second electrode (531) which is electrically connected to the power unit (41) so as to be capable of forming a ring-shaped current path including the power unit (41) and the first electrodes (511, 521).

(57) 要約: 修理作業を容易に行うことができる美容器を提供する。美容器 (1) は、肌の美容のための電流を発生する電源部 (41) を備えたコア部 (4) と、コア部 (4) に着脱可能に取り付けられ、コア部 (4) を覆うシェル部 (5) と、を有している。シェル部 (5) は、電源部 (41) に電氣的に接続され、肌に押し当てながら移動させてマッサージを施すための第1電極 (511, 521) と、電源部 (41) と第1電極 (511, 521) を含む環状の電流経路を形成することができるようにして電源部 (41) に電氣的に接続された第2電極 (531) と、を有している。

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ZW), ユーラシア (AM, AZ, BY, KG, KZ, RU, TJ, TM), ヨーロッパ (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

添付公開書類：

一 国際調査報告（条約第21条(3)）

明 細 書

発明の名称：美容器

技術分野

[0001] 本発明は、美容器に関する。

背景技術

[0002] 肌の美容のためのマッサージ方法として、ヘラやレンゲ等の縁を肌に摺動させることにより血流やリンパの流れを促進し、肌の新陳代謝を高める「かっさ」と呼ばれる方法が知られている。この種のマッサージ方法には、「かっさ板」と呼ばれる板状の美容器が使用されることがある。

[0003] 近年では、かっさ板の表面に電極を設け、かっさと同時に肌に微弱な電流を流すことができる美容器が提案されている。例えば、特許文献1には、本体と、前記本体の把持可能な部分に設けられた第1電極と、前記本体の一縁部に位置して凹状に湾曲した部分を有する第2電極と、を備え、前記第1電極及び前記第2電極は人体を介して電流を流すことが可能な外部回路を形成できるように構成されている美容器が記載されている。この美容器において、第1電極は本体の側面に、第2電極は本体の縁部にそれぞれ固定されている。また、本体の縁部には、更に、第3電極が設けられている。

先行技術文献

特許文献

[0004] 特許文献1：国際公開WO2014／208329号

発明の概要

発明が解決しようとする課題

[0005] 特許文献1の美容器の外表面は、例えば、使用中の落下等の種々の理由によって損傷を受けることがある。しかし、特許文献1の美容器を用いてかっさを行う場合には、第1電極を手で把持して第2電極または第3電極を肌に押し当てながら移動させる必要がある。第2電極及び第3電極といった肌に接触させる部分が損傷を受けた場合、これらの電極が損傷したままかっさを

行くと、肌へ不要なダメージを与えるおそれがある。

[0006] また、前述した第2電極及び第3電極に限らず、本体の外表面が損傷を受けた場合には、本体を把持する手等に要なダメージを与えるおそれがある。更に、本体の外表面が損傷していると、美容器の美観が損なわれるおそれもある。それ故、この種の美容器においては、電極を含めた本体の外表面の損傷は、たとえ小さな傷であってもない方がよい。

[0007] しかし、特許文献1の美容器において、第1電極や第2電極等の損傷を受けた部品を交換するためには本体を分解する必要があり、美容器の修理作業が煩雑である。

[0008] 本発明は、かかる背景に鑑みてなされたものであり、修理作業を容易に行うことができる美容器を提供しようとするものである。

課題を解決するための手段

[0009] 本発明の一態様は、肌の美容のための電流を発生する電源部を備えたコア部と、

前記コア部に着脱可能に取り付けられ、前記コア部を覆うシェル部と、を有し、

前記シェル部は、

前記電源部に電氣的に接続され、肌に押し当てながら移動させてマッサージを施すための第1電極と、

前記電源部と前記第1電極と人体とを含む環状の電流経路を形成することができるようにして前記電源部に電氣的に接続された第2電極と、を有している、

美容器にある。

発明の効果

[0010] 前記美容器は、電源部を備えたコア部と、コア部に着脱可能に取り付けられたシェル部と、を有している。また、シェル部は、第1電極と第2電極とを有している。そのため、何らかの理由で第1電極や第2電極が損傷した場合に、シェル部を交換するという単純な作業により、美容器を容易に修復す

ることができる。

[0011] また、前記美容器においては、シェル部をコア部から取り外した後、コア部を交換することもできる。そのため、例えば、美容器の外表面にコア部が露出している場合において、当該露出部分が損傷を受けた場合や、電源部に故障が発生した場合などに、コア部を交換するという単純な作業により、美容器を容易に修復することができる。

[0012] このように、前記美容器は、シェル部やコア部に損傷が生じた場合に、修理作業を容易に行うことができる。

図面の簡単な説明

[0013] [図1]実施例における、美容器の斜視図である。

[図2]実施例における、美容器の正面図である。

[図3]実施例の美容器における、凸状部及び凹状部の範囲を示す正面図である。

[図4]図3における、第2凸状部の拡大図である。

[図5]実施例における、美容器の上面図である。

[図6]実施例における、美容器の下面図である。

[図7]実施例における、美容器の右側面図である。

[図8]実施例における、美容器の左側面図である。

[図9]図1における、回転体を取り外した状態の第1頂部の拡大斜視図である。

[図10]図2のX-X線矢視断面における、隆起部周辺の拡大図である。

[図11]図5のXI-XI線矢視断面における、回転体周辺の拡大図である。

[図12]図5のXI-XI線矢視断面における、電源部周辺の拡大図である。

[図13]図12のXIII-XIII線一部矢視断面図である。

[図14]図13における第1端子収容空間及び連通口の拡大図である。

[図15]実施例の美容器における、シェル部の分解斜視図である。

[図16]実施例の美容器における、コア部を第1コア片側から見た平面図である。

[図17]図16において第1コア片を取り除いた状態のコア部の平面図である。

[図18]実施例の美容器における、通電経路を示す説明図である。

[図19]図18における、第2端子部の弾性片部周辺の拡大図である。

[図20]図18の図XX-XX線一部矢視断面図である。

[図21]実施例の美容器における、コア部の分解斜視図である。

[図22]実施例の美容器における、電源封止部の分解斜視図である。

[図23]実施例のコア本体部における、端子収容空間を示す斜視図である。

[図24]実施例のコア本体部における、第1開口及び第2開口を示す斜視図である。

[図25]実施例のコア本体部における、第3開口及び第4開口を示す斜視図である。

[図26]実施例の美容器における、コア本体部の下端の拡大斜視図である。

[図27]実施例の美容器における、第1コア片を厚み方向の外側から見た平面図である。

[図28]実施例の美容器における、第1コア片を厚み方向の内側から見た斜視図である。

[図29]図27におけるXXIX-XXIX線矢視断面図である。

[図30]実施例の美容器における、第2コア片を厚み方向の外側から見た平面図である。

[図31]実施例の美容器における、第2コア片を厚み方向の内側から見た斜視図である。

[図32]実施例の美容器における、第1シェル片の平面図である。

[図33]図32のXXXIII-XXXIII線矢視断面図である。

[図34]実施例の美容器における、第2シェル片の平面図である。

[図35]実施例の美容器における、第3シェル片の右側面図である。

[図36]図35のXXXVI-XXXVI線矢視断面図である。

[図37]図36のXXXVII-線XXXVII一部矢視断面図である。

[図38]実施例の美容器における、分配線部の斜視図である。

発明を実施するための形態

- [0014] 前記美容器は、種々の形態を採りうる。例えば、美容器は、板状を呈していてもよいし、棒状や球状等の、板状以外の形状を呈していてもよい。かっさによるマッサージ効果をより高める観点からは、美容器は板状を呈していることが好ましい。この場合には、板状形状の周縁部において肌をより強く押圧し、かっさによるマッサージ効果をより高めることができる。
- [0015] ここで、「板状」には、平板と、一般的な感覚として板と認められる程度に平板の少なくとも一部を湾曲してなる形状とが含まれる。例えば、板状形状の主面部、つまり、周縁部よりも内側の部分は、平坦であってもよいし、厚み方向に若干膨出し、または若干陥没していてもよい。また、当該部分の表面には、凹凸が設けられていてもよい。
- [0016] 前記美容器において、シェル部は、コア部の全体を覆っていてもよいし、コア部の一部を覆っていてもよい。また、シェル部は、単一の部品から構成されていてもよいし、複数の部品から構成されていてもよい。
- [0017] シェル部は、コア部に着脱可能に装着されている。シェル部が単一の部品から構成されている場合には、シェル部は、コア部に直接装着されている。シェル部が複数の部品から構成されている場合には、シェル部の各部品は、コア部に直接装着されていてもよいし、シェル部の他の部品を介してコア部に装着されていてもよい。また、シェル部の装着方法としては、例えば、スナップフィット、ボルト等の締結部材を介した締結等の種々の方法を採用することができる。
- [0018] 第1電極及び第2電極は、シェル部の表面に露出するようにして配置されている。第1電極及び第2電極は、例えば、第2電極を手で把持し、第1電極を肌に押し当てながら移動させることにより、第1電極、第2電極、電源部及び人体を含む環状の電流経路を形成することができる。この環状の電流経路に微弱な電流を流すことにより、第1電極によるマッサージの効果と、微弱な電流による効果とを相乗的に作用させ、高い美容効果を得ることがで

きる。

[0019] 第1電極及び第2電極の配置は、前述した環状の電流経路を形成することができれば、特に限定されることはない。例えば、シェル部が単一の部品から構成されている場合には、シェル部の表面上において、第1電極と第2電極とを互いに離間して配置すればよい。また、シェル部が複数の部品から構成されている場合には、第1電極と第2電極とを同一の部品上に配置してもよいし、別々の部品上に配置してもよい。

[0020] また、第1電極の数は、1個であってもよいし、2個以上であってもよい。第1電極を2個以上設ける場合には、例えば、美容器の内部において、第1電極同士を電氣的に接続すればよい。同様に、第2電極の数も、1個であってもよいし、2個以上であってもよい。第2電極を2個以上設ける場合には、例えば、美容器の内部において、第2電極同士を電氣的に接続すればよい。

[0021] 電源部はコア部に設けられており、第1電極及び第2電極に電氣的に接続されている。電源部としては、例えば、一次電池、二次電池、太陽電池などを使用することができる。

[0022] 前記美容器は、例えば、美容器外部から電源部への液体の進入を防止するための防水構造を有していてもよい。この場合には、例えば浴室等の水濡れし得る環境において美容器を使用する場合に、電源部の水濡れによる故障を防止することができる。また、使用者がリラックスできる浴室等の環境において美容器を使用することにより、美容効果をより高めることが期待できる。

[0023] 前述した防水構造としては、例えば、コア部全体を液密に封止する構造を採用してもよい。また、コア部における電源部の近傍のみを液密に封止する構造を採用することもできる。例えば、コア部は、電源部を液密に封止する電源封止部と、電源封止部を保持するコア本体部と、を有し、

コア本体部は、電源部と第1電極とを接続する第1配線部と、電源部と第2電極とを接続する第2配線部と、を有していてもよい。

- [0024] この場合には、コア部全体を液密に封止する場合に比べて簡素な構造で電源部の防水を行うことができる。それ故、美容器の組み立て作業をより簡素化するとともに、製造コストをより低減することができる。
- [0025] コア本体部は、半割状の第1コア片と第2コア片を有しており、第1配線部及び第2配線部は、第1コア片と第2コア片との間に配置されていてもよい。この場合には、第1コア片と第2コア片との間に第1配線部及び第2配線部を挟み込むという簡素な作業により、第1配線部及び第2配線部をコア本体部に組み込むことができる。それ故、美容器の組み立て作業をより簡素化することができる。
- [0026] ここで、半割状とは、第1コア片と第2コア片とが概ね同一の形状となるようにコア本体部を分割した形状をいう。例えば、コア本体部が板状の場合には、コア本体部を厚み方向における中央位置またはその近傍において分割してなる各部を、第1コア片及び第2コア片とすることができる。
- [0027] コア部は、液体を流通可能に構成された水抜き孔が形成されており、シェル部は、水抜き孔と美容器の外部空間とを連通する連通口を有していてもよい。この場合には、コア部とシェル部との間に液体が浸入した場合に、水抜き孔によって当該液体を連通口へ導くことができる。そして、コア部内の液体を連通口から美容器の外部へ速やかに排出することができる。その結果、第1電極と第2電極とが液体を介して短絡している状態を速やかに解除し、第1電極、第2電極、電源部及び人体を含む環状の電流経路を回復させることができる。
- [0028] 前記美容器は、更に、シェル部の外方に配置された回転可能な回転体を有していてもよい。この場合、前記美容器は、シェル部を肌に押し当てながら移動させるかっさと、回転体を肌に押し当てながら転動させる方法との2種類のマッサージを実施することができる。
- [0029] これらのマッサージは、肌に与える刺激の強さが異なっている。そのため、前記美容器は、例えば目元や頬骨に沿う部分などの比較的皮膚の薄い部分に回転体によるマッサージを施して比較的柔らかな刺激を与え、頬やあご等

の比較的皮膚の厚い部分にかっさを施して比較的強い刺激を与える等、マッサージを施す部位に応じて適切な刺激を与えることができる。それ故、前記美容器に回転体を設けることにより、使い勝手をより向上させることができる。

[0030] 回転体はコア部に着脱可能に取り付けられており、かつ、電源部に電氣的に接続されていてもよい。この場合、回転体を肌に押し当てることによって肌に微弱な電流を流すことができる。そのため、回転体による物理的なマッサージ効果と微弱な電流による刺激とを相乗的に作用させ、より美容効果を高めることができる。また、回転体の表面が何らかの理由で損傷を受けた際に、回転体を交換するという単純な作業により美容器の修理を行うことができる。

実施例

[0031] 前記美容器の実施例を、図1～図38を用いて説明する。本例の美容器1は、図15に示すように、肌の美容のための電流を発生する電源部41（図18参照）を備えたコア部4と、コア部4に着脱可能に取り付けられ、コア部4を覆うシェル部5と、を有している。シェル部5は、電源部41に電氣的に接続された第1電極511、521と第2電極531と、を有している。第1電極511、521は、肌に押し当てながら移動させてマッサージを施すことができるように配置されている。第2電極531は、電源部41と、第1電極511、521と、人体とを含む環状の電流経路を形成することができるようにして電源部41に電氣的に接続されている。なお、図18においては、便宜上、コア部4の構造を簡略化して記載した。

[0032] 本例の美容器1は、図1～図8に示すように、板状を呈する本体2と、本体2を、その厚み方向から視た場合の周縁部21から外方に突出するように配置された2個の回転体3と、を有している。美容器1の本体2は、図2に示すように、正面視においてハート形を呈している。即ち、本体2は、正面視において略半円状を呈するように外方に膨出し、互いに並んで配置された2か所の頂部22、23と、頂部22、23から延設され、先端に近いほど

幅が狭くなっている尾部 2 4 とを有している。2 個の回転体 3 は、頂部 2 2、2 3 のうち一方の頂部 2 2 から外方に突出するように配置されている。

[0033] 以下においては、便宜上、2 か所の頂部 2 2、2 3 のうち回転体 3 が突出している頂部を第 1 頂部 2 2 といい、他方の頂部を第 2 頂部 2 3 という。また、2 か所の頂部 2 2、2 3 の並び方向を幅方向 Y といい、並び方向における第 1 頂部 2 2 側を右方 Y 1、第 2 頂部 2 3 側を左方 Y 2 という。また、幅方向 Y 及び厚み方向の両方に直交する方向を上下方向 Z といい、上下方向 Z における頂部 2 2、2 3 側を上方 Z 1、尾部 2 4 側を下方 Z 2 という。これらの美容器 1 の方向に関する記載は便宜上のものであり、美容器 1 を使用する際の向きとは何ら関係がない。

[0034] また、前述した「正面視」とは、図 2 に示す平面視、つまり、第 1 頂部 2 2 及び第 2 頂部 2 3 が上方、尾部 2 4 が下方、回転体 3 が右方にそれぞれ向いた状態で、本体 2 の投影面積が最大となるように視た平面視をいう。

[0035] 本体 2 は、図 2 に示すように、頂部 2 2、2 3 側から尾部 2 4 側に近づくにつれて、右方 Y 1、つまり、幅方向 Y における第 1 頂部 2 2 側へ湾曲している。

[0036] 本体 2 の外表面は、正面視における本体 2 の輪郭を含む周縁部 2 1 と、周縁部 2 1 に囲まれた 2 枚の主面部 2 0 と、を有している。本体 2 の周縁部 2 1 は、図 3 に示すように、正面視における輪郭が凸状に湾曲した 6 か所の凸状部 2 1 1（第 1 凸状部 2 1 1 a～第 6 凸状部 2 1 1 f）を有している。また、周縁部 2 1 は、正面視における輪郭が凹状に湾曲し凸状部 2 1 1 に連なる 2 か所の凹状部 2 1 2（第 1 凹状部 2 1 2 a 及び第 2 凹状部 2 1 2 b）を有している。なお、図 3 においては、便宜上、回転体 3 を簡略化して記載した。

[0037] 第 1 凸状部 2 1 1 a は、本体 2 の周縁部 2 1 における、第 1 頂部 2 2 の上端 2 2 1 よりも右方 Y 1 に配置されている。図 3 に示すように、正面視における第 1 凸状部 2 1 1 a の輪郭は、第 1 頂部 2 2 の上端 2 2 1 から下方 Z 2 に向かうにつれて右方 Y 1 へ膨らみ、その後、左方 Y 2 へ後退する凸状を呈

している。また、第1凸状部211aの外方には、2個の回転体3が配置されている。

[0038] 第1凸状部211aの下方Z2には、第1凹状部212aが連なっている。第1凹状部212aは、本体2の周縁部21における第1頂部22から尾部24までの範囲に亘って配置されている。正面視における第1凹状部212aの輪郭は、第1凸状部211aの下端213から下方Z2に向かうにつれて左方Y2へ後退し、その後、右方Y1へ膨らむ凹状を呈している。

[0039] また、第1凸状部211aの左方Y2には、第2凸状部211bが連なっている。第2凸状部211bは、本体2の周縁部21における第1頂部22の上端221よりも左方Y2に配置されている。正面視における第2凸状部211bの輪郭は、第1頂部22の上端221から第1頂部22と第2頂部23との間へ向かって延設されており、図3に示すように、第1頂部22の上端221と第2凸状部211bの左端214との中間部分がわずかに外方に膨らんだ凸状を呈している。また、第2凸状部211bの輪郭は、第1凸状部211aよりも大きな曲率半径を有している。なお、図3においては、第2凸状部211bが凸状に湾曲した輪郭を有していることを明確にするため、第1頂部22の上端221と第2凸状部211bの左端214とを結ぶ直線Lを破線にて表示した。また、図3においては、便宜上、回転体3を簡略化して記載した。

[0040] 図3に示すように、第2凸状部211bの左方Y2には、第2凹状部212bが連なっている。第2凹状部212bは、第1頂部22と第2頂部23との間に配置されている。正面視における第2凹状部212bの輪郭は、第2凸状部211bの左端214から左方Y2へ向かうにつれて下方Z2へ陥没し、その後上方Z1へ突出する凹状を呈している。

[0041] 第2凹状部212bの左方Y2には、第3凸状部211cが連なっている。第3凸状部211cは、第2凹状部212bの左端215から、第2頂部23の上端231までの範囲に亘って配置されている。正面視における第3凸状部211cの輪郭は、第2凹状部212bの左端215と第2頂部23

の上端 2 3 1 との中間部分が外方に膨らんだ凸状を呈している。

[0042] 第 3 凸状部 2 1 1 c の左方 Y 2 には、第 4 凸状部 2 1 1 d が連なっている。第 4 凸状部 2 1 1 d は、第 2 頂部 2 3 の上端 2 3 1 から後述する第 1 シェル片 5 1 と透光部 6 1 との合わせ目 5 0 4 までの範囲に亘って配置されている。正面視における第 3 凸状部 2 1 1 c の輪郭は、第 2 頂部 2 3 の上端 2 3 1 と合わせ目 5 0 4 との中間部分が外方に膨らんだ凸状を呈している。

[0043] 第 4 凸状部 2 1 1 d の下方 Z 2 には、第 5 凸状部 2 1 1 e が連なっている。第 5 凸状部 2 1 1 e は、第 1 シェル片 5 1 と透光部 6 1 との合わせ目 5 0 4 から後述する透光部 6 1 と第 3 シェル片 5 3 との合わせ目 5 0 5 までの範囲に亘って配置されている。正面視における第 5 凸状部 2 1 1 e の輪郭は、合わせ目 5 0 4 と合わせ目 5 0 5 との中間部分が外方（つまり、右方 Y 1）へ膨らんだ凸状を呈している。

[0044] 第 6 凸状部 2 1 1 f は、本体 2 の周縁部 2 1 の残部、即ち、透光部 6 1 と第 3 シェル片 5 3 との合わせ目 5 0 5 から尾部 2 4 の下端 2 4 1 を介して第 1 凹状部 2 1 2 a の下端 2 1 6 までの範囲に亘って配置されている。正面視における第 6 凸状部 2 1 1 f の輪郭は、尾部 2 4 の下端 2 4 1 を頂点とする凸状を呈している。

[0045] また、本体 2 は、図 2 に示すように、正面視における周縁部 2 1 の内側に主面部 2 0 を有している。主面部 2 0 は、尾部 2 4 から頂部 2 2、2 3 に向かって延設された複数の隆起部 2 0 0 を有している。複数の隆起部 2 0 0 は、正面視において、本体 2 の輪郭に沿って湾曲した曲線状を呈している。また、図 1 0 に示すように、各隆起部 2 0 0 は、幅方向 Y の断面において円弧状の輪郭を有している。

[0046] 図 1、図 3 及び図 1 5 に示すように、本体 2 の外表面には、シェル部 5 が露出している。本例のシェル部 5 は、3 個のシェル片 5 1 ～5 3 を有している。第 1 シェル片 5 1 は、本体 2 の上部に配置されている。図 3 に示すように、第 1 シェル片 5 1 には、第 1 凸状部 2 1 1 a における上方 Z 1 の部分、第 2 凹状部 2 1 2 b、第 2 凸状部 2 1 1 b、第 3 凸状部 2 1 1 c 及び第 4 凸

状部 2 1 1 d が含まれている。また、第 1 シェル片 5 1 の表面には、第 1 電極 5 1 1 が配置されている。

[0047] 図 3 に示すように、第 2 シェル片 5 2 は、本体 2 の右方 Y 1 の部分に配置されている。第 2 シェル片 5 2 には、第 1 凸状部 2 1 1 a における下方 Z 2 の部分と第 1 凹状部 2 1 2 a とが含まれている。また、第 2 シェル片 5 2 の表面には、第 1 電極 5 2 1 が配置されている。

[0048] また、図 3 に示すように、本体 2 の周縁部 2 1 における第 2 頂部 2 3 の下方 Z 2 には、後述する透光部 6 1 が配置されている。透光部 6 1 は、本体 2 の外表面に露出している。美容器 1 の外部から透光部 6 1 に入射した光は、電源部 4 1 としての太陽電池セル 4 1 1（図 1 2 参照）に照射される。また、透光部 6 1 には、第 5 凸状部 2 1 1 e が含まれている。

[0049] 図 3 及び図 1 5 に示すように、本体 2 の外表面における第 1 シェル片 5 1、第 2 シェル片 5 2 及び透光部 6 1 以外の部分は、第 3 シェル片 5 3 から構成されている。つまり、第 3 シェル片 5 3 には、厚み方向の両面に配置された 2 枚の主面部 2 0 と、第 6 凸状部 2 1 1 f と図 3 5 が含まれている。第 3 シェル片 5 3 の表面には、第 2 電極 5 3 1 が配置されている。

[0050] 図 2 に示すように、本体 2 における第 1 頂部 2 2 の外方、より具体的には第 1 凸状部 2 1 1 a の外方には、2 個の回転体 3 が設けられている。2 個の回転体 3 は、互いに間隔を開けて配置されている。各回転体 3 の回転中心 3 1 は、本体 2 の周縁部 2 1 から外方に突出した直線であり、図 3 に示すように、当該回転体 3 の重心 3 1 0 を貫くように配置されている。また、各回転体 3 の回転中心 3 1 は、本体 2 から外方へ向かうほど互いの間隔が広がるように配置されている。

[0051] 本例における回転体 3 同士の間隔、即ち、一方の回転体 3 の表面と他方の回転体 3 の表面との距離の最小値は、例えば 7 ～ 1 0 m m の範囲から適宜設定することができる。また、図 2 に示す回転体 3 の回転中心 3 1 同士のなす角 θ は、4 0 ～ 7 0 度の範囲から適宜設定することができる。本例の美容器 1 においては、回転体 3 同士の間隔は 8. 3 m m であり、回転体 3 の回転中

心 3 1 同士のなす角 θ は 5 3 度である。

[0052] また、図 7 に示すように、各回転体 3 における回転中心 3 1 は、本体 2 の厚み方向と直交する方向に延設されている。即ち、各回転体 3 における回転中心 3 1 の延設方向と、本体 2 の厚み方向とのなす角度は 9 0 度である。

[0053] 各回転体 3 は、図 1 及び図 2 に示すように、球状を呈している。本例の回転体 3 は、より具体的には、図 1 5 に示すように、涙滴形状における尖った部分を切除したような形状、つまり、先端側の半分が半球状を呈し、当該半球状部分から本体 2 側へ向かうにつれて、回転体 3 を完全な球状とした場合に比べて緩やかに外径が小さくなるような形状を有している。回転体 3 の直径、即ち、回転中心 3 1 と直交する方向における外径の最大値は、例えば、1 0 ～ 2 0 m m の範囲から適宜設定することができる。回転体 3 の表面は、多数の三角形状を呈する平面から構成されている。回転体 3 の表面には、後述する第 3 電極 3 1 1 が設けられている。

[0054] 次に、美容器 1 の内部構造をより詳細に説明する。図 1 5 に示すように、美容器 1 の本体 2 は、電源部 4 1 (図 1 2 参照) を備えたコア部 4 と、コア部 4 を覆うシェル部 5 と、を有している。図 2 に示すように、本体 2 の外表面には、シェル部 5 を構成する第 1 シェル片 5 1、第 2 シェル片 5 2 及び第 3 シェル片 5 3 と、透光部 6 1 (後述) とが露出している。図 1 に示すこれらの部品の合わせ目 5 0 1 ～ 5 0 5 は、液体が流通可能に構成されており、シェル部 5 の内側と美容器 1 の外部空間とを連通する連通口 5 0 としての機能を有している。

[0055] 本例のコア部 4 は、電源部 4 1 としての太陽電池セル 4 1 1 を有している。また、コア部 4 は、図 1 5 ～ 図 1 7 に示すように、電源封止部 6 と、電源封止部 6 を保持するコア本体部 7 と、を有している。電源封止部 6 は、図 1 2 に示すように、電源部 4 1 としての太陽電池セル 4 1 1 を液密に封止している。

[0056] 電源封止部 6 は、図 3、図 1 2 及び図 2 2 に示すように、本体 2 の周縁部 2 1 における第 2 頂部 2 3 の下方 Z 2 に露出した透光部 6 1 と、透光部 6 1

に覆われたセルホルダー 6 3 と、透光部 6 1 とセルホルダー 6 3 との間に介在するシール材 6 2 と、を有している。透光部 6 1 は、透明樹脂より構成されており、外光を透過させることができる。

[0057] 図 1 2 及び図 2 2 に示すように、透光部 6 1 の上方 Z 1 の端部 6 1 1 は、締結部材としてのネジ 6 1 2 を介してセルホルダー 6 3 の上方 Z 1 の端部 6 3 1 に締結されている。また、透光部 6 1 の下方 Z 2 の端部 6 1 3 は、締結部材としてのネジ 6 1 4 を介してセルホルダー 6 3 の下方 Z 2 の端部 6 3 4 に締結されている。

[0058] セルホルダー 6 3 は、上下方向 Z における中間部に、コア本体部 7 側へ突出した締結板 6 3 2、6 3 3 を有している。締結板 6 3 2、6 3 3 は、図 1 3 及び図 2 1 に示すように、コア本体部 7 における第 1 コア片 7 a と第 2 コア片 7 b (後述) との間に挟持されており、締結部材としてのネジ 6 3 5 (図 1 3 参照) によりコア本体部 7 に締結されている。

[0059] また、図 1 2 及び図 2 2 に示すように、セルホルダー 6 3 における、コア本体部 7 と対面する部分には、第 1 配線部 7 2 及び第 2 配線部 7 3 が取り付けられている。第 1 配線部 7 2 は締結部材としてのネジ 7 2 2 を介してセルホルダー 6 3 に締結されている。また、第 2 配線部 7 3 は第 1 配線部 7 2 よりも下方 Z 2 に配置されており、締結部材としてのネジ 7 3 2 を介してセルホルダー 6 3 に締結されている。

[0060] 図 1 2 及び図 2 2 に示すように、セルホルダー 6 3 には、電源部 4 1 としての太陽電池セル 4 1 1 が保持されている。太陽電池セル 4 1 1 は、透光部 6 1 から入射した光によって、微弱な電流を発生させることができる。

[0061] 図 1 8 及び図 2 2 に示すように、太陽電池セル 4 1 1 は、上下方向 Z の両端に端子 4 1 2、4 1 3 を有している。太陽電池セル 4 1 1 の上方 Z 1 に設けられた端子 4 1 2 は、図 1 2 及び図 1 8 に示すように、ネジ 7 2 2 の先端と接触している。これにより、太陽電池セル 4 1 1 が、上方 Z 1 の端子 4 1 2 及びネジ 7 2 2 を介して第 1 配線部 7 2 と電氣的に接続されている。

[0062] また、太陽電池セル 4 1 1 の下方 Z 2 に設けられた端子 4 1 3 は、図 1 2

及び図 18 に示すように、ネジ 732 の先端と接触している。これにより、太陽電池セル 411 が、下方 Z2 の端子 413 及びネジ 732 を介して第 2 配線部 73 と電氣的に接続されている。

[0063] 図 16 及び図 17 に示すように、コア本体部 7 は、正面視において、美容器 1 の外形と同様のハート形を呈している。図 21 に示すように、コア本体部 7 は、半割状の第 1 コア片 7a (図 27～図 29 参照) と第 2 コア片 7b (図 30 及び図 31 参照) とを有している。

[0064] より具体的には、第 1 コア片 7a 及び第 2 コア片 7b は、コア本体部 7 が厚み方向において概ね半分に分割された形状を有しており、第 1 コア片 7a の厚みは第 2 コア片 7b よりも薄くなっている。第 1 コア片 7a は、図 16 に示す締結部材としてのネジ 701a～701g を介して第 2 コア片 7b に締結されている。また、図 17 及び図 21 に示すように、第 1 コア片 7a と第 2 コア片 7b との間には、両者を接着する接着シート 702 が介在している。

[0065] 図 9 及び図 31 に示すように、第 2 コア片 7b は、第 1 頂部 22 に相当する部分から外方に突出した筒状部 703 を有している。筒状部 703 は円筒状を呈している。筒状部 703 には、後述するように回転体 3 を保持するためのシャフト 81 (図 11 参照) が挿通されている。

[0066] 図 23 に示すように、コア本体部 7 の左側面、つまりセルホルダー 63 と対面する部分には、右方 Y1 に陥没した 2 か所の端子収容部 711、712 が設けられている。図 18 及び図 24 に示すように、コア本体部 7 の上部、つまり第 1 シェル片 51 と対面する部分には、第 1 開口 704 と、第 1 開口 704 よりも回転体 3 側 (つまり、右方 Y1) に配置された第 2 開口 705 とが設けられている。また、図 18 及び図 25 に示すように、コア本体部 7 の右側面、つまり第 2 シェル片 52 と対面する部分には、第 3 開口 706 と、第 3 開口 706 の下方 Z2 に配置された第 4 開口 707 とが設けられている。

[0067] 2 か所の端子収容部 711、712 のうち上方 Z1 に配置された第 1 端子

収容部 7 1 1 とセルホルダー 6 3 との間には、図 1 2 に示すように、第 1 配線部 7 2（後述）を収容するための第 1 端子収容空間 S 1 が形成されている。第 1 端子収容空間 S 1 は、図 2 8 に示すように、コア本体部 7 の第 1 開口 7 0 4 に連通している。

[0068] 図 1 8 に示すように、第 1 端子収容空間 S 1 及び第 1 開口 7 0 4 には、第 1 配線部 7 2（後述）が収容されている。また、第 1 開口 7 0 4 内には、後述する第 1 シェル片 5 1 の第 1 端子片 5 1 2（図 3 2 参照）が挿入されている。第 1 端子片 5 1 2 は、図 1 8 及び図 2 0 に示すように、第 1 開口 7 0 4 内において第 1 配線部 7 2 と当接している。

[0069] 図 2 3 に示すように、第 2 端子収容部 7 1 2 は、第 1 端子収容部 7 1 1 よりも下方 Z 2 に配置されている。第 2 端子収容部 7 1 2 とセルホルダー 6 3 との間には、図 1 2 に示すように、第 2 配線部 7 3（後述）を収容するための第 2 端子収容空間 S 2 が形成されている。図 1 8 に示すように、第 2 端子収容空間 S 2 には第 2 配線部 7 3 が収容されている。

[0070] コア本体部 7 の上方 Z 1 に設けられた第 2 開口 7 0 5 は、図 2 8 に示すように第 3 開口 7 0 6 に連通している。図 1 8 に示すように、第 2 開口 7 0 5 及び第 3 開口 7 0 6 を含む分配線収容空間 7 5 0（図 2 8 参照）には、後述する分配線部 7 5 が収容されている。図 1 8 に示すように、第 2 開口 7 0 5 内には、第 1 シェル片 5 1 の第 2 端子片 5 1 3（図 3 2 参照）が挿入されている。第 2 端子片 5 1 3 は、第 2 開口 7 0 5 内において分配線部 7 5 に当接している。

[0071] また、コア本体部 7 は、第 1 端子収容空間 S 1 に連なった複数の切り欠き 7 1 3（7 1 3 a、7 1 3 b）と、第 2 端子収容空間 S 2 に連なった複数の切り欠き 7 1 4（7 1 4 a、7 1 4 b）と、を有している。具体的には、図 1 6、図 2 3 及び図 2 7 に示すように、第 1 コア片 7 a におけるセルホルダー 6 3 と対面する位置には、第 1 端子収容空間 S 1 に連なった 2 か所の切り欠き 7 1 3 a と、第 2 端子収容空間 S 2 に連なった 2 か所の切り欠き 7 1 4 a とが設けられている。これらの切り欠き 7 1 3 a、7 1 4 a は、上下方向

Zに間隔をあけて配置されている。

[0072] 図23及び図30に示すように、第2コア片7bにおけるセルホルダー63と対面する位置には、第1コア片7aと同様に、第1端子収容空間S1に連なった2か所の切り欠き713bと、第2端子収容空間S2に連なった2か所の切り欠き714bとが設けられている。これらの切り欠き713b、714bは、上下方向Zに間隔をあけて配置されている。

[0073] また、コア本体部7は、第3シェル片53と対面する部分に、上下方向Zの全長に亘って延設された溝74（74a、74b）を有している。具体的には、図27に示すように、第1コア片7aにおける第3シェル片53に対面する部分には、2本の溝74aが設けられている。図27及び図29に示すように、これらの溝74aは、上下方向Zの中間部に深さが段階的に変化する段部741aを有しており、段部741aの下方Z2における溝74aの深さは段部741aの上方Z1における溝74aの深さよりも深くなっている。

[0074] また、図29に示すように、段部741aには、後述する第3シェル片53のガイド突起533（図36及び図37参照）を挿入するためのガイド突起挿入孔742aが設けられている。図37に示すように、ガイド突起挿入孔742aには、ガイド突起533が下方Z2から挿入されている。

[0075] また、図30に示すように、第2コア片7bにおける第3シェル片53に対面する部分には、2本の溝74bが設けられている。溝74bは、上下方向Zにおける中間部に、深さが段階的に変化する段部741bを有している。第2コア片7bの溝74bの構成は、第1コア片7aの溝74aと同様である。

[0076] 即ち、溝74bは、上下方向Zにおける中間部に、深さが段階的に変化する段部741bを有している。図には示さないが、段部741bの下方Z2における溝74bの深さは段部741bの上方Z1における溝74bの深さよりも深くなっている。また、段部741bにはガイド突起挿入孔742bが設けられており、ガイド突起挿入孔742bには後述する第3シェル片5

3のガイド突起533が下方Z2から挿入されている。

[0077] 図14に一例を示すように、本例のコア本体部7に設けられた第1端子收容空間S1、第2端子收容空間S2及び切り欠き713（713a、713b）、714（714a、714b）は、液体を流通可能に構成されている。また、例えば図10に示すように、第1コア片7a及び第2コア片7bに設けられた溝74（74a、74b）は、液体を流通可能に構成されている。第1端子收容空間S1、第2端子收容空間S2、切り欠き713、714及び溝74は、美容器1の内部に浸入した液体を、連通口50を介して美容器1の外部へ排出する水抜き孔40としての機能を有している。

[0078] 例えば、8か所の切り欠き713、714の周辺には、第1シェル片51と第3シェル片53（後述）との合わせ目502（図13及び図14参照）や、第3シェル片53と透光部との間の合わせ目505（図1参照）が配置されている。切り欠き713、714は、これらの合わせ目502、503を含む、連通口50としてのシェル片同士の合わせ目501～503（図1参照）及びシェル部5と透光部61との合わせ目504、505を介して美容器1の外部空間に連通している。

[0079] そのため、本例の美容器1は、第1端子收容空間S1、第2端子收容空間S2及びこれらに連なる切り欠き713、714内に浸入した液体を、前述した連通口50から美容器1の外部へ排出することができる。このように、本例の美容器1は、コア本体部7に設けられた端子收容空間S1、S2及び切り欠き713、714を、水抜き孔40として機能させることができる。

[0080] また、図には示さないが、第1コア片7a及び第2コア片7bに設けられた溝74（74a、74b）の上端の周辺には、第1シェル片51と第3シェル片53との合わせ目502が配置されている。また、溝74の下端の周辺には、第2シェル片52と第3シェル片53との合わせ目503や、透光部61と第3シェル片53との合わせ目504が配置されている。

[0081] そのため、本例の美容器1は、コア本体部7の溝74に浸入した液体を、前述した合わせ目502～504を含む連通口50から美容器1の外部へ排

出することができる。このように、本例の美容器 1 は、コア本体部 7 に設けられた溝 7 4 を、水抜き孔 4 0 として機能させることができる。

[0082] 図 1 8 及び図 2 1 に示すように、第 1 コア片 7 a と第 2 コア片 7 b との間には、電源部 4 1 と第 1 電極 5 1 1 とを接続する第 1 配線部 7 2 (図 2 2 参照) と、電源部 4 1 と第 2 電極 5 3 1 とを接続する第 2 配線部 7 3 (図 2 2 参照) とが配置されている。第 1 配線部 7 2 の一端 7 2 1 は、図 1 2 及び図 1 8 に示すように第 1 端子収容空間 S 1 内に配置されており、締結部材としてのネジ 7 2 2 によりセルホルダー 6 3 に締結されている。また、ネジ 7 2 2 の先端は、セルホルダー 6 3 を貫通し、太陽電池セル 4 1 1 の上方 Z 1 の端子 4 1 2 に接触している。

[0083] 図 1 7 及び図 1 8 に示すように、第 1 配線部 7 2 の他端 7 2 3 は、第 1 コア片 7 a と第 2 コア片 7 b との間に形成された第 1 開口 7 0 4 内に配置されている。図 2 4 に示すように第 1 開口 7 0 4 はコア本体部 7 の上方 Z 1 に開口している。また、図 1 8 に示すように第 1 開口 7 0 4 内には第 1 シェル片 5 1 の第 1 端子片 5 1 2 (後述) が挿入されている。そして、図 2 0 に示すように、第 1 配線部 7 2 は、締結部材としてのネジ 7 0 1 a により第 1 端子片 5 1 2 に締結されている。第 1 シェル片 5 1 は、後述するように、その全面に第 1 電極 5 1 1 としての導電性めっき膜を有している。そのため、第 1 配線部 7 2 と第 1 端子片 5 1 2 とを締結することにより、第 1 電極 5 1 1 と電源部 4 1 とを第 1 配線部 7 2 を介して電氣的に接続することができる。

[0084] 図 1 2、図 1 8 及び図 2 1 に示すように、第 2 配線部 7 3 の一端 7 3 1 は、第 2 端子収容空間 S 2 内に配置されており、締結部材としてのネジ 7 3 2 によりセルホルダー 6 3 に締結されている。ネジ 7 3 2 の先端は、セルホルダー 6 3 を貫通し、太陽電池セル 4 1 1 の下方 Z 2 の端子 4 1 3 に接触している。

[0085] また、第 2 配線部 7 3 は、第 2 端子収容部 7 1 2 から下方 Z 2 に延設されている。図 1 9 及び図 2 2 に示すように、第 2 配線部 7 3 の先端には弾性片部 7 3 3 が設けられている。弾性片部 7 3 3 は、コア本体部 7 と第 3 シェル

片 5 3 との間に配置されており、第 3 シェル片 5 3 によって押圧されコア本体部 7 側に弾性変形している。そして、弾性片部 7 3 3 は、この弾性変形に対する反発力によって、図 1 9 に示すように第 3 シェル片 5 3 の内表面に押し付けられている。

[0086] 後述するように、第 3 シェル片 5 3 は、その全面に第 2 電極 5 3 1 としての導電性めっき膜を有している。そのため、第 3 シェル片 5 3 の内表面に弾性片部 7 3 3 を当接させることにより、第 2 配線部 7 3 を介して第 2 電極 5 3 1 と電源部 4 1 とを電氣的に接続することができる。また、本例のように、第 2 配線部 7 3 の先端に、コア本体部 7 の表面に露出した弾性片部 7 3 3 を設けることにより、シェル部 5 をコア部 4 に取り付けるという単純な作業によって第 2 電極 5 3 1 と第 2 配線部 7 3 とを電氣的に接続することができる。

[0087] 本例のコア本体部 7 は、更に、電源部 4 1 から流れる微弱な電流を第 2 シェル片 5 2 に設けられた第 1 電極 5 2 1 及び回転体 3 に設けられた第 3 電極 3 1 1 に分配する分配線部 7 5 (図 3 8 参照) を有している。図 1 7 及び図 2 1 に示すように、分配線部 7 5 は、第 1 コア片 7 a と第 2 コア片 7 b との間に形成された分配線収容空間 7 5 0 に配置されている。また、図 2 8 に示すように、分配線収容空間 7 5 0 には、コア本体部 7 の上方 Z 1、つまり、第 1 シェル片 5 1 側に開口した第 2 開口 7 0 5 と、幅方向 Y の右方 Y 1、つまり、第 2 シェル片 5 2 側に開口した第 3 開口 7 0 6 とが含まれている。

[0088] 図 1 8 に示すように、第 2 開口 7 0 5 内には、分配線部 7 5 の左方 Y 2 の端部 7 5 1 と、第 1 シェル片 5 1 の第 2 端子片 5 1 3 (後述) とが配置されている。また、第 3 開口 7 0 6 には、分配線部 7 5 の右方 Y 1 の端部 7 5 2 と、第 2 シェル片 5 2 の第 3 端子片 5 2 2 (後述) とが配置されている。

[0089] 分配線部 7 5 は、第 1 シェル片 5 1 の第 2 端子片 5 1 3 と、第 2 シェル片 5 2 の第 3 端子片 5 2 2 とのそれぞれに、締結部材としてのネジ 7 0 1 b、7 0 1 c (図 1 6 参照) を介して締結されている。第 2 シェル片 5 2 は、後述するように、その全面に第 1 電極 5 2 1 としての導電性めっき膜を有して

いる。そのため、分配線部 7 5 と第 2 端子片 5 1 3 とを締結することにより、第 2 シェル片 5 2 に設けられた第 1 電極 5 2 1 と電源部 4 1 とを分配線部 7 5 を介して電氣的に接続することができる。

[0090] また、図 1 8 及び図 3 8 に示すように、分配線部 7 5 は、回転体 3 を保持するためのシャフト 8 1（後述）を保持する 2 か所のシャフト保持凹部 7 5 3 と、2 か所のシャフト保持凹部 7 5 3 の間から外方に延設された締結部 7 5 4 と、を有している。2 か所のシャフト保持凹部 7 5 3 は、図 1 1 及び図 1 8 に示すように、シャフト 8 1 に当接している。

[0091] 図 1 1 に示すように、シャフト 8 1 は、後述するベアリング 8 2 及びベアリングホルダー 8 3 を介して、回転体 3 の全面に設けられた第 3 電極 3 1 1 としての導電性めっき膜に電氣的に接続されている。それ故、分配線部 7 5 とシャフト 8 1 とを当接させることにより、第 3 電極 3 1 1 と分配線部 7 5 とを電氣的に接続することができる。そして、図 1 8 に示すように、第 3 電極 3 1 1 と電源部 4 1 とを電氣的に接続することができる。

[0092] また、図 1 8 に示すように、締結部 7 5 4 は、締結部材としてのネジ 7 0 1 g（図 1 6 参照）を介してコア本体部 7 に締結されている。締結部 7 5 4 をコア本体部 7 に締結することにより、シャフト保持凹部 7 5 3 とシャフト 8 1 とを確実に当接させ、両者を電氣的に接続することができる。

[0093] また、図 2 5 に示すように、コア本体部 7 は、第 3 開口 7 0 6 の下方 Z 2 に、後述する第 2 シェル片 5 2 の締結片 5 2 3 を挿入するための第 4 開口 7 0 7 を有している。第 2 シェル片 5 2 の締結片 5 2 3 は、図 1 8 に示すように第 4 開口 7 0 7 内に挿入されている。締結片 5 2 3 は、締結部材としてのネジ 7 0 1 d（図 1 6 参照）を介してコア本体部 7 に締結されている。

[0094] 図 1 5 に示すように、コア本体部 7 における透光部 6 1 を除く部分、つまり、第 1 コア片 7 a、第 2 コア片 7 b 及びセルホルダー 6 3 は、シェル部 5 によって覆われている。本例のシェル部 5 は、第 1 シェル片 5 1 と、第 2 シェル片 5 2 と、第 3 シェル片 5 3 とを有している。第 1 シェル片 5 1 には、本体 2 の周縁部 2 1 における上方 Z 1 の部分、より具体的には、図 3 に示す

ように、第1凸状部211aから第4凸状部211dに亘る部分が含まれている。第1シェル片51の全面は、導電性めっき膜からなる第1電極511によって覆われている。

[0095] 図15及び図32に示すように、第1シェル片51は、下方Z2、つまり、コア本体部7側に突出した2本の端子片512、513を有している。2本の端子片512、513のうち左方Y2に配置された第1端子片512は、図18に示すようにコア本体部7の第1開口704に挿入されており、第1開口704内において第1配線部72に締結されている。これにより、第1シェル片51に設けられた第1電極511と第1配線部72とが電氣的に接続されている。

[0096] 2本の端子片512、513のうち右方Y1に配置された第2端子片513は、図18に示すようにコア本体部7における第2開口705に挿入されており、第2開口705内において分配線部75に締結されている。これにより、分配線部75と第1シェル片51に設けられた第1電極511とが電氣的に接続され、更には分配線部75と電源部41とが第1配線部72を介して電氣的に接続されている。

[0097] また、図33に示すように、第2端子片513は、厚み方向における第1シェル片51の中央に配置されており、第1端子片512は、図19及び図33に示すように、本体2の厚み方向において、第2端子片513よりも第1コア片7a側に偏った位置に配置されている。

[0098] 第2シェル片52には、本体2の周縁部21における右方Y1の部分、より具体的には、図3に示すように、第1凸状部211aにおける下方Z2の部分と第1凹状部212aが含まれている。第2シェル片52の全面は、導電性めっき膜からなる第1電極521によって覆われている。

[0099] 図15及び図34に示すように、第2シェル片52は、第1凹状部212aから左方Y2、つまり、コア本体部7側に突出した第3端子片522と締結片523とを有している。図18に示すように、第3端子片522は、コア本体部7における第3開口706に挿入されており、第3開口706内に

において分配線部 7 5 に締結されている。これにより、第 2 シェル片 5 2 の表面に設けられた第 1 電極 5 2 1 と分配線部 7 5 とが電氣的に接続され、更には第 1 電極 5 2 1 と電源部 4 1 とが第 1 シェル片 5 1 の表面に設けられた第 1 電極 5 1 1 及び第 1 配線部 7 2 を介して電氣的に接続されている。

[0100] 図 3 4 に示すように、締結片 5 2 3 は、第 3 端子片 5 2 2 の下方 Z 2 に配置されている。締結片 5 2 3 は、図 1 8 に示すように、コア本体部 7 における第 4 開口 7 0 7 内に挿入されており、第 4 開口 7 0 7 内において締結部材としてのネジ 7 0 1 d (図 1 6 参照) を介してコア本体部 7 に締結されている。

[0101] また、図 2 6 に示すように、第 2 シェル片 5 2 の下端には、切り欠き 5 2 4 が設けられている。切り欠き 5 2 4 は、第 2 シェル片 5 2 と第 3 シェル片 5 3 との合わせ目 5 0 3 に対面する位置に設けられており、液体を流通可能に構成されている。第 2 シェル片 5 2 の切り欠き 5 2 4 の周辺には、第 2 シェル片 5 2 と第 3 シェル片 5 3 との合わせ目 5 0 3 が配置されている。

[0102] そのため、切り欠き 5 2 5 は、前述した合わせ目 5 0 3 を含む連通口 5 0 を介して美容器 1 の外部空間に連通している。それ故、本例の美容器 1 は、第 2 シェル片 5 2 の切り欠き 5 2 4 内に浸入した液体を、連通口 5 0 から美容器 1 の外部へ排出することができる。このように、本例の美容器 1 は、第 2 シェル片 5 2 に設けられた切り欠き 5 2 4 を、水抜き孔 4 0 として機能させることができる。

[0103] 図 3 及び図 1 5 に示すように、第 3 シェル片 5 3 は、本体 2 の外表面における第 1 シェル片 5 1、第 2 シェル片 5 2 及び透光部 6 1 以外の部分を構成している。つまり、第 3 シェル片 5 3 には、2 枚の主面部 2 0 と、第 6 凸状部 2 1 1 f 分とが含まれている。第 3 シェル片 5 3 の全面は、導電性めっき膜からなる第 2 電極 5 3 1 から構成されている。

[0104] 図 3 5 及び図 3 6 に示すように、第 3 シェル片 5 3 は、コア本体部 7 側に突出し、上下方向 Z に延設された 4 本のガイド部 5 3 2 と、各ガイド部 5 3 2 の上端に設けられ、上方 Z 1 に突出したガイド突起 5 3 3 とを有している

。4本のガイド部532のうち2本のガイド部532は、第1コア片7aの溝74a（図27参照）内に配置されており、残る2本のガイド部532は、第2コア片7bの溝74b（図30参照）内に配置されている。

[0105] ガイド部532は、第3シェル片53をコア本体部7へ取り付けの際に、第3シェル片53を所定の位置に案内することができる。即ち、第3シェル片53をコア本体部7に取り付ける際に、図10に示すように、これらのガイド部532を溝74内に挿入しつつ第3シェル片53を上方Z1へ滑動させることにより、第3シェル片53を溝74に沿って案内し、所定の位置へ取り付けることができる。

[0106] 各ガイド部532のガイド突起533は、図37に示すように、溝74（74a、74b）の段部741a、741bに設けられたガイド突起挿入孔742a、742b（図29及び図30参照）内に挿入されている。ガイド突起533は、図37に示すように段部741a、741bにおいてコア本体部7と係合することにより、コア本体部7から離れる方向への第3シェル片53の変形、例えば、第3シェル片53の厚み方向外方への反り等を規制することができる。

[0107] また、図36に示すように、第3シェル片53は、コア本体部7側に突出した係合凹部534を有している。これらの係合凹部534は、第1コア片7a及び第2コア片7bに設けられた係合突起708（図27及び図30参照）と係合されている。これにより、第3シェル片53の上下方向Zへの変位を規制することができる。

[0108] シェル部5は、その外表面に開口した連通口50を有している。具体的には、本例のシェル部5においては、図1に示す、第1シェル片51と第2シェル片52との合わせ目501、第1シェル片51と第3シェル片53との合わせ目502、第2シェル片52と第3シェル片53との合わせ目503、第1シェル片51と透光部61との合わせ目504、第3シェル片53と透光部61との合わせ目505に、液体を流通可能な隙間が形成されている。それ故、合わせ目501～505は連通口50としての機能を有している。

- 。
- [0109] また、図9に示すように、シェル部5における第1凸状部211aを構成する部分には、2か所のシャフト挿入孔506が設けられている。シャフト挿入孔506には、コア本体部7の筒状部703が挿入されており、筒状部703とシャフト挿入孔506との間には、液体を流通可能な隙間が形成されている。それ故、シャフト挿入孔506は、連通口50としての機能を有している。
- [0110] 本例の美容器1において、2個の回転体3は、コア本体部7に設けられた回転体保持部8により、回転可能に保持されている。図11に示すように、各回転体保持部8は、コア本体部7に保持されコア本体部7の外方まで延設されたシャフト81と、シャフト81の先端部813を覆うように配置されたベアリングホルダー83と、ベアリングホルダー83とシャフト81との間に介在する2個のベアリング82（82a、82b）と、を有している。回転体3は、ベアリングホルダー83に取り付けられている。
- [0111] シャフト81は、ステンレス鋼から構成されており、導電性を有している。シャフト81は、コア本体部7における第1コア片7aと分配線部75との間に挟持された基端部811と、基端部811に連なりコア本体部7の筒状部703内に覆われた中間部812と、中間部812に連なりコア本体部7の外部に突出した先端部813と、を有している。
- [0112] シャフト81の先端部813には、2個のベアリング82（82a、82b）が間隔をあけて配置されている。ベアリング82は導電性を有する樹脂から構成されている。また、2個のベアリング82のうち先端側のベアリング82aは、Cリング821によってシャフト81からの抜け止めがなされている。
- [0113] 2個のベアリング82は、ベアリングホルダー83によってシャフト81に摺動可能に保持されている。ベアリングホルダー83は、導電性を有する樹脂からなり、筒状を呈している。
- [0114] また、ベアリングホルダー83には、回転体3が着脱可能に取り付けられ

ている。回転体 3 は、その外表面を構成する外皮部 301 と、外皮部 301 内に埋設された第 1 芯材 302 及び第 2 芯材 303 と、を有している。外皮部 301 の表面は、三角形状を呈する多数の平面から構成されており、これらの平面が全体として球状を呈するように互いに連なっている。第 1 芯材 302 は、本体 2 側に開口したカップ状を呈している。また、第 2 芯材 303 は環状を呈しており、第 1 芯材 302 に重ね合わされている。ベアリングホルダー 83 は、第 1 芯材 302 及び第 2 芯材 303 の内側に收容され、スナッフフィットによって着脱可能に取り付けられている。

[0115] 回転体 3 の表面に設けられた第 3 電極 311 は、導電性を有するベアリングホルダー 83、ベアリング 82 及びシャフト 81 を介して分配線部 75 に電氣的に接続され、更には第 1 シェル片 51 の表面に設けられた第 1 電極 511 及び第 1 配線部 72 を介して電源部 41 に電氣的に接続されている。

[0116] 本例の美容器 1 は、種々の態様で 사용할 ことができる。例えば、頬及び目元のリフトアップを行う場合には、本体 2 の第 1 凹状部 212a を法令線に沿って頬に押し当てるとともに、2 個の回転体 3 のうち下方 Z2 に配置された回転体 3（図 2 参照）を目元に押し当てる。そして、美容器 1 を頬に沿って押し当てながら左右に往復移動することにより、第 1 凹状部 212a を頬の膨らみに沿って摺動させると同時に当該回転体 3 を目元において転動させることができる。これにより、比較的皮膚の厚い頬にかっさを施して血流を促進させることができる。更に、かっさと同時に回転体 3 を比較的皮膚の薄い目元に転動させ、エステティシャンによるマッサージのような柔らかな刺激を与えて目元をほぐすことができる。

[0117] このマッサージを行う際、頬には第 2 シェル片 52 に設けられた第 1 電極 521 が、目元には回転体 3 に設けられた第 3 電極 311 がそれぞれ当接する。そのため、第 3 シェル片 53 を把持して前述のマッサージを行うことにより、第 3 シェル片 53 に設けられた第 2 電極 531 と、第 1 電極 521、第 3 電極 311、電源部 41 及び人体とを含む環状の電流経路が形成され、当該電流経路に微弱な電流を流すことができる。そして、前述したマッサー

ジの効果と微弱な電流による効果とが相乗的に作用することにより、頬のリフトアップをより効果的に行うことができる。

[0118] あごの引き締めを行う場合には、2個の回転体3のうち上方Z1に配置された回転体3（図2参照）を口元側に向けつつ、第1頂部22と第2頂部23との間にあごが挟まれるようにして本体2及び当該回転体3を顔に押し当てる。そして、美容器1をあごに沿って押し当てながら往復移動することにより、本体2の周縁部21における、第1頂部22の上端221から第2頂部23の上端231までに亘る部分をあごに沿って摺動させると同時に、当該回転体3を口元に沿って回転させることができる。これにより、比較的皮膚の厚いあごに沿う部分にかっさを施して血流を促進させることができる。更に、かっさと同時に回転体3を比較的皮膚の薄い口元に回転させ、エステティシャンによるマッサージのような柔らかな刺激を与えて当該部分をほぐすことができる。

[0119] このマッサージを行う際、あごには第1シェル片51に設けられた第1電極511が、口元には第3電極311がそれぞれ当接する。そのため、第3シェル片53を把持して前述のマッサージを行うことにより、第3シェル片53に設けられた第2電極531と、第1電極511、第3電極311、電源部41及び人体とを含む環状の電流経路が形成され、当該電流経路に微弱な電流を流すことができる。そして、前述したマッサージの効果と微弱な電流による効果とが相乗的に作用することにより、あごの引き締めをより効果的に行うことができる。

[0120] 本例の美容器1は、前述したように、本体2の周縁部21と回転体3とを同時に肌に押し当ててマッサージを行う方法以外に、かっさを単独で行う方法や、回転体3によるマッサージを単独で行う方法を実施することもできる。例えばかっさを単独で行う場合には、本体2における第2頂部23や尾部24等を肌に押し当てながら美容器1を往復移動させることにより、本体2が押し当てられた部分に適度な刺激を与えて血流を促進させることができる。

- [0121] また、回転体 3 によるマッサージを単独で行う場合には、例えば、いずれかの回転体 3 を目元に押し当てながら美容器 1 を左右に往復移動することにより、比較的皮膚の薄い目元に沿う部分にエステティシャンによるマッサージのような柔らかな刺激を与えて当該部分をほぐすことができる。
- [0122] 本例の美容器 1 は、2 個の回転体 3 を同時に肌に押し当てて往復移動させることにより、2 個の回転体 3 の間に肌を摘み上げるマッサージを行うこともできる。例えば、目元の皮膚を摘み上げるマッサージを行う場合には、2 個の回転体 3 が縦方向に並ぶようにして目元に押し当てる。そして、この状態で、美容器 1 を目元に沿って左右に往復移動することにより、目元の皮膚を摘み上げて血流を促進させることができる。
- [0123] また、かっさを単独で行う場合、回転体 3 によるマッサージを単独で行う場合、2 個の回転体 3 により肌を摘み上げるマッサージを行う場合のいずれにおいても、第 2 シェル片 5 2 を把持して当該マッサージを行うことにより、肌に微弱な電流を流し、マッサージの効果をより高めることができる。
- [0124] このように、本例の美容器 1 は、肌への押し当て方を適宜変更することにより、種々のマッサージを行うことができるように構成されている。
- [0125] 次に、本例の作用効果を説明する。本例の美容器 1 は、電源部 4 1 を備えたコア部 4 と、コア部 4 に着脱可能に取り付けられたシェル部 5 と、を有している。また、シェル部 5 は、第 1 電極 5 1 1、5 2 1 と第 2 電極 5 3 1 とを有している。そのため、何らかの理由で第 1 電極 5 1 1、5 2 1 や第 2 電極 5 3 1 が損傷した場合に、シェル部 5 を交換するという単純な作業により、美容器 1 を容易に修復することができる。
- [0126] 特に、本例の美容器 1 は、本体 2 の外表面のほぼ全体、つまり、透光部 6 1 を除く部分に第 1 電極 5 1 1、5 2 1 及び第 2 電極 5 3 1 が設けられている。そのため、本体 2 の外表面に占める電極の面積の割合が低い場合に比べて、第 1 電極 5 1 1、5 2 1 及び第 2 電極 5 3 1 が損傷を受ける可能性が高い。しかし、このような場合であっても、シェル部 5 を着脱可能に構成することにより美容器 1 を容易に修復することができるため、美容器 1 の使い勝

手を向上させることができる。

[0127] また、本例の美容器 1 においては、シェル部 5 をコア部 4 から取り外した後に、コア部 4 を交換することもできる。そのため、例えば、美容器の外表面に露出した透光部 6 1 が損傷を受けた場合や、電源部 4 1 に故障が発生した場合などに、これらの部品をコア部 4 ごと交換するという単純な作業により、美容器 1 を容易に修復することができる。

[0128] 更に、本例の美容器 1 においては、コア部 4 を構成する部品のうち、電源封止部 6 とコア本体部 7 とが図 1 6 に示すネジ 7 0 1 e、7 0 1 f を介して締結されている。また、コア本体部 7 を構成する第 1 コア片 7 a と第 2 コア片 7 b とが、図 1 6 に示すネジ 7 0 1 a ～ 7 0 1 g を介して締結されるとともに、図 1 7 に示す接着シート 7 0 2 を介して接着されている。

[0129] そのため、ネジ 7 0 1 a ～ 7 0 1 g を取り外した後、第 2 コア片 7 b を第 1 コア片 7 a から引きはがすことにより、コア部 4 を容易に分解することができる。そして、このようにしてコア部 4 を分解することにより、電源部 4 1 を備えた電源封止部 6 や、電源部 4 1 から肌に至る電流の経路となる第 1 配線部 7 2、第 2 配線部 7 3、分配線部 7 5、回転体保持部 8 を露出させることができる。それ故、本例の美容器 1 によれば、電源封止部 6 や前述した電源部 4 1 から肌に至る電流の経路となる部品が劣化した場合などに、これらの部品を交換し、美容器 1 を容易に修復することができる。

[0130] また、美容器 1 は、美容器 1 の外部から電源部 4 1 への液体の進入を防止するための電源封止部 6 を有している。そのため、例えば浴室等の水濡れし得る環境において美容器 1 を使用する場合に、電源部 4 1 の水濡れによる故障を防止することができる。また、使用者がリラックスできる浴室等の環境において美容器 1 を使用することにより、美容効果をより高めることが期待できる。

[0131] コア部 4 は、電源部 4 1 を液密に封止する電源封止部 6 と、電源封止部 6 を保持するコア本体部 7 と、を有し、コア本体部 7 は、電源部 4 1 と第 1 電極 5 1 1、5 2 1 とを接続する第 1 配線部 7 2 と、電源部 4 1 と第 2 電極 5

31とを接続する第2配線部73と、を有している。そのため、コア部4全体を液密に封止する場合に比べて簡素な構造で電源部41の防水を行うことができる。それ故、美容器1の組み立て作業をより簡素化するとともに、製造コストをより低減することができる。

[0132] コア本体部7は、半割状の第1コア片7aと第2コア片7bを有しており、第1配線部72及び第2配線部73は、第1コア片7aと第2コア片7bとの間に配置されている。そのため、第1コア片7aと第2コア片7bとの間に第1配線部72及び第2配線部73を挟み込むという簡素な作業により、第1配線部72及び第2配線部73をコア本体部7に組み込むことができる。それ故、美容器1の組み立て作業をより簡素化することができる。

[0133] また、本例のコア本体部7においては、筒状部703を有する第2コア片7bの厚みが、筒状部703を有しない第1コア片7aに比べて厚くなっている。これにより、第2コア片7bの剛性を確保しつつ、第2コア片7bに、第1コア片7aと組み合わせた際に第1開口704～第4開口707や分配線収容空間750となる凹部を形成することができる。

[0134] コア部4は、液体を流通可能に構成された水抜き孔40が形成されており、シェル部5は、水抜き孔40と美容器1の外部空間とを連通する連通口50を有している。そのため、コア部4とシェル部5との間に液体が浸入した場合に、水抜き孔40によって当該液体を連通口50へ導くことができる。そして、コア部4内の液体を連通口50から美容器1の外部へ速やかに排出することができる。その結果、第1電極511、521と第2電極531とが液体を介して短絡している状態を速やかに解除し、第1電極511、521と、第2電極531と、電源部41と、人体とを含む環状の電流経路を回復させることができる。

[0135] 美容器1は、更に、シェル部5の外方に配置された回転可能な回転体3を有している。そのため、美容器1は、シェル部5を肌に押し当てながら移動させるかっさと、回転体3を肌に押し当てながら転動させる方法との2種類のマッサージを実施することができる。

- [0136] また、回転体 3 は、その表面に、電源部 4 1 に電氣的に接続された第 3 電極 3 1 1 を有しており、第 3 電極 3 1 1 を通じて肌に微弱な電流を流すことができる。そのため、回転体 3 による物理的なマッサージ効果と微弱な電流による刺激とを相乗的に作用させ、より美容効果を高めることができる。
- [0137] また、これらのマッサージは、肌に与える刺激の強さが異なっている。そのため、前記美容器 1 は、例えば目元や頬骨に沿う部分などの比較的皮膚の薄い部分に回転体 3 によるマッサージを施して比較的柔らかな刺激を与え、頬やあご等の比較的皮膚の厚い部分にかっさを施して比較的強い刺激を与える等、マッサージを施す部位に応じて適切な刺激を与えることができる。それ故、前記美容器 1 に回転体 3 を設けることにより、使い勝手をより向上させることができる。
- [0138] 回転体 3 は、コア部 4 に着脱可能に取り付けられている。そのため、回転体 3 の表面に設けられた第 3 電極 3 1 1 が何らかの理由で損傷を受けた際に、回転体 3 ごと第 3 電極 3 1 1 を交換することができる。そのため、第 3 電極 3 1 1 の修理作業をより容易に行うことができる。
- [0139] また、図 1 9 及び図 3 3 に示すように、第 1 シェル片 5 1 の第 2 端子片 5 1 3 は厚み方向における第 1 シェル片 5 1 の中央に配置されている。また、第 1 端子片 5 1 2 は、厚み方向において第 2 端子片 5 1 3 よりも第 1 コア片 7 a 側に偏った位置に配置されている。つまり、第 1 端子片 5 1 2 と第 2 端子片 5 1 3 との間には段差が形成されている。
- [0140] そのため、第 1 端子片 5 1 2 と第 2 端子片 5 1 3 との間に段差がない場合に比べて、第 1 端子片 5 1 2 から第 2 端子片 5 1 3 までの沿面距離、つまり、コア本体部 7 の内表面に沿った距離を維持しつつ、正面視における第 1 端子片 5 1 2 から第 2 端子片 5 1 3 までの距離を近づけることができる。
- [0141] このように、第 1 端子片 5 1 2 から第 2 端子片 5 1 3 までの沿面距離を十分に長くすることにより、第 1 端子片 5 1 2 と第 2 端子片 5 1 3 との短絡を抑制することができる。更に、正面視における第 1 端子片 5 1 2 から第 2 端子片 5 1 3 までの距離を近づけることにより、第 1 シェル片 5 1、ひいては

美容器 1 全体の幅方向 Y の外形寸法をより低減することができる。これらの結果、本例の美容器 1 によれば、第 1 端子片 5 1 2 と第 2 端子片 5 1 3 との間に段差がない場合に比べて、第 1 端子片 5 1 2 と第 2 端子片 5 1 3 との短絡を抑制しつつ、幅方向 Y への小型化をより容易に行うことができる。

[0142] 本発明に係る美容器 1 の具体的な態様は、実施例に示した態様に限定されるものではなく、本発明の趣旨を損なわない範囲で適宜変更することができる。例えば、実施例においては、回転体 3 を有する美容器 1 の例を示したが、回転体 3 を設けないことも可能である。また、回転体 3 の表面に設けられた第 3 電極 3 1 1 は、実施例に示したように第 1 電極 5 1 1 を介して電源部 4 1 に接続されていてもよいし、第 1 電極 5 1 1 とは別の電流経路を介して電源部 4 1 に接続されていてもよい。

符号の説明

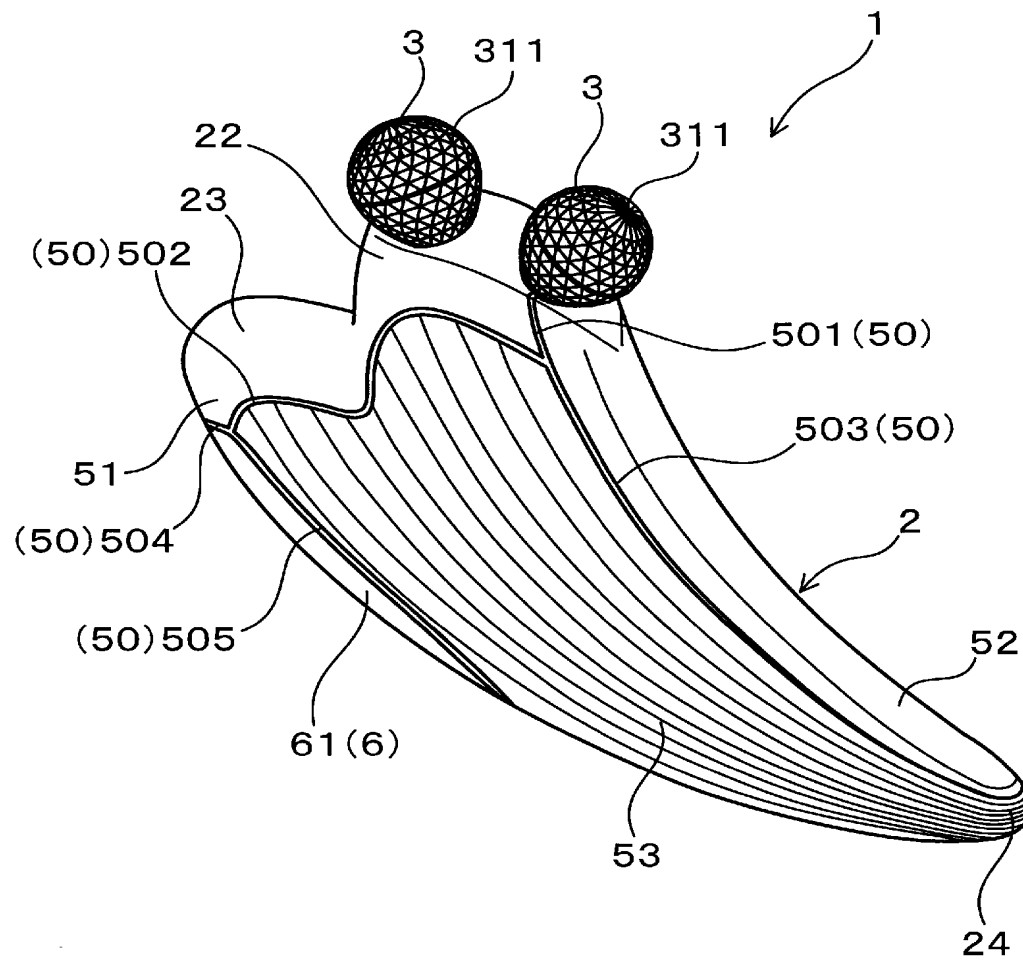
[0143] 1 美容器
4 コア部
4 1 電源部
5 シェル部
5 1 1、5 2 1 第 1 電極
5 3 1 第 2 電極

請求の範囲

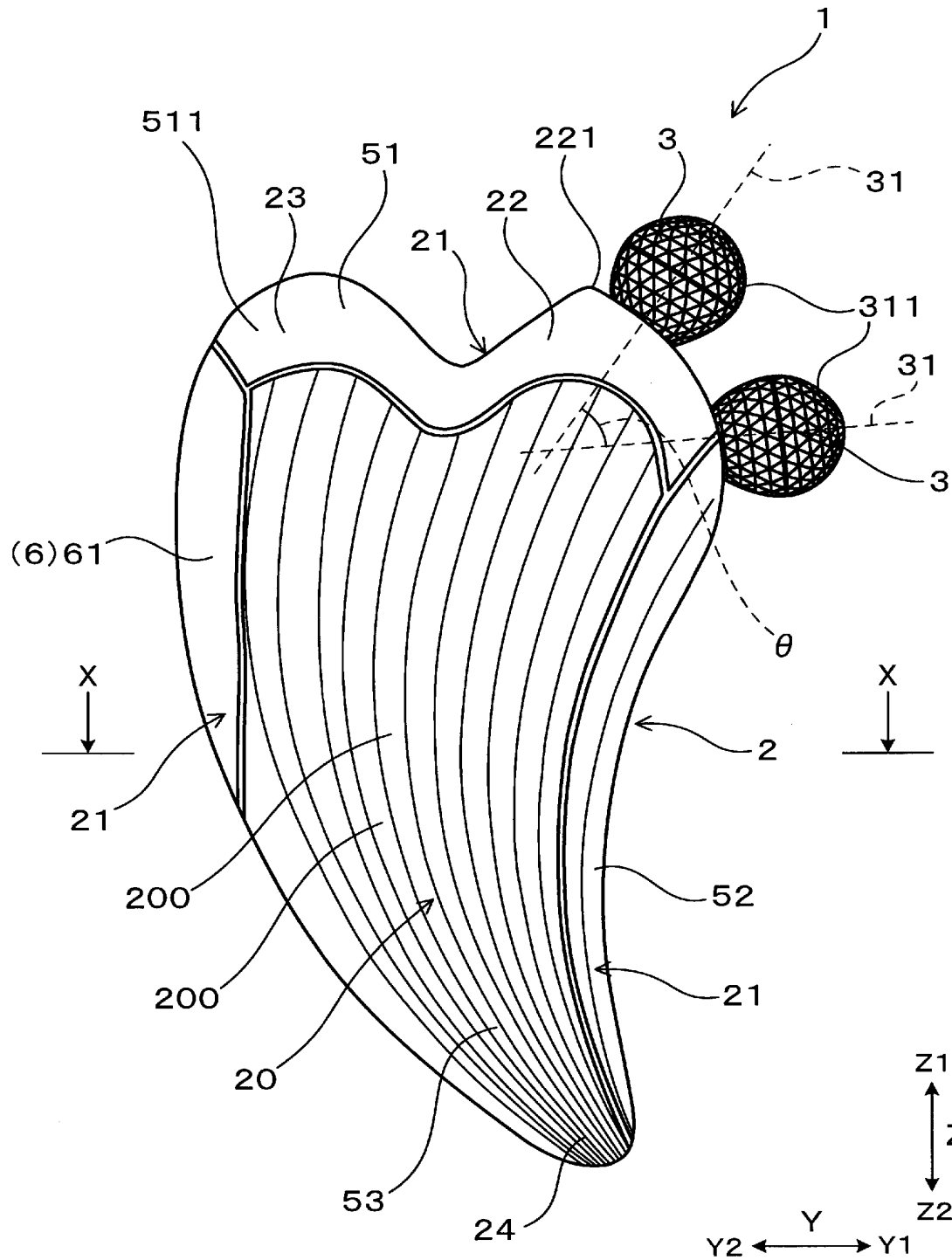
- [請求項1] 肌の美容のための電流を発生する電源部を備えたコア部と、
前記コア部に着脱可能に取り付けられ、前記コア部を覆うシェル部と、を有し、
前記シェル部は、
前記電源部に電氣的に接続され、肌に押し当てながら移動させてマッサージを施すための第1電極と、
前記電源部と前記第1電極と人体とを含む環状の電流経路を形成することができるようにして前記電源部に電氣的に接続された第2電極と、を有している、
美容器。
- [請求項2] 前記コア部は、前記電源部を液密に封止する電源封止部と、前記電源封止部を保持するコア本体部と、を有し、
前記コア本体部は、前記電源部と前記第1電極とを接続する第1配線部と、前記電源部と前記第2電極とを接続する第2配線部と、を有している、請求項1に記載の美容器。
- [請求項3] 前記コア本体部は、半割状の第1コア片と第2コア片とを有しており、前記第1配線部及び前記第2配線部は、前記第1コア片と前記第2コア片との間に配置されている、請求項2に記載の美容器。
- [請求項4] 前記コア部は、液体を流通可能に構成された水抜き孔を有しており、前記シェル部は、前記水抜き孔と前記美容器の外部空間とを連通する連通口を有している、請求項2に記載の美容器。
- [請求項5] 前記コア部は、液体を流通可能に構成された水抜き孔を有しており、前記シェル部は、前記水抜き孔と前記美容器の外部空間とを連通する連通口を有している、請求項3に記載の美容器。
- [請求項6] 前記美容器は、更に、前記シェル部の外方に配置された回転可能な回転体を有している、請求項1～5のいずれか1項に記載の美容器。
- [請求項7] 前記回転体は前記コア部に着脱可能に取り付けられており、かつ、

前記電源部に電氣的に接続されている、請求項 6 に記載の美容器。

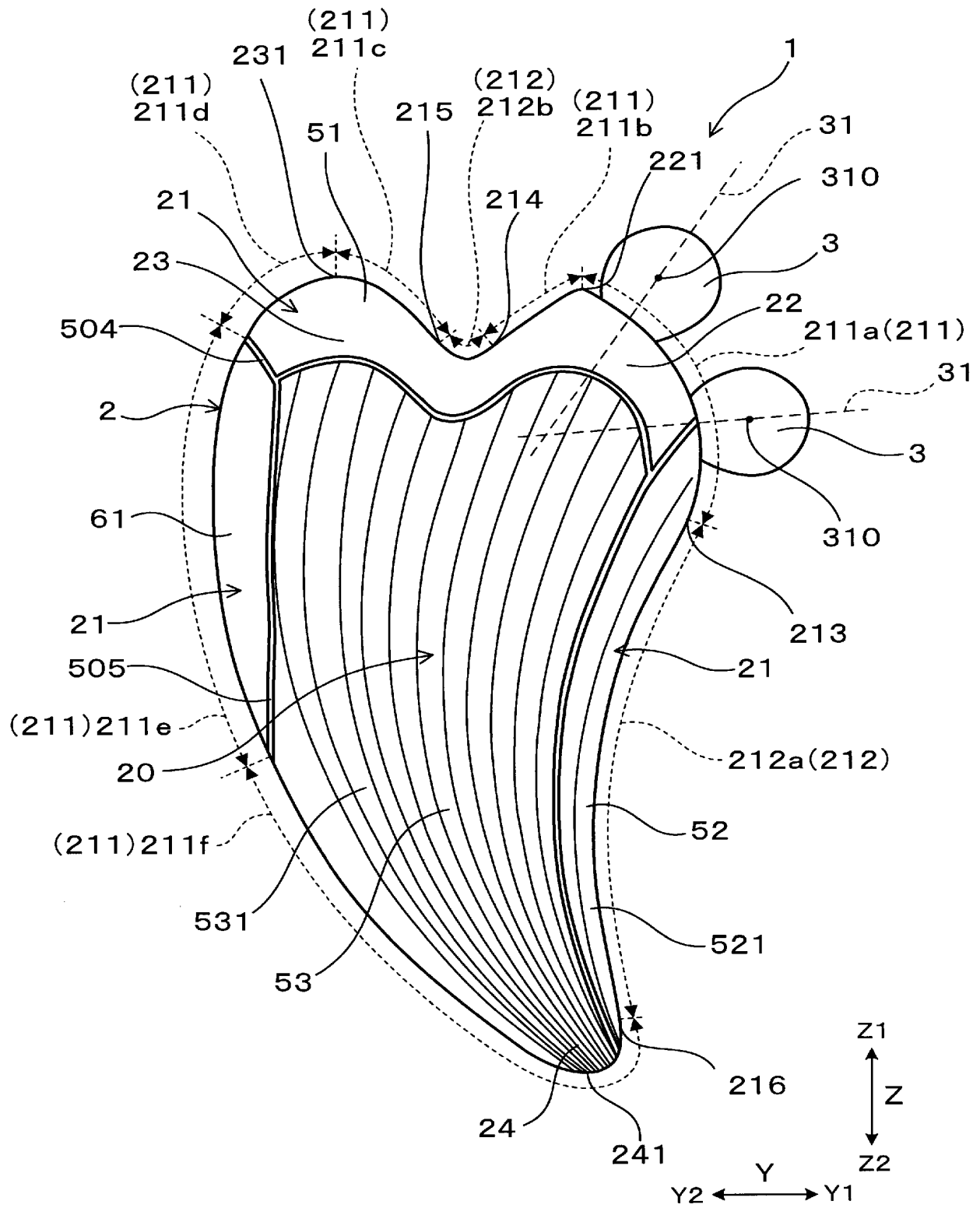
[図1]



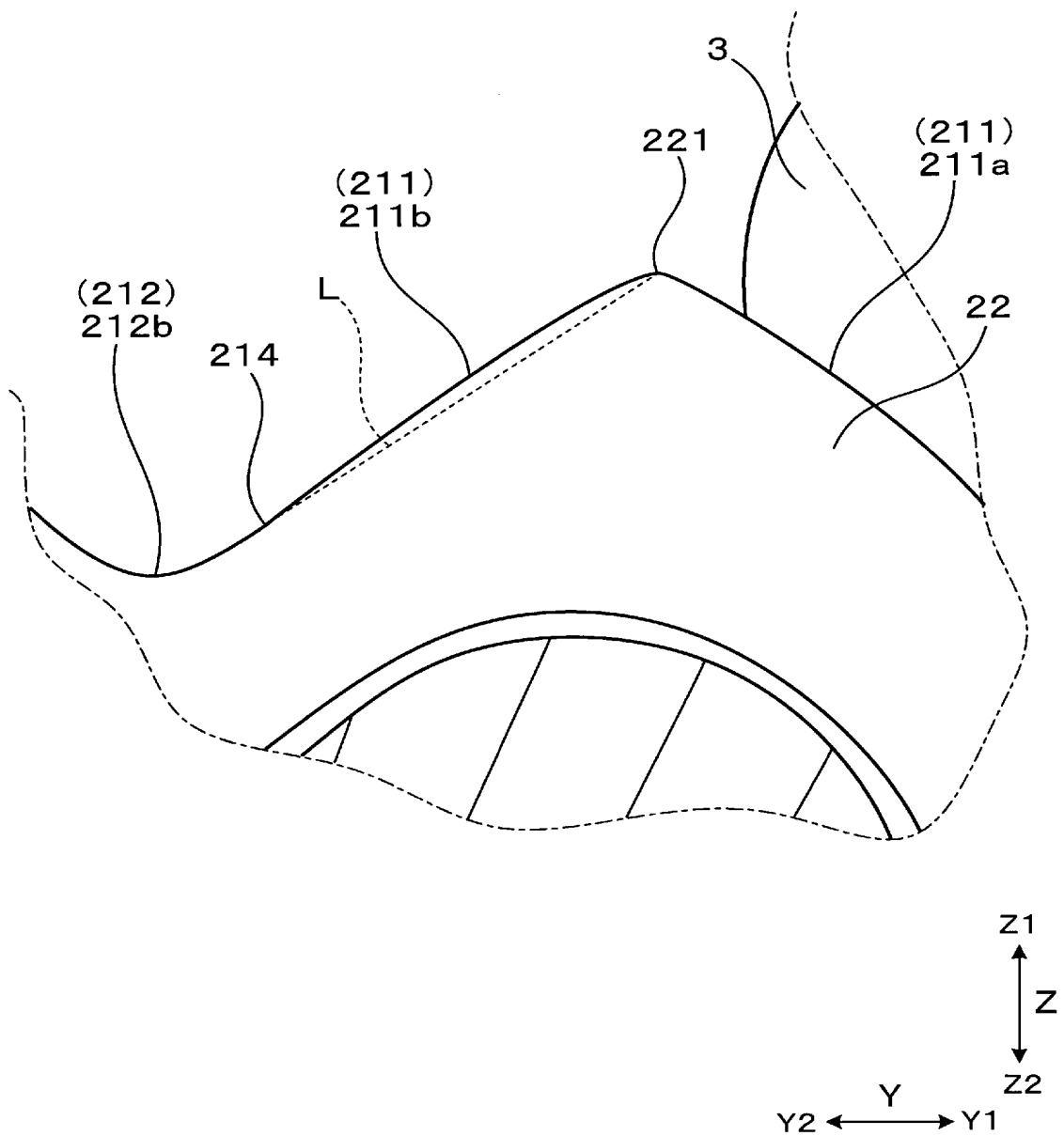
[図2]



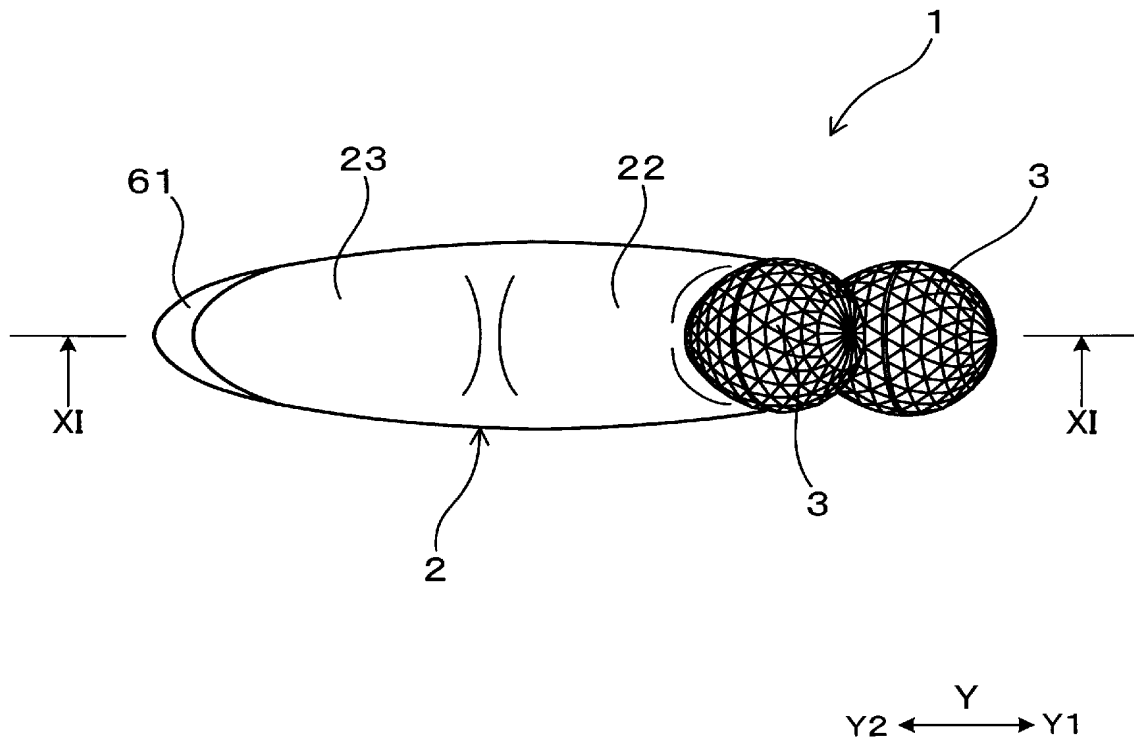
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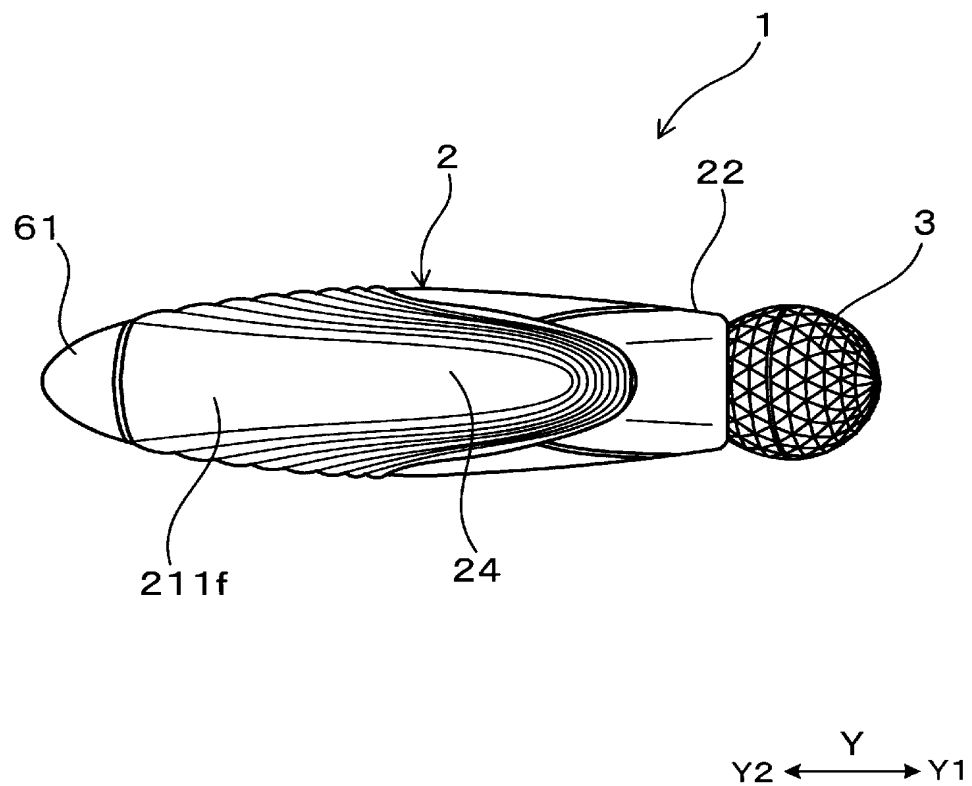
[図4]



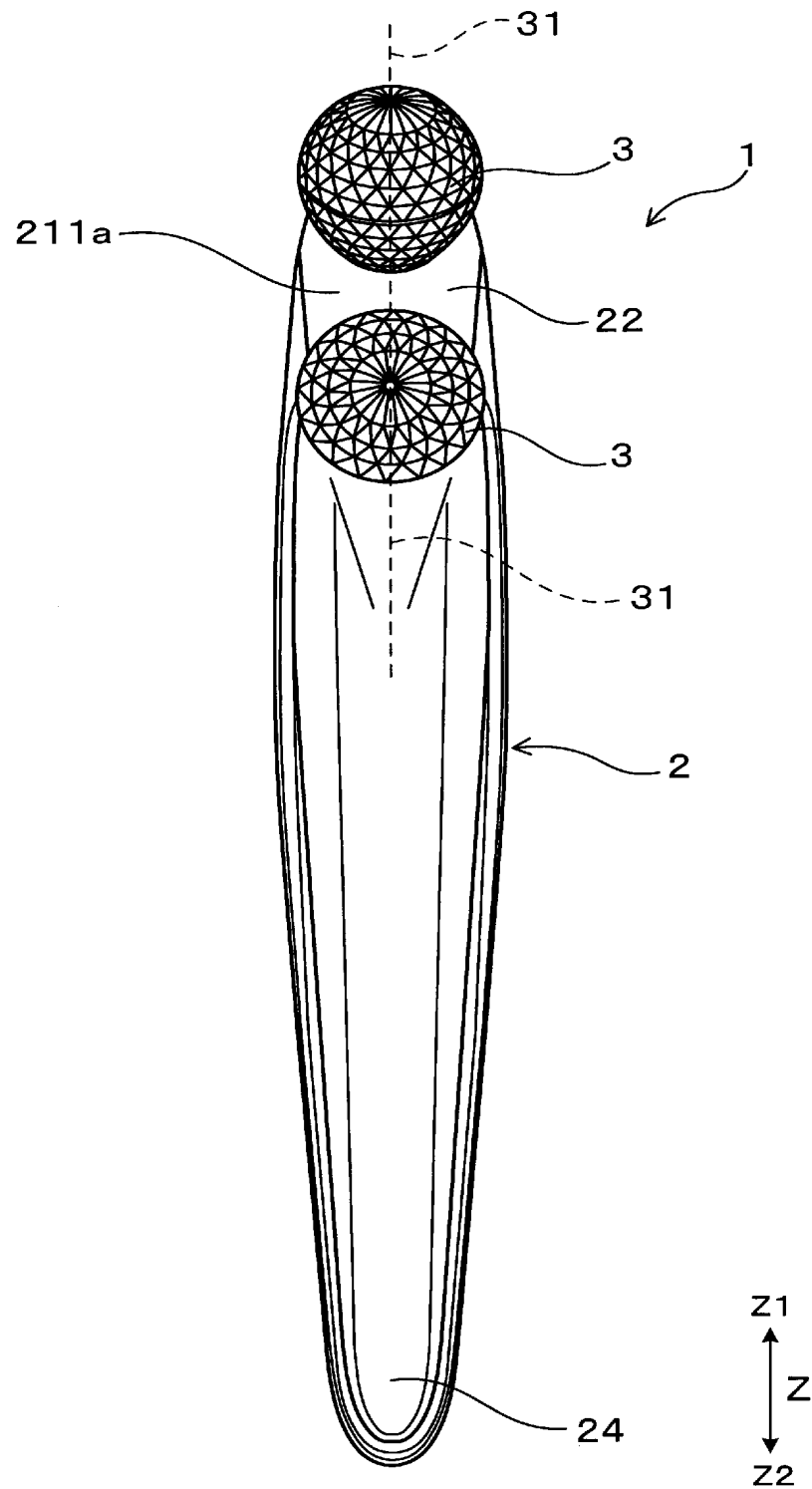
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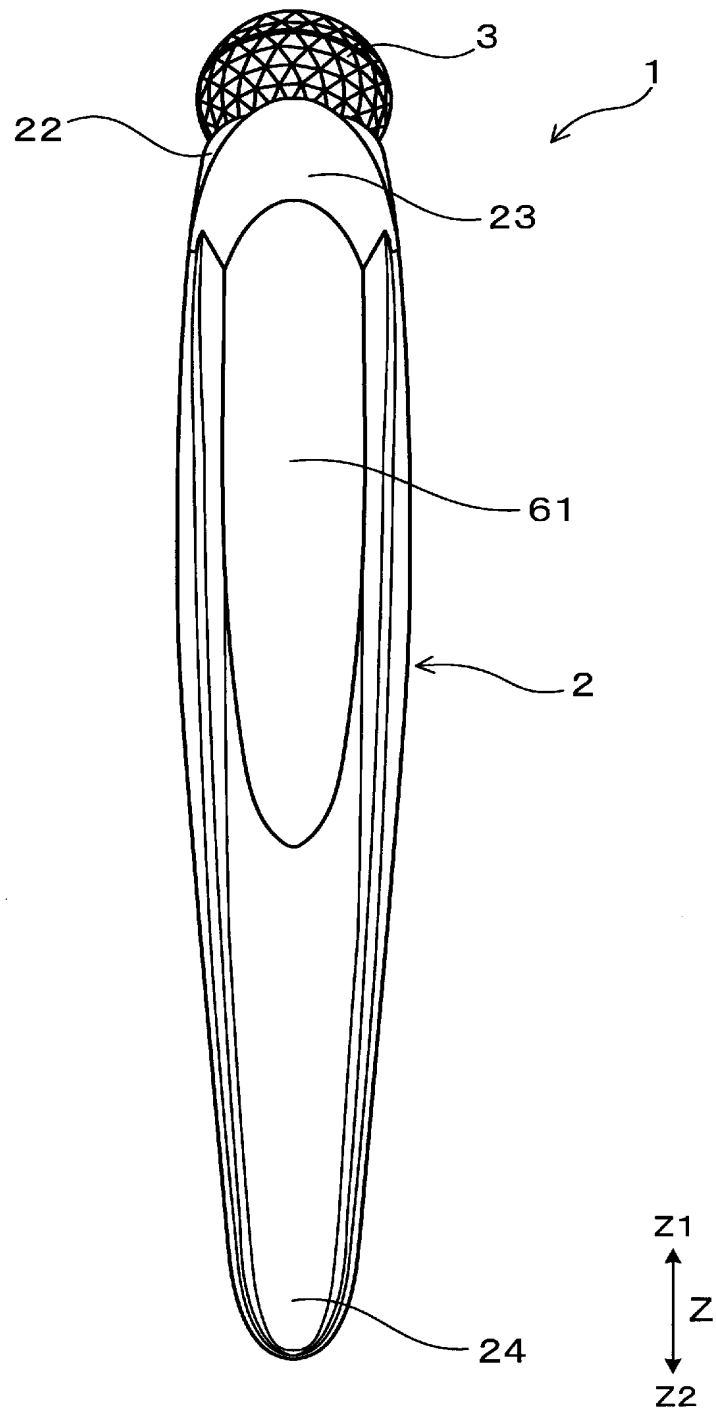
[図6]



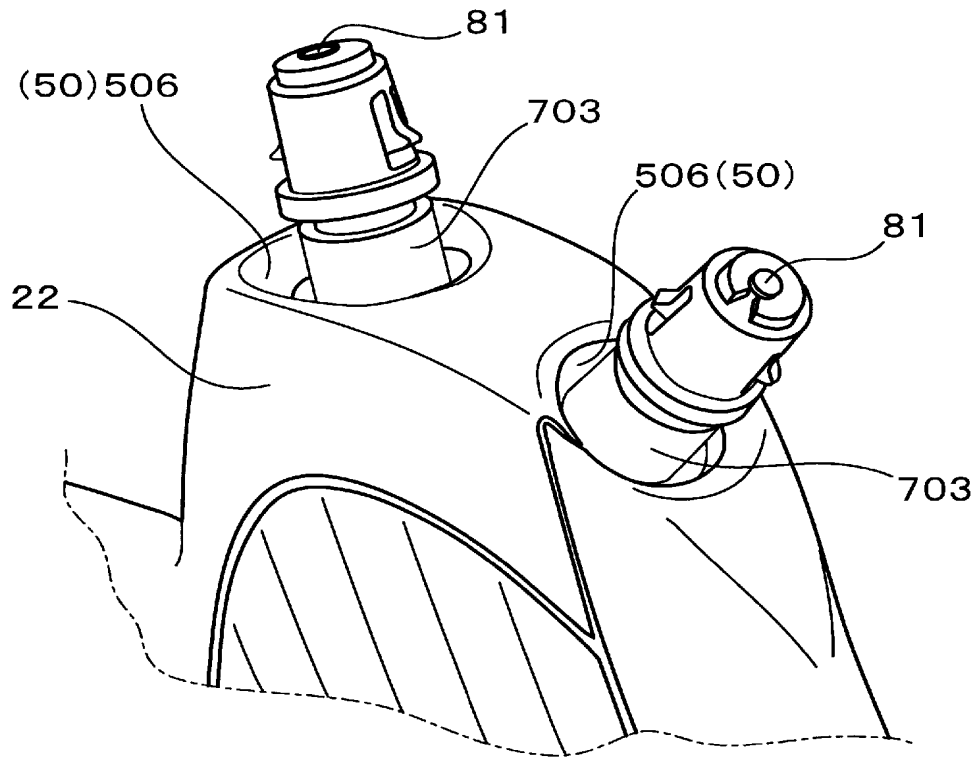
[図7]



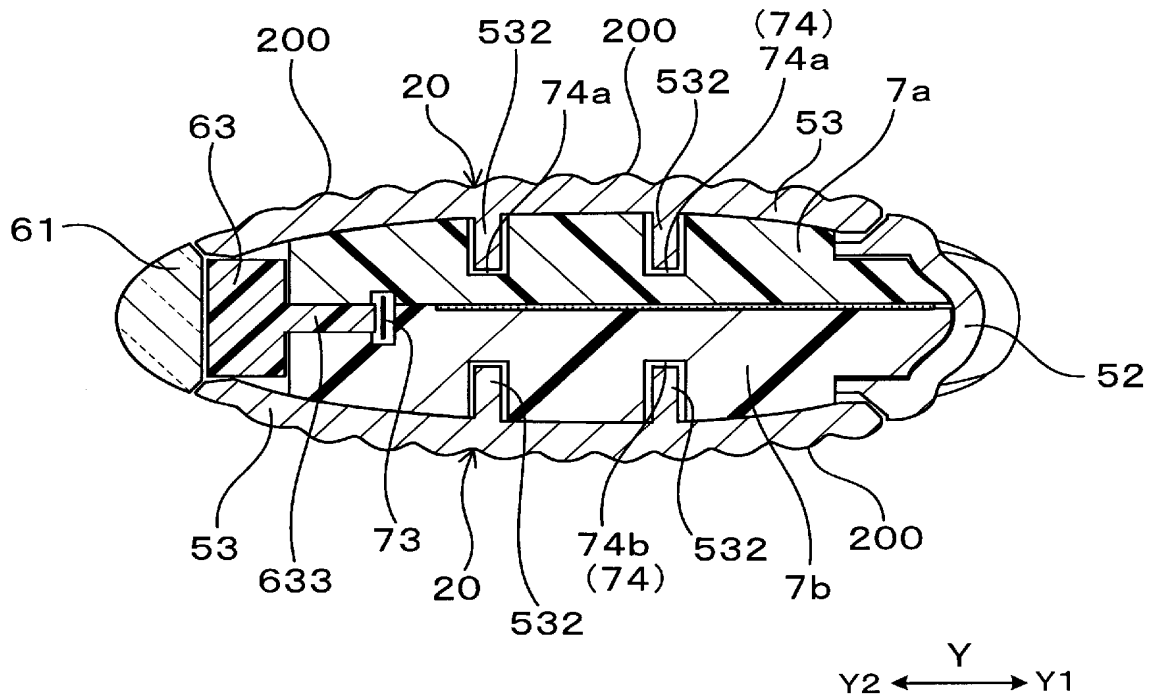
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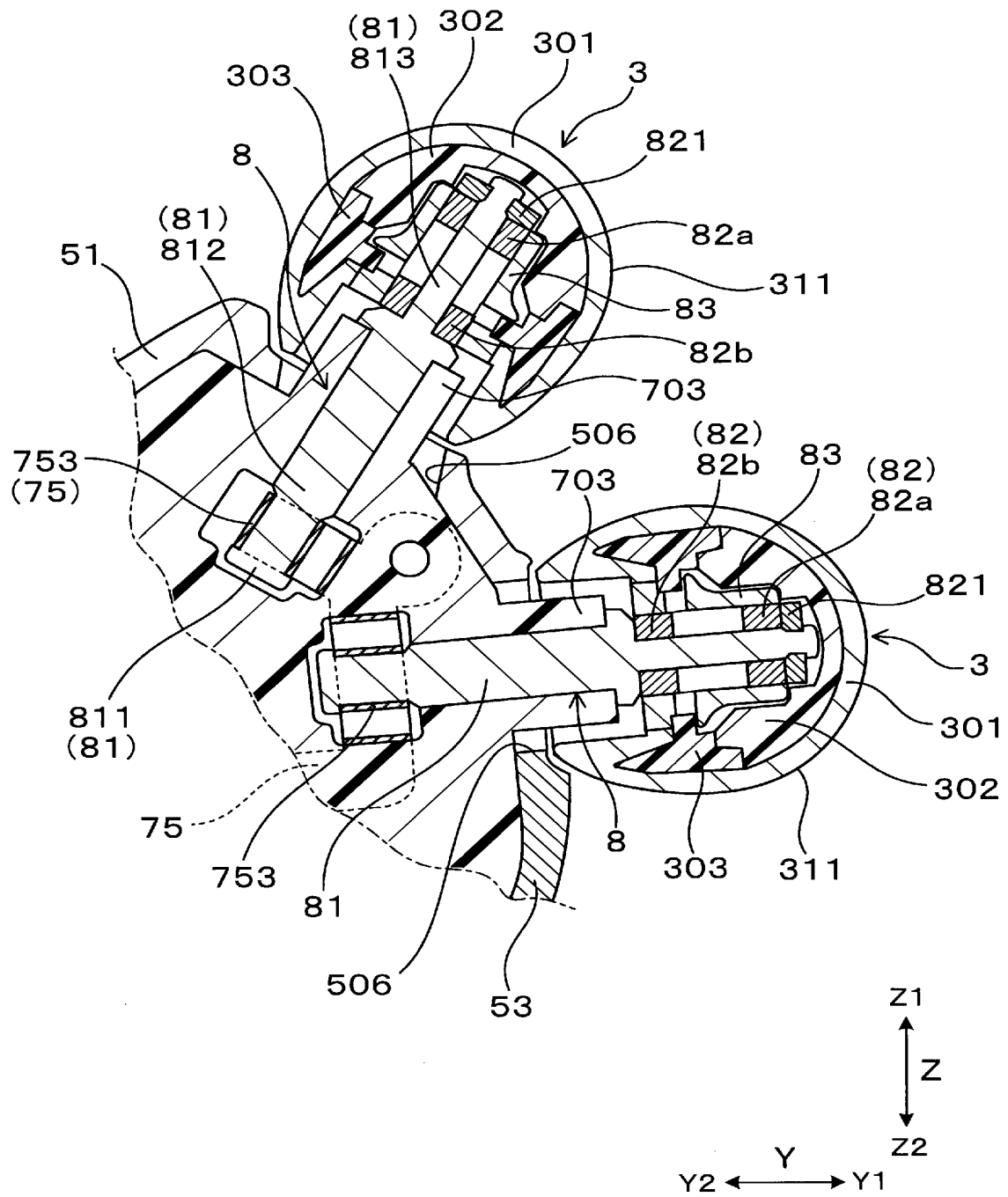
[図9]



[図10]

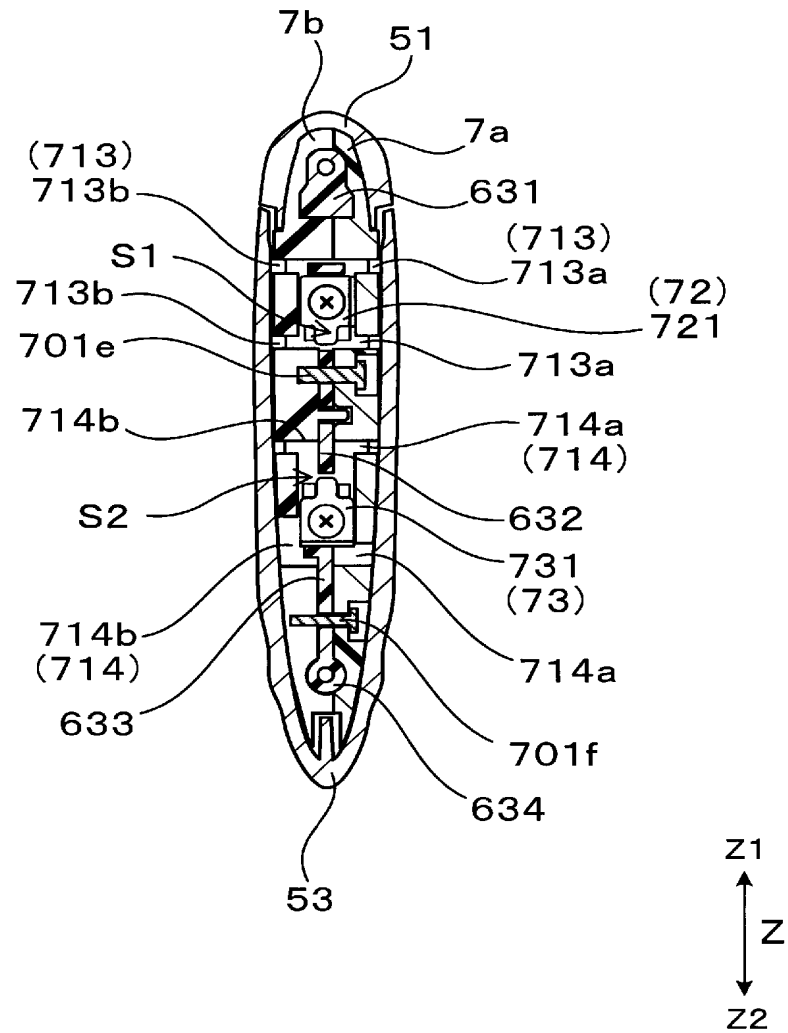


[図11]

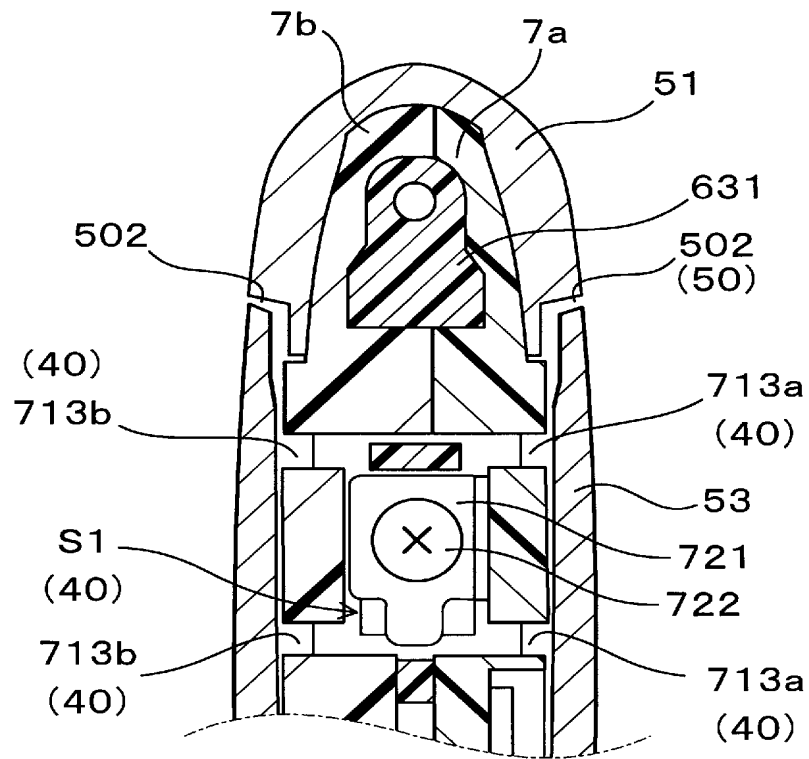
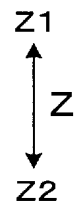


[illegible]

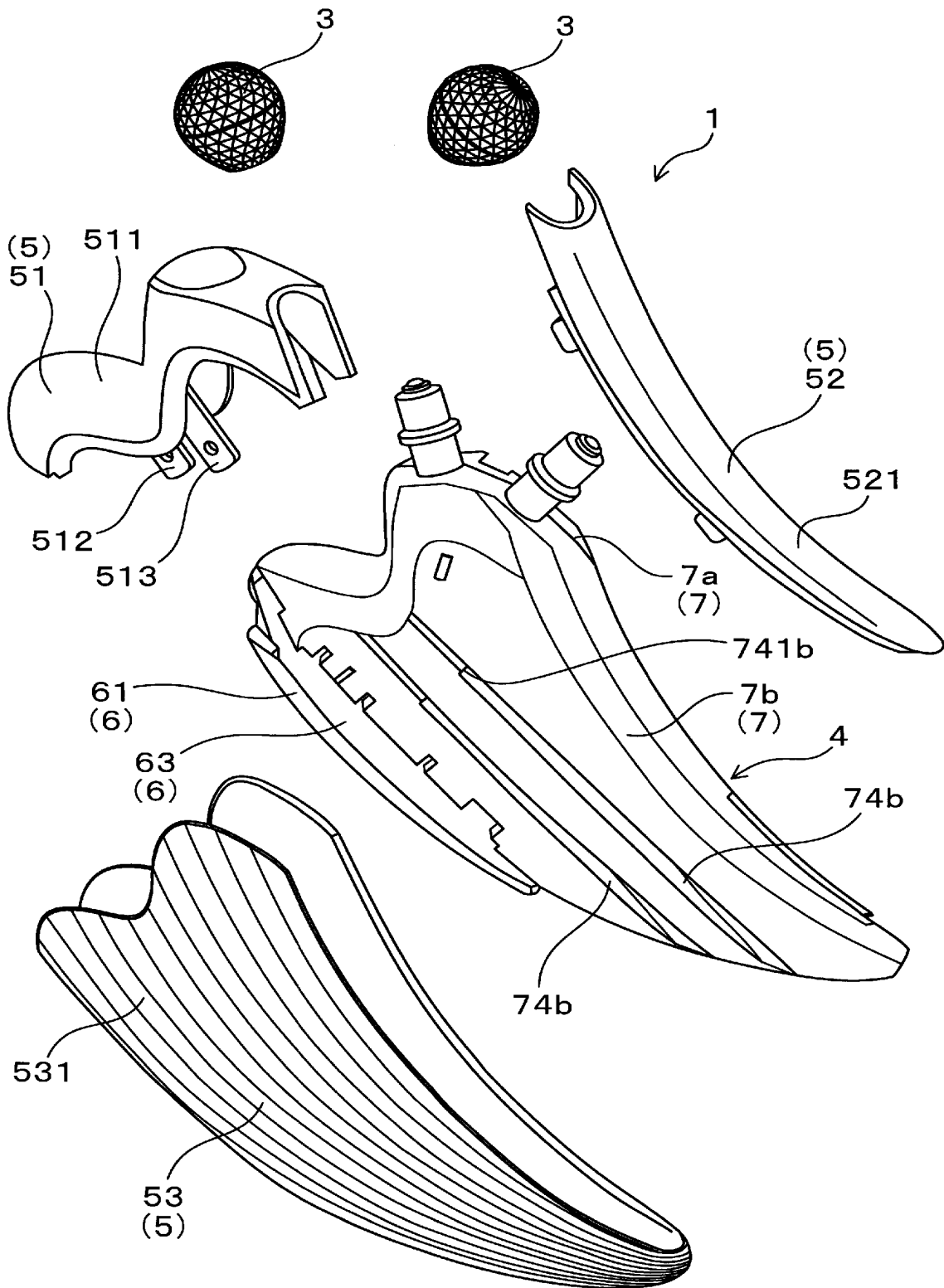
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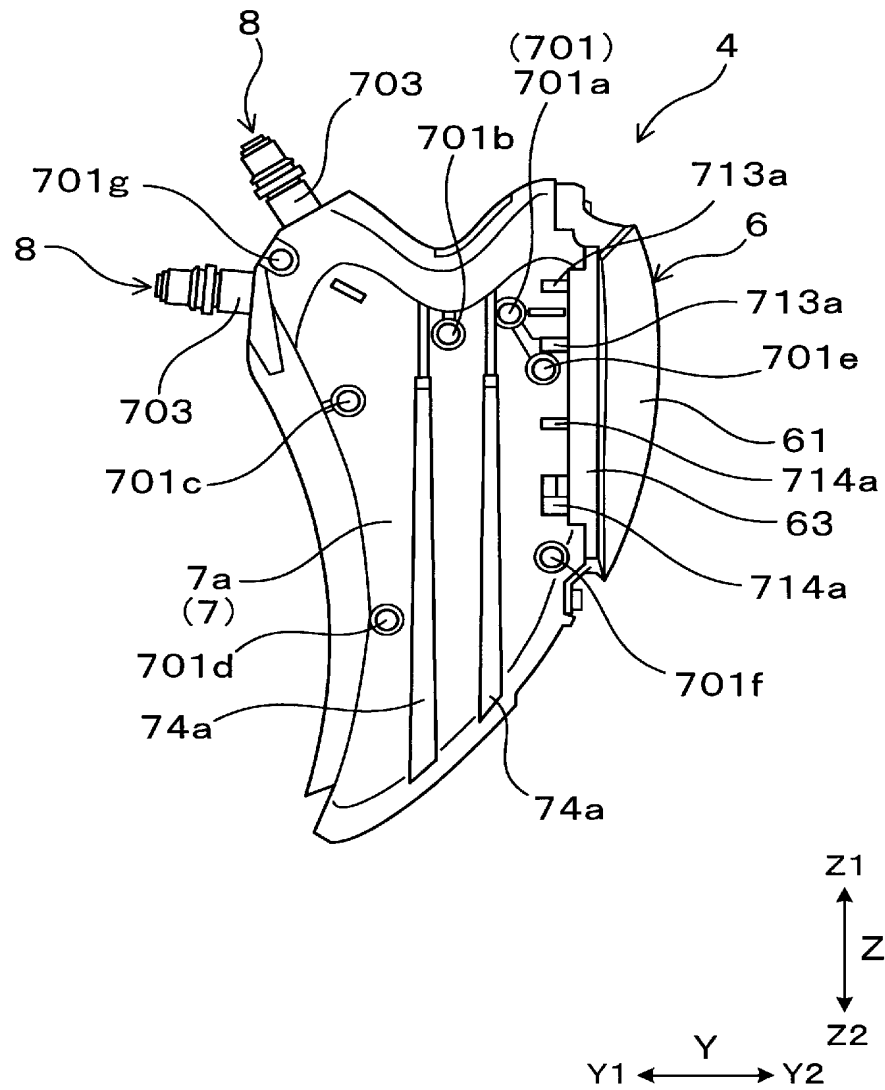
[図14]



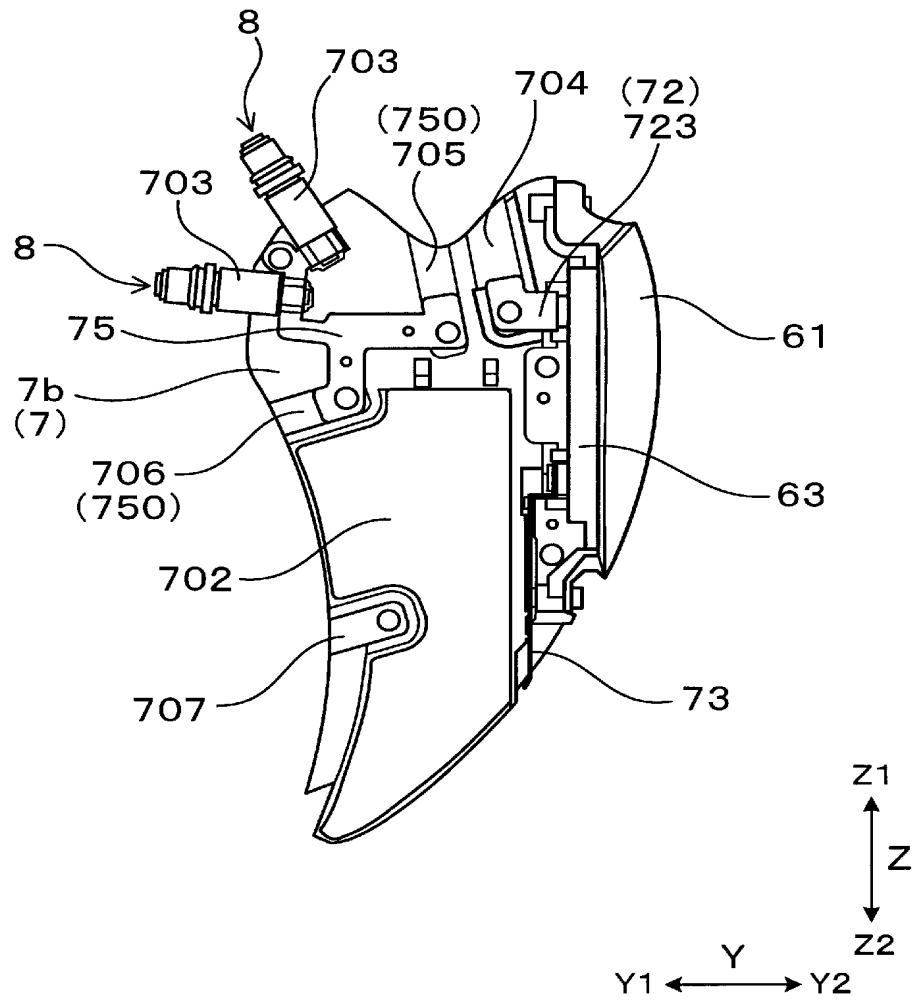
[図15]



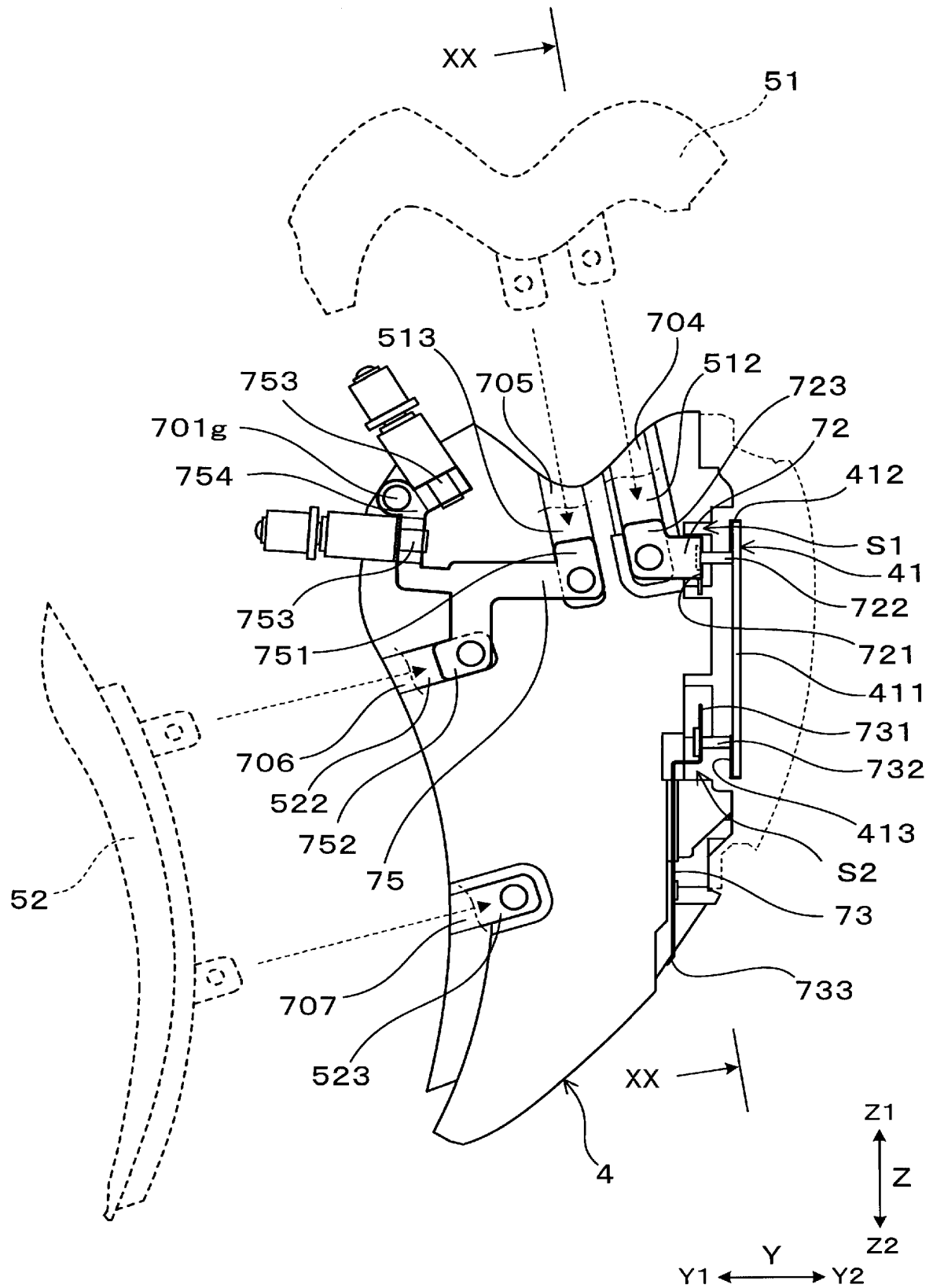
[図16]



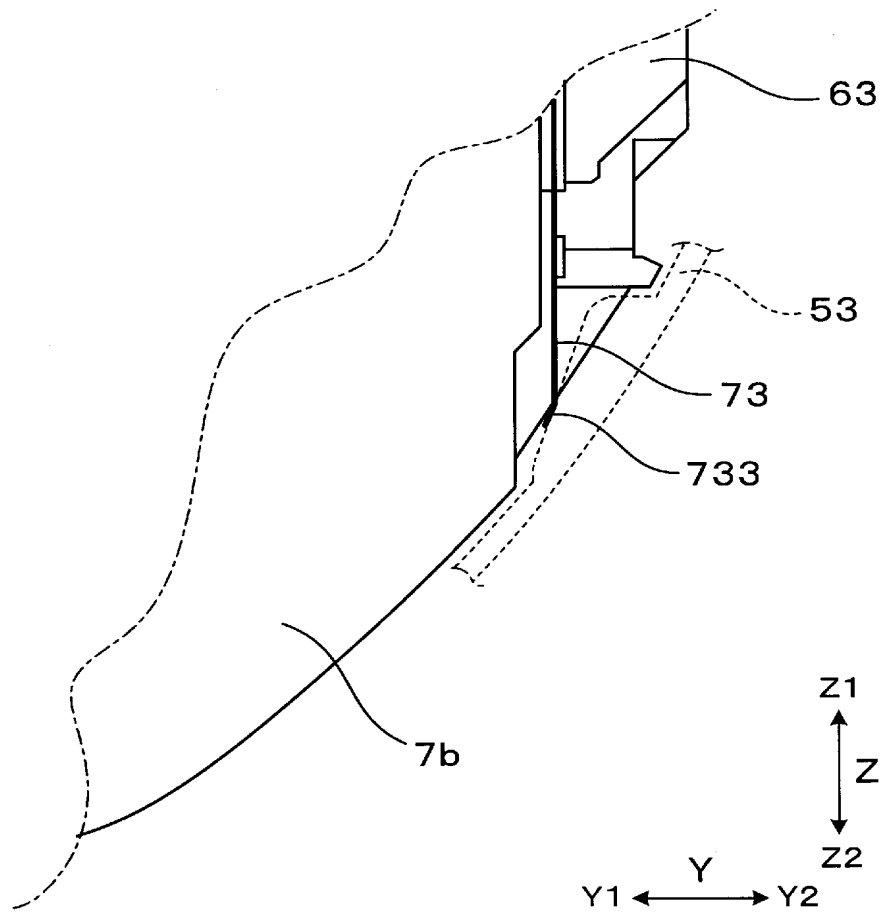
[図17]



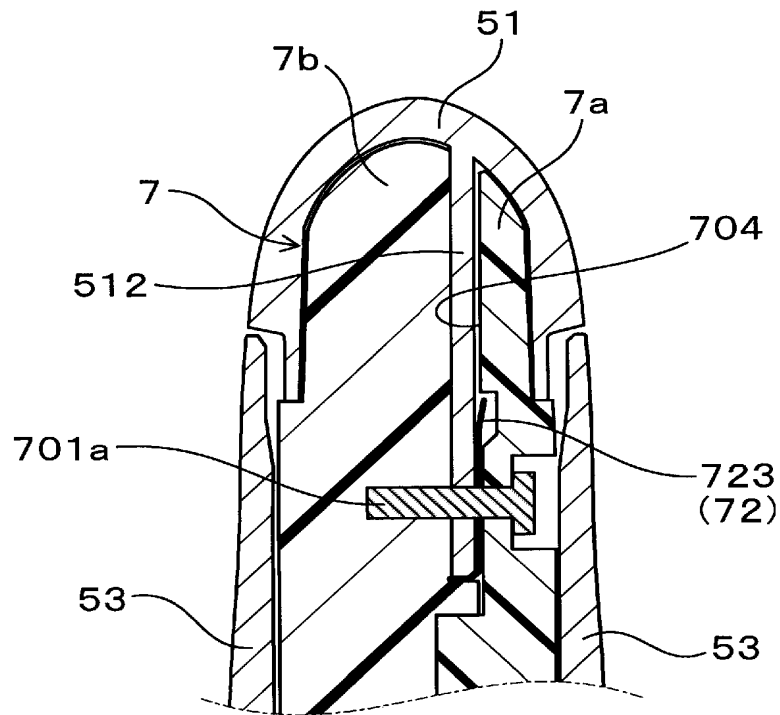
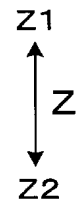
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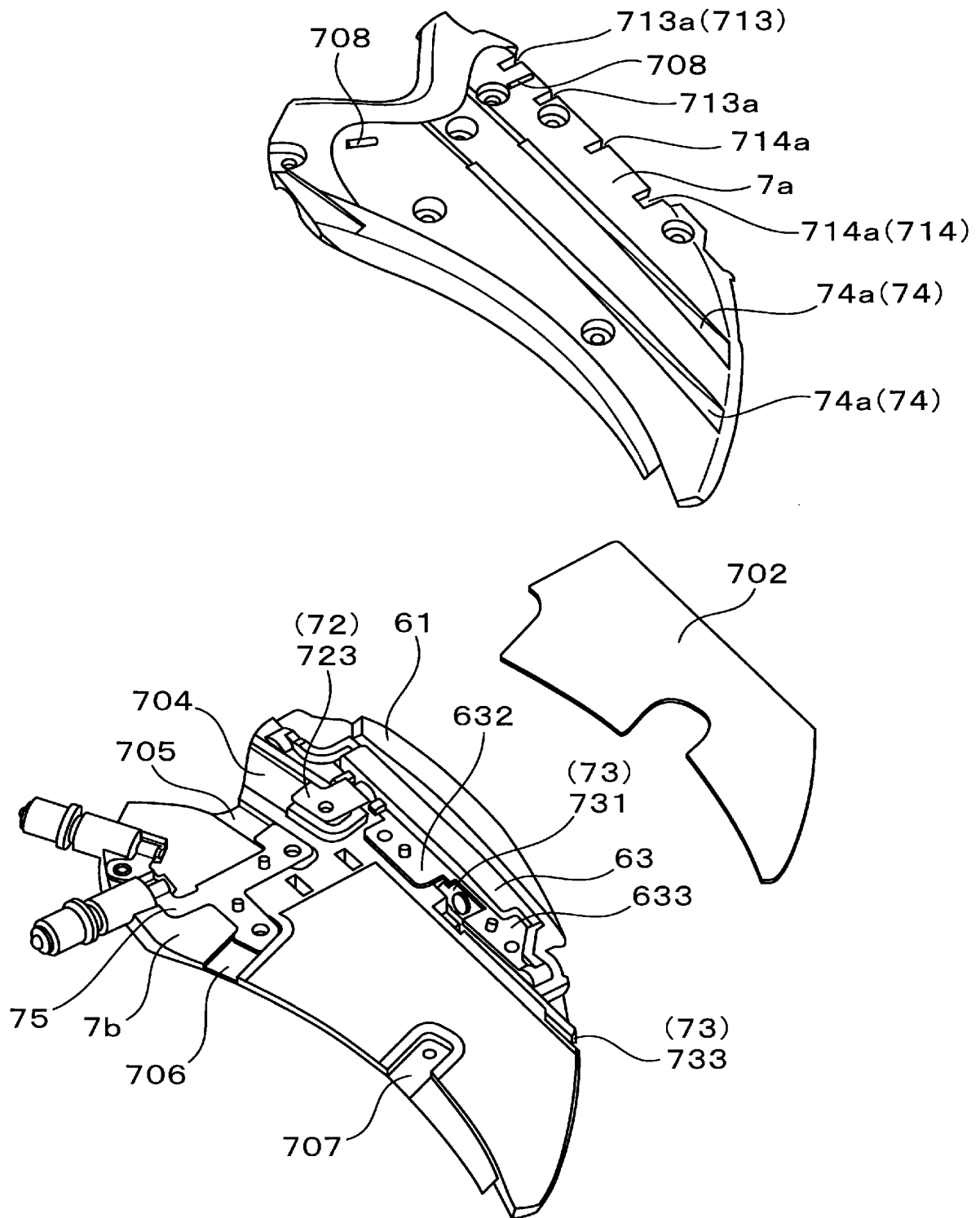
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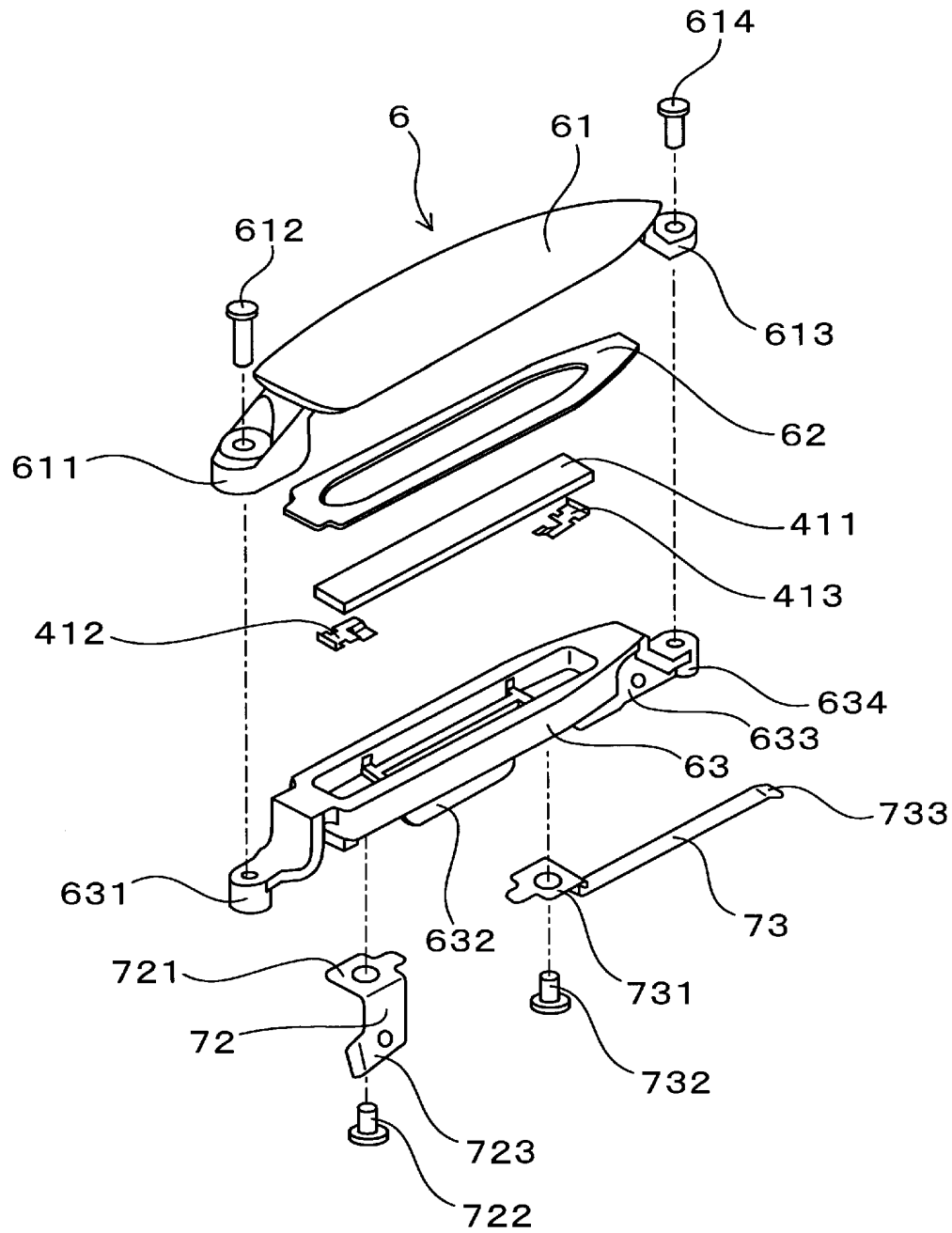
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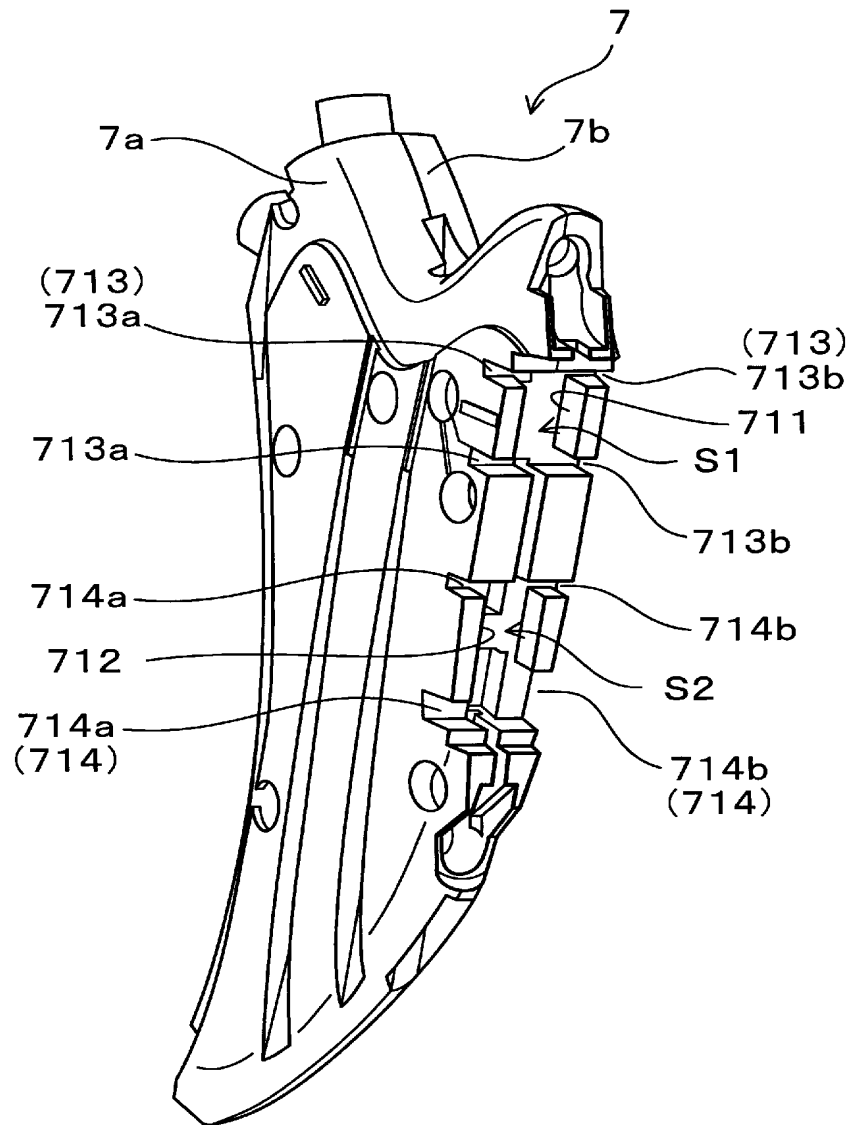
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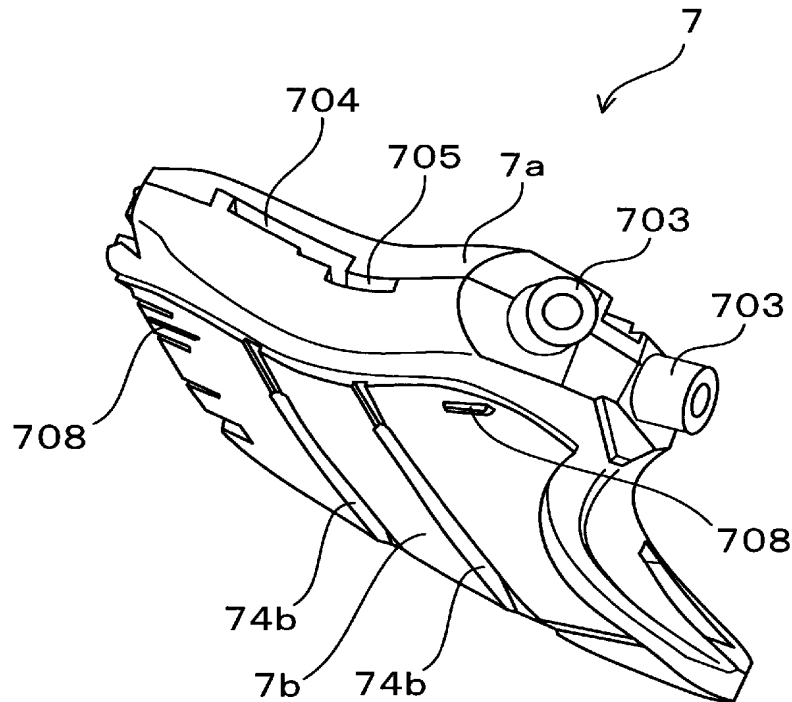
[図22]



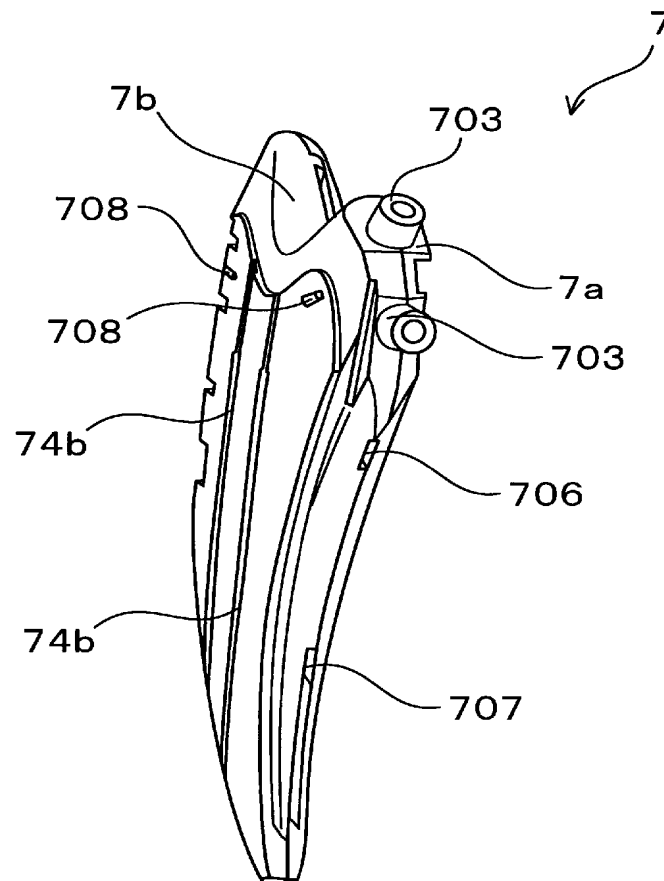
[図23]



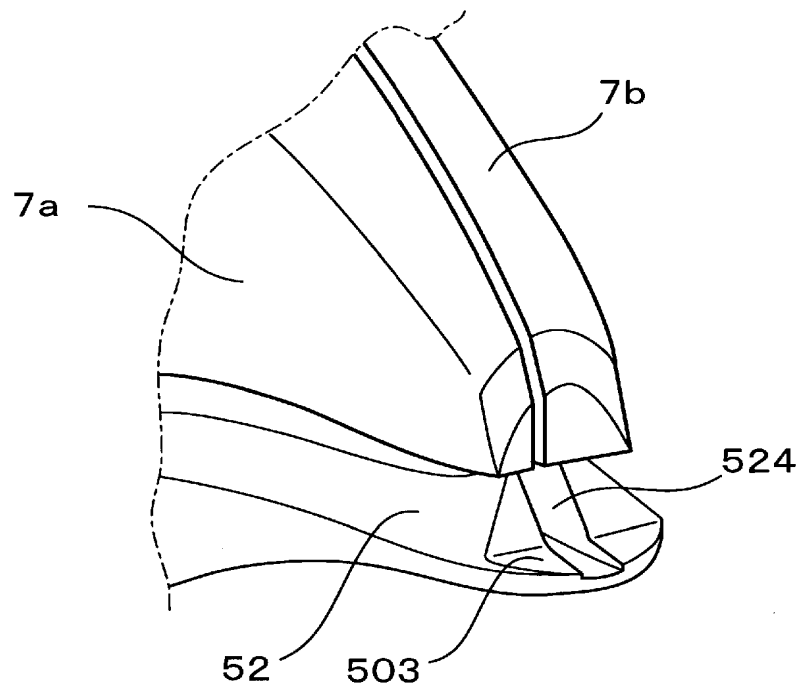
[図24]



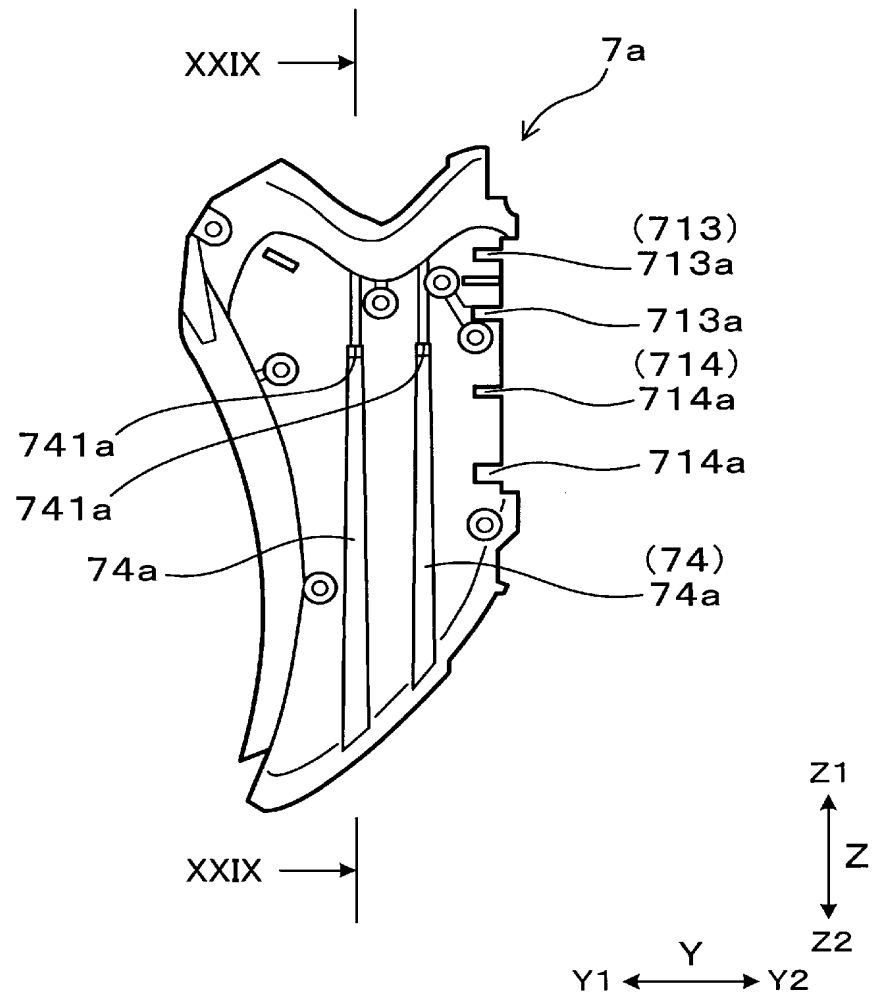
[図25]



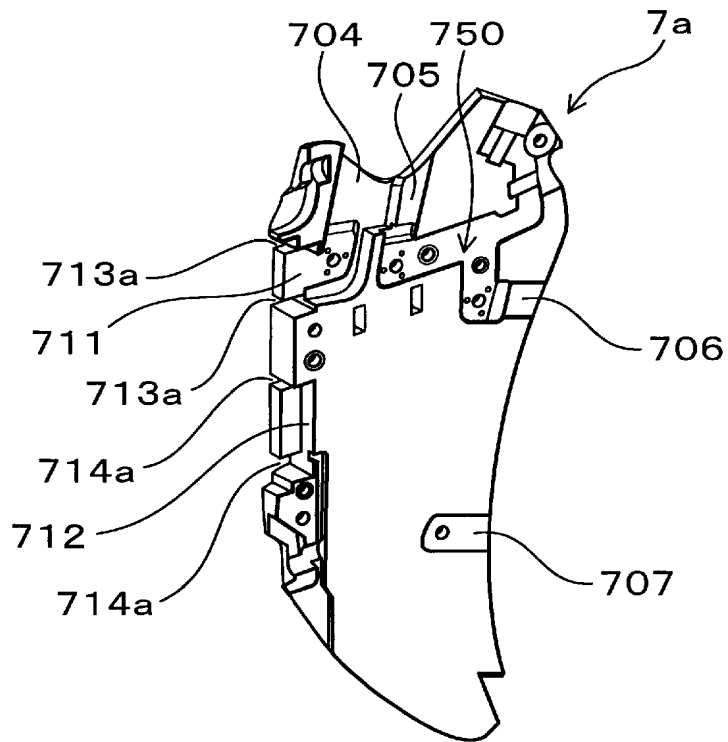
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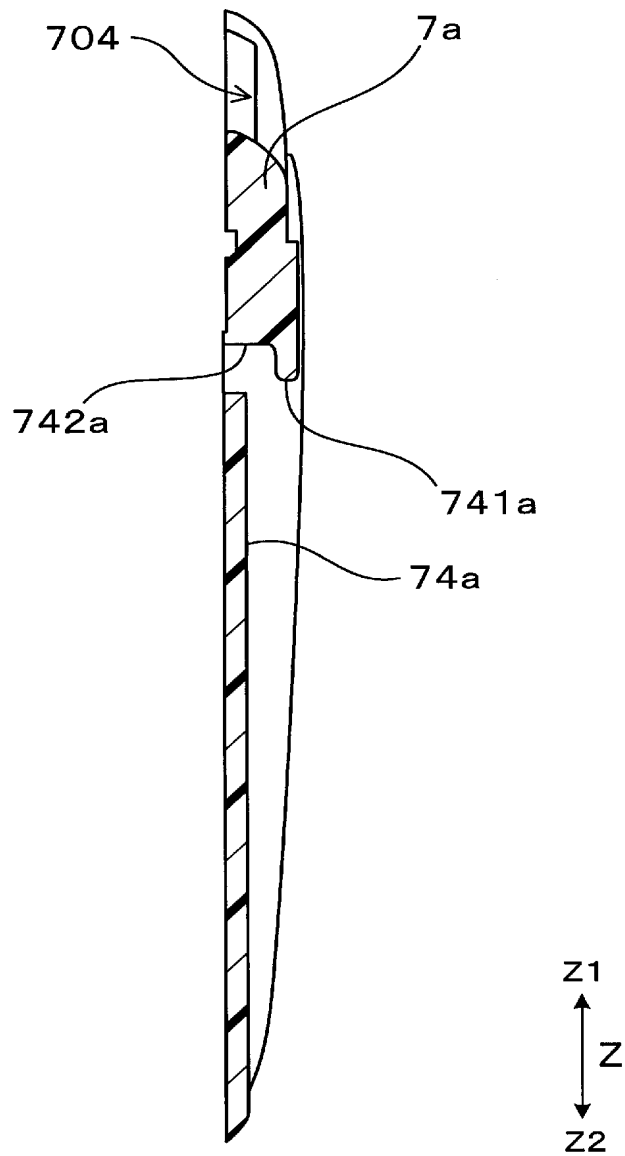
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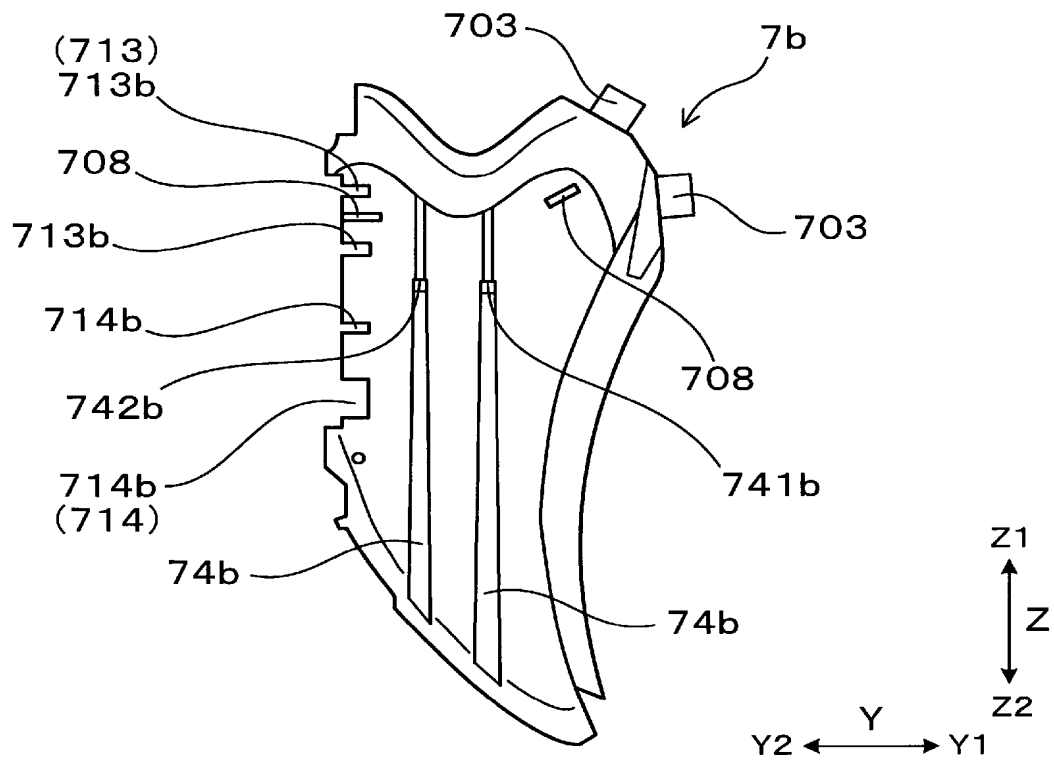
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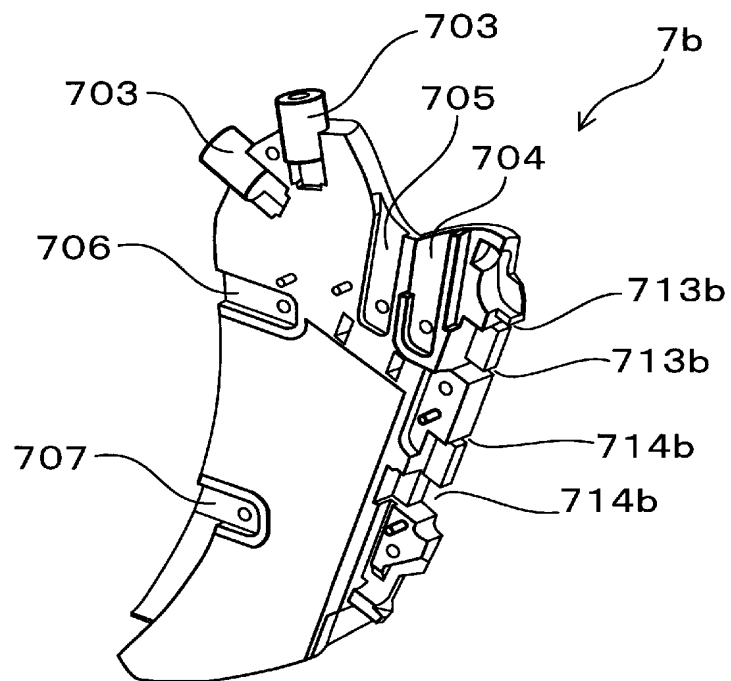
[図29]



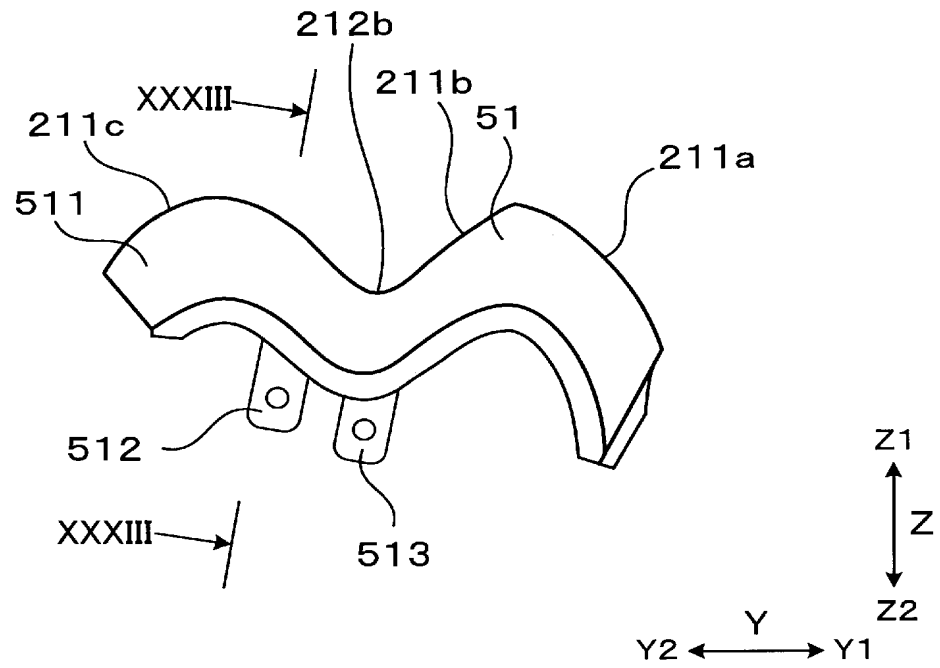
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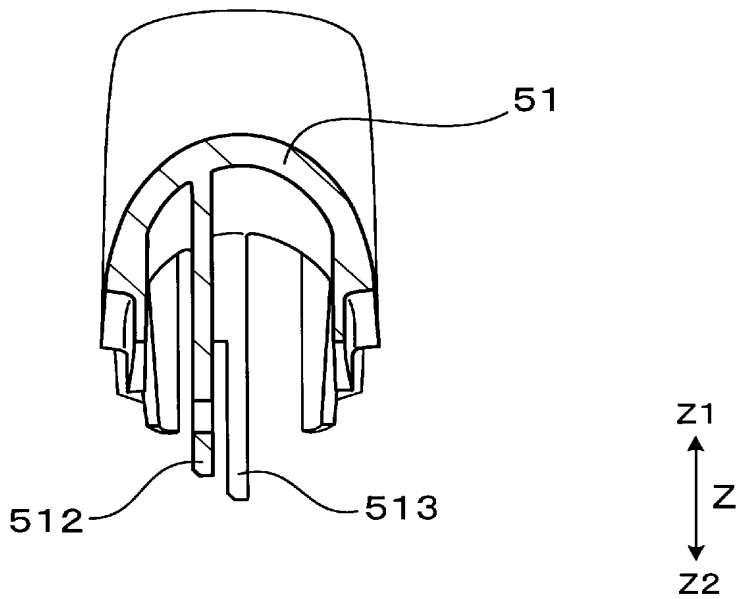
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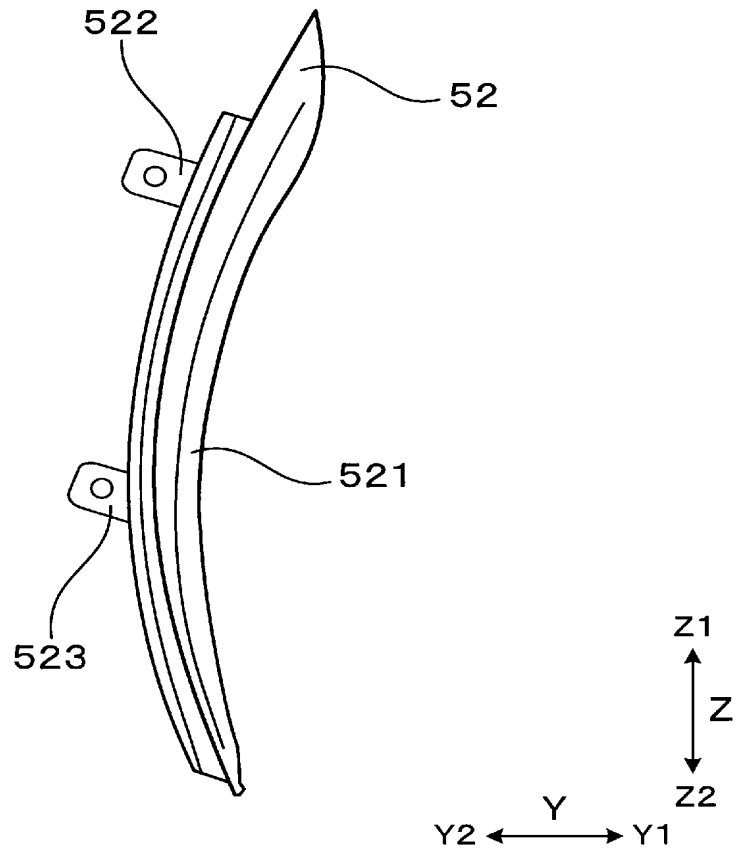
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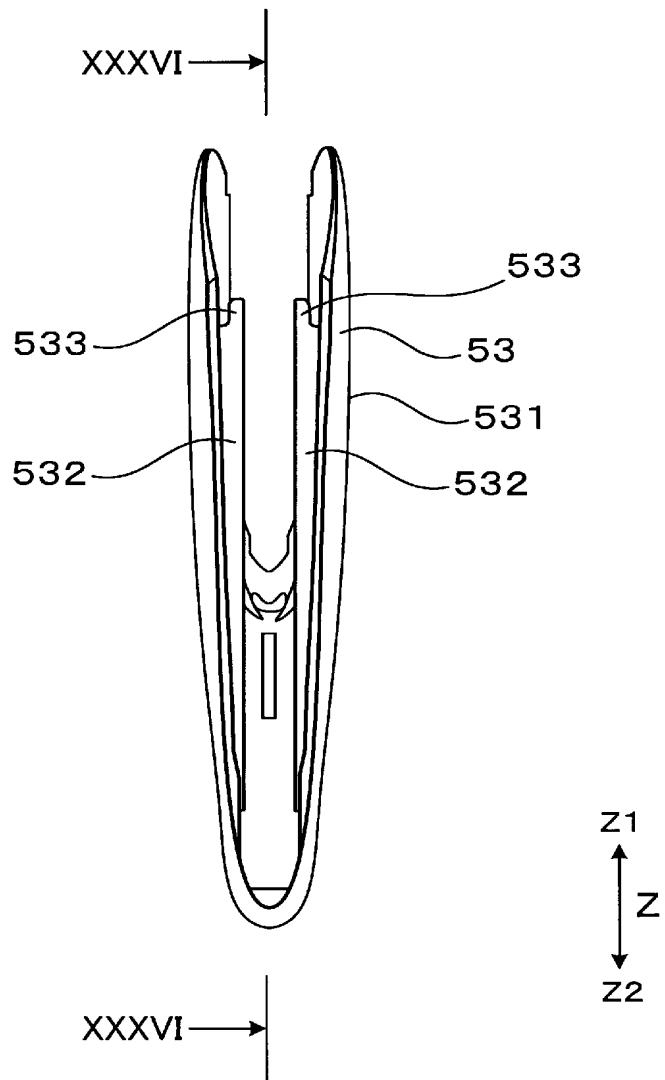
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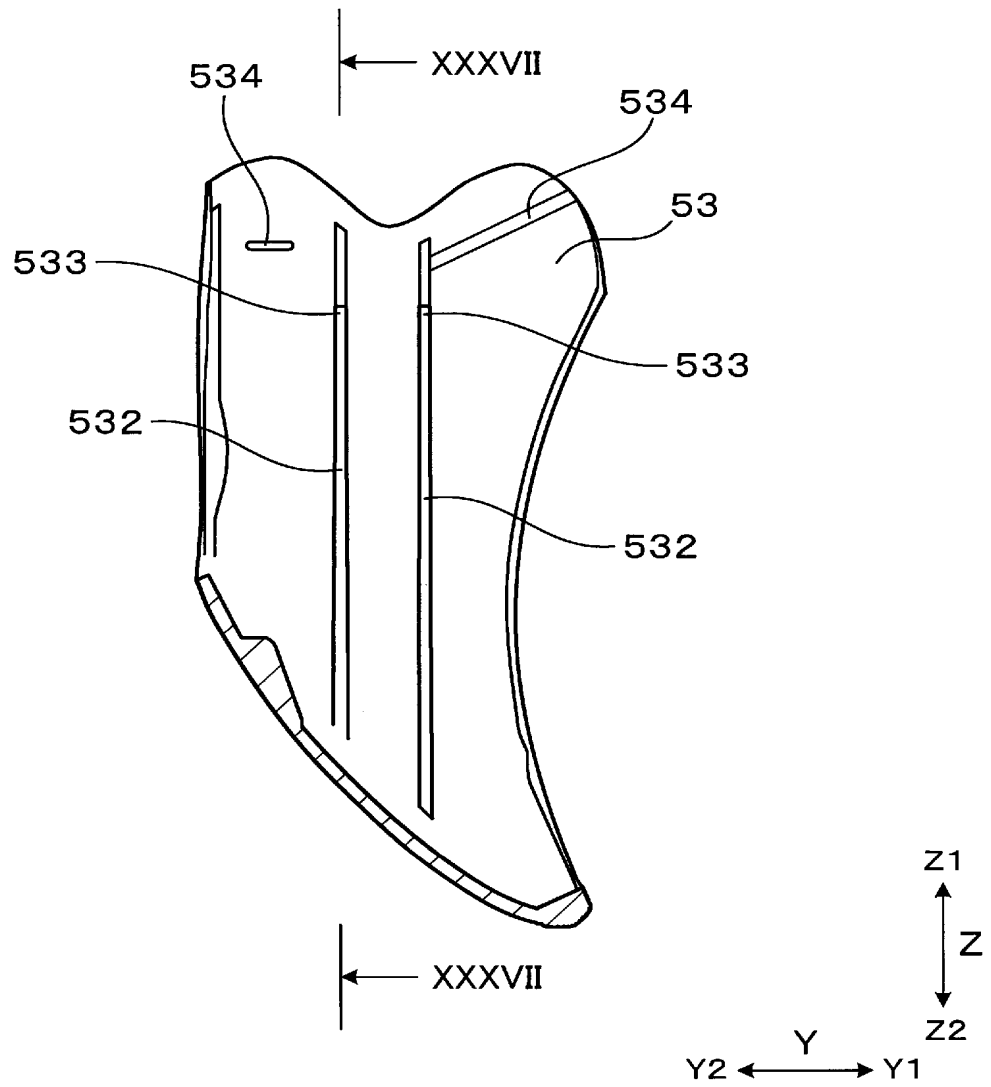
[図34]



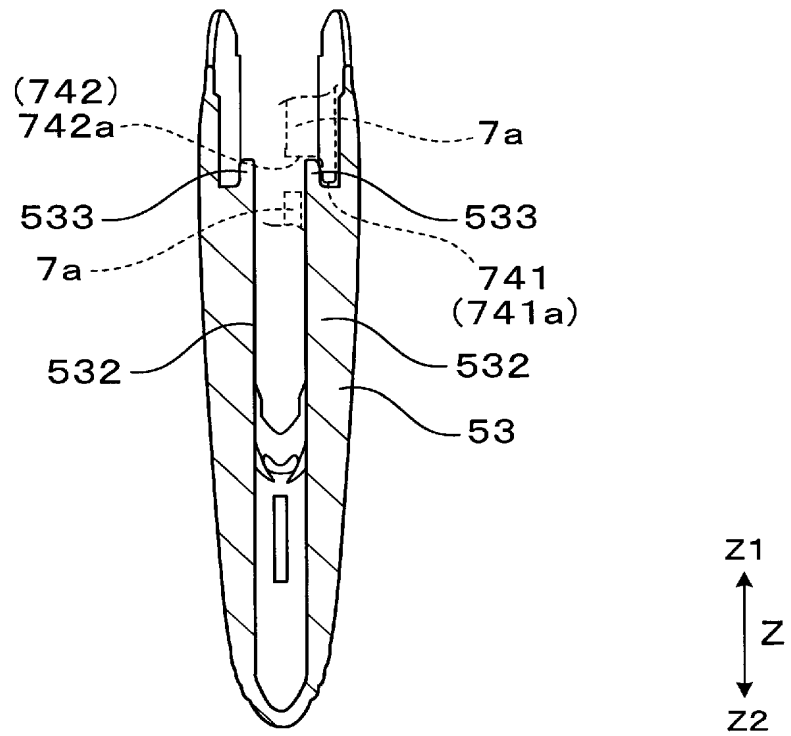
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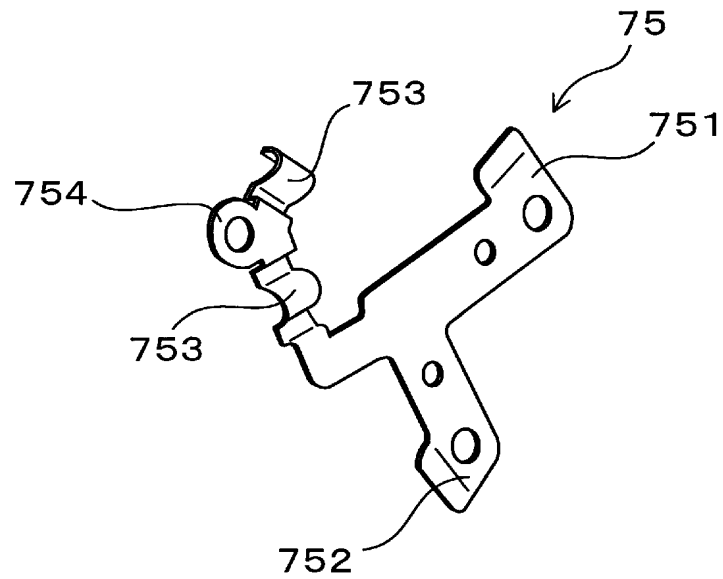
[図36]



[図37]



[図38]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2019/000117

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. A61N1/20(2006.01)i, A61H7/00(2006.01)i, A61H15/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. A61N1/20, A61H7/00, A61H15/00

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

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2019

Registered utility model specifications of Japan 1996-2019

Published registered utility model applications of Japan 1994-2019

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2016/068199 A1 (MTG CO., LTD.) 06 May 2016, paragraphs [0027], [0029], [0038], [0043], [0044], [0047], [0052], fig. 1, 3, 5, 6	1-7
Y	& KR 10-2017-0078778 A & CN 107205880 A & TW 201625331 A	2-5
X	CN 205698899 U (SHENZHEN SUNRAY TECH CO., LTD.) 23 November 2016, paragraphs [0079], [0099], [0103], [0126], fig. 1-4, 9, 10, 14	1
Y	(Family: none)	2-5



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

05.02.2019

Date of mailing of the international search report

19.02.2019

Name and mailing address of the ISA/

Japan Patent Office

3-4-3, Kasumigaseki, Chiyoda-ku,

Tokyo 100-8915, Japan

Authorized officer

Telephone No.

Hyperice IP Subco Ex 2014 - Page 222

Therabody, Inc. v. Hyperice IP Subco, LLC

PGR2024-00053

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2019/000117

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	KR 10-1782850 B1 (RNU CO., LTD.) 29 September 2017, paragraphs [0039], [0064], fig. 2-5 (Family: none)	1 2-5
X Y	KR 10-1597724 B1 (HABALAN MED & BEAUTY CO., LTD.) 07 March 2016, paragraphs [0064], [0074]-[0078], [0094], [0105], fig. 1-3 (Family: none)	1 2-5
X	JP 2005-66304 A (JAPAN ELECTRONIC MATERIALS CORPORATION) 17 March 2005, paragraph [0033], fig. 1, 2 & JP 3099756 U	1, 6-7
A	JP 2013-198552 A (HITACHI MAXELL LTD.) 03 October 2013, paragraphs [0032]-[0039], [0046], fig. 2-6, 8-10 (Family: none)	1-7
A	WO 2014/208329 A1 (MTG CO., LTD.) 31 December 2014, abstract, paragraph [0009], fig. 2 & CN 104274903 A & TW 201524546 A	1-7

A. 発明の属する分野の分類（国際特許分類（I P C））

Int.Cl. A61N1/20(2006.01)i, A61H7/00(2006.01)i, A61H15/00(2006.01)i

B. 調査を行った分野

調査を行った最小限資料（国際特許分類（I P C））

Int.Cl. A61N1/20, A61H7/00, A61H15/00

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報	1922-1996年
日本国公開実用新案公報	1971-2019年
日本国実用新案登録公報	1996-2019年
日本国登録実用新案公報	1994-2019年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

C. 関連すると認められる文献

引用文献の カテゴリー*	引用文献名 及び一部の箇所が関連するときは、その関連する箇所の表示	関連する 請求項の番号
X Y	WO 2016/068199 A1（株式会社 MTG） 2016.05.06, 段落0027, 0029, 0038, 0043-0044, 0047, 0052, 図1, 3, 5-6 & KR 10-2017-0078778 A & CN 107205880 A & TW 201625331 A	1-7 2-5
X Y	CN 205698899 U（SHENZHEN SUNRAY TECH CO LTD） 2016.11.23, 段落0079, 0099, 0103, 0126, 図1-4, 9-10, 14 (ファミリーなし)	1 2-5

C欄の続きにも文献が列挙されている。

パテントファミリーに関する別紙を参照。

* 引用文献のカテゴリー

「A」 特に関連のある文献ではなく、一般的技术水準を示すもの

「E」 国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの

「L」 優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）

「O」 口頭による開示、使用、展示等に言及する文献

「P」 国際出願日前で、かつ優先権の主張の基礎となる出願

の日の後に公表された文献

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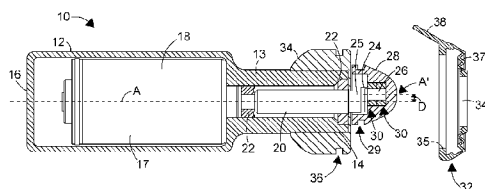


FIG. 1A

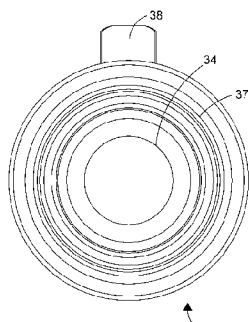


FIG. 1B

(57) Abstract: Massage Therapy Apparatus An apparatus for massage therapy is provided for optimising therapy while reducing negative effects on a therapist. The apparatus comprises, a housing comprising a first end and a second end; a drive assembly coupled to the housing; a massage member in communication with the drive assembly, the massage member being proximate the first end of the housing; and a static mass coupled to the housing; wherein the static mass is proximate the first end of the housing and wherein, in use the static mass is arranged to be immovable with respect to the housing. The apparatus of the present invention aims to provide an effective therapy solution while reducing the risk of vibration related injury to an individual providing the therapy. [FIG. 1 FOR ABSTRACT]

Massage Therapy Apparatus

Field of the Invention

5 The present invention relates to massage therapy devices, in particular to hand-held massage therapy devices.

Background to the Invention

10 Massage therapy can include whole body or localised vibration therapy.

During whole-body vibration therapy, a recipient would typically stand, sit, or lay on a machine supported by a vibrating platform.

15 During localized vibration therapy, a therapist typically places a hand-held vibrating device on certain parts of the body.

The direction and intensity of vibrations may determine how well vibration therapy works. Some machines produce only vertical vibrations, providing a percussive or Shiatsu-type therapy. There are many percussive and Shiatsu type massagers already. Percussive type
20 massagers generally act normal to the surface of the tissue, depressing and releasing the surface. Other forms of vibrations therapy device produce vibrations that occur laterally.

Localised vibration therapy devices typically transmit a degree of vibration throughout the body of the device to the hand of a therapist holding the device. A force is typically required to be
25 applied by the therapist to the device in order to maximise therapeutic efficacy. Continuous vibratory action against the hand of the therapist, which is often combined with a requirement for continuous pressure to be applied to the device by the therapist, can cause an increased risk of injury to the therapist. Such injuries can include Vibration White Finger, Repetitive Strain Injury (RSI) and Hand Arm Vibration Syndrome (HAVS) .

30 Therapists often apply considerable pressure to a vibration therapy device to maximise the therapeutic effect. The incidence of injury to the therapist's hand can be exacerbated in devices requiring more pressure to be applied during operation of the device.

35 Examples of current such devices include the Niagara Therapy Cyclo-Therapy Handheld massager, another is the Rapid Release Therapy (RRT) Pro2.

Many current portable devices for delivering topical, medically effective vibration therapy have attempted to alleviate the effects of continuous vibration on the user. Such devices typically use an electric motor having eccentric weights, causing some or all of the body of the delivery device to vibrate. This is then held in the hand and applied to the body. Rotating weights are intended to provide a counterweight and/or flywheel effect to stabilise the body of the device during operation. Dynamic counterbalancing is the most common method for balancing rotational machinery. Examples of vibration therapy devices incorporating such technology can be found in, for example, WO 2016/123343 A1, WO 2009/049185 A1, and include the G5 GBM by General Physiotherapy Inc.

Solutions in other fields, such as vibrational hand-drilling, have been to attach a handle to a device with the intention of isolating vibratory forces of the rotational or vibratory device from the user. These solutions have been found to be suboptimal in reducing the vibratory forces transmitted to a user. The best that can be achieved in these iterations is a degree of isolation, but there is a trade-off, in that if the handle connection is sufficiently rigid to allow precise manipulation of the application surface, it cannot provide much isolation.

It is therefore desirable to provide an apparatus providing effective hand-held localised massage therapy while minimising effort from a therapist and reducing the risk of injury through repetitive strain.

Summary of the Invention

In accordance with a first aspect of the present invention, there is provided an apparatus for massage therapy comprising, a housing comprising a first end and a second end; a drive assembly coupled to the housing; a massage member in communication with the drive assembly, the massage member arranged to extend from the drive assembly; and a static mass coupled to the housing; wherein the static mass is proximate the first end of the housing and wherein, in use, the static mass is arranged to be immovable with respect to the housing.

In preferable embodiments, the massage member is arranged to extend from a drive shaft of the drive assembly. In some embodiments the massage member is arranged to protrude from the first end of the housing. In some embodiments, the static mass may be considered a component of the housing.

In accordance with an additional aspect of the present invention, which may comprise any of the herein described optional features of the first aspect of the present invention, there is provided an apparatus for massage therapy comprising, a housing comprising a first end and a second end; a drive assembly coupled to the housing; a massage member in communication
5 with the drive assembly, the massage member arranged to protrude from the first end of the housing; and a static mass coupled to the housing; wherein the static mass is proximate the first end of the housing and wherein, in use, the static mass is arranged to be immovable with respect to the housing.

10 The present invention preferably provides an apparatus for massage therapy having a housing comprising a drive assembly arranged to drive a massage member. Preferably the drive assembly causes oscillation of the massage member through rotation of a drive shaft. In embodiments wherein oscillation of the massage member is provided by rotation of a drive shaft, shear forces may be generated by the oscillating massage member. Preferably the static
15 mass proximate the first end of the apparatus, and therefore preferably proximate the massage member, provides inertia, counteracting the shear forces, and reducing the effect of said forces on the housing of the apparatus. In the context of the present invention, the term "static mass" refers to an inert mass which follows D'Alembert's principle.

20 D'Alembert's principle might be considered a reworking of Newton's second law. Specifically it introduces a fictitious force, ' $-ma$ ' so that the equation of Newton's second law ($F = ma$) becomes $F - ma = 0$. If F is the force applied by the soft tissue of a recipient of the apparatus according to the present invention, in reaction to the movement of the massage member, and ' m ' is the mass of the inert static mass, then as ' m ' increases, ' a ' (the acceleration) reduces.
25 So there is less acceleration acting on a larger mass (m) and hence the static mass (and the portion of the housing affixed thereto) moves a shorter distance following a given force exerted by the massage member, before the force F (which in a preferable embodiment is a vibratory force) is reversed and moves the inert (static) mass back to the other extreme of movement, which in a preferable embodiment describes a generally circular path, having a much smaller
30 radius than that described by the massage member. Considering the problem observed along the length of the device, it is important that the inert (static) mass is as near as possible along the length of the device to the massage member, as in a preferable embodiment a rotating torque is applied to a centre of mass of the whole apparatus by the force F . The inert (static) mass effectively reduces the force F , thus the torque is very much reduced. This principle can
35 be seen to be very effective in limiting vibration in the housing of an apparatus for massage therapy according to the present invention, and also may be applicable to rotary and linear vibratory and oscillatory devices in general.

The exact amount of movement of the static mass of the apparatus (wherein in preferable embodiments the movement is by vibration), is dependent upon the stiffness of the tissue being treated, and reduces greatly as a speed of (for example rotation of) the drive assembly increases.

The static mass is immovable with respect to the housing during operation of the device, the static mass having a static mass weight which is relative to the weight of the apparatus (the apparatus weight).

Preferably the housing is arranged to be held by a user. More preferably the housing is arranged to be held proximate the second end of the housing. In preferable embodiments, the housing is arranged to be held single-handed. Additional embodiments will be appreciated wherein the housing is arranged to be held proximate the first end of the housing. Additional embodiments will be appreciated wherein the housing is arranged to be held with two hands.

A hand held apparatus for massage therapy is preferably provided, the housing of which, through reacting with lateral forces of a massage member against what is preferably an integral and inert static mass does not significantly vibrate, therefore being safer for a therapist to use for extended periods. This device has the further advantage of allowing not only speed control and changing of the tip, but also changing of the vibration displacement by the user as the means of generating displacement is a part of the user-changeable tip (otherwise referred to herein as an interchangeable therapy member).

In embodiments wherein the apparatus of the present invention is arranged to be held by a user, the static mass of the present invention preferably reduces the effect of vibratory forces, generated by movement of the massage member, on the held portion of the device.

Preferably the drive assembly comprises a motor, and a drive shaft arranged to be driven by the motor; and wherein the drive shaft is arranged to drive the massage member. More preferably the massage member comprises a crankshaft having a longitudinal axis, the crankshaft comprising a first engagement portion arranged to engage with the drive shaft, and a second operative portion comprising a crankpin, the crankpin being positioned eccentric to the longitudinal axis of the crankshaft. Still more preferably the crankpin comprises at least one bearing. Still more preferably the bearing is a ball bearing. Preferably the crankpin is eccentric to the longitudinal axis of the crankshaft by a distance, the distance being one selected from the range: 0.05 mm to 15 mm.

Preferably the massage member is in communication with a drive shaft of the drive assembly. Preferably the massage member is affixed to the drive shaft, and preferably the massage member is reversibly affixed to the drive shaft. Preferably the massage member is interlocked
5 with the drive shaft, and preferably the massage member is reversibly interlocked to the drive shaft. Preferably the massage member is reversibly detachable from the drive assembly. Embodiments will be appreciated wherein the massage member is permanently affixed to the drive assembly. Preferably the massage member is in communication with the drive assembly using interlocking teeth located on a portion of the massage member and corresponding
10 interlocking teeth located on a portion of the drive assembly. In embodiments wherein at least a portion of the drive assembly is a ferromagnetic material, the massage member preferably comprises a magnetic portion arranged to reversibly affix the massage member to the ferromagnetic material of the drive assembly.

15 In accordance with preferable embodiments, the massage member is detachable from the drive assembly, and the same massage member, or an alternative massage member may then be attached to the drive assembly. Preferably therefore the massage member may be changed to vary or adjust the amplitude of massage therapy provided, such as, for example, by using a massage member having different or varying eccentricity of the crankpin relative to
20 the crankshaft.

Preferably at least a portion of the drive assembly is located inside the housing.

Preferably the static mass is located substantially exterior to the housing. Additional
25 embodiments will be appreciated wherein at least part of the static mass is located inside the housing. Embodiments will be appreciated wherein the housing is arranged to encase the static mass.

Preferably the static mass is coupled to the housing by way of one selected from the range: a
30 screw thread; a push fit; a clamp; a fixing member. Fixing member, for the purpose of coupling the static mass to the housing as described, can be considered any appropriate material arranged to affix the static mass to the housing, and may for example include screws, pins, rivets, nails, clips, clamps, or any combination thereof.

35 In preferable embodiments, the static mass is fixed to the housing. In more preferable embodiments, the static mass is detachable from the housing. In more preferable

embodiments the static mass is arranged to be replaceable according to the requirements of a recipient.

Preferably the static mass has a static mass weight and the apparatus has an apparatus weight, the static mass weight being relative to the apparatus weight according to a weight ratio, wherein the weight ratio of static mass weight : apparatus weight is selected from between: 1:10 and 1:2. More preferably the weight ratio is selected from between: 1:5 and 1:2.

In preferable embodiments the weight of the static mass is selected from between 50 g and 500 g. In more preferable embodiments the weight of the static mass is selected from between 100 g and 250 g.

Preferably the distance between the static mass and the first end of the housing is shorter than the distance between the motor and the first end of the housing. Preferably the static mass is positioned in between the motor and the first end of the housing.

Preferably the static mass is isolated from the drive assembly. The rubber mounts the motor has are for improvements in noise reduction (bearing rumble, brush clicking etc) among other benefits. The body of the device has a motor, the inert mass, a casing and other parts. Rubber isolation of the motor from the body can be provided.

Preferably at least a portion of the drive assembly is coupled to the housing using a compressive material. More preferably at least a portion of the drive assembly is coupled to the housing using mounts comprising one selected from the range: rubber; gel; a polymeric material; sponge; felt; cork. In accordance with preferable embodiments, forces impinged upon the housing by at least a portion of the drive assembly are reduced by coupling at least a portion of the drive assembly to the housing using a compressive material, which preferably acts as a dampener. In preferable embodiments the drive assembly comprises a motor. In more preferable embodiments, the motor is coupled to the housing using rubber mounts, which preferably reduces noise from the motor such as, for example, bearing rumble and brush clicks.

Preferably the apparatus is a massage therapy apparatus. More preferably massage therapy includes vibration therapy.

The apparatus of the first aspect of the present invention is preferably suitable for use on humans and animals.

- Preferably the apparatus further comprises a power supply. Preferably the power supply comprises a battery. Preferably the battery is rechargeable. Preferably the battery is located at a battery position, the battery position being relative to the drive assembly (such as a motor),
5 the battery position being more proximate the second end of the housing relative to the drive assembly. Preferably the apparatus comprises a printed circuit board (PCB), or other suitable componentry for connecting electrical or electronic components of the apparatus, having a power socket attached thereto, the PCB being arranged to provide power to the battery when the power socket is engaged with a power source such as, for example, a DC power source
10 or an AC power source, which may include a battery charger (such as a lithium ion battery charger). The power socket optionally comprises a retention member arranged to retain the power source in engagement with the socket during operation of the apparatus. Thereby, preferably the apparatus may be attached to an external power source during operation. Operation of the apparatus typically includes manual handling of the apparatus. Such manual
15 handling may potentially pose a risk of detachment of an external power supply from the PCB socket of the apparatus and thus cause the apparatus to rely on any on-board power supply – such as a battery. A socket having a retention member preferably permits extensive manual handling without posing a risk of detachment of the external power supply from the socket.
- 20 Preferably the massage member is arranged to describe a circular, ellipsoid or gyratory path. In embodiments comprising an interchangeable therapy member, the massage member is arranged to impart a circular, ellipsoid, lateral or shearing motion upon at least a portion of the interchangeable therapy member. Preferably the massage member is positioned eccentric to a central longitudinal axis of the apparatus and/or a drive shaft of the drive assembly,
25 preferably the eccentric position is a distance from the central longitudinal axis of the apparatus and/or a drive shaft of the drive assembly. More preferably the distance of eccentricity is selected from the range: 0.05 mm to 15 mm. Most preferably the distance of eccentricity is selected from the range: 1 mm to 6 mm.
- 30 Preferably the drive assembly is arranged to drive the massage member to describe the path, the path preferably being described by the massage member at a frequency selectable by a user. More preferably the frequency is selectable from between 0 Hz and 300 Hz. Most preferably the frequency is selectable from between 15 Hz and 300 Hz.
- 35 Preferably the apparatus further comprises an interchangeable therapy member in communication with the massage member. More preferably at least a portion of the interchangeable therapy member is reversibly detachable from the massage member. Still

more preferably the interchangeable therapy member comprises a first contact portion arranged to engage with the massage member and a second fixation portion arranged to engage with a component of the apparatus. Preferably the massage member comprises at least one bearing arranged to engage with the interchangeable therapy member. More preferably the massage member comprises at least one bearing arranged to engage with the first contact portion. Preferably the at least one bearing comprises a ball bearing. Alternate embodiments will be appreciated wherein the massage member and the interchangeable therapy member are permanently coupled in an interchangeable sub-assembly of the apparatus according to the present invention. In said preferable embodiments, the housing and/or the drive assembly of the present invention are arranged to engage with the sub-assembly. In said preferable embodiments, the sub-assembly preferably comprises a fixing member arranged to affix the sub-assembly to the housing and/or the drive assembly. Preferably the sub-assembly may be reversibly affixed to the housing and/or the drive assembly.

Preferably the second fixation portion is arranged to affix the first contact portion to the massage member. Preferably the first contact portion comprises a material selected from the range: rubber; polymer; gel; plastic; wood; metal; rigid material; pliable material. Preferably the second fixation portion is the static mass. Preferably the first contact portion is arranged to transfer energy from the massage member to a surface. Preferably the interchangeable therapy member comprises an occlusion portion arranged to extend inside the housing of the apparatus. More preferably the occlusion portion extends about the perimeter of at least a portion of the massage member. More preferably the occlusion portion extends about the perimeter of at least a portion of the drive assembly. More preferably the occlusion portion extends about the perimeter of at least a portion of a drive shaft of the drive assembly. Preferably the occlusion portion is arranged to prevent access of hair to the massage member and/or the drive assembly.

Preferably the apparatus of the present invention comprises an occlusion member. More preferably the occlusion member extends between at least a portion of the drive assembly and the housing of the present invention. More preferably the occlusion member extends between at least a portion of the drive assembly and the interchangeable therapy member. Preferably the occlusion member provides a labyrinth arranged to prevent access of hair to the massage member and/or the drive assembly. More preferably an occlusion portion of the interchangeable therapy member is arranged to compliment the labyrinthine properties of the occlusion member. Preferably the occlusion member comprises a coupling portion arranged to couple (preferably in a reversible manner) with a portion of the first end of the housing, and

a labyrinth portion extending between a drive shaft of the drive assembly and a portion of the massage member and/or the interchangeable therapy member. The labyrinth portion preferably provides an increased travel distance from an exterior of the interchangeable therapy member and/or massage member to the drive shaft of the drive assembly. Thereby preferably the occlusion member prevents entanglement of hair and other loose fibres about the drive shaft. Preferably the occlusion member is not in contact with the drive assembly and/or the massage member and/or the interchangeable therapy member. In such embodiments, the occlusion member does not impede movement of the drive assembly and/or the massage member and/or the interchangeable therapy member during use.

Preferably, the apparatus comprises a handle extending from the housing. Preferably the handle extends in a plane offset from the longitudinal axis of the housing. In most preferable embodiments, the handle extends in a plane substantially orthogonal to the longitudinal axis of the housing. The term "offset from the longitudinal axis of the housing" will be understood to mean that the handle may in some embodiments extend in a plane being between 1° and 90° relative to the longitudinal axis of the housing. The term "substantially orthogonal" will be understood by the skilled addressee to mean that the handle may extend in a direction which is either approximately or exactly 90° relative to the longitudinal axis of the housing. Preferably the handle comprises a first portion extending from a point on the housing in a first direction and a second portion extending from a point on the housing in a second direction, wherein preferably the first direction and the second direction are substantially or exactly opposite. There will be embodiments appreciated wherein the first direction and the second direction are any directions suitable to enable a therapist to apply massage therapy, and may in some embodiments be adjustable. The handle preferably enables a therapist to apply optimum force to the housing during massage therapy while maintaining maximum comfort, and without unnatural or uncomfortable positioning of the hands or arms.

Preferably the handle is reversibly detachable from the housing and comprises an attachment portion arranged to engage a corresponding attachment portion of the housing. Preferably the attachment portion of the handle engages the attachment portion of the housing by one or more selected from: screw fit; friction fit; snap fit; bayonet fit. Preferably the housing comprises a disengagement member arranged to provide disengagement of the attachment position of the handle from the attachment portion of the housing. Preferably the disengagement member is one selected from: a push button; a slideable clip; a rotatable clip. Preferably the handle comprises a handle material, the handle material being one selected from the range: metal; wood; plastic; rubber; polymer; composite material.

In accordance with a second aspect of the present invention, there is provided an interchangeable therapy member arranged to be positioned in communication with a massage member according to the first aspect of the present invention.

- 5 In accordance with a third aspect of the present invention, there is provided a kit of parts comprising, an apparatus for massage therapy according to the first aspect of the present invention; and an interchangeable therapy member according to the second aspect of the present invention.

10 **Detailed Description**

Specific embodiments will now be described by way of example only, and with reference to the accompanying drawings, in which:

- 15 FIG. 1a provides a sectional diagram of an example embodiment of an apparatus for massage therapy according to the first aspect of the invention, comprising an interchangeable therapy member according to the second aspect of the present invention and a kit of parts according to the second aspect of the present invention;

- 20 FIG. 1b provides a plan view of a second fixation portion of the embodiment shown in FIG. 1a;

FIG. 2 provides an exploded view of the embodiment shown in FIG. 1a;

- 25 FIG. 3 provides a perspective view of the embodiment shown in FIG. 1a;

- FIG. 4 provides a sectional diagram of an additional example embodiment of the first aspect present invention, comprising an interchangeable therapy member according to the second aspect of the present invention and a kit of parts according to the second aspect of the present invention;
- 30

FIG. 5 provides and exploded view of the embodiment shown in FIG. 4;

- FIG. 6 provides a perspective view of the embodiment shown in FIG. 4; and
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FIG. 7 provides an additional perspective view of the embodiment shown in FIG. 4;

FIG. 8 provides a sectional view of an additional example embodiment of the first aspect present invention, comprising an interchangeable therapy member according to the second aspect of the present invention and a kit of parts according to the second aspect of the present invention, substantially as shown in FIG. 4;

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FIG. 9 provides a perspective view of the embodiment shown in FIG. 8;

FIG. 10 provides a perspective view of an example embodiment of an apparatus according to the first aspect of the present invention comprising a handle;

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FIG. 11a provides an exploded sectional view of an example interchangeable therapy member for use with an example embodiment the first aspect of the present invention; and

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FIG. 11b provides a sectional view of the example shown in FIG. 11a.

Referring to FIG. 1a, an example embodiment of an apparatus for massage therapy 10 according to the first aspect of the present invention is shown, the apparatus 10 comprising a housing 12 having a first portion 13 defining a first end 14 of the housing 12, and a second portion 15 defining a second end of the housing 16. Each of the first portion 13 and the second portion 15 are substantially cylindrical, having a circular cross sectional configuration. Additional embodiments will be appreciated wherein the cross sectional configuration of the housing is not circular, and is any appropriate shape suitable for an apparatus for massage therapy. The first portion 13 circular cross-section having a larger diameter than the second portion 15 circular cross-section. Accommodated within the housing 12 and substantially affixed thereto is a drive assembly 17 comprising a motor 18 located substantially within the second portion 15 of the housing 12. Extending from the motor 18, along the longitudinal axis of the housing 12 and through the first portion 13 is a drive shaft 20 arranged to be driven by the motor 18. The drive shaft is supported within the housing 12 by bearings 22, located proximate to each end of the first portion 13. In communication with the drive shaft 20 of the drive assembly 17, and proximate the first end 14 of the housing 12, there is positioned a crankshaft 24. The crankshaft 24 comprises a first engagement portion 25 arranged to engage with the drive shaft 20, the first engagement portion 25 having a longitudinal axis that is substantially coaxial with the longitudinal axis A of the drive shaft 20. The crankshaft 24 protrudes from the first end 14 of the housing 12 and at the terminal end of the crankshaft 24 and located outside of the housing 12 is a second operative portion 26 taking the form of a crank pin 26, the longitudinal axis A' of the crankpin 26 being eccentric to the longitudinal axis

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A of the drive shaft 20 by a distance of eccentricity D . The crankshaft 24, comprising the first engagement portion 25 and the second operative portion 26, forms a massage member.

5 Immovably affixed to the first end 14 of the housing 12 is a static mass 34 taking the form of an annular weight having a groove 36 located about the periphery thereof.

10 In communication with the second operative portion 26 of the massage member is an interchangeable therapy member, having a first contact portion 28 taking the form of a rubber or plastic part having a curved or flat exterior surface. Additional embodiment will be appreciated wherein the first contact portion does not have a curved exterior surface, and has an exterior surface that is flat, textured, and/or angular as appropriate for the desired effect of massage therapy. The second operative portion 26 of the massage member is in rotatable communication with the first contact portion 28 due to the positioning of bearings 30 located about the second operative portion 26 and arranged to engage with an internal surface of the first contact portion 28. Due to the positioning of bearings 30 about the second operative portion 26, the massage member is arranged to rotate relative to the first contact portion 28.

20 The first contact portion 28 of the interchangeable therapy member, in the example embodiment shown in FIG. 1a, further comprises a second fixation portion 32, taking the form of a plastic bellows cap. A plan view of the second fixation portion 32 is shown in FIG. 1b, the second fixation portion 32 comprising a central aperture 34 arranged to engage with grooves 29 located about the periphery of the first contact portion 28. Located on the underside of the second fixation portion 32, there is positioned a flange 35 arranged to engage with the groove 36 of the static mass 34. The second fixation portion 32 comprises a plurality of concentric annular convolutions 37, diverging from the central aperture 34, the convolutions 37 providing a pliable mechanism such that the position of the central aperture 34 is movable laterally relative to the position of the second fixation portion 32. A tab 38 is provided at a position located on the periphery of the bellows cap 32, the tab 38 providing ease of removal of the bellows cap 32 from the apparatus 10.

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In use a user, such as a therapist, holds the apparatus of the example embodiment shown by the second portion 15 of the housing 12 proximate the second end 16. The motor 18 of the drive assembly 17 is arranged to provide rotational drive the drive shaft 20, which in turn is arranged to provide rotational drive the massage member comprising the crankshaft 24. The distance of eccentricity D (otherwise known as the "throw") of the crank pin 26 causes the crank pin 26 to define a circular or gyratory path around the longitudinal axis A of the drive shaft 20. The first contact portion 28 of the interchangeable therapy member is arranged to

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move laterally in a path defined by the crank pin 26, and does not substantially rotate relative to the apparatus 10 as a result of fixation to the static mass 34 by the second fixation portion 32. Lateral movement of the first contact portion 28 is permitted due to the pliable nature of the convolutions 37 of the second fixation portion 32. The extent of lateral movement is defined by the throw distance D of the crank pin 26 and the frequency of rotation of the drive shaft 20 defined by the motor 18. In the example embodiment shown, at therapeutic frequencies, the first contact portion 28 is arranged to provide vibration therapy to a surface, the vibration causing shear forces to the first end 14 of the housing 12. The static mass 34 located proximate the first end 14 is arranged to provide inertia, thus substantially reducing or preventing the transmission of vibration resulting from said shear forces along the extent of the housing from the first end 14 proximate the massage member, to the second end 16 proximate the user's hands.

The apparatus 10 of the example embodiment shown is used perpendicular to the surface requiring therapy, which in a preferable example is a surface of a human or animal body, with the massage member being proximate the surface. The apparatus 10 is typically in dynamic rotational balance when not in contact with body tissue and imparts very little hand arm vibration (HAV) to the user. The apparatus 10 is not a percussive or Shiatsu type device. The first contact portion 28 of the example embodiment shown is relatively small and indents the soft tissue of the surface to which it is applied. In the example embodiment shown, the throw distance D is 0.1 to 5 mm, and thus the first contact portion 28 describes a circular (gyratory) path having a diameter of up to 10 mm, but does not rotate, therefore impinging upon the surface to cause a circular, shearing motion into the tissue because the tissue moves easily, whilst immediately adjacent to the first contact portion 28 is a heavy weight 34, which in the example shown weighs 200 g, and which moves very little due to its inertia. The weight 34 permits for the user to be required to apply only a minimum level of external force to the apparatus perpendicular to the surface. Resistance to rotation of the first contact portion 28 is offered by the soft tissue of the surface and/or the bellows cap, and movement of the first contact portion 28 is countered by the inertia provided by the static mass 34. The greater the weight of the static mass 34, the less the first end 14 of the housing 12 of the apparatus 10 will move in reaction to rotation of the massage member and subsequent movement ("vibration") of the first contact portion 28. The therapy provided is most effective at frequencies between 15 and 200 Hz. With a first contact portion comprising a rigid, non-compressive material, the apparatus of the example embodiment shown might be unsuitable for use in bony areas, such as the skull, and spinal column, but with a more pliable rubber first contact portion 28 and smaller displacement (throw distance D), application to bony areas

may be tolerable for a recipient. Another function of the bellows cap 32 is preferably to prevent entanglement of hair from a recipient around moving parts of the apparatus 10.

5 In normal operation of the apparatus 10, the second fixation portion (bellows cap) 32 is attached to the first contact portion 28, the sub-assembly of which is easily interchangeable with other similar sub-assemblies with different shape, texture and material (e.g. hard or soft). In further normal operation, the massage member comprising the crankshaft 24 having first engagement portion 25 and second operative portion 26 is in removable communication with the drive shaft 20 and such provides a sub-assembly which is easily interchangeable with
10 other similar sub-assemblies with different properties, such as throw distance D . A different throw distance D preferably provides for alternate therapeutic properties, with the resulting circular or gyratory paths providing a customisable therapy according to the requirements of a recipient.

15 An exploded view of the example embodiment in FIG. 1 is shown in FIG. 2, the example embodiment of FIG. 2 providing a detachable and interchangeable massage member 24, with fixation of the detachable massage member 24 to the drive shaft 20 being by way of a collar 44 retaining a 'Dee' shaped drive portion 40 and a retaining detent spring 42 which engages with a feature on the crankshaft to effect adequately firm retention, such that the first
20 engagement portion 25 of the massage member 24 is non-rotatably coupled to the drive shaft 20. The parts for providing a detachable and interchangeable massage member in the example embodiment shown are provided for exemplification only, and additional embodiments will be conceivable wherein an appropriate detachable and interchangeable massage member is provided. Such as a ball-type detent, a spline rather than a Dee drive, a
25 round shaft with drive dogs, a magnetic coupling or a threaded coupling.

FIG. 3 shows a perspective view of the complete apparatus 10 of the embodiment of FIG. 1 and FIG. 2.

30 The apparatus 10 of the embodiment shown is powered externally by a cable, but alternate embodiments may be high or low voltage AC, or low voltage DC from a power adapter, or powered by external or internal batteries.

The rotational speed of the motor 18 and drive shaft 20 may be fixed, or may be variable from
35 0 to 500 Hz. Power consumed by the apparatus is typically 2 W to 5 W without load and 6 W to 20 W in use. The power dissipated (that over and above the quiescent power) may be used as a measure or metric of the therapy delivered. This measure or metric may be employed in

an electronic therapy limiting control, such that if the apparatus is used aggressively for, for example, 5 minutes, this may be equivalent (in energy dissipated (Joules)) to perhaps 15 minutes of very gentle usage. Or to provide warning to the therapist that a higher than desirable amount of energy is being dissipated, such as might be safe or efficacious for a particular area of the body.

An additional example embodiment 50 is shown in FIG. 4, wherein the housing 52 comprises a first portion 54 accommodating a drive assembly motor 56 therein, and a second portion 58 (both the first and second portion comprised within a single moulding) accommodating a rechargeable battery pack 60 therein, together with an integrated circuit or circuit board 62 providing on-board on/off and speed control and a visual battery charge status features for the apparatus, as well as a time-limit feature and a power limit feature. The motor 56 is arranged to drive a drive shaft 64 coupled thereto, the drive shaft 64 being in communication with an detachable and interchangeable massage member 66 comprising a crankshaft 68 having a crank pin 70, the crankshaft 68 being in communication with an interchangeable therapy member 72, the interchangeable therapy member 72 being in detachable communication with the crank pin 70 by push fit over bearings 74 positioned therebetween. The massage member 66 and the interchangeable therapy member 72 detachably coupled thereto provide an interchangeable sub-assembly, wherein the massage member 66 and/or the interchangeable therapy member 72 may be detached individually or as one and replaced by an alternate massage member 66 and/or interchangeable therapy member 72 having more preferable properties. The properties may include the material and/or shape of the interchangeable therapy member 72 or the throw distance of the crank pin 70 of the massage member 66. The crank shaft 68 of the massage member 66 is detachably coupled to, but sufficiently retained on the drive shaft 64 using a second fixation portion 76. The second fixation portion 76 prevents detachment of the massage member 66 from the drive shaft 64 during normal operation of the apparatus 50, but permits detachment following specific longitudinally applied force, applied by a user. Frictional forces present between the interchangeable therapy member 72 and the bearings 74 are sufficient to prevent detachment of the interchangeable therapy member 72 from the massage member 66 during normal operation, but can be overcome by targeted longitudinally applied forces, applied by a user to remove the interchangeable therapy member 72. Located affixed to the first portion 54 of the housing 52 and proximate the massage member 66 is a static mass 78 providing an inert weight relative to the rest of the apparatus 50.

The shape of the interchangeable therapy member, including a collar extending into the device and substantially isolating rotational parts from the exterior of the device provides a labyrinth

to occlude entry to the device for stray hairs and thus aids in prevention of entanglement of hair around rotational parts. Additional embodiments may comprise an appropriate seal to isolate hair from the internal moving parts of the apparatus.

- 5 An exploded view of the example embodiment of FIG. 4 is shown in FIG. 5. An occlusion member 80 is shown having a tubular portion, the tubular portion arranged to extend between the crankshaft 68 of the massage member 66 and the static mass 78 once affixed in place within the apparatus 50. The tubular portion of the occlusion member 80 is arranged to compliment a tubular occlusion portion of the interchangeable therapy member 72 arranged
10 to extend between the occlusion member 80 and the static mass 72 once affixed in place in the apparatus 50. The occlusion member 80 and the tubular occlusion portion of the interchangeable therapy member 72 act as a labyrinth, arranged to prevent access of hair to the drive assembly or massage member, thus preventing entanglement.
- 15 A perspective view of the apparatus 50 is shown in FIG. 6 having the interchangeable therapy member 72 closest to the viewer. A further perspective view of the apparatus 50 is shown in FIG. 7, providing a view of the back of the apparatus 50, wherein the controls and visual diagnostic features of the control PCB (including one or more integrated circuits) 62 are shown, these including a power control 82, a rotational speed control 84, a rechargeable
20 battery charging port 86, and a visual battery level indicator 88. Speed control coupled with an adjustment or replacement of the massage member and/or interchangeable therapy member therefore provide for varying of the speed and/or amplitude, providing adaptation for specific tissue types and localisation or otherwise of therapy provided by the present invention.
- 25 Referring to FIG. 8 and FIG. 9, an apparatus substantially according to that shown in FIG. 4 is provided, having an interchangeable tip assembly 92 comprising a massage member having a crankshaft and a crankpin eccentric thereto, and further comprising a therapy member substantially equal to the interchangeable therapy member discussed herein. The individual components of the interchangeable tip subassembly 92 are permanently affixed to one
30 another and the interchangeably tip subassembly 92 is therefore arranged to be detached and reattached to the rest of the apparatus 90. Additional embodiments will be appreciated wherein the interchangeable tip subassembly (like that shown 92) comprises individual components which are separable from one another and may themselves be reattached or interchanged.
- 35 FIG. 10 shows an example embodiment of an apparatus for massage therapy 100 substantially as hereinbefore described, the example of FIG. 10 further comprising a detachable handle 102. The apparatus 100 comprises an attachment portion 104 upstream of

the static mass and proximate the first end of the housing. The attachment portion 104 extends around the circumference of the housing and comprises a plurality of interspersed flanges 106 extending outwardly from the attachment portion 104. The handle 102 comprises an annular central attachment portion 108 which corresponds in shape and size to the attachment portion 104 of the housing. The central attachment portion 108 of the handle 102 comprises an attachment mechanism along an interior edge of the central attachment portion 108, the attachment mechanism comprising a plurality of interspersed channels forming bayonet mounts having open 110 and closed 112 positions. In use, the handle 102 is passed along the length of the housing of the apparatus 100 until the interspersed channels 110 engage with corresponding interspersed flanges 106, at which point the handle is rotated such that the flanges 106 engage with the channels in the closed position 112.

FIG. 11A and FIG. 11B show an example of an interchangeable subassembly 120 for use in an apparatus according to the first aspect of the present invention, the subassembly 120 comprising a metal massage member 126 and a rubber interchangeable therapy member 122. In the subassembly 120 shown, the massage member 126 is semi-permanently affixed to the interchangeable therapy member 122 and the subassembly 120 itself therefore makes up a single interchangeable unit and may, in some embodiments, be considered as the "massage member". In the example shown, the massage member 126 comprises a connecting portion 126 having a cylindrical channel 130 arranged to accept a cylindrical drive shaft, which in FIG. 11B is hidden by the outer portion of the connection portion (crank shaft) 126. The connecting portion 126 comprises, at the base of the channel 130, a plurality of teeth 132 spaced at regular intervals about the circumference of the channel 130. The teeth 132 are arranged to engage corresponding teeth 140 (which may otherwise be referred to as a drive dog) located on the drive shaft, and as such, rotational movement of the drive shaft, and consequently the teeth 140, imparts a rotational force on the interlocking teeth 132, causing the massage member 126 to rotate at a rotational speed equivalent to that of the drive shaft and teeth 140. At an end of the channel 130 opposing the end having the teeth 132 is positioned a groove arranged to accept a magnet 134. The magnet 134 acts to attract the ferromagnetic drive shaft such that it is retained in the channel 130, that the massage member is retained on the shaft and that the interlocking teeth 132 remain engaged with the corresponding teeth 140 of the drive shaft. Extending from the connecting portion of the massage member 126 is a crank pin 128 having a crankpin longitudinal axis which is parallel to the central longitudinal axis of the channel 130 and therefore parallel to a central longitudinal axis of a corresponding drive shaft. The crankpin longitudinal axis is, however, eccentric relative to the central longitudinal axis of the drive shaft by a distance of eccentricity, the distance of eccentricity causing the crankpin

128 to define an oscillatory path as the drive shaft rotates. The crankpin 128 is coupled to a coupling portion 124 of the interchangeable therapy member 122 using two bearings 136 separated by a spacer 138. The interchangeable therapy member 122 comprises an occluding portion 122 extending parallel to the longitudinal axis of the massage member 126 and is arranged to prevent access of hair to the drive shaft or rotating massage member 126 and therefore prevents entanglement and potential injury. The occluding portion 122 of the interchangeable therapy member may complement an additional occlusion member 146 of the apparatus, or in other embodiments for example, the occlusion member 80 described for FIG. 5.

In the embodiment shown in FIG. 11B, the housing 144 is coupled to the drive assembly 142 which comprises an aperture through which the drive shaft with interlocking teeth 140 protrude. Coupled an immovable portion of the drive assembly 142 is an occluding member 146 having a collar portion 146 extending from a base. The collar portion 142 extends about the crankshaft of the massage member 126 and is coupled thereto by an outboard bearing 148. In use the static mass (not shown) would be coupled to the first end of the housing 144 about the occluding member 146 and thereby fixing the base of the occluding member 146 in place such that the occluding member 164 is immovable in use. The crankshaft of the massage member 126 is arranged to rotate freely within the occluding member 146 as a result of the outboard bearing 148. The occluding member 146 and outboard bearing 148 in use are arranged to provide additional structural support to the massage member 126 during use. Use may, for example, include intense massage therapy, which may impart larger than average shear forces on the massage member. In these example use cases, the additional structural support provided to the massage member 126 by the occluding member 146 and the outboard bearing 148 reduces any deleterious effect of said shear forces on the massage member 126, interlocking teeth 132, 140 or the drive shaft.

In the embodiment shown in FIG. 11A and FIG. 11B, the magnetic massage member and corresponding interlocking teeth on the massage member and the drive shaft provide a convenient self-locating mechanism enabling a simple push-fit and detachment of the massage member. The magnet is of sufficient strength to retain the massage member in communication with the drive shaft during high-speed rotation of the drive shaft, such as would be appreciated by the skilled addressee. Embodiments will be appreciated wherein the massage member is arranged to extend from the drive assembly by way of a different coupling mechanism, or alternatively wherein the massage member is permanently affixed to the drive assembly.

In the embodiment shown, the massage member 126 is metal. Additional embodiments will be appreciated wherein the massage member is any suitable structural material, and may for example be a polymer, plastic or carbon fibre material. The interchangeable therapy member 122 is rubber, but other embodiments will be appreciated wherein the interchangeable therapy member comprises any suitable material for use in applying vibration and pressure to a surface of the skin, such as for example polymer, plastic, glass, foamed rubber, foam, cloth, fabric, wood, foamed polymers, reinforced polymers, wherein the tip may optionally comprise a (optionally flexible) portion filled with, for example, a gel, an oil, a lubricant or a lotion. In such embodiments, the interchangeable therapy member may be foraminous or may comprise one or more pores or apertures arranged to release a material during use, wherein the releasable material may for example be a gel, an oil, a lubricant, a lotion or other suitable material as will be appreciated by the skilled addressee. In the embodiment shown, the massage member 126 and the drive shaft comprise a plurality of interlocking teeth 132, 140. Additional embodiments will be appreciated wherein the massage member and/or the drive shaft comprise one or more interlocking teeth.

The shape of the interchangeable therapy member 122 in the example shown is substantially dome-shaped. Other shapes of interchangeable therapy member will be appreciated to suit different therapies required. For example, a therapy targeting deep tissue may comprise a more angular tip, such that the interchangeable therapy member is substantially cone-shaped. Other therapies for large tissue areas may require an interchangeable member having a substantially flattened surface such that the surface of the interchangeable therapy member resembles a disc or an oblate or flattened spheroid.

The example of FIG. 11a and FIG. 11b uses a magnet 134 and interlocking teeth 132 for reversible engagement of the massage member 126 with a drive shaft. Other forms of fixation or reversible engagement will be appreciated, such as, for example, a ball-type detent, a spline, a Dee drive, a round shaft with drive dogs or a threaded coupling.

It will be appreciated that the above described embodiments are given by way of example only and that various modifications may be made to the described embodiments without departing from the scope of the invention as defined in the appended claims. For example, in the embodiments described, the interchangeable therapy member comprises only a single point of contact with a surface. Additional embodiments will be appreciated wherein an interchangeable member for use in the present invention comprises any appropriate number of points of contact with a required surface.

The described embodiments comprise an interchangeable therapy member comprising rubber and/or plastic. Additional embodiments will be appreciated wherein the interchangeable therapy member comprises any appropriate material suitable for use in vibration therapy of soft tissue and tissue comprising or proximate to cartilage or bone.

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In the described embodiments, the throw distance of the crank pin of the massage member is 2 mm. Additional embodiments will be appreciated wherein any appropriate throw distance is provided, suitable for providing an appropriate vibration therapy to a recipient. Additional embodiments will be appreciated wherein the throw distance of a massage member is adjustable.

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In the described embodiments, the static mass is located on the outside of the housing. Additional embodiments will be appreciated wherein at least part of the static mass is located inside the housing.

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In the described embodiments, the weight of the static mass is fixed. Additional embodiments will be appreciated wherein the static mass can be removed from the housing and reattached. Further additional embodiments will be appreciated wherein the static mass can be exchanged for a static mass of differing weight. Still further additional embodiments will be appreciated wherein the weight of the static mass is adjustable by addition or subtraction of parts.

20

In the described embodiment of FIG. 4, the rechargeable battery pack is fixed. Additional embodiments will be appreciated wherein the rechargeable battery pack is removable, rechargeable external to the apparatus, and replaceable. In additional embodiments, the device can be simultaneously used and charged. In additional embodiments, the apparatus is powered by non-rechargeable batteries.

25

In the embodiments described, the internal circuit comprises fixed controls. Additional embodiments will be appreciated wherein the controls are quickly detachable with the intention that they could be upgraded by a user to controls of a more versatile and sophisticated nature, perhaps having a timer, servo-locked speed control, and/or varying speed 'programs' or cyclically varying rotations and/or oscillations.

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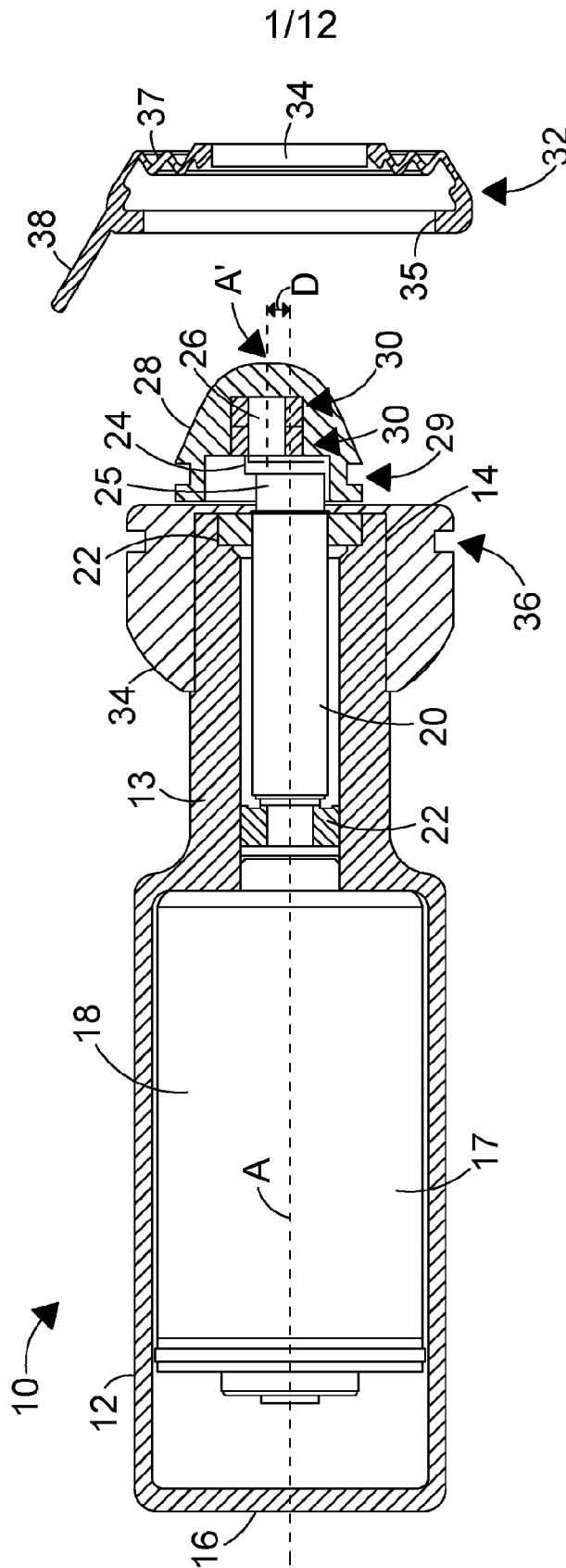
CLAIMS

1. An apparatus for massage therapy comprising,
a housing comprising a first end and a second end;
5 a drive assembly coupled to the housing;
a massage member in communication with the drive assembly, the massage member
arranged to extend from the drive assembly; and
a static mass coupled to the housing; wherein the static mass is proximate the first end
of the housing and wherein, in use the static mass is arranged to be immovable with
10 respect to the housing.
2. An apparatus as claimed in claim 1, wherein the housing is arranged to be held by a user.
3. An apparatus as claimed in claim 2, wherein the housing is arranged to be held proximate
15 the second end of the housing.
4. An apparatus as claimed in claim 1, claim 2, or claim 3, wherein the drive assembly
comprises a motor, and a drive shaft arranged to be driven by the motor; and
wherein in the drive shaft is arranged to drive the massage member.
20
5. An apparatus as claimed in claim 4, wherein the massage member comprises a
crankshaft having a longitudinal axis, the crankshaft comprising a first engagement
portion arranged to engage with the drive shaft, and a second operative portion
comprising a crankpin, the crankpin being positioned eccentric to the longitudinal axis of
25 the crankshaft.
6. An apparatus as claimed in claim 5, wherein the crankpin comprises at least one bearing.
7. An apparatus as claimed in claim 6, wherein the bearing is a ball bearing.
30
8. An apparatus as claimed in claim 5, claim 6 or claim 7, wherein the crankpin is eccentric
to the longitudinal axis of the crankshaft by a distance, the distance being one selected
from the range: 0.05 mm to 15 mm.
- 35 9. An apparatus as claimed in any one of the preceding claims, wherein the massage
member is reversibly detachable from the drive assembly.

10. An apparatus as claimed in any one of the preceding claims, wherein at least a portion of the drive assembly is located inside the housing.
- 5 11. An apparatus as claimed in any one of the preceding claims, wherein the static mass is located substantially exterior to the housing.
12. An apparatus as claimed in any one of the preceding claims, wherein the static mass is coupled to the housing by way of one selected from the range: a screw thread; a push fit; a clamp; a fixing member.
- 10 13. An apparatus as claimed in any one of the preceding claims, wherein the static mass has a static mass weight and the apparatus has an apparatus weight, the static mass weight being relative to the apparatus weight according to a weight ratio of static mass weight : apparatus weight, wherein the weight ratio is selected from between: 1:10 and 1:2.
- 15 14. An apparatus as claimed in claim 13, wherein the weight ratio is selected from between: 1:5 and 1:2.
- 20 15. An apparatus as claimed in any one of the preceding claims, wherein the distance between the static mass and the first end of the housing is shorter than the distance between the drive assembly and the first end of the housing.
- 25 16. An apparatus as claimed in any one of the preceding claims, wherein the apparatus is a massage therapy apparatus.
- 30 17. An apparatus as claimed in claim 16, wherein the massage therapy includes vibration therapy.
18. An apparatus as claimed in any one of the preceding claims, wherein the apparatus further comprises an interchangeable therapy member in communication with the massage member.
- 35 19. An apparatus as claimed in claim 18, wherein at least a portion of the interchangeable therapy member is reversibly detachable from the massage member.

20. An apparatus as claimed in claim 18 or claim 19 wherein the interchangeable therapy member comprises a first contact portion arranged to engage with the massage member and a second fixation portion arranged to engage with a component of the apparatus.
- 5 21. An apparatus as claimed in claim 20, wherein the second fixation portion is arranged to affix the first contact portion to the massage member.
22. An apparatus as claimed in claim 20 or claim 21, wherein the first contact portion is arranged to transfer energy from the massage member to a surface.
- 10 23. An interchangeable therapy member arranged to be positioned in communication with a massage member of an apparatus as claimed in any one of claims 1 to 18.
24. A kit of parts comprising,
- 15 an apparatus for massage therapy as claimed in any one of claims 1 to 18; and
an interchangeable therapy member as claimed in claim 23.

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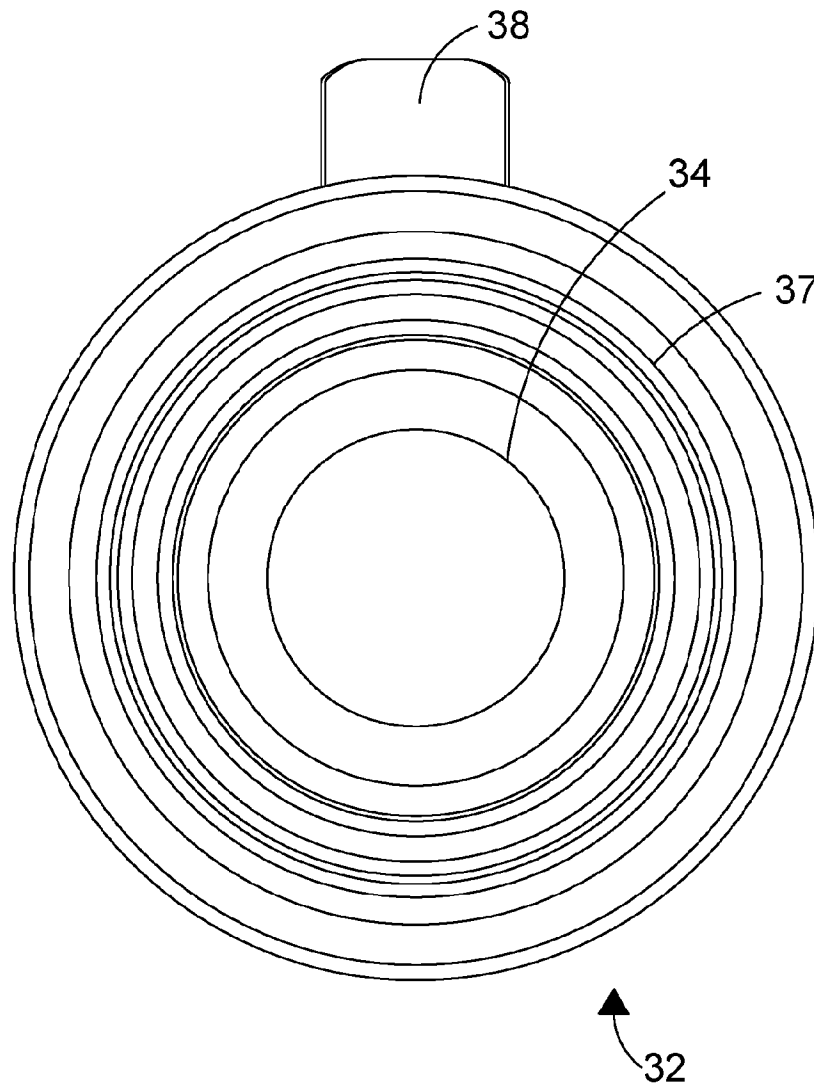


FIG. 1B

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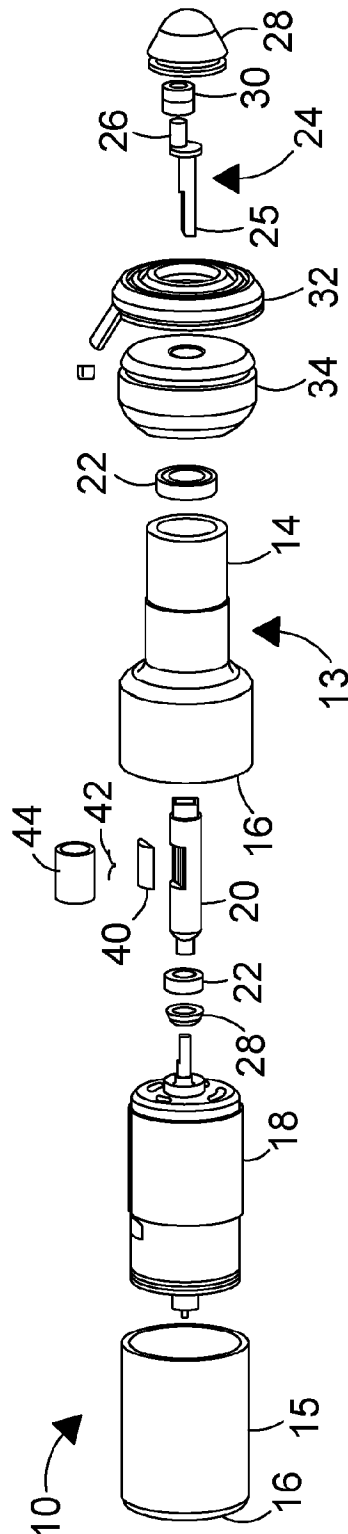


FIG. 2

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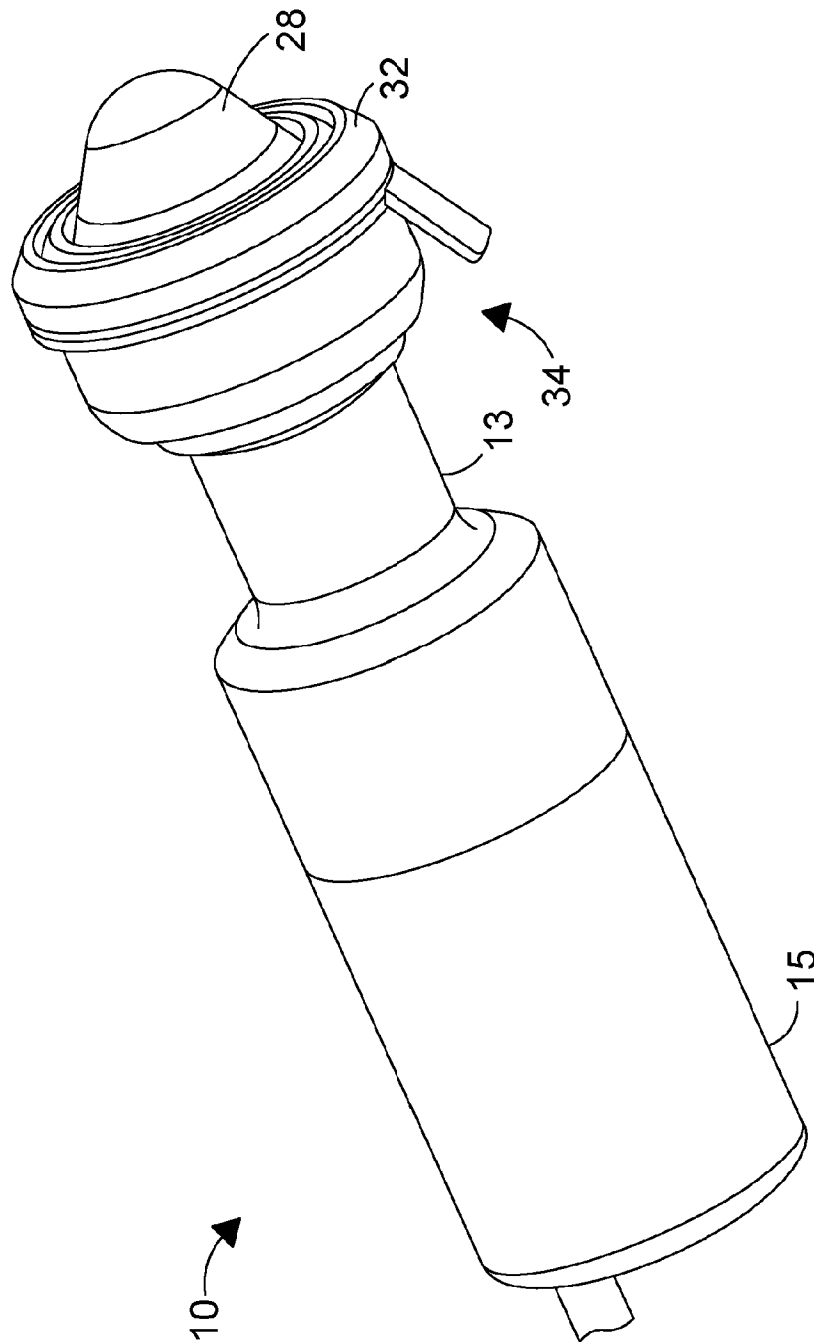
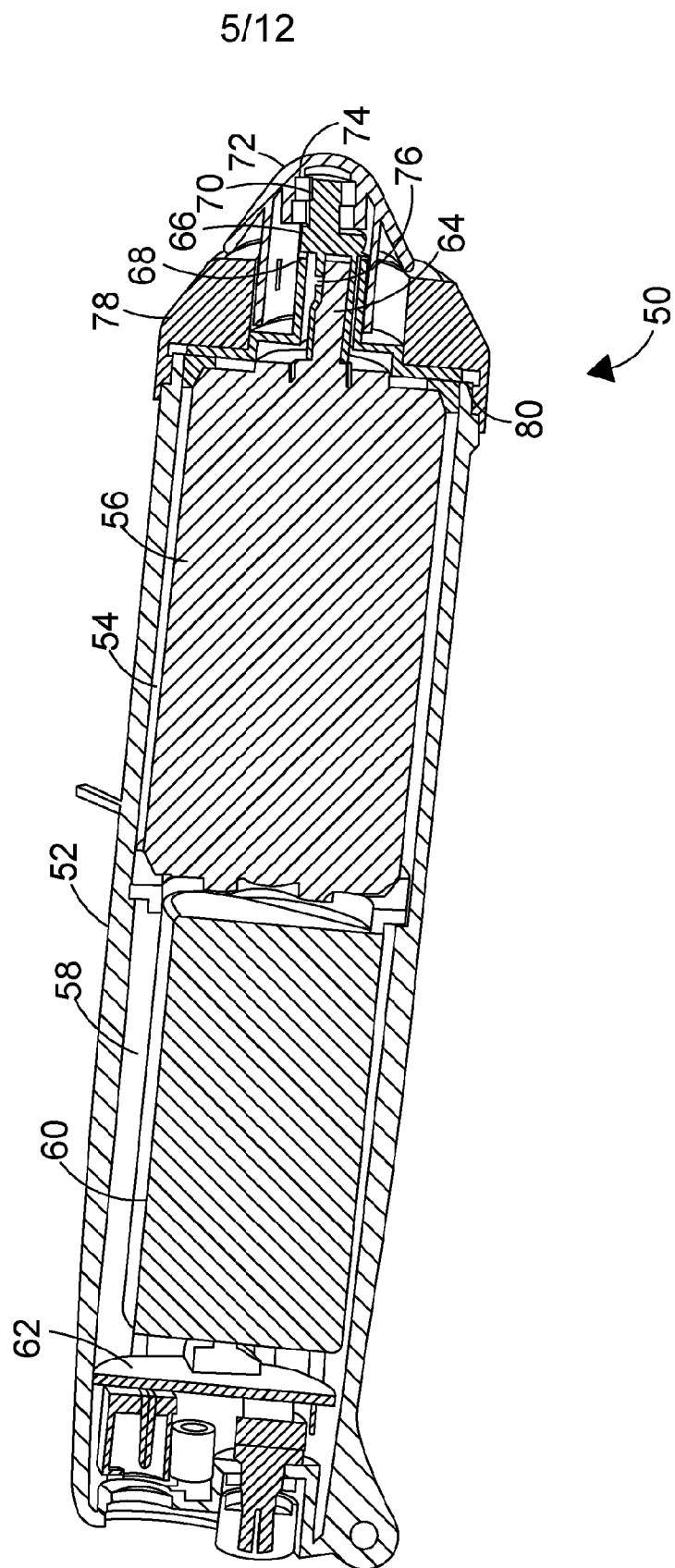


FIG. 3



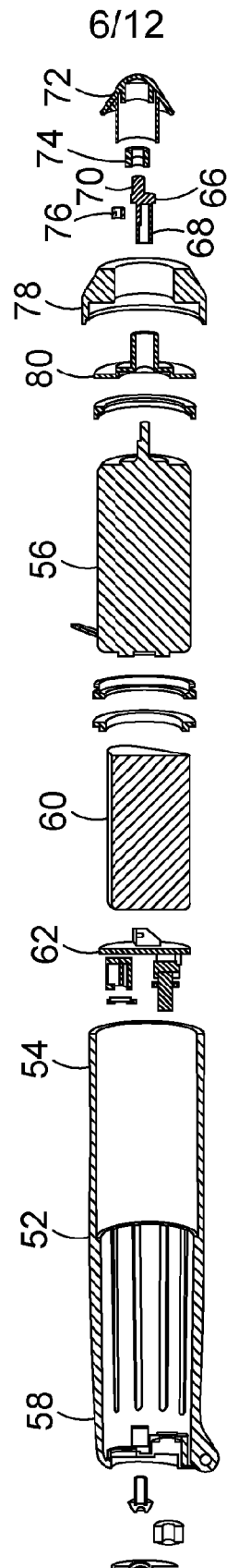


FIG. 5

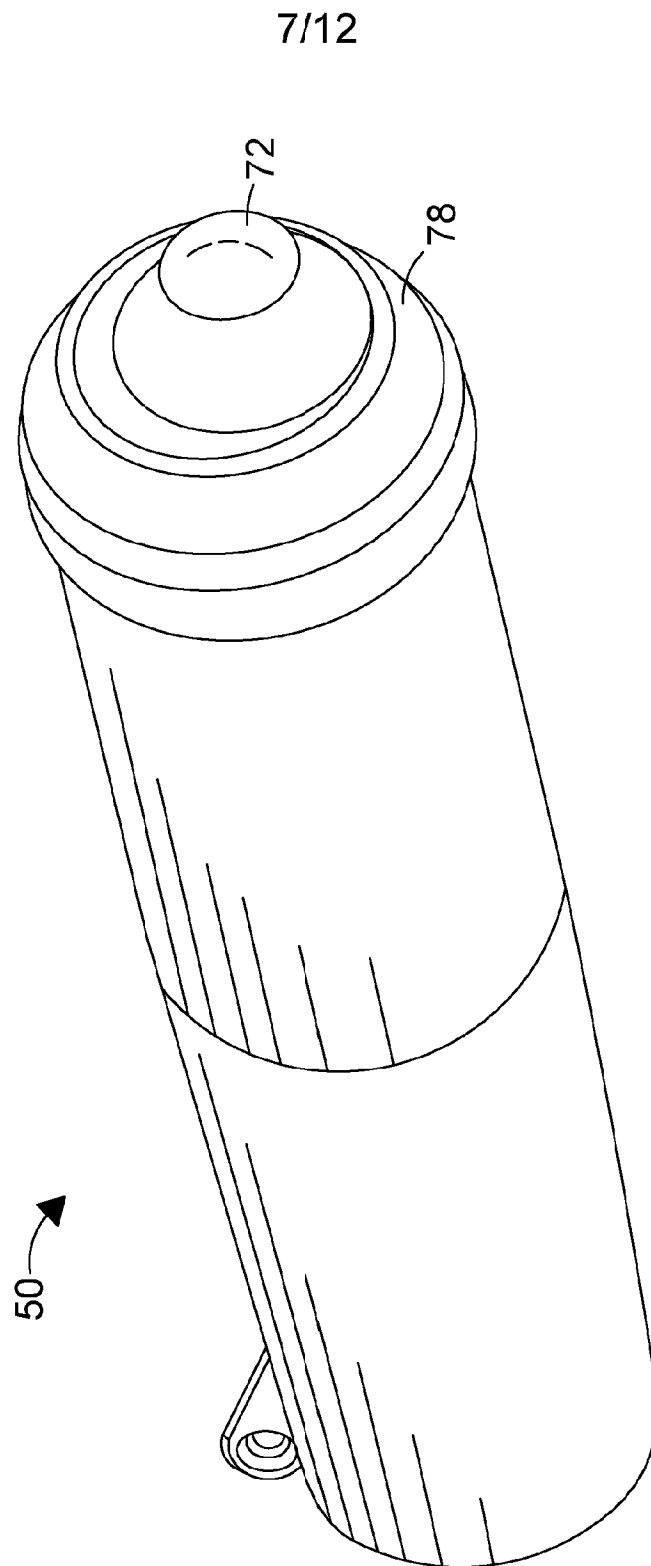


FIG. 6

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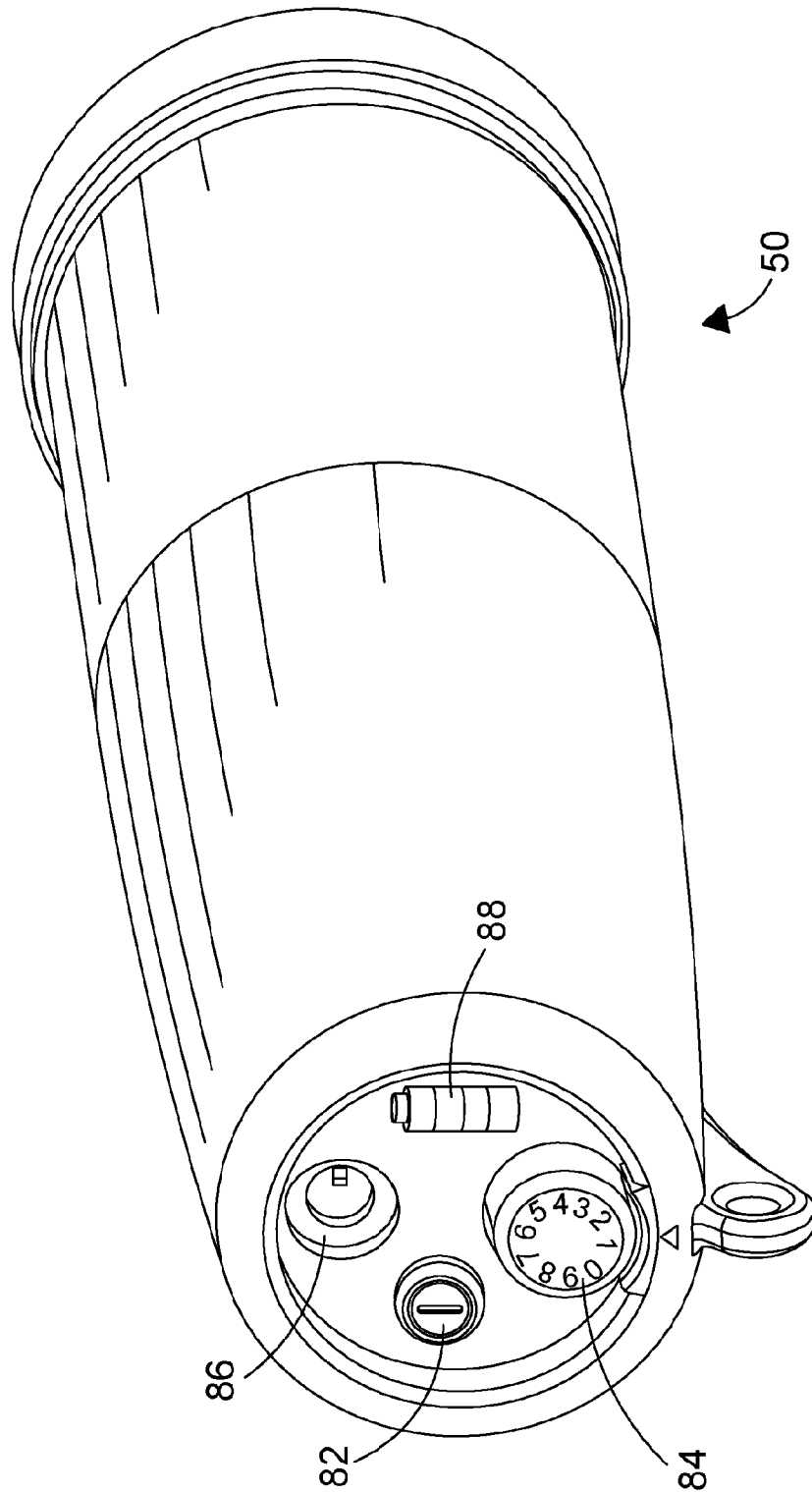


FIG. 7

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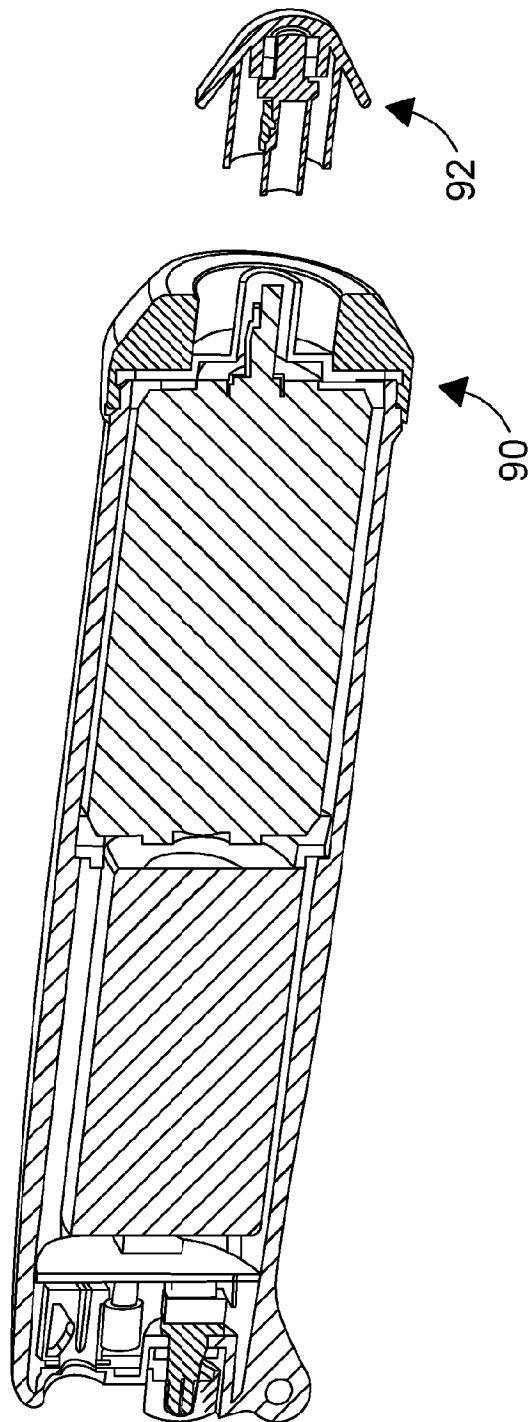


FIG. 8

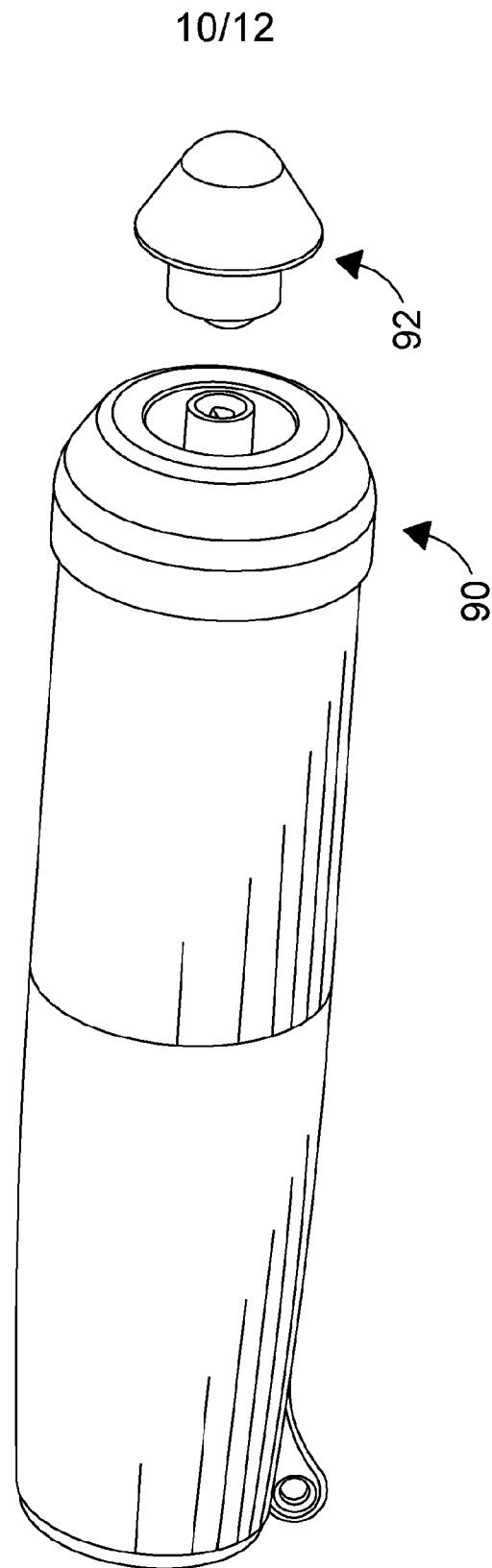


FIG. 9

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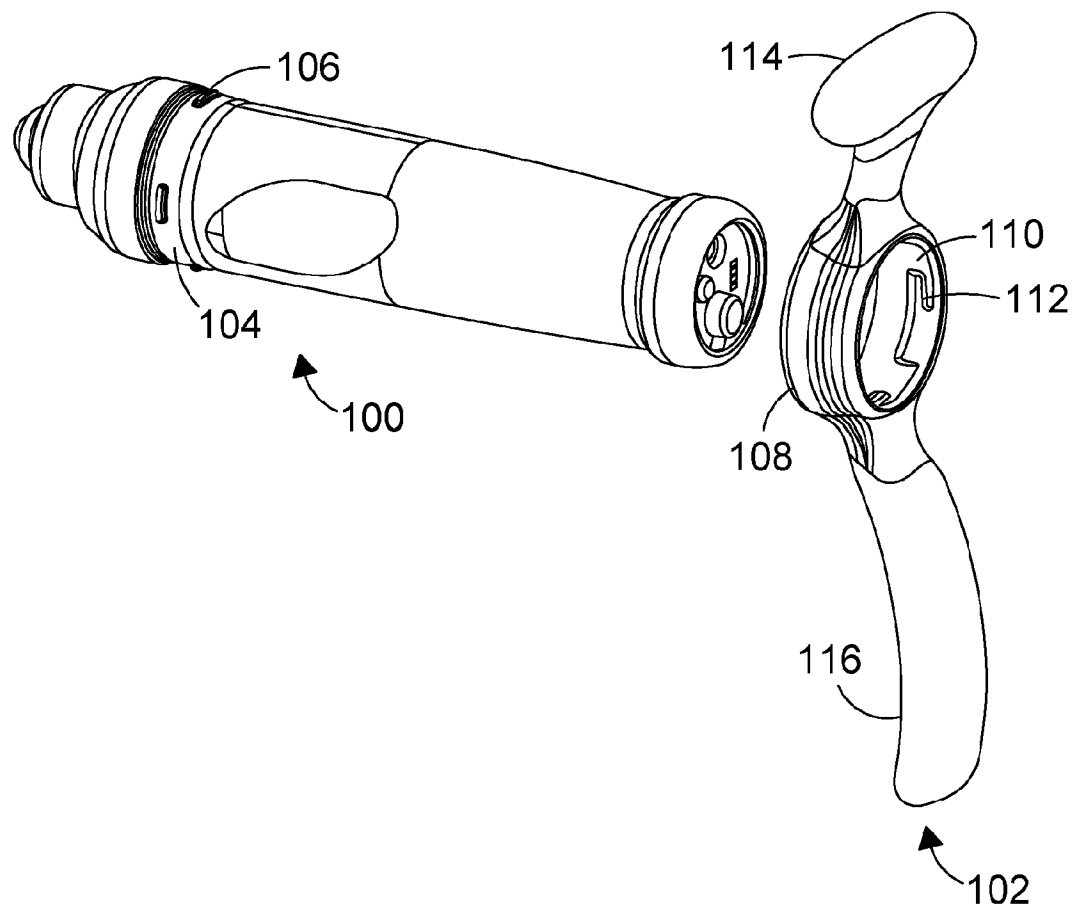


FIG. 10

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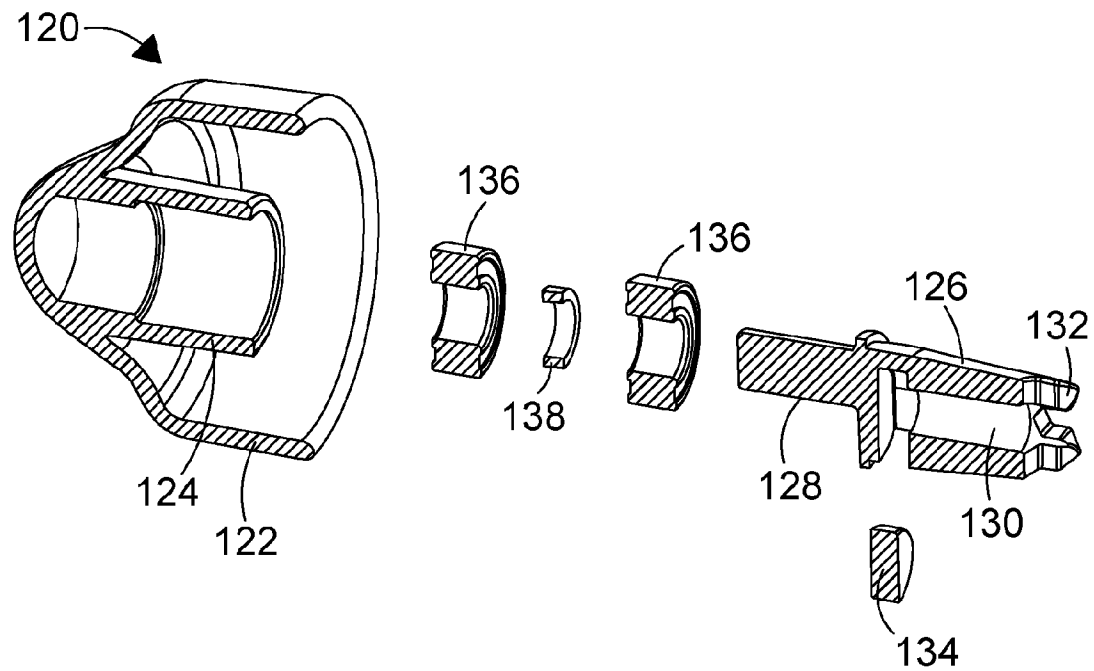


FIG. 11A

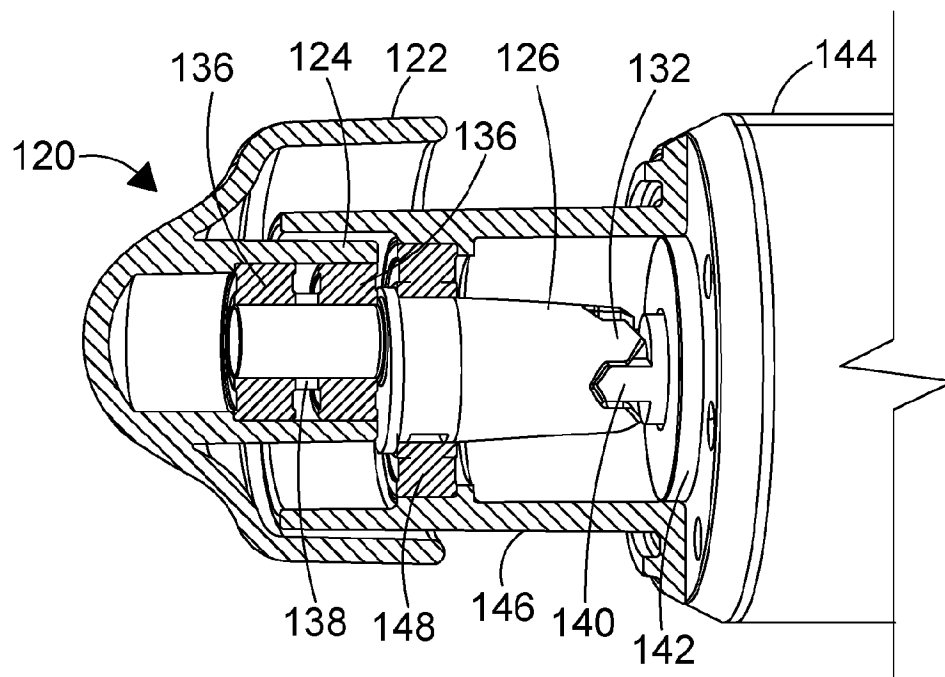


FIG. 11B



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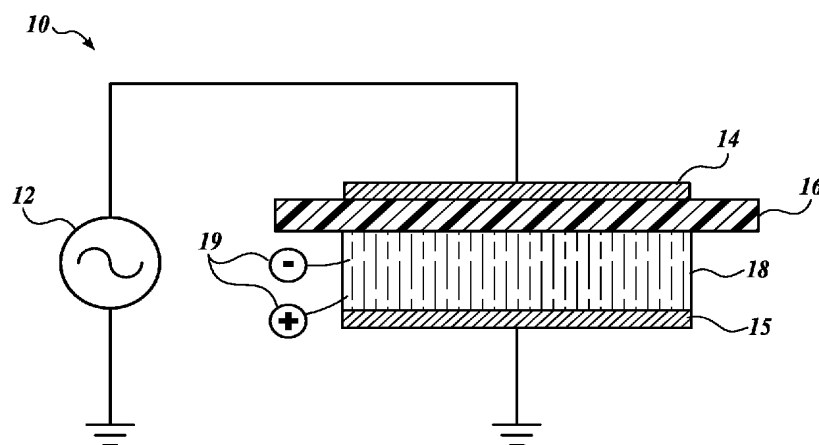


FIG. 1
(PRIOR ART)

(57) Abstract: A system and method for cosmetic treatment of a region of a biological surface using cold atmospheric plasma is presented. In one embodiment, a method of treatment of a region of a biological surface with cold plasma includes: selecting a post-treatment formulation; and applying the post-treatment formulation to the region pre-treated by the cold plasma.

MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
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COLD PLASMA GENERATING DEVICES, SYSTEMS, AND METHODS

CROSS-REFERENCES TO RELATED APPLICATIONS

5 This application claims the benefit of U.S. Provisional Application No. 62/712,812, filed July 31, 2018; U.S. Provisional Application No. 62/712,849, filed July 31, 2018; U.S. Provisional Application No. 62/712,860, filed July 31, 2018; U.S. Provisional Application No. 62/712,873, filed July 31, 2018; U.S. Provisional Application No. 62/712,876, filed July 31, 2018; each of which applications are expressly
10 incorporated herein by reference in their entirety.

SUMMARY

This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features of the claimed subject matter, nor is it intended to be
15 used as an aid in determining the scope of the claimed subject matter.

Portable cosmetic devices incorporating cold atmospheric plasma (additionally referred to as "cold plasma" or "plasma"), as currently available, implement limited modalities of treatment. Most focus solely on generating a plasma in proximity to a region of a person's skin as an avenue for treatment of the region. Such an approach does
20 not leverage the therapeutic advantages and benefits of a multi-modal treatment and does not create synergistic therapy outcomes that exceed the effect of the individual treatment modalities in isolation. In some embodiments of the present technology, a multi-modal cold plasma device includes one or more auxiliary or additional mechanisms (vibration, heat, etc.) in addition to generating the cold plasma.

25 A multi-modal plasma device that takes advantage of synergistic treatment effects will achieve enhanced results over a shortened treatment duration and a reduced power demand, relative to a mono-modal plasma device. What is more, a multi-modal device mitigates the potential risks of excessive exposure to potentially harmful species generated in the plasma, such as oxidizing species or reactive radicals, by enhancing
30 permeability of plasma generated species, or by providing secondary treatment that does not rely on plasma generated species for efficacy.

Blemishes develop for multiple reasons, some of which include harmful bacteria, blocked pores, irritation, imbalance in moisture or oil, etc. Typically, blemishes develop from an easily treatable early stage to a painful and difficult condition within a single day,

often within hours of first sensing a new blemish. Without being bound to theory, it is believed that exposure to a cold atmospheric plasma and species generated therein will effectively treat blemishes. It is further believed that rapid treatment at the site of the blemish, immediately upon detection, prevents the growth of unsightly blemishes that may leave permanent scarring.

Cold plasma devices designed to treat large regions of the skin, incorporating internal power sources sufficient for prolonged use, are too large and too heavy to conveniently carry on a regular basis. While well suited for a cosmetic routine that takes place at home, their size and weight makes them less suited for rapid response to a developing blemish or acne sore that is discovered when away from the home. It is believed that a small area plasma device designed for rapid treatment of individual blemishes, also called "spot treatments," will effectively treat a blemish in its early stages and will be portable and convenient.

Direct exposure of a region of biological surface to cold atmospheric plasma may be supplemented with therapy regimes (also referred to as "formulations" or "therapeutic formulations"). For example, plasma generated species, such as ultraviolet photons or reactive oxygen species, may damage biological surfaces. Therefore, therapeutic formulations may be used to prevent or minimize damage to biological surfaces.

In one embodiment, a pre-treatment formulation protects the region against potentially harmful plasma generated species. In another embodiment, a post-treatment formulation neutralizes plasma generated acids that may harm the biological surface following treatment. In one embodiment, plasma-activated media provides effective therapy when applied to the region without direct exposure to the plasma. Without being bound to theory, it is believed that cold atmospheric plasma produces reactive species and secondary reaction products that remain in liquid media following exposure to the plasma.

While a basic plasma treatment is thought to beneficially impact biological systems, the risks of over-exposure or inadvertent damage are non-negligible. Accordingly, conventional plasma devices limit a consumer's ability to implement customized treatment. These treatment risks may be mitigated by customizing the plasma for a specific therapeutic result being sought. In some embodiments, a size of the target treatment area is selectable. In other embodiments, a chemical intermediary may modify the concentrations of potentially harmful species generated in the plasma.

In practice, surface conditions and plasma parameters are coupled, where variation in one induces changes in the other. A sudden shift in surface moisture, for example, may affect electrical conductivity of the surface and lead to an increase in plasma intensity. Conversely, a sudden increase in plasma intensity may vaporize moisture from the surface, in turn changing the properties of plasma. This variability and multi-parameter coupling necessitates control of the plasma treatment device.

Complex interactions between light emission from the plasma, plasma generated species, and biological chemicals native to biological surfaces further complicates cold plasma therapy. In some cases, plasma generated species may acidify a biological surface, thereby aggravating preexisting conditions and outweighing any beneficial outcomes of plasma treatment, for example by light emission, or by exposure to plasma generated species that stimulate wound healing or that would otherwise denature harmful bacteria present in the biological surface. However, measurement of the plasma treatment on a biological surface may allow modulation of the plasma, therefore making the treatment more effective and safer.

Uniformity and steady application of cold plasma during treatment is desirable for several reasons. Non-limiting examples include providing a predictable dose of plasma generated species to the biological surface, providing a consistent treatment result despite variability in conditions of the biological surface, maintaining a uniform exposure to the cold plasma across a region of a biological surface, etc.

Cold Plasma Therapy Devices

Non-thermal "cold" atmospheric plasma can interact with living tissue and cells during therapeutic treatment in multiple ways. Among the possible applications, cold atmospheric plasma may be used in biology and medicine for sterilization, disinfection, decontamination, and plasma-mediated wound healing.

Several commercialized devices are certified for medical treatment at the present time. These devices are not designed for home use by consumers. Instead, they are designed for use by medical technicians with expertise and training in medical treatment techniques. An example of such device is Rhytec Portrait®, which is a plasma jet tool for topical dermatological treatments. This device features complex power supplies with tightly regulated parameters, using radio-frequency power sources. In addition, the Bovie J-Plasma®, the Canady Helios Cold Plasma, and the Hybrid Plasma™ Scalpel are all

available for use as medical treatment devices. In Germany, the kINPen®, also a plasma jet device, and the PlasmaDerm®, a dielectric barrier discharge (DBD) device, are both certified medical devices that have been introduced to the market within recent years. These devices aim at medical treatment of human tissues, either externally, as in the PlasmaDerm®, or internally. In contrast with the plasma devices for the medical use, the devices for the cosmetic use are geared for a generally intuitive use by consumers, resulting in cosmetic care and pleasant sensation, as opposed to well controlled and certifiable therapeutic effect.

FIG. 1 is a schematic diagram of a plasma generator 10 in accordance with prior art. As shown in FIG. 1, a cold plasma 18 forms through disparate excitation of electrons in a plasma gas by electric fields, relative to the milder excitation effect of the fields on the more massive nuclei of the plasma gas. The cold plasma 18 is formed between a live electrode 14 and a ground electrode 15, also called a counter-electrode, when the live electrode 14 is energized relative to the ground electrode 15 by a power source 12. The power source 12 is an alternating current source or an amplitude modulated direct current source. The cold plasma 18 is a dielectric barrier discharge if the plasma generator 10 includes a dielectric barrier 16 that is placed against the live electrode 14. The cold plasma 18 contains both high temperature electrons 19 and low temperature ions 19 and neutral species. In conventional systems, the plasma gas includes noble gases like helium or argon, and also oxygen and nitrogen containing gases to form reactive oxygen and nitrogen species (RONS). In some cases, as with the PlasmaDerm®, the plasma forms directly in air.

FIG. 2 is an image of dielectric barrier discharges 20 in operation in accordance with prior art. FIG. 2 was obtained as a plan view through a transparent electrode. The plasma 18 forms as multiple discrete filamentary discharges that individually form conductive bridges for ions and electrons 19 to migrate between the electrodes.

For topical treatment, several forms of plasma are used. The first is the gas jet plasma which provides a jet of ions and reactive species that can be directed to a target over varying distances, typically at distances greater than a few millimeters. The medical plasmas described in a preceding paragraph typically feature a gas jet plasma. A second form is the Floating Electrode Dielectric Barrier Discharge (FE-DBD) devices, in which the target substrate (often the human body) acts as a floating ground electrode. The third form is a DBD plasma wand, where the dielectric barrier is placed against a floating

ground, instead of the live electrode, and may take the form of a fluorescent tube. The fourth form is a coordinated plurality of dielectric barrier discharge sources. In such an arrangement, a number of atmospheric FE-DBD plasma sources are incorporated into a handheld or flexible device, that is then used to treat one or more anatomical regions.

5 FIGs. 3A and 3B are two views of a cold plasma system in accordance with prior art. A skin treatment device 30 produces cold plasma 18 through a unitary structure that includes a head 31 and a body 34. The device includes one or more user controls, including a plasma power switch 32, and a light switch 33. The head 31 includes one or more light emitting diodes 35 (LEDs). The skin treatment device 30 further includes a
10 plasma pulse control 37, configured to create the plasma 18 at the head 31 while the plasma pulse control 37 is pressed. The skin treatment device 30 includes a charging port 36 for charging an enclosed battery. The skin treatment device 30 includes internal electronic components that drive the plasma 18.

 FIG. 4 is a block diagram of a cold plasma system in accordance with prior art.
15 Electronic components 40 include a unitary structure having a DBD head 47 and body 42. The cold plasma 18 is produced between electrodes included in the DBD head 47, which serves as the treatment site. The DBD head 47 is electrically connected to a high voltage unit 45, providing power to the DBD head 47. The power needed to drive the plasma 18 is provided by a rechargeable battery pack 43 enclosed within the body 42. The system
20 includes one or more LEDs 46, connected to the system through a main PC board and control circuitry 44. The main PC board and control circuitry 44 controls the flow of electricity to the LED 46 and the high voltage unit 45, and receives input from one or more user controls 48 and external power in 49 to charge the rechargeable battery pack 43.

25 Without being bound to theory, it is believed that the effect of cold atmospheric plasma therapy is due to some extent to interaction between RONS and biological systems. A non-exhaustive list of RONS includes: hydroxyl (OH), atomic oxygen (O), singlet delta oxygen ($O_2(^1\Delta)$), superoxide (O_2^-), hydrogen peroxide (H_2O_2), and nitric oxide (NO). Hydroxyl radical attack is believed to result in peroxidation of cell
30 membrane lipids, in turn affecting cell-cell interaction, regulation of membrane-protein expression, and many other cellular processes. Hydrogen peroxide is a strong oxidizer, believed to have a harmful effect on biological systems. Nitric oxide is believed to play a role in cell-cell signaling and bio-regulation. At the cellular level, nitric oxide is believed

to affect regulation of immune deficiencies, cell proliferation, phagocytosis, collagen synthesis, and angiogenesis. At the system level, nitric oxide is a potent vasodilator.

Cold atmospheric plasmas also expose biological surfaces to electric fields, on the order of 1-10 kV/cm. It is believed that cells respond to such fields by opening trans-
5 membrane pores. Such electric-field induced cellular electroporation is believed to play a role in transfection of molecules across cell membranes. Without being bound to theory, the efficacy of treatment is believed to be due at least in part to long-lived plasma-generated species, which in an air plasma will be a variety of RONS at concentrations particular to the operating parameters of the cold atmospheric plasma source.

10 While cold atmospheric plasma can also be used to ablate tissue or effect treatment in a very short time when operated at high power and intensity, such treatment is believed to harm surrounding tissue and to penetrate far beyond the treated area. Without being bound to theory, it is believed that cold atmospheric plasma treatment at low intensity avoids damaging cells.

15 Without being bound to theory, it is believed that an important parameter both for direct cold atmospheric plasma treatment and for indirect treatment using plasma-treated media is the dose of plasma species imparted to the treatment surface. In general, this is expressed as a concentration of a given plasma species produced by the cold atmospheric plasma source that is imparted to a unit area of the treated surface over a unit time.

20 Alternatively, the dose may be expressed as a simple length of time, if the treatment has been determined and the behavior of the cold atmospheric plasma source is well understood. For example, for a stable cold atmospheric plasma source and a uniform surface, a particular dose of a given RONS will be achieved after the cold atmospheric plasma has treated the uniform surface for a given length of time. In practice, surface
25 conditions and plasma characteristics are coupled, where variation in one induces changes in the other. A sudden shift in surface moisture, for example, may affect the conductivity of the surface and lead to an increase in plasma intensity. Conversely, a sudden increase in plasma intensity may vaporize moisture from the surface, producing RONS and changes in the surface. This variability necessitates control of the plasma treatment
30 device, as discussed in greater detail below.

Without being bound to theory, it is believed that cold atmospheric plasma treatment penetrates into the treatment surface through a synergistic effect of electroporation, permeability of plasma generated species, and cell-to-cell signaling. The

so called "bystander effect" is thought to play a role in propagating plasma induced cellular changes away from the treatment surface and into a volume beneath it. The bystander effect is believed to occur through chemical signals passed between cells in response to the introduction of a biologically active chemical, potentially amplifying the magnitude of the treatment impact.

In experiments it has been shown that RONS include reactive nitrogen species (RNS) and reactive oxygen species (ROS) that are believed to interact in differing ways to diverse biological surfaces. In agarose films, for example, RONS permeate a volume beneath the film, while in living tissues, only RNS will do so. ROS do penetrate, however, into gelatin and other liquids. ROS, being more reactive than RNS are shorter-lived and are believed to be linked in some circumstances to aggressive or harmful effects on biological surfaces, as previously discussed with respect to hydrogen peroxide.

Cold Plasma Treatment with Additional Treatment Devices

In some embodiments, a cold plasma system for treating a region of a biological surface includes a plasma treatment device, including an electrode and a dielectric barrier having a first side that faces the electrode and a second side that faces away from the electrode. The system may include an auxiliary treatment device configured to enhance effects of the cold plasma on the region. In an aspect, the auxiliary treatment device is selected from a group consisting of a vibration device, a light source configured to illuminate the region, and a source of air directed to the region.

In an aspect the vibration device includes a multi-axis eccentric mass vibrator. The vibration device may include a piezo-electric actuator.

In an aspect, the light source includes one or more light-emitting diodes, configured to direct light having a wavelength in a range of 400-500 nm toward the region.

In an aspect the source of air includes a conduit configured to direct a stream of air toward the region, an air mover disposed within the conduit, and one or more temperature control elements configured to regulate temperature of the stream of air. The air mover may include a fan. The temperature control elements may include at least one of a thermal-resistive heater coil and a Peltier cooler.

In an aspect, the plasma treatment device further includes one or more actuating members, configured to repeatedly strain and relax the biological surface in the region.

In an aspect, the plasma treatment device further includes a cover placed over the dielectric barrier, and wherein the cover is configured to protect the dielectric barrier from contact damage or contamination. The cover may include glass, plastic, or quartz.

5 In an aspect, the biological surface includes at least one of: skin, hair, and fingernails.

In an aspect, the plasma is discharged at least partially into the biological surface.

In some embodiments a method of treating a region of a biological surface with a cold plasma system includes generating the plasma by a plasma treatment device that comprises a plasma generator. In some embodiments, the method includes applying the
10 plasma to the biological surface, activating an auxiliary treatment device, treating the biological surface with the auxiliary treatment device, and turning off the plasma.

In an aspect, treating the biological surface with the auxiliary treatment device includes vibrating the plasma treatment device.

15 In an aspect, treating the biological surface with the auxiliary treatment device includes vibrating the biological surface at or near the region.

In an aspect, treating the biological surface with the auxiliary treatment device includes irradiating the region with light from a source of light disposed on the plasma treatment device. The source of light may emit visible light. The source of light may emit infrared light.

20 In an aspect, treating the biological surface with the second treatment device includes providing a stream of flowing air to the region via a conduit disposed within the plasma treatment device and an air mover disposed within the conduit. In an aspect, the method includes cooling or heating the stream of flowing air with one or more temperature control elements configured in the conduit.

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Cold Plasma Treatment System with External Support Devices

In some embodiments, a cold plasma system for treating a region of a biological surface includes a plasma treatment device, including an electrode and a dielectric barrier having a first side that faces the electrode and a second side that faces away from the
30 electrode. In an aspect, the plasma treatment device further includes a rechargeable battery electrically connected to the electrode and operably coupled to the power cell via a charging link.

In some embodiments, the plasma treatment system further includes a support device external to the plasma treatment device. In some embodiments, the support device includes a power cell electrically connected to the plasma treatment device and a controller operably coupled to the power cell and to the plasma treatment device. In an aspect, the support
5 device is wirelessly connected to the plasma treatment device. In an aspect, the support device is electrically connected to the plasma treatment device via a detachable cable.

In an aspect, the dielectric barrier and the electrode are disposed on a retractable support, the extension of which positions the second side of the dielectric barrier for treatment of the region, the retractable support being disposed within a housing. In an aspect,
10 the plasma treatment device is a lipstick-size device.

In an aspect, the support device is a smart device. The smart device may be selected from a group consisting of: a smart phone, a tablet, a laptop, an electronic hair-styling device, and a plasma device including a charging dock.

In an aspect, the plasma is discharged at least partially into the biological surface.

15 In an aspect, the biological surface includes at least one of: skin, hair, or fingernails.

In some embodiments, a cold atmospheric plasma system for treating a region of a biological surface includes a plasma treatment device. The plasma treatment device may include an electrode and a dielectric barrier having a first side that faces the electrode and a second side that faces away from the electrode. In some embodiments, the dielectric barrier
20 and the electrode are disposed on a retractable support the extension of which positions the second side of the dielectric barrier for treatment of the region, the retractable support being disposed within a housing. In some embodiments, the plasma treatment device includes a battery electrically connected to the electrode and a controller operably coupled to the battery and the electrode, configured to receive data and to send control inputs. The system may be a
25 lipstick-sized system.

In some aspects, the battery is a rechargeable battery, enclosed within the device.

In some aspects, the plasma treatment device is configured to connect to a support device external to the plasma treatment device via a detachable cable. The support device may be configured to provide power and control inputs to the plasma treatment device.

30 In some embodiments, a method of treatment of a region of a biological surface with a cold atmospheric plasma system includes attaching a detachable cable to the plasma system and transferring power and control inputs to the plasma system from a support device via the detachable cable. In some embodiments, the method further includes generating a cold

atmospheric plasma between the plasma system and the region, switching off the cold atmospheric plasma, and detaching the detachable cable from the plasma system.

In some aspects, the method includes extending a retractable support carrying an electrode and a dielectric barrier, the support being disposed within the plasma treatment device, that when extended places the dielectric barrier in position to generate the cold atmospheric plasma in proximity to the region. The method may include retracting the retractable support.

In some aspects, the method includes transferring power wirelessly to the plasma system, wherein the plasma system includes a rechargeable battery.

Cold Plasma Treatment System with Formulation Dispensing

In some embodiments, a cold plasma system for treating a region of a biological surface, the system includes a plasma generator and a pre-treatment formulation. In some embodiments, the cold plasma system includes an electrode and a dielectric barrier having a first side that faces the electrode and a second side that faces away from the electrode. In an aspect, the system further comprises a post-treatment formulation configured for applying onto the region of the biological surface.

The pre-treatment formulation may be configured for applying onto the region of the biological surface. In an aspect, the pre-treatment formulation comprises plasma treated species. In an aspect, the pre-treatment formulation comprises one or more of a fragrance, an essential oil, a pigment, and an active ingredient.

In an aspect, the biological surface includes at least one of: skin, hair, and fingernails.

In an aspect, the plasma is discharged at least partially into the pre-treatment formulation.

In some embodiments, a method of treatment of a region of a biological surface with a cold plasma includes selecting a pre-treatment formulation, applying the pre-treatment formulation to the region, generating a cold plasma between a plasma treatment device and the pre-treatment formulation, and switching off the cold plasma.

In an aspect, the method includes removing the pre-treatment formulation from the region. The method may include, prior to applying the pretreatment formulation to the region, treating the pre-treatment formulation by discharging the cold plasma into the pre-treatment formulation.

In an aspect, the method includes selecting a post-treatment formulation and, after switching off the cold plasma, applying the post-treatment formulation to the region.

In an aspect, the method includes removing the post-treatment formulation from the region.

5 In some embodiments, a method of treatment of a region of a biological surface with a cold-plasma treated formulation includes selecting a formulation, applying the cold plasma to the formulation, switching off the cold plasma, and applying the formulation to the region.

In an aspect, the method includes removing the formulation.

10 In an aspect, the method includes, after applying the formulation to the region, discharging the cold plasma into the formulation.

In an aspect, the method includes selecting a post-treatment formulation and applying the post-treatment formulation to the region, following application of the formulation. The method may include removing the post-treatment formulation from the region.

15 *Cold Plasma Treatment with Modular System*

In some embodiments, a modular cold atmospheric plasma system for treating a region of a biological surface includes a plasma generator body and a head that is removeably attached to the plasma generator body. The head may have a mounting side facing the generator body and an application side configured to face the biological surface. The application side of the head may carry an electrode and a dielectric barrier having a first side that faces the electrode and a second side that faces away from the electrode.

In some aspects, the plasma is discharged at least partially into the biological surface.

In some aspects, the biological surface includes at least one of: skin, hair, or fingernails.

25 In some aspects, the head is tapered from a first dimension at the mounting side to a second dimension at the application side. The second dimension may be smaller than the first dimension. In some aspects, the second dimension is larger than the first dimension, and the electrode and the dielectric barrier are configured to produce a cold atmospheric plasma across an enlarged portion of the treatment region on the biological surface with respect to a size of the application side.

30 In some aspects, the head is a formula-application head that includes a reservoir for a liquid formula and an exuding surface connected to the reservoir via one or more conduits, wherein the exuding surface is configured to allow the liquid formula onto the region.

In some aspects, the head includes a flexible skirt at the application side of the head, and wherein the flexible skirt is configured to conform to the biological surface by compressing the flexible skirt between the biological surface and the head. The flexible skirt may include a rigid spacer that restricts the compression of the flexible skirt between the application side of the head and the biological surface.

In some aspects, the head includes a plasma filter placed between the dielectric barrier and the region. The plasma filter may include at least one of a chemical filter, an ultraviolet filter configured to block the transmission of ultraviolet photons, and a charged species filter that includes a conductive surface configured to neutralize anions, cations, and free electrons.

In some aspects, the chemical filter includes at least one of activated carbon, graphene, catalyst, and radical-scavenging material. The plasma filter may be configured to at least partially cover the region of the biological surface.

In some aspects, the application side of the head includes a conformable material at least partially surrounding the dielectric barrier material, wherein the conformable material is conformable to the contours of the region. The electrode and the dielectric barrier may be conformable to the contours of the region.

In some aspects, the head includes one or more air outlets on the application side of the head, configured to provide a cushion of flowing air around the dielectric barrier, and an air mover, enclosed within the air-cushion head, configured to provide the flowing air to the air outlets.

In some aspects, the electrode is pixelated into individually activated areas capable of generating the cold plasma. The system may include a controller configured to energize the activated areas of the electrode.

In some embodiments, a method of treatment of a region of a biological surface with a modular cold atmospheric plasma system includes selecting a head from a plurality of removeably attachable heads, attaching the head to a generator body, generating a cold plasma between the plasma system and the region, and switching off the cold plasma.

In some aspects, the method includes wherein the head is tapered from a first dimension at a mounting side of the generator body to a second dimension at an application side of the head.

In some aspects, wherein the head carries a formula, the method further includes providing the formula at the application side of the head via an exuding opening, and applying the liquid formula to the region of the biological surface.

In some aspects, wherein the head is configured to filter the plasma, the method further includes generating the cold plasma through a plasma filter and applying the cold plasma onto the region of the biological surface through the filter.

5 In some aspects, the method includes filtering the plasma through a liquid formula applied to the region of the biological surface.

In some aspects, wherein the head is an air-cushion head, the method includes activating an air mover that is located within the head and providing a cushion of flowing air around a dielectric barrier of the head.

10 In some aspects, the head is a flexible head conformable to the biological surface at the region.

In some aspects, generating the cold atmospheric plasma between the plasma system and the region includes applying a flexible skirt against the region, wherein the flexible skirt surrounds a dielectric barrier of the head and containing the cold atmospheric plasma in a space between the region, the flexible skirt, and the head.

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Cold Plasma Treatment with Sensors and Controlled Plasma Generation

In some embodiments, a cold plasma system for treating a region of a biological surface includes a plasma treatment device, including an electrode and a dielectric barrier having a first side that faces the electrode and a second side that faces away from the electrode. The system may include one or more sensors. The sensors may measure properties of at least one of a cold plasma, the ambient environment around the system, and the biological surface. The system may include a controller operably coupled to the plasma treatment device and to at least one of the sensors. The controller may receive input from the sensors to determine control data for the plasma treatment device and send control data to the plasma treatment device.

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In an aspect, the electrode is pixelated into a plurality of areas that are individually addressable by the controller.

In an aspect, the one or more sensors include a sensor placed on or near the region of the biological surface.

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In an aspect, the one or more sensors include one or more motion sensors. In an aspect, the one or more sensors include a humidity sensor configured to measure a humidity of ambient air. In an aspect, the one or more sensors include a reactive oxygen sensor. In an aspect, the one or more sensors include a light sensor. In an aspect, the one or more sensors

include a plasma conductivity sensor. In an aspect, the one or more sensors include a surface temperature sensor. In an aspect, the one or more sensors include a distance sensor. In an aspect, the one or more sensors include an ion concentration sensor.

In an aspect, the plasma is discharged at least partially into the biological surface.

5 In an aspect, the biological surface includes at least one of: skin, hair, and fingernails.

In an aspect, the cold plasma system further includes a ballast circuit connected to the electrode.

In an aspect, the cold plasma system further includes a non-transitory computer readable medium having computer executable instructions stored thereon that, in response to
10 execution by one or more processors of a computing device, cause the computing device to perform actions including determining a uniformity of the plasma as a function of time, determining a dose of one or more plasma generated species, and modulating the plasma as a function of time to control the uniformity and the dose.

In an aspect, the cold plasma system further includes a formulation engine that, in
15 communication with the controller, determines a target dose of plasma and a set of plasma parameters necessary for providing an application dose and a data storage system that stores data related to the application dose.

In some embodiments, a method of treatment of a region of a biological surface with a cold plasma includes generating the cold plasma between a plasma source and the region
20 and measuring one or more treatment parameters with one or more sensors. In some embodiments, the method includes determining a plasma dose from the treatment parameters, modulating one or more of the treatment parameters to adjust the plasma dose, and switching off the cold plasma.

In an aspect, the method includes at least one sensor being carried by the plasma
25 source.

In an aspect, the method includes at least one sensor being carried by the biological surface.

In an aspect, the method includes moving the plasma source while the plasma source is generating the cold plasma.

30 In an aspect, the method includes providing a perceptible signal when the plasma dose is outside a safe range or an effective range.

In an aspect, the method includes determining a discharge voltage as a function of time, determining a discharge current as a function of time, determining a plasma

temperature as a function of time, and determining a gas temperature near the region as a function of time.

In an aspect, the method includes, prior to generating the plasma, placing at least one of the sensors onto the biological surface at or near the region, exposing the at least one sensor to the plasma, and, after generating the plasma, removing the at least one sensor.

In an aspect, the method includes automating a determination of a treatment dose by determining the treatment dose via a formulation engine that is in communication with a data storage system, determining a set of plasma parameters for achieving the treatment dose during treatment of the region, and providing the treatment dose and the set of plasma parameters to the plasma source.

In an aspect, the method includes intermittently redefining the treatment dose by re-measuring the plasma parameters during the cold plasma treatment.

In an aspect, the method includes determining an indicator of uniformity of the plasma; and modulating one or more of the plasma parameters in response to changes in the indicator.

In an aspect, the method includes measuring the plasma parameters from a group including a current provided to the discharge, a driving frequency, a voltage waveform, a peak to peak voltage, a root mean square voltage, a plasma temperature, a gas temperature, and optical emission from the plasma.

In an aspect, the method includes generating the plasma by a plurality of pixelated electrodes arranged in a matrix, and determining a discharge power for a given pixelated electrode. In an aspect the method includes modulating the discharge power for the given pixelated electrode if the plasma has localized to the given pixelated electrode.

DESCRIPTION OF THE DRAWINGS

The foregoing aspects and advantages of the inventive technology will become more readily appreciated as the same become better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a schematic diagram of a plasma generator in accordance with prior art;

FIGURE 2 is an image of a dielectric barrier discharge surface in operation in accordance with prior art;

FIGURES 3A-3B are two views of a cold plasma system in accordance with prior art;

FIGURE 4 is a block diagram of a cold plasma system in accordance with prior art;

5 FIGURE 5 is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

FIGURE 5A is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

10 FIGURE 6 is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

FIGURE 7 is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

FIGURE 8 is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

15 FIGURE 9 is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

FIGURE 9A is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

20 FIGURE 10 is a flowchart of a method of cold plasma treatment according to the present disclosure;

FIGURE 11 is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

FIGURE 11A is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

25 FIGURE 11B is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

FIGURE 11C is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

30 FIGURE 11D is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

FIGURE 12 is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure;

FIGURE 13 is a schematic diagram of a cold plasma electrode system in accordance with the present disclosure; and

FIGURE 14 is a flowchart of a method of cold plasma treatment according to the present disclosure.

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DETAILED DESCRIPTION

While several embodiments have been illustrated and described, it will be appreciated that various changes can be made therein without departing from the spirit and scope of the inventive technology.

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Cold plasma system with additional treatment devices

FIG. 5 presents a schematic diagram of a cold plasma treatment system in accordance with the present disclosure. In some embodiments, the cold plasma treatment system provides cosmetic treatment of a region of a biological surface 210 of a consumer 200. In some embodiments, the system includes a cold atmospheric plasma treatment device 100 including a plasma generator having an electrode 114 and a dielectric barrier 116.

In some embodiments, the plasma treatment device 100 includes a vibration device 130. Without being bound to theory, it is believed that the actuation of the vibration device 130 provides the consumer 200 with an enhanced treatment experience, and improves treatment efficacy by mitigating plasma 118 non-uniformity over the region. In some embodiments, the vibration device 130 may emit ultrasound vibrations. In operation, the ultrasound may enhance the transport of active plasma species into the tissue (or across diffusion barriers, in general) therefore increasing the efficacy of cold plasma treatment.

The vibration device 130 may vibrate the treatment device 100, thereby affecting the distance L between the second side of the dielectric barrier 116 and the biological surface 210. In some embodiments, the vibration device 130 vibrates the treatment device 100 in multiple axes simultaneously. In other embodiments, the vibration device 130 vibrates the treatment device 100 along only one axis. The vibration device 130 may vibrate the treatment device 100 such that the plasma 118 moves parallel to the biological surface 210 in one or two axes. It is believed that such movement distributes the plasma 118 across the region, thereby improving plasma 118 uniformity.

The vibration device 130 may include one or more vibration sources, such as a piezoelectric actuator or a multi-axis eccentric mass vibrator.

FIG. 5A illustrates a cold plasma treatment system in accordance with the present disclosure. In some embodiments, the plasma treatment device 100 directly actuates the biological surface 210 by one or more actuating members 120. Without being bound to theory, it is believed that repeated tension and compression of the biological surface 210 enhances the efficacy of multimodal treatment by stimulating synergistic effects with permeability of plasma generated species and consumer 200 experience of the treatment. The actuating members 120 may be in direct contact with the biological surface 210 at or near the region. In some embodiments, the actuating members 120 move in opposite directions to each other, parallel to the biological surface 210. The actuating members 120 may move towards each other, in turn compressing and releasing the biological surface 210. The actuating members 120 may move away from each other, in turn stretching and releasing the biological surface 210. In some embodiments, the actuating members 120 move both towards and away from each other, thus both stretching and compressing the biological surface 210. In some embodiments, the plasma 118 is generated toward the region while the actuating members 120 actuate the biological surface 210.

The actuation may be in the form of the ultrasound emitted by the vibration device 130. In different embodiments, the ultrasound may be transmitted to the target biological surface 210 through the actuating members 120 capable of generating ultrasound. In some embodiments, the actuating members 120 form an annular shape with the electrode 114 and the dielectric barrier 116 contained within the annular shape. In other embodiments, a source of ultrasound may include multiple apertures for directing cold plasma toward the biological surface 210. In operation, an acoustic coupling medium may couple the source of ultrasound (e.g., the actuating members 120) with the biological surface 210. Some nonexclusive examples of such coupling media are hydrogels, solid gel pads, etc. The coupling medium can be formulated to have additional ingredients and properties to enhance the experience, such as precursors and ingredients that can be activated by plasma and/or work with it, fragrance etc. In some embodiments, no coupling gel is used and the source of ultrasound couples enough energy to biological surface even in the absence of coupling medium.

The actuating members 120 may actuate the surface without plasma 118 exposure, thereby providing a tactile experience to the consumer 200.

FIG. 6 is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure. In addition to treatment by the plasma 118, the plasma treatment device 100 may include a light source 150, configured to illuminate the region with light 152 within the area described by the characteristic dimension T. As previously described, it is believed that irradiation of the biological surface 210 with light having a wavelength in the range of 400-500 nm provides desirable therapeutic results for cosmetic treatment of blemishes. In some embodiments, the plasma treatment device 100 includes multiple light sources. The light source 150 may include one or more light emitting diodes, individually emitting light having a wavelength within a target range.

The light source 150 may include an infrared light element, providing radiative heating to the biological surface 210. Without being bound to theory, it is believed that radiative heating of the biological surface enhances the therapeutic effect of plasma treatment by triggering a response of the biological surface 210 to plasma generated species and by providing an enhanced experience for the consumer 200.

The plasma treatment device 100 may include a cover 117 disposed on or over the dielectric barrier 116. Non-exclusively, the cover 117 may include plastic, glass, or quartz, and may block plasma generated species from reaching the biological surface 210. Without being bound to theory, it is believed that the plasma 118 may emit ultraviolet photons under certain conditions. As such, it may be desirable to block the transmission of ultraviolet photons using a cover 117.

FIG. 7 is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure. In some embodiments, the plasma treatment device 100 includes a source of air that directs an air stream 162 to the region within the area described by the characteristic dimension T. The source of air may include an air mover 160, such as a fan or a blower, disposed within an air conduit 164 that is shaped to provide the air stream 162 at the surface of the region. In some embodiments, one or more temperature control elements 168 disposed within the plasma treatment device 100 adjust the temperature of the air. Non-limiting examples of the temperature control elements 168 include thermoelectric cooling elements including Peltier coolers, electric heating elements including resistive heating coils, etc. In some embodiments, a volatile

oil is disposed within the air conduit 164 that contains a fragrance such that, when the air mover 160 is active, the oil imparts a pleasant aroma to the region.

Small Size Device

5 FIG. 8 presents a schematic diagram of a cold plasma treatment system in accordance with the present disclosure. In some embodiments, the plasma treatment device 100 is electrically connected to an external device 300 having a power cell 310 and a controller 320. In some embodiments, the plasma treatment device 100 is electrically connected to the external device via a cable 111. In some embodiments, the
10 cable 111 carries control inputs and electrical power to the plasma treatment device 100. In some embodiments, the cable 111 is detachable from the plasma treatment device 100, the external device 300, or both. The power cell 310 may be a rechargeable battery including, for example a lithium ion battery. The controller 320 may be capable of receiving data and sending control signals to the plasma treatment device 100.

15 In some embodiments, the plasma treatment device 100 includes a battery 119 electrically connected to the electrode 114. The battery 119 may be rechargeable, charged by connecting the cable 111 to the plasma treatment device 100 and to a power source. Some non-limiting examples of such power source are the external device 300, an adapter connected to a standard wall outlet providing electricity, a solar cell, etc. In
20 some embodiments, the battery 119 charges wirelessly 330. In some embodiments, the battery 119 is a commercially available battery, such as a battery of one of the A-series types ("A," "AA," or "AAA").

 In some embodiments, the external device 300 is a smart phone. In some embodiments, the external device 300 is a laptop or a tablet, configured to be compatible
25 with the plasma treatment device 100 and to provide power and control inputs to the external device 300. In some embodiments, the external device 300 is a cosmetic tool, including but not limited to an electronic beard trimmer, a hair iron, a hair drier, an electronic epilator, etc. The external device 300 may be a large area plasma treatment device, as described previously, further including a charging dock for electrically
30 connecting to the plasma treatment device 100. In some embodiments, the charging dock is configured to accept the plasma treatment device 100, which can be operably mounted into the large-area device for compact charging and operation as a plasma generator.

In some embodiments, the electrode 114 and the dielectric barrier 116 are disposed behind a cover 117. The cover 117 may be removable. The cover 117 may provide protection for the dielectric barrier 116 when the plasma treatment device 100 is not in use.

5 In some embodiments, the electrode 114 and the dielectric barrier 116 are disposed on a retractable support enclosed within the plasma treatment device 100. The retractable support may be configured such that when retracted, the dielectric barrier 116 and the electrode 114 are hidden from view and the plasma treatment device 100 cannot be activated. The retractable support may rotate through the action of a mechanism
10 disposed at an end of the plasma treatment device 100 opposite to the dielectric barrier 116, such that the dielectric barrier 116 emerges from the opposite end of the plasma treatment device 100 in a manner resembling a lipstick. The plasma treatment device 100 may have a form factor similar or comparable to a retractable lipstick tube, such that it resembles the lipstick tube when inactive. In some embodiments, the
15 retractable support is a linear slide that is configured to slide the electrode 114 and the dielectric barrier 116 behind the shield 119 when not in use.

In some embodiments, the plasma treatment device 100 is controlled via a user interface in the external device 300. In some embodiments, the external device 300 is any type of device including a battery, a general purpose computer, and computer
20 readable memory with instructions stored thereon that, when executed by the computer implement a method of treatment of a region of a biological surface by cold atmospheric plasma.

In some embodiments, the plasma treatment device 100 includes one or more user controls including, but not limited to, a power switch, a plasma intensity selector, and a
25 safety switch. The plasma treatment device 100 may be switched on and switched off using a power switch disposed on the plasma treatment device 100, and the plasma 118 is generated while the plasma treatment device 100 is on. In some embodiments, a safety switch prevents the plasma treatment device 100 from turning on until the safety switch is disengaged. In some embodiments, the safety switch is a fingerprint reader. In some
30 embodiments, a plasma intensity selector permits smooth and continuous modulation of the plasma intensity, in terms of a power supplied to the electrode 114. In some embodiments, the plasma intensity selector limits the plasma treatment device 100 to one

of a number of discrete intensity settings, in terms of incremental steps in the power supplied to the electrode 114.

In some embodiments, the plasma treatment device 100 includes one or more light emitting diodes (not shown), providing therapeutic light to the biological surface 210. In some embodiments, the light emitting diodes provide blue light, in the range of 400 – 500 nm.

Cold plasma with formulation dispensing

FIG. 9 presents a schematic diagram of a cold plasma treatment system in accordance with the present disclosure. In some embodiments, the plasma treatment device 100, including the dielectric barrier 116 and the electrode 114, discharges the plasma 118 into the biological surface 210 through a formulation 410. The formulation 410 may include one or more active ingredients, including but not limited to anti-oxidants, radical scavenging compounds, ultraviolet absorbing compounds, rejuvenating compounds, etc. In some embodiments, the radical scavenging compound is an anhydrous, glycol-in-silicone formula with ascorbic acid and ascorbyl glucoside. In some embodiments, the radical scavenging compound is a water-in-silicone emulsion with a large internal aqueous phase incorporating water-soluble active ingredients. Without being bound to theory, it is believed that the aqueous phase will form encapsulations, containing active ingredients. Rejuvenating compounds may include collagen, elastin, and the like. The formulation may include inactive ingredients, such as dyes, pigments, fragrances, essential oils, emulsifiers, viscosity modifiers, etc. In some embodiments, the dye may be chemically reactive, and may respond to changes in pH induced by exposure to the plasma 118.

As shown in FIG. 9A, in some embodiments the plasma 118 is discharged into the formulation 410 in a container 415, before application to the biological surface 210 at or near the region. Without being bound to theory, it is believed that the plasma 118 generates beneficial species in the plasma, including ions, radicals, and long-lived RONS. The plasma treatment device 100 may generate the plasma in proximity of the formulation 410, by placing the plasma treatment device 100 near the exposed surface of the formulation 410 while it is in the container 415.

In some embodiments, a pre-treatment formulation enhances the effects of exposure to the plasma 118 by including reagent compounds to generate RONS. In some

embodiments, a post-treatment formulation reduces the potentially harmful effects of prolonged exposure to plasma generated species. For example, the post-treatment formulation may control the pH shift of the region after exposure to plasma generated species by including buffer compounds.

FIG. 10 illustrates a method of treatment 500 using the plasma treatment device 100 to generate the plasma 118 between the plasma treatment device 100 and the biological surface 210 that includes at least one formulation 410. In some embodiments, the method may include additional steps or may be practiced without all steps illustrated in the flow chart.

The method starts in block 510, and proceeds to a pre-treatment phase, including selecting a formulation, as shown in block 520, and applying the formulation to the region, as shown in block 530. As previously described, the formulation 410 may have protective or enhancing properties that improve therapeutic results following exposure to the plasma 118. In some embodiments, the formulation 410 is selected for reducing exposure of the region to ultraviolet photons produced in the plasma, or for enhancing production of RONS, etc.

In some embodiments, a pre-treatment formulation is applied to the region before exposure to the plasma 118. The method then proceeds to block 540, which includes generating the plasma 118. The plasma treatment device 100 may generate the plasma 118 in proximity to the region. The plasma treatment in block 540 may continue until the plasma 118 turns off. In some embodiments, the method then proceeds to block 550, where a post-treatment formulation is selected. The post-treatment formulation may be applied to the region following exposure to the plasma 118. The pre-treatment formulation and the post-treatment formulation may be identical or different, and selected to provide different effects to the region. The method ends in block 570. In some embodiments, the method includes removing the pre-treatment formulation following plasma treatment 540. In some embodiments, the method includes removing the post-treatment formulation after applying the post-treatment formulation 560.

Modular Cold Plasma Generating Device

FIG. 11 is a schematic diagram of a cold plasma treatment system 100 in accordance with the present disclosure. In some embodiments, the system includes a treatment device body 100 and a head 110 that is removeably attached to the treatment

device body 100. The illustrated head 110 has a mounting side facing the treatment device body 100 and an application side carrying an electrode 114, and a dielectric barrier 116 has a first side facing the electrode 114 and a second side facing away from the electrode 114. The cold plasma system 100 may include a plurality of attachable
5 heads 110 for cosmetic treatment over a region of a biological surface 210. The biological surface 210 includes, but is not limited to, skin, hair, fingernails, etc.

In some embodiments, a head 110-x is selected to produce the cold plasma 118 to execute a particular treatment. For example, when treating a relatively small region on the biological surface 210, a size of plasma 118 may be selected to avoid exposing the
10 non-target portion of the biological surface 210 to plasma-generated species. Here, the term "size of plasma" refers to a characteristic or a descriptive dimension of the plasma. For example, for a plasma generated by a round electrode 114, the characteristic dimension of the plasma is related to a diameter of the electrode 114.

As illustrated in FIG. 11A, a head 110a may be selected and attached to the treatment device body 100. The head 110a tapers from a larger size at the mounting side to a smaller size at the application side. Therefore, the illustrated head 110a generates the plasma 118 having a characteristic size that differs from the diameter of the mounting side of the head 110a. While FIG. 11A illustrates the head 110a having the application side that is smaller than the attachment side, it should be understood that the reverse is
15 also possible. For example, the head 110a may have its application side larger than the attachment side to cause a low intensity treatment over a region of the biological surface 210.

As illustrated in FIG. 11B, a head 110b may include a formula reservoir 180 and an exuding surface 186 on the application side of the head 110b. The exuding
25 surface 186 may be connected to the formula reservoir 180 via one or more conduits 184. In some embodiments, the formula exuding surface 186 includes one or more nozzles on the application side of the head 110b. In some embodiments, the formula exuding surface 186 is a porous material having a void volume to buffer the flow of formula from the formula exuding surface. The porous material may include a cured gel, a soft plastic foam, a rigid plastic foam, a natural porous material such as pumice, etc. In some
30 embodiments, the formula exuding surface 186 may include a vent barred by one or more grills, a wire mesh screen, a patterned perforated screen, etc.

In some embodiments, the formula reservoir 180 is compressed by pressure when the application side of the head 110b is applied to the biological surface 210. In some embodiments, the formula reservoir 180 is compressed by a mechanism enclosed within the head 110b including, but not limited to an electric actuator, a servo, a manually operated lever, a roller, a pair of rollers, etc. In some embodiments, the formula reservoir 180 is removable and interchangeable, and contains a prepared formula tailored to a desired therapeutic or cosmetic result.

In some embodiments, the formula includes one or more cosmetic ingredients. Cosmetic ingredients may include a fragrance, a pigment, a cream, an oil, a natural extract, a moisturizer, etc. In some embodiments, the formula includes one or more medicaments, for example, astringents, pharmaceutically active compounds, acid neutralizing creams, anti-oxidants, etc. In some embodiments, the formula includes one or more protective compounds to protect the biological surface from potentially harmful effects of exposure to the plasma 118. Some non-limiting examples of such protective compounds are an anti-oxidant, a moisturizer, a clarifying cream, an acidity buffering cream, etc.

In one embodiment, the head 110b includes a flexible skirt 170 at the application side of the head 110b. In some embodiments, the flexible skirt 170 is made from corrugated plastic or soft rubber, and attached to the application side of the head 110b. In some embodiments, the flexible skirt 170 is compressed by contacting the biological surface 210. In some embodiments the flexible skirt 170 includes a rigid spacer 174, restricting the compression of the skirt 170, thereby defining a minimum spacing between the head 110b and the biological surface 210. In some embodiments the flexible skirt 170 is impermeable to gases and, when compressed, creates a contained environment for the plasma 118 to form therein. The rigid spacer 174 may be enclosed by the flexible skirt 170 or may be external to it, and may be added or removed. In some embodiments, the rigid spacer 174 includes a conductive material including but not limited to a metal. In some embodiments, the rigid spacer 174 including a conductive material is biased at a voltage greater than or equal to zero. Without being bound to theory, it is believed that the rigid spacer 174 thus biased may allow the plasma to form between the head 110b and the rigid spacer 174, thereby reducing the dose of ions and electrons directed to the biological surface 210. In some embodiments, the plasma 118 discharging into the rigid

spacer 174 produces RONS that are contained in the volume defined by the flexible skirt 170.

In one embodiment, the head 110b includes a filter 190 for filtering the plasma 118. The filter 190 may be placed between the head 110b and the biological surface 210, e.g., on a path of the plasma 118 applied to the biological surface.

In some embodiments, the filter 190 is an ultraviolet filter, placed at least partially to block the path of ultraviolet photons from the plasma 118 to the biological surface 210. In some embodiments, the filter 190 blocks ultraviolet photons because the filter is made of UV absorbent or UV scattering material, including, but not limited to, plastic, glass or quartz treated with a UV-blocking film, etc.

In some embodiments, the filter 190 is a chemical filter designed to sequester or convert one or more plasma generated species that would otherwise reach the biological surface 210. In some embodiments, the filter 190 includes a carbonaceous material, non-limiting examples of which include graphene, carbon nanotubes, activated carbon paper, carbon fiber, etc. In another embodiment, the filter 190 includes a catalytic material, non-limiting examples of which include metal particles embedded in a porous matrix. In some embodiments, the filter 190 includes radical scavenging materials, for example, antioxidants, including catalases, glutathione peroxidase, superoxide dismutase (SOD), α -tocopherol (Vit. E), ascorbic acid (Vit. C), β carotene (Vit. A), selenium, etc. In some embodiments, the filter includes a pH sensitive polymer that responds to changes in proton concentration by changing its porosity, surface properties, dimensions, etc. Some non-limiting examples of such pH sensitive polymers include polyacids and polybases, chitosan, hyaluronic acid, and dextran. In some embodiments, the filter responds to changes in pH by opening pores and releasing one or more of the previously described radical scavenging materials.

In some embodiments, the filter 190 includes a liquid formula that is applied to the biological surface 210 upon contact. The liquid formula may include any of the previously mentioned filter materials, carried in a liquid emulsion including but not limited to a cream or an oil. In some embodiments, the liquid formula filter 190 includes additional materials such as cosmetic ingredients, medical ingredients, etc. In some embodiments, the liquid formula includes an indicator material that provides a colorimetric indicator of exposure to plasma generated species. In some embodiments, the indicator material is a pH sensitive dye that will change color when the biological

surface 210 has been exposed to a concentration of plasma-generated acidifying or alkalizing species that is sufficient to alter the molecular structure of the dye. Non limiting examples of pH sensitive dye include Gentian violet, Methyl yellow, Methyl red, Cresolphthalein, Indigo carmine, etc.

5 In some embodiments, the filter 190 includes a charged particle filter placed between the plasma 118 and the biological surface 210 that attracts and neutralizes charged particles present in the plasma 118. In some embodiments, the charged particle filter includes one or more conductive elements, individually biased at a nonzero voltage. Non-limiting examples of a conductive element include a metal screen, a metal probe, a
10 metal ring, etc., placed near or around the dielectric material 116 on the application side of the head 110b. In some embodiments, the charged particle filter selectively filters out positive ions by having a negative polarity, therefore neutralizing the positive ions that approach the surface of the filter 190. In some embodiments, the charged particle filter filters out all charged particles by combining multiple conductive elements, e.g., at least
15 one conductive element carrying a negative polarity and at least one conductive element carrying a positive polarity.

As illustrated in FIG.11C, the biological surface 210 includes contours that may affect the uniformity of exposure of the region to the plasma 118. Non-limiting examples of contoured biological surfaces 210 include regions on a face and body, including but
20 not limited to convex surfaces such as the cheekbones, the chin, the eyebrows, the nose, the jaw, knuckles, ankles, elbows, knees, etc. Similarly, contoured biological surfaces 210 may include concave surfaces, as in the area beneath the jaw, around the ears, along the neck, etc. In some embodiments, a head 110c includes a conformable material on the application side. The conformable material is configured to reversibly
25 conform to the contours of the region. Non-limiting examples of the conformable material include gel, cured foam, rubber, plastic, etc. In some embodiments, the conformable material on the head 110c includes a consumable material, for example a dry solid, a moisturizing gel, a water soluble cream, etc.

In some embodiments, the application side of the head 110c is reversibly
30 conformable with respect to the biological surface 210. In some embodiments, the dielectric barrier 116 includes a flexible surface, including but not limited to a woven dielectric cloth, such as a glass cloth, a ceramic cloth, etc. In some embodiments, the electrode 114 includes a flexible conductive surface, such as a woven metal cloth, copper

mesh, stainless steel mesh, etc. In some embodiments, the flexible surface included in the dielectric barrier 116 is sealed to prevent accumulation of material abraded from the biological surface 210 during the plasma treatment. The flexible surface may be sealed with a coating including, but not limited to, Teflon, SiO_x film, graphene, etc.

5 As illustrated in FIG.11D, a head 110d may provide an air cushion between the head 110d and the biological surface 210. In some embodiments, the head 110d includes a plurality of air conduits 164 that at least partially surround the electrode 114 and the dielectric barrier 116. In operation, the air mover 160 provides air to the air conduits 164 (e.g., nozzles, vents, etc.) that direct a vectored flow of air away from the head 110d. The
10 flow of air may create an air cushion that prevents or at least minimizes a contact between the head 110d and the biological surface 210. In some embodiments, the air mover 160 is an electric fan, located within the head 110d. The air mover may operate independently from the electrode 116 and may be turned on and turned off without altering the state of the plasma 118.

15

Cold Plasma Device with Sensors

FIG. 12 is a schematic diagram of a cold plasma treatment system in accordance with the present disclosure. In some embodiments, the cold plasma treatment device 100 includes one or more sensors 140 to measure plasma parameters. Based on the measured
20 plasma parameters, a controller 142 may control the cold atmospheric plasma 118 and maintain a predetermined cosmetic treatment over a region of a biological surface 210.

As previously described, in some embodiments, the cold atmospheric plasma 118 is formed using the biological surface 210 as a floating reference electrode. Without being bound to theory, it is believed that such an arrangement is sensitive to non-uniform
25 distribution of water and ion concentrations over the biological surface 210. It is believed that a localized region that is relatively rich in ions, such as a sweat gland, may provide a preferred conductive path for plasma-generated charged species, and the cold atmospheric plasma 118 may form preferentially at such a site on the biological surface 210. In turn, plasma preference for a particular location over another on a
30 biological surface 210 introduces poorly controlled non-uniformity in treatment and variability in plasma dosage over the region treated by the plasma 118. It is believed that uniformity is an important criterion in the operation of a cold atmospheric plasma source. Therefore, in at least some embodiments, the design of the plasma treatment device 100

takes into account the sensitivity of the cold atmospheric plasma 118 to variations in properties of the surface 210.

Uniformity of the plasma 118 is defined in terms of a variability of one or more plasma parameters, for example, discharge power, discharge volume, the concentrations of plasma generated species, etc. In a highly variable system, for example, where the treatment region contains many discrete sub-regions of disparate properties, the plasma treatment device 100 may exhibit discontinuities in the discharge current or discharge voltage as the plasma treatment device 100 translates between ion-rich and ion-poor sub-regions of the surface 210. Without being bound to theory, it is believed that a plasma source, passing over a conductive sub-region may exhibit a spike in discharge current and a corresponding drop in discharge voltage.

In some embodiments, the controller 142 actuates an electronic ballast circuit, connected to the electrode 114. Without being bound to theory, it is believed that an electronic ballast circuit may permit the controller 142 to regulate the current to electrode 142, thereby preventing thermal runaway of the plasma 118 and constriction of the plasma 118 at one or more localized spots on the biological surface 210.

As illustrated in FIG. 12, which demonstrates an embodiment of the inventive technology, the plasma source 100 incorporates one or more sensors 140 to measure parameters of a cold atmospheric plasma 118 and a biological surface 210. In some embodiments, the plasma treatment device 100 includes sensors 140 that measure plasma parameters. The plasma parameters may include measurements of the electric current discharged into the biological surface 210, the voltage drop between the dielectric barrier 116 and the surface 210. The plasma parameters may include one or more parameters indicative of the energy density of the plasma 118, such as the spectrum of light emitted by the plasma 118, the ion-density in the plasma 118, or variation in time of the prior-mentioned parameters that would indicate non-uniform surface treatment. Without being bound to theory, it is believed that one or more short-lived discontinuities in the discharge voltage or discharge current indicates a non-uniformity in the form of preference of the cold atmospheric plasma 118 for one or more highly localized ion-rich regions on the surface.

In some embodiments, one or more sensors 140, placed on the surface 210 at or near the treatment region, measure parameters of the plasma 118 or of the biological surface 210. For example, the plasma treatment device 100 may include ion sensors,

such as pH sensors or chloride sensors, light sensors, reactive oxygen sensors, a surface temperature sensor, a distance sensor, humidity sensors, etc.

5 In some embodiments, sensors 140 placed either on the surface 210 or on the plasma treatment device 100 measure the ambient environment. Such sensors 140 may include ion sensors, light sensors, reactive oxygen sensors, temperature sensors, humidity sensors, etc.

10 In some embodiments, a position reference sensor placed on the plasma treatment device 100 is operably coupled to a distance sensor on the biological surface 210. The position reference sensor may determine the distance of the dielectric barrier 118 from the surface 210. In some embodiments, a distance sensor, such as a laser rangefinder included in the plasma treatment device 100, measures the distance from the dielectric barrier 118 to the surface 210.

15 In some embodiments, the sensors 140 communicate with the controller 142, as part of the plasma source 110. The controller 140 may be operably coupled to the plasma treatment device 100, and may receive input from the sensors 140 and process that input to determine control data for the plasma treatment device 100. In some embodiments, the control data includes, but is not limited to, signals sent to electronic components of the plasma treatment device 100 to modulate the current or the voltage provided to the electrode 116, and signals sent to other components of the plasma treatment device 100 to produce a perceptible signal. In some embodiments, the perceptible signal is a haptic feedback or an audible or visible indicator. In some embodiments, the controller 142 sends control data in response to an unsafe dose of energy or reactive species produced by the plasma 118.

25 As previously described, without being bound to theory, a plasma dose is believed to determine exposure to one or more plasma generated species such as, reactive chemical species, energetic species including ions and electrons, photons, etc.

30 In some embodiments, a plasma dose is a concentration of a given species imparted to a given region on the biological surface 210 over a period of time, expressed as a number per unit-area, per unit-time (such as "per square-centimeter seconds"). In some embodiments, the controller 142 determines a treatment duration and control data to send to the plasma treatment device 100, by integrating the plasma dose over the area of the dielectric barrier 116, to provide a plasma dose per unit time.

In some embodiments, when the plasma treatment device 100 remains over a given region on the biological surface 210 for a length of time such that the plasma 118 is likely to harm the surface 210, the plasma treatment is considered unsafe. Conversely, in some embodiments, if the treatment device 100 remains over the given region for a length of time such that the plasma 118 is unlikely to have the desired effect, the plasma treatment is considered to have provided an ineffective dose. In some embodiments, these doses are not unique values, but rather are thought to occur in ranges. As such, a controller 142 may determine an unsafe range or an ineffective range of doses, wherein it will send control data to the plasma treatment device 100 to produce a perceptible signal or to modulate the plasma 118, or both.

In some embodiments, the controller 142 responds to an unsafe dose by sending a signal for the source to be moved away from the region on the biological surface 210 toward a second region. The controller 142 may respond to an unsafe dose by sending control data to the electronic components of the plasma treatment device 100 to turn off the plasma 118, or to modulate the power provided to the electrode 114 to diminish the generation of energetic species and reactive species in the plasma 118.

In some embodiments the plasma 118 is generated by a plurality of pixelated electrodes 114i,j arranged in a matrix, as shown in FIG. 13. The pixelated electrodes may be individually addressable by the controller 142, where the controller determines a discharge power for a given pixelated electrode 114. In some embodiments, the controller uses input from current and voltage sensors 140 for the pixelated electrodes 114i,j to counteract non-uniform plasma 118 constriction or localization. In some embodiments, when the plasma 118 localizes to a spot on the biological surface 210 having disparate chemical or physical properties, the controller 142 receives input indicating which pixelated electrodes 114i,j are drawing a disproportionate rate of electrical power, relative to the average for the matrix 114. The controller 142 may modulate the plasma 118 by turning off the electrodes 114i,j that are drawing excess power, thereby distributing plasma energy to operational electrodes O, and diminishing the undesirable effects of plasma non-uniformity near the non-operational electrodes NO.

The components of the cold plasma system 100 may communicate directly through wired and powered connections. These components may communicate to each other via a network (not shown), which may include suitable communication technology including, but not limited to, wired technologies such as DSL, Ethernet, fiber optic, USB,

and Firewire; wireless technologies such as WiFi, WiMAX, 3G, 4G, LTE, and Bluetooth; and the Internet.

In some embodiments, the controller 142 includes a non-transitory computer readable medium having computer executable instructions and data stored thereon that cause, in response to execution by one or more processors of a computing device, the computing device to implement a method of treatment 600 as described herein and illustrated in Fig. 14.

FIG. 14 is a flowchart of a method of cold plasma treatment according to the present disclosure. In some embodiments, the method of treatment 600 of the region of the biological surface 210 with the cold atmospheric plasma 118 includes generating the cold plasma between the plasma treatment device 100 and the region. The method of treatment 600 may include measuring one or more treatment parameters with one or more sensors 140 and determining a plasma dose from the treatment parameters. In some embodiments, the method of treatment 600 includes modulating one or more of the treatment parameters to adjust the plasma dose, and switching off the cold atmospheric plasma 118.

In some embodiments, the method may include additional steps or may be practiced without all steps illustrated in the flow chart. The method starts at block 605, and proceeds to block 610 where one or more sensors 140 measure treatment parameters, for example, ambient parameters and surface parameters. In some embodiments, prior to generating the plasma 118, the method 600 includes placing at least one sensor 140 onto the biological surface 210 at or near the region. As previously described, the sensors 140 may be operably coupled to the controller 142, and may provide sensor input to the controller 142 to be used in block 615 to determine plasma parameters necessary for effective treatment. In some embodiments, the plasma parameters are defined by default values, and the controller 142 does not act until the plasma 118 has been turned on. In some embodiments, the plasma parameters include a discharge voltage as a function of time, a discharge current as a function of time, a plasma temperature as a function of time, or a gas temperature near the region as a function of time. In some embodiments, the sensor measurements are provided to a data storage system 620, which may aggregate the measurements with other sensor data. In some embodiments, a parameter engine communicates parameter information to the controller 142 as shown in block 627. The parameter engine determines a treatment dose based on aggregate sensor inputs

accumulated and stored in a data storage system 620, and further determines a set of plasma parameters that are provided to the controller 142.

In block 630, a cosmetic formulation is applied to the treatment region. In some embodiments, the cosmetic formulation enhances plasma treatment. In some
5 embodiments, the cosmetic formulation protects the biological surface 210 from harmful aspects of the plasma 118. A formulation engine, shown in block 625, may determine the formulation, which may receive input from the data storage system 620. In some embodiments, the formulation engine applies machine learning to optimize the components of the formulation for a given purpose such as radical scavenging, UV
10 absorption, electrical conductivity, thermal conductivity, etc.

In block 635, the plasma treatment device 100 applies the cold atmospheric plasma 118 to the biological surface 210 at the treatment region. In block 635, a post-plasma formulation is applied to the treatment region of the biological surface 210. As in
15 block 630, the formulation may be determined by a formulation engine as shown in block 625. In some embodiments, the post-plasma formulation may be the same as the formulation of block 630. In some embodiments, the post-plasma formulation may be different from the formulation of block 630. In some embodiments, the post-plasma formulation neutralizes ions and moisturizes the biological surface 210. In some
20 embodiments, the post-plasma formulation counteracts possible oxidative effects of plasma treatment by including anti-oxidant ingredients.

In block 645, the treatment may be repeated. In some embodiments, the controller 142 determines whether the treatment dose has been met at block 645. Where
the treatment dose has not been met, the controller 142 may repeat the sensor measurements, determine new plasma parameters, and modulate the plasma to provide an
25 effective and safe dose of plasma generated species. In some embodiments, the treatment is not repeated, and the method ends in block 650.

The controller 142 may determine plasma parameters from a group including a current provided to the electrode 114, a driving frequency, a voltage waveform, a peak to
peak voltage, a root mean square voltage, a plasma temperature, a gas temperature,
30 optical emission from the plasma 118, etc.

In some embodiments, the controller determines an indicator of uniformity of the cold atmospheric plasma 118. As previously described, uniformity describes the spatial distribution of plasma 118 between the second side of the dielectric barrier 116 and the

biological surface 210, as well as whether a time-averaged flow of current between the two surfaces is evenly spread across the treated region on the biological surface 210. In some embodiments, the controller sends control data to the plasma treatment device 100 to modulate one or more of the plasma parameters in response to changes in the indicator of uniformity. The controller may determine the indicator of uniformity intermittently, based on sensor inputs provided to the controller 142.

As understood by one of ordinary skill in the art, a "data storage system" as described herein may be any suitable device configured to store data for access by a computing device. An example of the data storage system 620 is a high-speed relational database management system (DBMS) executing on one or more computing devices and being accessible over a high-speed network. However, other suitable storage techniques and/or devices capable of providing the stored data in response to queries may be used, and the computing device may be accessible locally instead of over a network, or may be provided as a cloud-based service. The cloud storage system 620 may also include data stored in an organized manner on a computer-readable storage medium.

In general, the word "engine," as used herein, refers to logic software and algorithms embodied in hardware or software instructions, which can be written in a programming language, such as C, C++, COBOL, JAVA™, PHP, Perl, HTML, CSS, JavaScript, VBScript, ASPX, Microsoft .NET™, PYTHON, and/or the like. An engine may be compiled into executable programs or written in interpreted programming languages. Software engines may be callable from other engines or from themselves. Generally, the engines described herein refer to logical modules that can be merged with other engines, or can be divided into sub engines. The engines can be stored in any type of computer readable medium or computer storage device and be stored on and executed by one or more general purpose computers, thus creating a special purpose computer configured to provide the engine or the functionality thereof.

Many embodiments of the technology described above may take the form of computer- or controller-executable instructions, including routines executed by a programmable computer or controller. Those skilled in the relevant art will appreciate that the technology can be practiced on computer/controller systems other than those shown and described above. The technology can be embodied in a special-purpose computer, application specific integrated circuit (ASIC), controller or data processor that is specifically programmed, configured or constructed to perform one or more of the

computer-executable instructions described above. Of course, any logic or algorithm described herein can be implemented in software or hardware, or a combination of software and hardware.

5 From the foregoing, it will be appreciated that specific embodiments of the technology have been described herein for purposes of illustration, but that various modifications may be made without deviating from the disclosure. Moreover, while various advantages and features associated with certain embodiments have been described above in the context of those embodiments, other embodiments may also exhibit such advantages and/or features, and not all embodiments need necessarily exhibit
10 such advantages and/or features to fall within the scope of the technology. Where methods are described, the methods may include more, fewer, or other steps. Additionally, steps may be performed in any suitable order. Accordingly, the disclosure can encompass other embodiments not expressly shown or described herein.

For the purposes of the present disclosure, lists of two or more elements of the
15 form, for example, "at least one of A, B, and C," is intended to mean (A), (B), (C), (A and B), (A and C), (B and C), or (A, B, and C), and further includes all similar permutations when any other quantity of elements is listed.

CLAIMS

What is claimed is:

1. A method of treatment of a region of a biological surface with a cold plasma, the method comprising:

selecting a post-treatment formulation; and

applying the post-treatment formulation to the region pre-treated by the cold plasma.

2. The method of claim 1, further comprising:

generating the cold plasma between a plasma treatment device and the region; and
prior to applying the post-treatment formulation, switching off the cold plasma.

3. The method of claim 2, further comprising:

activating an auxiliary treatment device, wherein the auxiliary treatment device is selected from a group consisting of (i) a vibration device, (ii) a source of ultrasound, (iii) a light source configured to illuminate the region, and (iv) a source of air directed to the region; and

containing the cold plasma between the plasma treatment device and the region by a skirt disposed at least partially about the cold plasma.

4. The method of claim 1, further comprising:

selecting a pre-treatment formulation;

applying the pre-treatment formulation to the region;

generating the cold plasma between a plasma treatment device and the pre-treatment formulation;

switching off the cold plasma; and

removing the pre-treatment formulation from the region.

5. The method of claim 4, further comprising:

prior to applying the pretreatment formulation to the region, treating the pre-treatment formulation by discharging the cold plasma into the pre-treatment formulation;
during generating the cold plasma between a plasma treatment device and the region, sensing one or more treatment parameters with one or more sensors;
determining a plasma dose from the treatment parameters; and
adjusting the plasma dose.

6. The method of claim 4 or 5, further comprising:
optimizing at least one of the pre-treatment formulation and post-treatment formulation by a formulation engine configured for a machine learning; and
modulating plasma parameters by the formulation engine based on sensing one or more treatment parameters with one or more sensors.

7. A cold plasma system for cosmetic treatment of a region of a biological surface, comprising:
a cold plasma generator comprising:
an electrode, and
a dielectric barrier having a first side that faces the electrode and a second side that faces away from the electrode; and
an auxiliary treatment device configured to enhance effects of the cold plasma on the region.

8. The system of claim 7, wherein the auxiliary treatment device is selected from a group consisting of (i) a vibration device, (ii) a source of ultrasound, (iii) a light source configured to illuminate the region, (iv) a source of air directed to the region; and (v) a source of heat directed to the region.

9. The system of claim 7, wherein the cold plasma generator comprises:
a plasma generator body; and

a head that is removeably attached to the plasma generator body, wherein the head has a mounting side facing the generator body and an application side that carries the electrode and the dielectric barrier.

10. The system of claim 7, wherein the electrode is pixelated into individually activated areas capable of generating the cold plasma, the system further comprising:

a controller configured to energize the activated areas of the electrode.

11. A cold plasma system for treating a region of a biological surface, the system comprising:

a plasma treatment device, including-

an electrode; and

a dielectric barrier having a first side that faces the electrode and a second side that faces away from the electrode;

at least one sensor configured to measure properties of at least one of a cold plasma, an ambient environment around the system, and the biological surface; and

a controller operably coupled to the plasma treatment device and to the at least one sensor, wherein the controller is configured to-

receive input from the at least one sensors;

determine control data for the plasma treatment device; and

send control data to the plasma treatment device.

12. The system of claim 11, wherein the at least one sensor is selected from a group consisting of: a motion sensor; a humidity sensor configured to measure a humidity of ambient air; a reactive oxygen species sensor; reactive nitrogen species sensor; a light sensor; a plasma conductivity sensor; a surface temperature sensor; a distance sensor; and an ion concentration sensor.

13. The system of claim 12, wherein the controller is further configured to:

determine effectiveness of the plasma treatment device based on the input from the at least one sensor; and

determine a length of time for a safe plasma treatment based on the input from the at least one sensor.

14. The system of claim 11, further comprising at least one auxiliary treatment device configured to enhance effects of the cold plasma on the region, wherein the auxiliary treatment device is selected from a group consisting of (i) a vibration device, (ii) a source of ultrasound, (iii) a light source configured to illuminate the region, (iv) a source of air directed to the region; and (v) a source of heat directed to the region.

15. The system of claim 11, wherein the system is operatively coupled to a cloud storage system configured to:

determine plasma parameters from the at least one sensor; and

optimize at least one of a pre-treatment formulation and a post-treatment formulation by a formulation engine configured for a machine learning.

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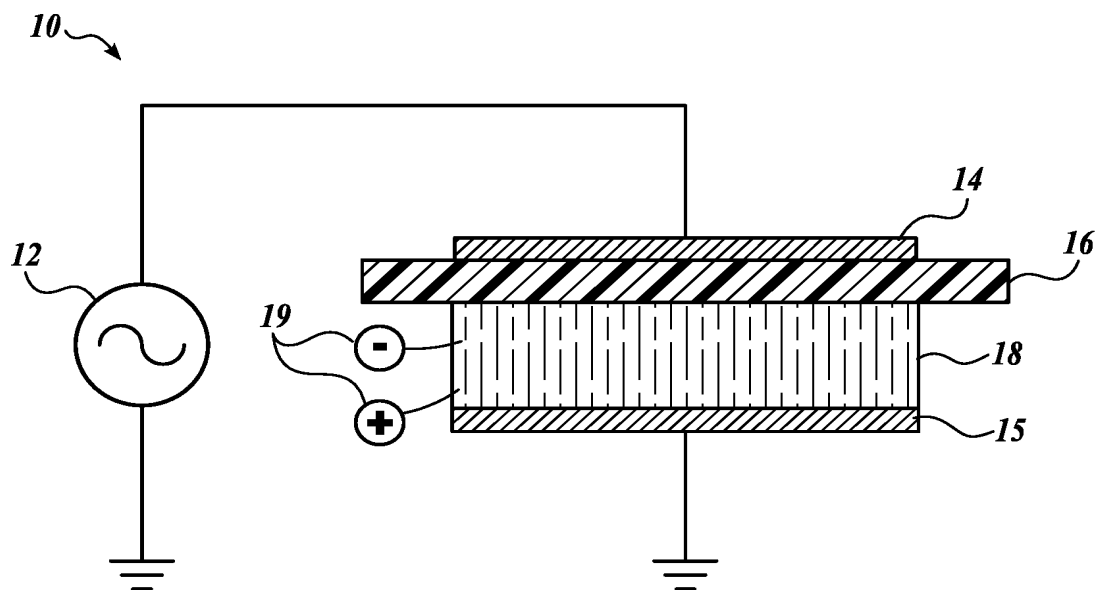


FIG. 1
(PRIOR ART)

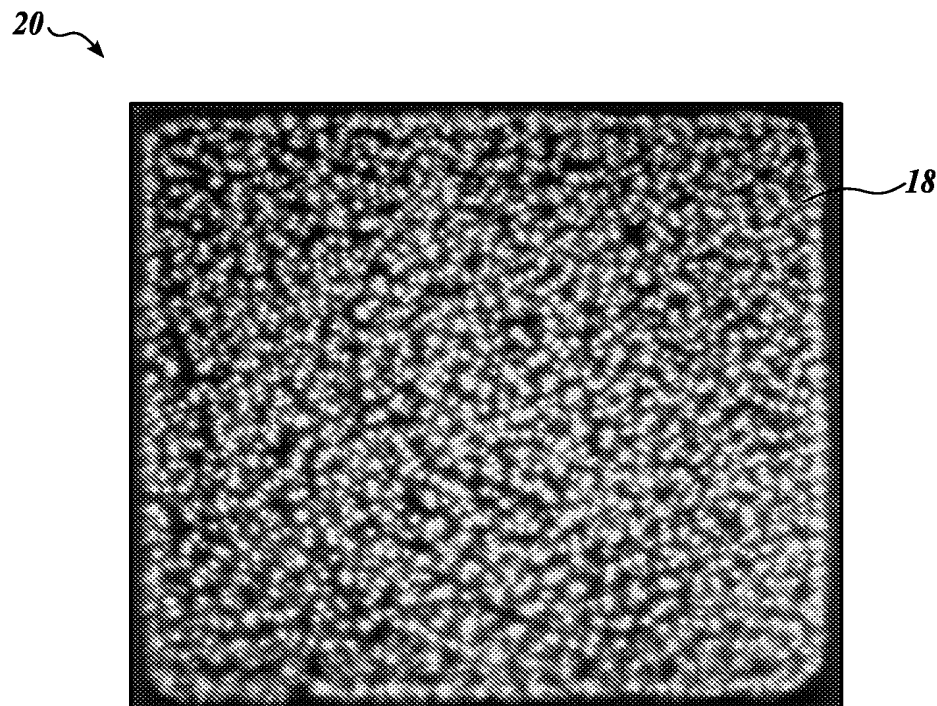


FIG. 2
(PRIOR ART)

2/15

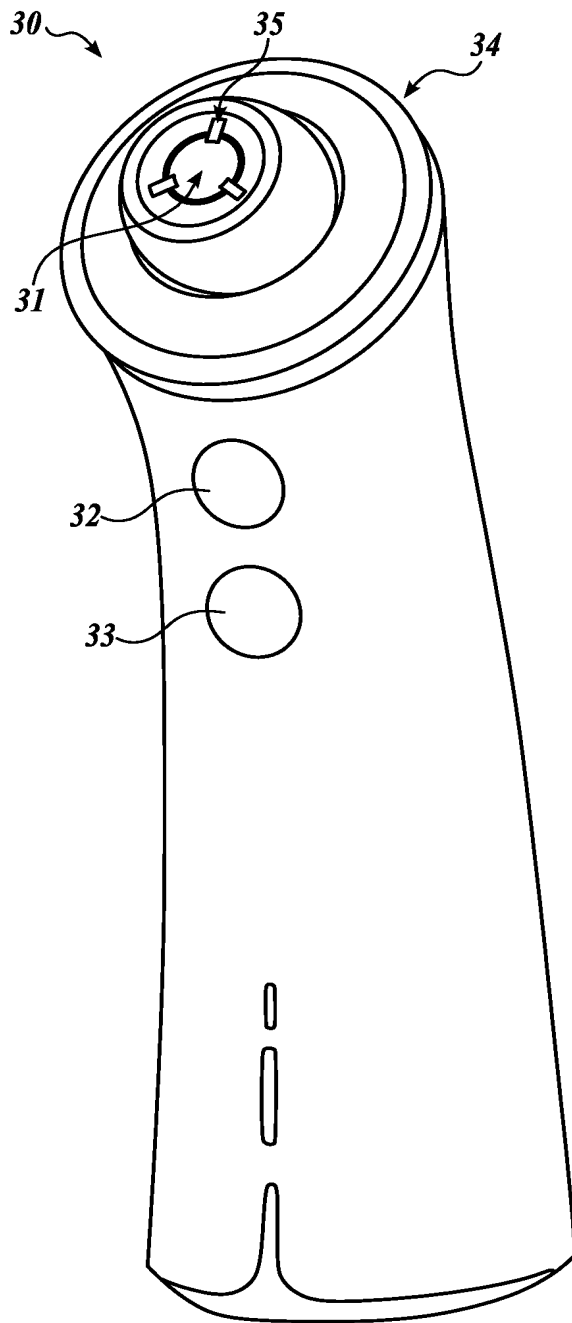


FIG. 3A
(PRIOR ART)

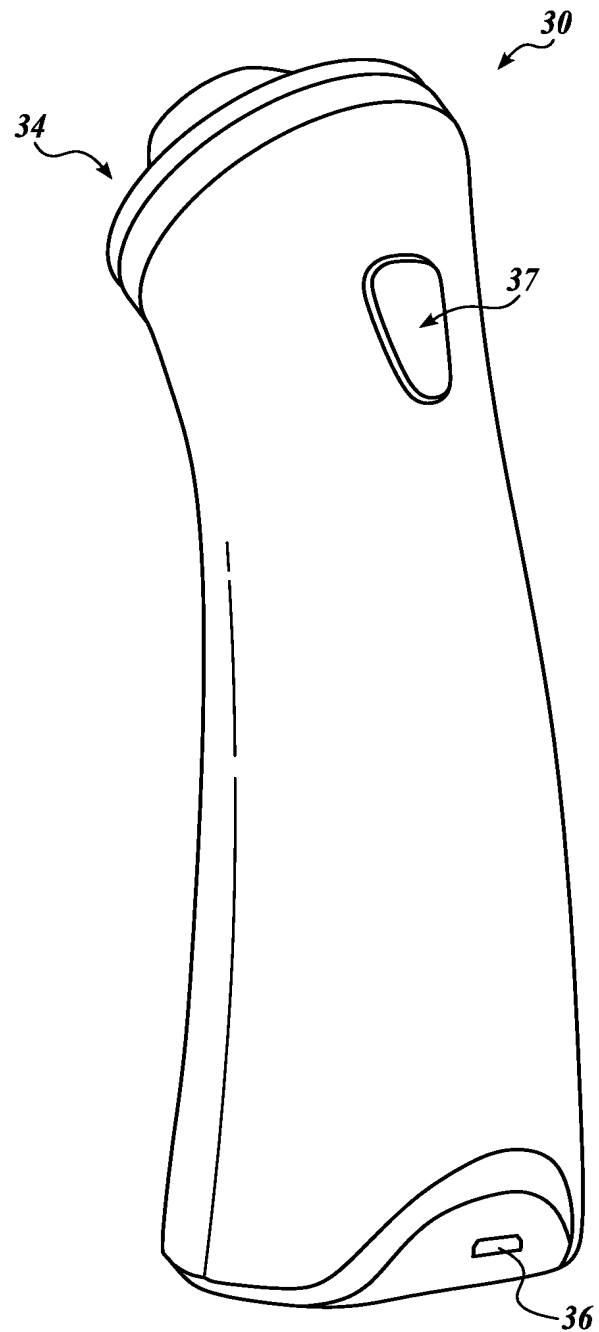


FIG. 3B
(PRIOR ART)

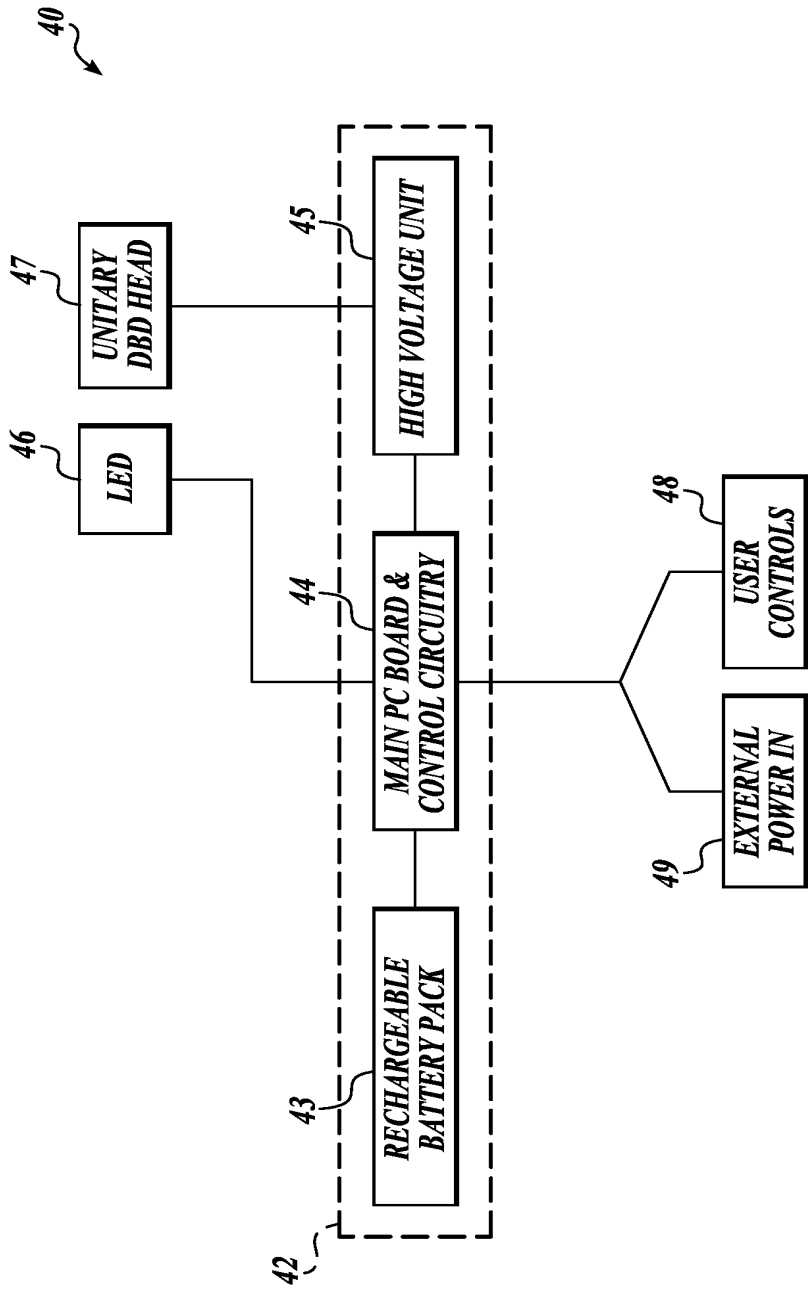


FIG. 4
(PRIOR ART)

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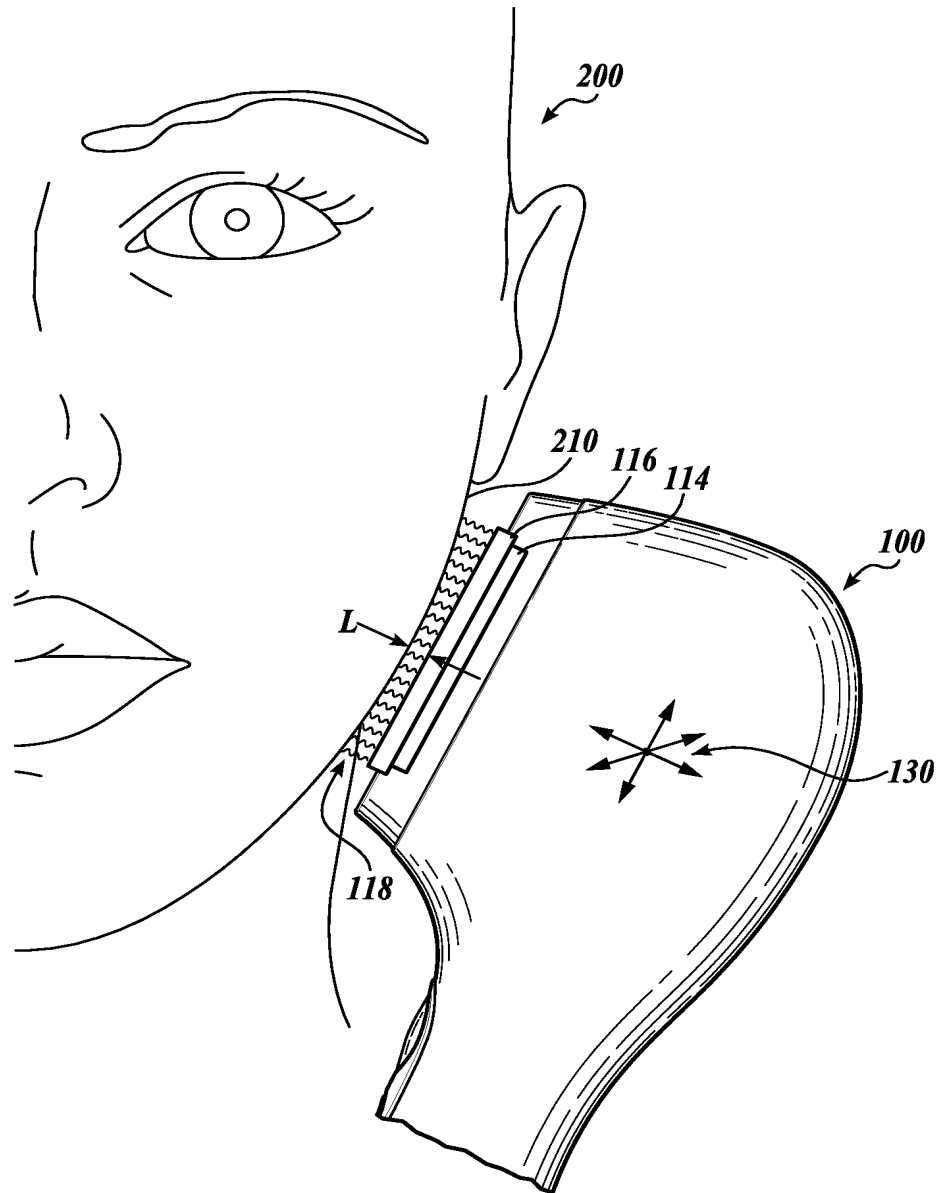


FIG. 5

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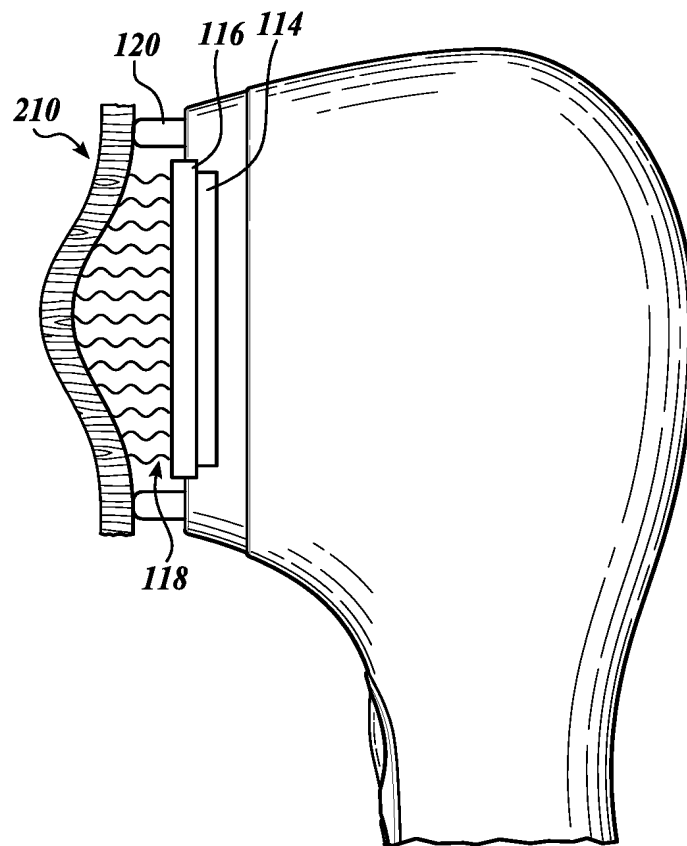
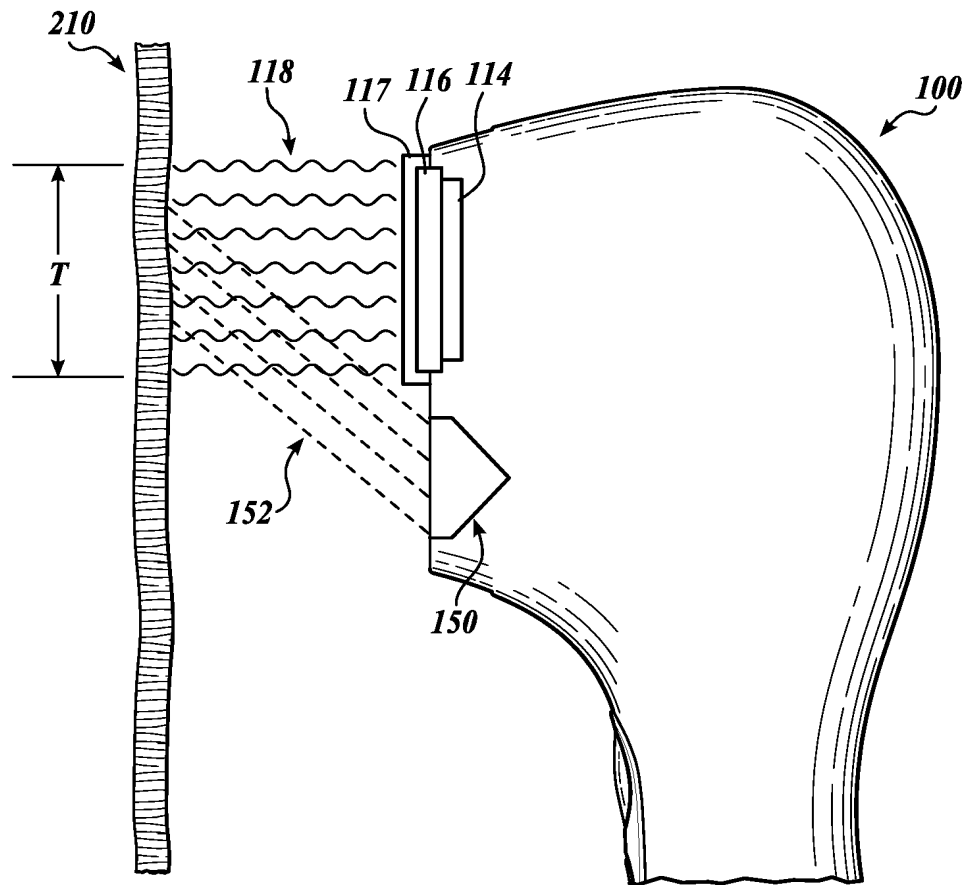
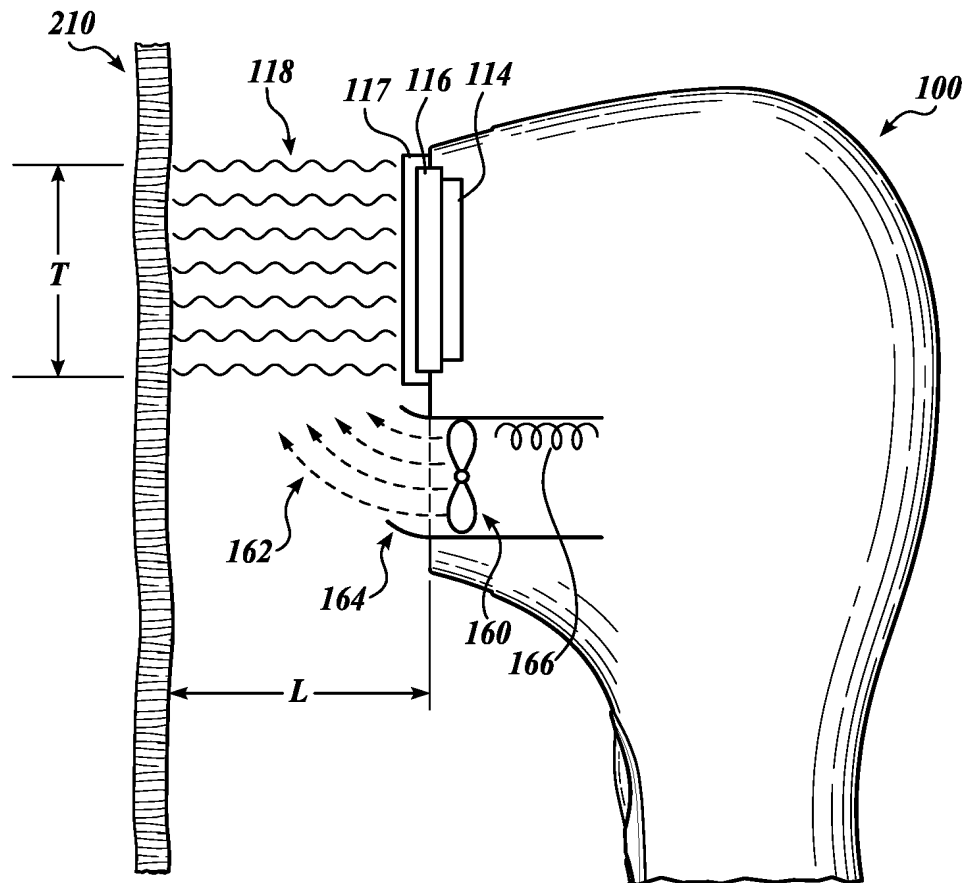


FIG. 5A

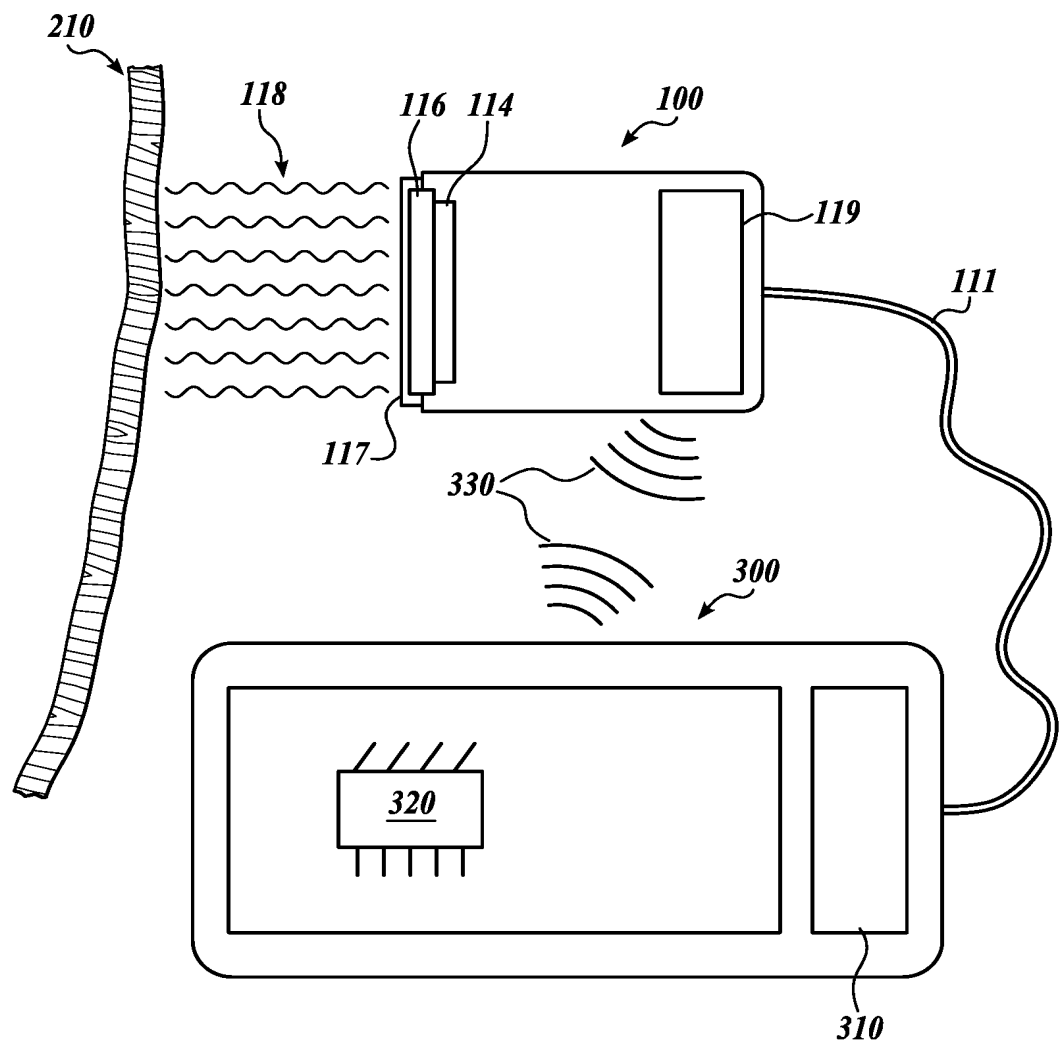
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**FIG. 6**

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**FIG. 7**

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**FIG. 8**

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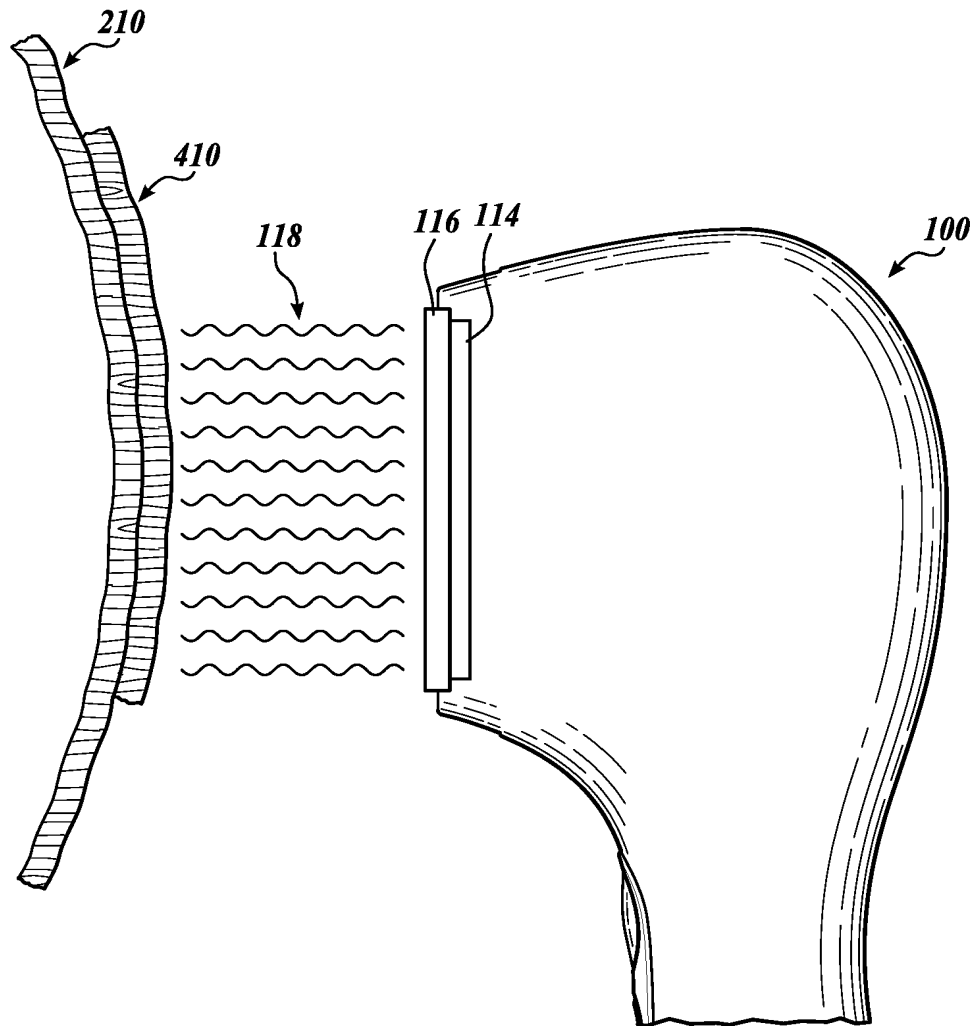


FIG. 9

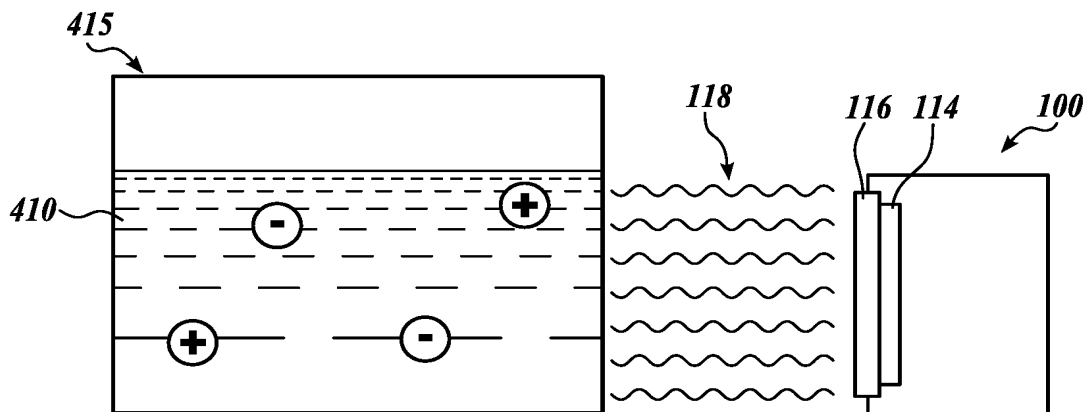
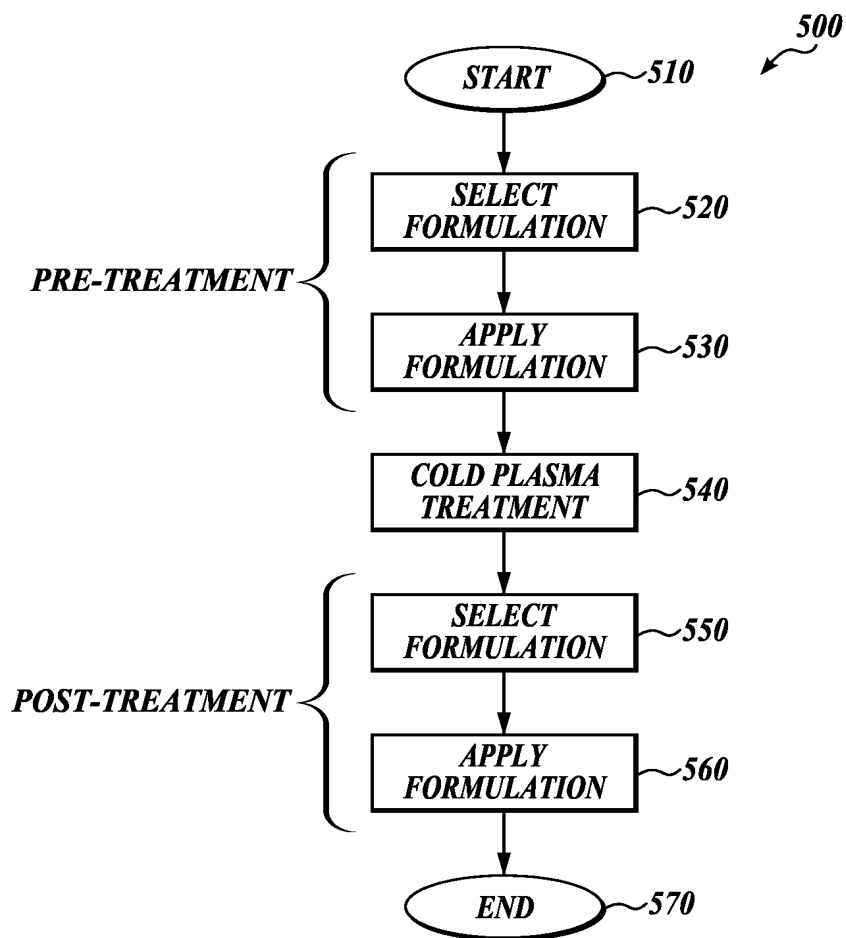


FIG. 9A

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**FIG. 10**

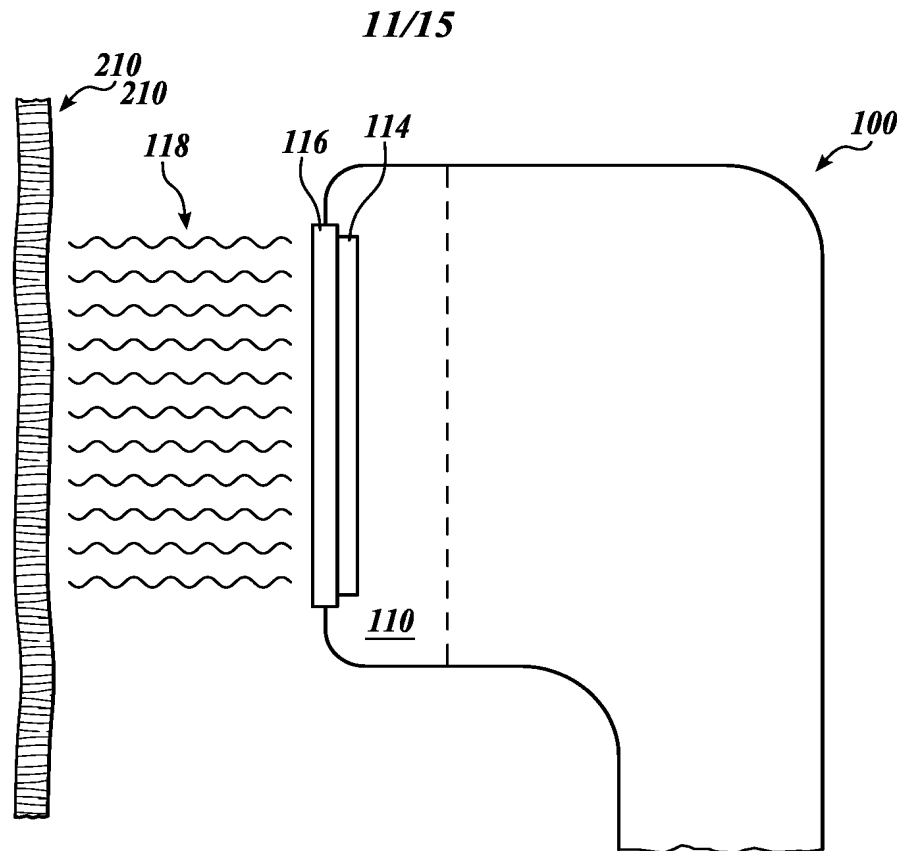


FIG. 11

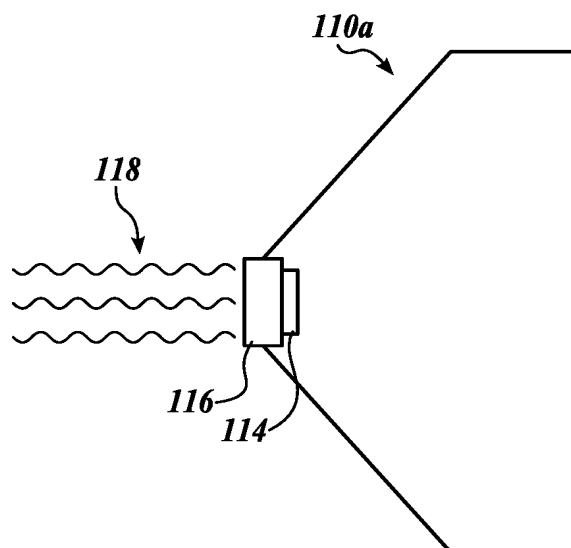
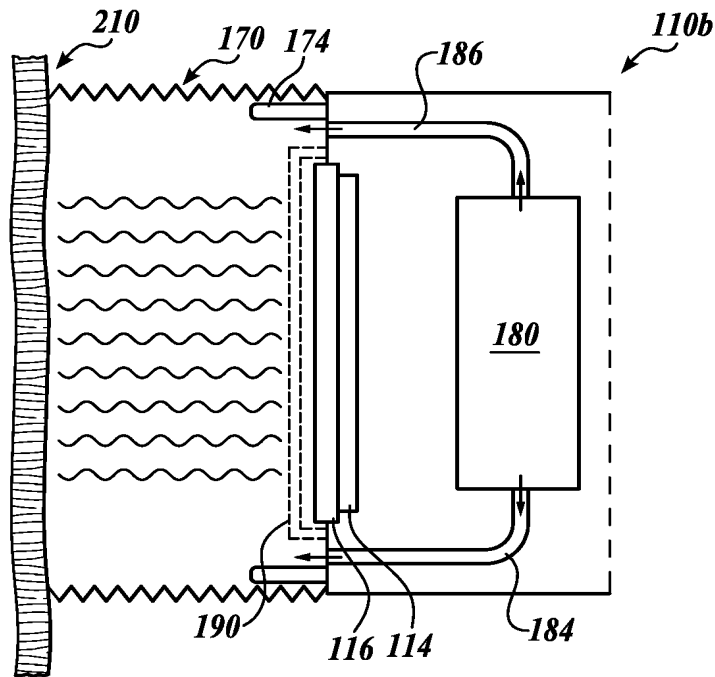
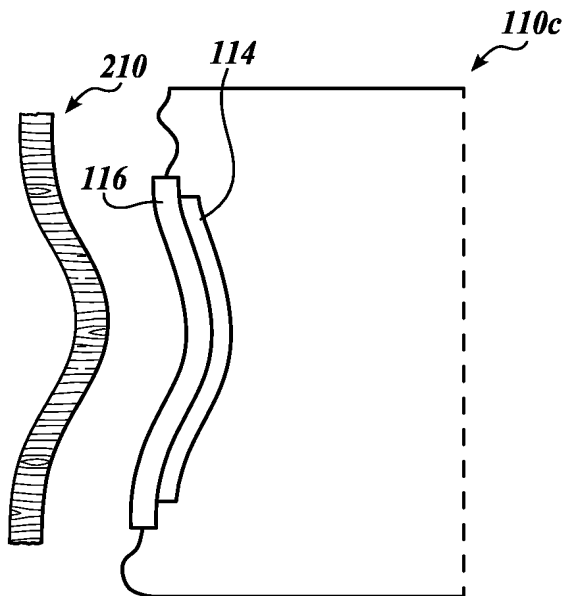
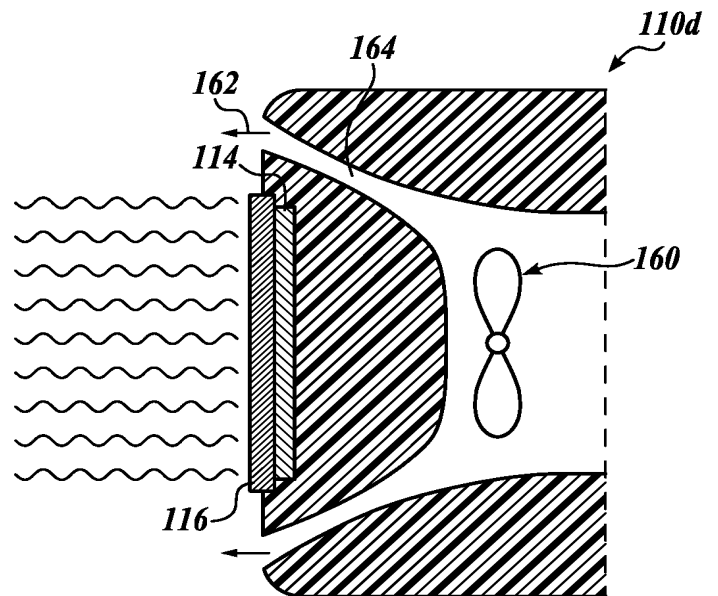
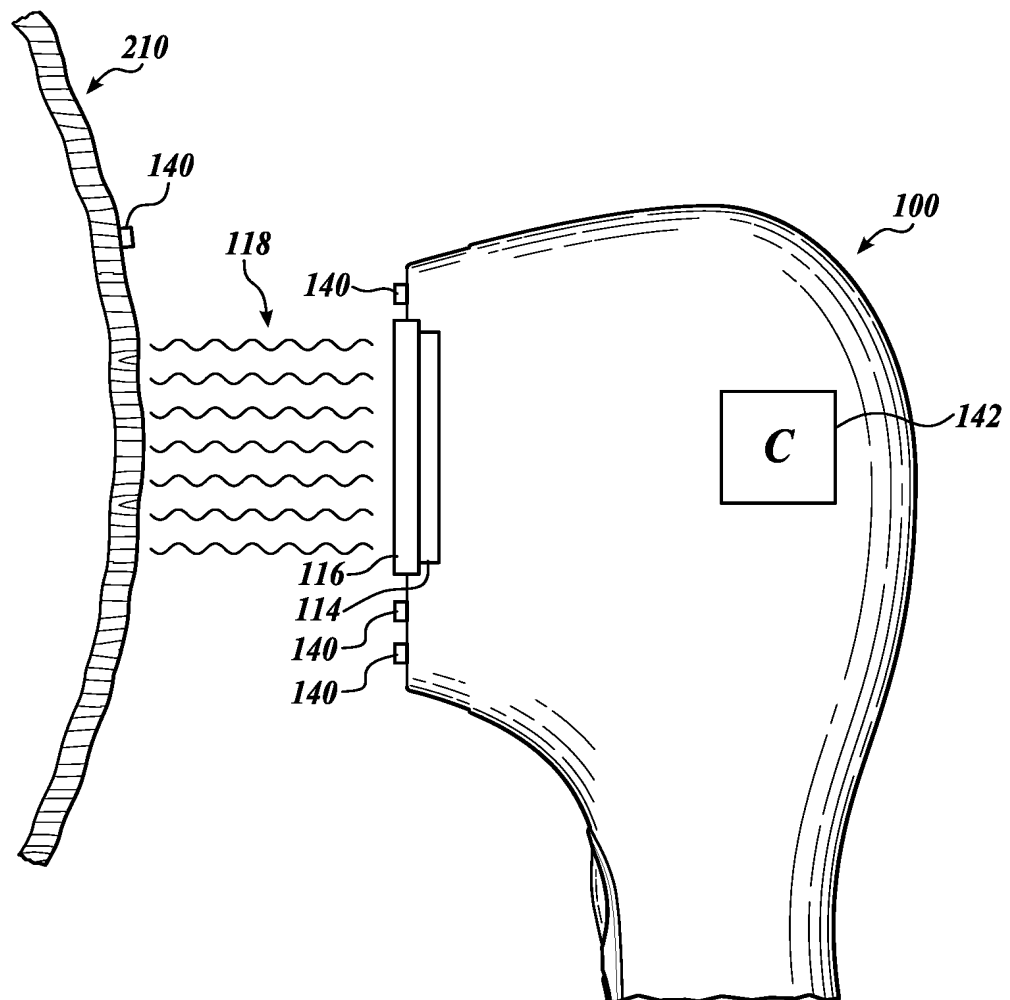


FIG. 11A

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**FIG. 11B****FIG. 11C****FIG. 11D**

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**FIG. 12**

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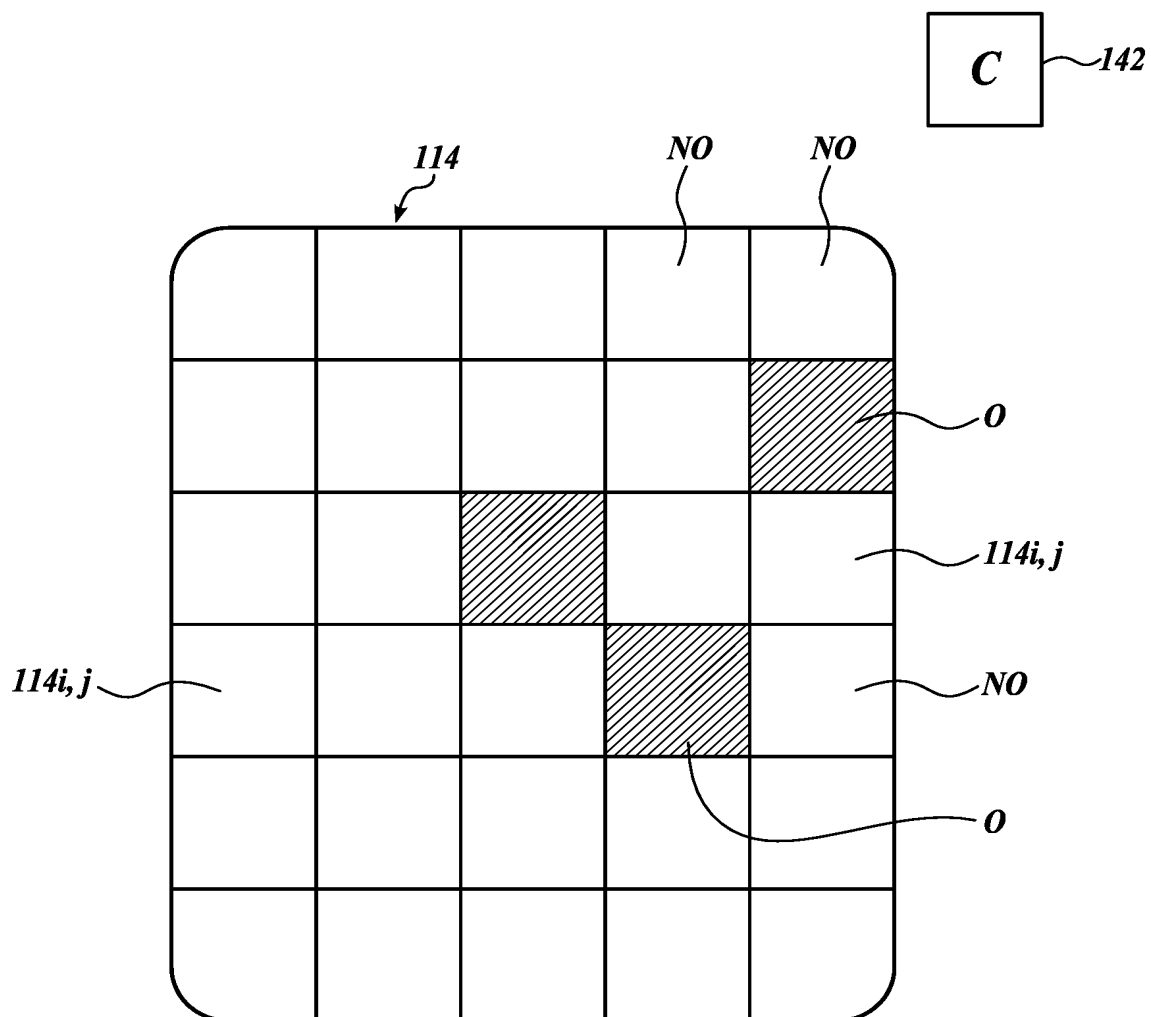
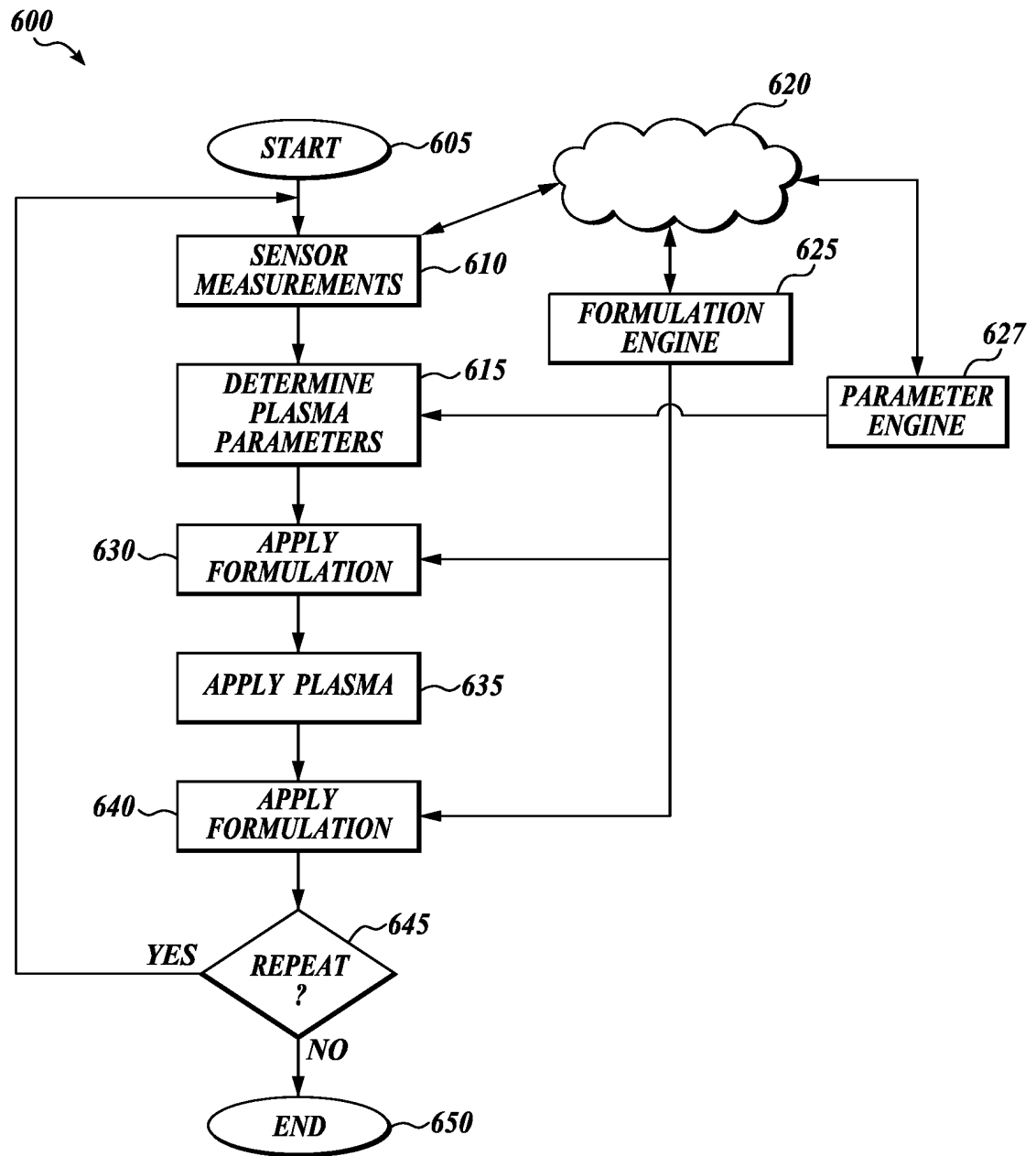


FIG. 13

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**FIG. 14**

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/044083

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61B18/04

ADD. A61N1/44 H05H1/24 A61N1/04 A61N1/32 A61N5/02
A61N5/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61B H05H A61L A61N

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2018/008333 A1 (JIN SEOK [KR]) 11 January 2018 (2018-01-11) paragraphs [0042] - [0058], [0072] - [0075], [0094] - [0103]; figures 1,2,4,5 -----	7-10
X	EP 3 068 328 A1 (KONINKL PHILIPS NV [NL]) 21 September 2016 (2016-09-21) paragraphs [0012] - [0014], [0019] - [0038]; figures 2,3A,3B -----	7,8
X	US 2014/188097 A1 (WATSON GREGORY A [US] ET AL) 3 July 2014 (2014-07-03) paragraphs [0012], [0033] - [0040]; figure 8 -----	7,8



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

16 October 2019

Date of mailing of the international search report

08/01/2020

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
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Fax: (+31-70) 340-3016

Authorized officer

Koolen, Ninah

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/044083

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 1-6
because they relate to subject matter not required to be searched by this Authority, namely:
see FURTHER INFORMATION sheet PCT/ISA/210
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

7-10

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 7-10

A cold plasma system comprising an auxiliary treatment device

2. claims: 11-15

A cold plasma system with a controller

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 1-6

The subject-matter of independent method claim 1 includes, in light of the description, the implicit step of treating blemishes including bacteria. Therefore, claim 1 and its dependent claims 2-6 relate to a method of treatment of the human or animal body by therapy (Rule 39.11.1(iv) PCT). Claims 1-6 were therefore not searched and cannot be examined.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2019/044083

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 2018008333	A1	11-01-2018	JP	2018000921 A		11-01-2018
			KR	101805683 B1		08-12-2017
			US	2018008333 A1		11-01-2018
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			EP	3068328 A1		21-09-2016
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US 2014188097	A1	03-07-2014	US	2014188097 A1		03-07-2014
			WO	2014106277 A1		03-07-2014



(51) International Patent Classification:

A61H 7/00 (2006.01) **A46B 15/00** (2006.01)
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(21) International Application Number:

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(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO,
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HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP,
KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME,
MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,
SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR,
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(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: SKINCARE BRUSH WITH HEATING AND COOLING CAPABILITIES, AND ASSOCIATED SYSTEMS AND METHODS

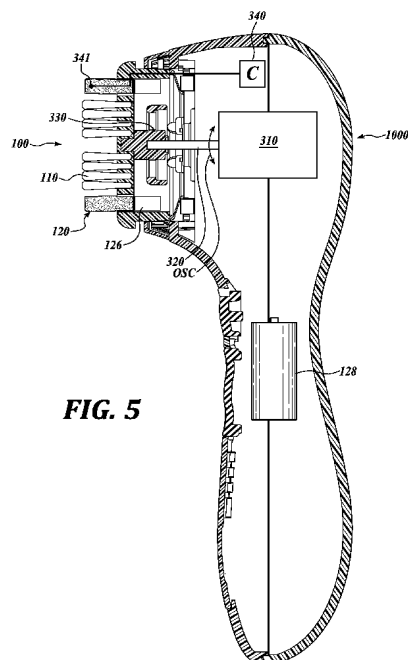


FIG. 5

(57) Abstract: A skincare device having a brush head configured to contact a face of a user is presented. The brush head includes a plurality of bristles configured to oscillate about a center point, and a thermal element configured to heat or cool skin of the user. In some embodiments, the thermal element includes a thermal element vessel, and a thermal element filler inside the thermal element vessel.

SKINCARE BRUSH WITH HEATING AND COOLING CAPABILITIES, AND
ASSOCIATED SYSTEMS AND METHODS

CROSS-REFERENCE TO RELATED APPLICATION

5 This application claims the benefit of U.S. Application No. 16/258,283, filed January 25, 2020; the contents of which is hereby incorporated by reference in its entirety.

SUMMARY

10 This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

 In an embodiment, a skincare device includes a brush head configured to contact a
15 face of a user. The brush head includes: a plurality of bristles configured to oscillate about a center point; and a thermal element configured to heat or cool skin of the user.

 In one aspect, the thermal element includes: a thermal element vessel; and a thermal element filler inside the thermal element vessel. In one aspect, the thermal
20 element filler includes granular material. In another aspect, the thermal element vessel includes a textile material.

 In one aspect, the thermal element includes a phase-change material. In another aspect, the phase-change material is a wax material. In one aspect, the phase-change
25 material is a first phase-change material configured to change its phase at a first temperature that is lower than a skin temperature, and the thermal element also includes a second phase-change material configured to change its phase at a second temperature that is higher than the skin temperature. In one aspect, the thermal element comprises a Peltier element configured to lower a temperature of the thermal element.

 In one aspect, the skincare device also includes a handle configured to mate with the brush head, where the handle has: a motor; a battery configured to provide electrical
30 current to the motor; and a shaft mechanically connected with the brush head. The shaft is configured to impart an oscillatory motion onto the plurality of bristles.

In one aspect, the thermal element includes a receiver coil and the handle includes a transmitter coil, and the receiver coil is configured to generate heat when electromagnetically coupled with the transmitter coil.

5 In one aspect, the skincare device includes a charging base configured to thermally charge the thermal element. In one aspect, the charging base is further configured to electrically charge a battery of the device.

In one aspect, the thermal element at least partially surrounds the plurality of bristles. In one aspect, the end effector is face brush.

10 In an embodiment, a skincare device includes a brush head configured to contact a face of a user. The brush head includes: a plurality of bristles configured to oscillate about a center point, and a thermal element configured to heat or cool skin of the user. The skincare device also includes a handle configured to mate with the brush head, where the handle has: a motor, a battery configured to provide electrical current to the motor, and a shaft mechanically connected with the brush head.

15 In one aspect, the thermal element includes granular material.

In one aspect, the thermal element vessel includes a phase-change material. In another aspect, the phase-change material is a first phase-change material configured to change its phase at a first temperature that is lower than a skin temperature, the thermal element further having a second phase-change material configured to change its phase at
20 a second temperature that is higher than the skin temperature.

In one aspect, the thermal element includes a Peltier element configured to lower a temperature of the thermal element. In another aspect, the thermal element includes a receiver coil and the handle includes a transmitter coil, and the receiver coil is configured to generate heat when electromagnetically coupled with the transmitter coil.
25

DESCRIPTION OF THE DRAWINGS

The foregoing aspects and the attendant advantages of the inventive technology will become more readily appreciated as the same become better understood by reference
30 to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a side view of a skincare device in accordance with an embodiment of the present technology;

FIGURE 2 is a front view of the skincare device in accordance with an embodiment of the present technology;

FIGURES 2A and 2B are cross-sectional views of the embodiments of the skincare device shown in FIGURE 2;

5 FIGURE 2C is a detail view of the skincare device shown in FIGURE 2A;

FIGURE 3 is a front view of the skincare device in accordance with an embodiment of the present technology;

FIGURE 4 is a partial view of charging a skincare device in accordance with an embodiment of the present technology; and

10 FIGURE 5 is a cross-sectional view of a skincare device in accordance with an embodiment of the present technology.

DETAILED DESCRIPTION

15 The following disclosure describes various embodiments of systems and associated methods for measuring and indicating brush head life. A person skilled in the relevant art will also understand that the technology may have additional embodiments, and that the technology may be practiced without several of the details of the embodiments described below with reference to Figures 1-5.

20 Briefly described, skincare brushes with heating and cooling capabilities are described herein. In some embodiments, the device includes an oscillating end effector (e.g., a face brush) and one or more thermal elements. In operation, the end effector oscillates to impart motion onto skin of a user, while the thermal element contacts skin of the user. In some embodiments, the thermal element is stationary with respect to skin, that is, the face brush oscillates and the thermal element does not oscillate. Without
25 being bound to theory, it is believed that heating or cooling skin of a user in conjunction with imparting motion onto skin may have therapeutic or soothing effects on the user. In different embodiments, the thermal element is peripheral to the face brush, or is surrounded by the face brush. In some embodiments, the thermal element includes a filler material (e.g., a granular material) inside a thermal element vessel or holder (e.g., a
30 textile material). In different embodiments, the face brush may have different number and/or location of thermal elements.

Thermal elements may be brought to their set temperature by electrical heaters, Peltier elements, inductive heaters, contact heating/cooling through the base of the

device, air heating/cooling through the base of the device, etc. The thermal element may be preheated or precooled to a set temperature that is either below or above skin temperature, depending on a desired effect on the user. In some embodiments, the thermal element includes phase-change materials that undergo solid/liquid phase-change at a temperature that is below or above the skin temperature. Generally, the phase-change materials have relatively high thermal capacity, thus being capable of operating for relatively long periods of time without thermal recharging.

Figure 1 is a side view of a skincare device 1000 in accordance with an embodiment of the present technology. In some embodiments, the skincare device 1000 is a face brush having a brush head 100 that oscillates about a center axis when in operation. As bristles 110 contact skin of a user 50, a thermal element 120 also contacts skin. The thermal element 120 may be warmer or colder than skin of a user. Without being bound to theory, it is believed that heating or cooling skin of the user, in conjunction with imparting motion onto skin, may have therapeutic or soothing effects to the user. The thermal element 120 may be deformable, thus approximating the contour of the skin in use. In some embodiments, the thermal element 120 can heat/cool skin of the user without making physical contact with the user. For example, the thermal element 120 may emit infrared waves to heat skin of the user.

Illustrated skincare device 1000 includes a handle 200. In different embodiments, the handle 200 carries an energy source (e.g., batteries), a motor for imparting motion on the brush head 100, a controller for regulating operation of the device, and/or other elements of the skincare device.

Figure 2 is a front view of the skincare device in accordance with an embodiment of the present technology. In the illustrated embodiment, the thermal element 120 surrounds the bristles 110, but in different embodiments different arrangements of the thermal elements and bristles are also possible. For example, the bristles 110 may surround a centrally located thermal element 120.

Figures 2A and 2B are cross-sectional views of the embodiments of the skincare device shown in Figure 2. Figure 2A shows the thermal element 120 having a thermal element filler (material) 124 that is kept inside a thermal element vessel 122. The thermal element filler may be granular material, either non-organic (e.g., salt granules, sand, etc.) or organic (e.g., rice seeds, other plant seeds, etc.). In some embodiments, the thermal filler 124 can be bees wax, wax-like artificial material, gelatinous material, etc.

In operation, a shaft 320 oscillates the bristles 110 against skin of the user, while the thermal element 120 remains generally static with respect to skin. The shaft 320 may extend through an opening 130 in the brush head 100. The shaft 320 may be actuated by a motor (not shown) carried by the handle 200. In the illustrated embodiment, the oscillation of the shaft 320 oscillates the face brush 110, while the thermal element 120 remains in a relatively fixed position in contact with skin of the user.

In some embodiments, the thermal element 120 is heated or cooled by one or more thermal sources or sinks 126. Some non-exclusive examples of such thermal sources/sinks are electrical heaters and Peltier cooling elements. In other embodiments, the thermal element 120 may be heated through infrared radiation 126. This "thermal charging" of the thermal element 120 may take place while the brush head operates or when the brush head is at rest. The thermal sources/sinks 126 may be powered by electrical current 127 from one or more batteries 128 or from a line source of power.

Figure 2B shows the thermal element 120 having an induction based source of power for the thermal source 126. In some embodiments, an inductive coil 141 is in electrical contact with a source of alternating current (AC). For example, the battery 128 may be connected to a direct current – to – alternate current (DC to AC) converter to provide AC to the inductive coil 141. In operation, the inductive coil 141 transfers energy to either a receiver inductive coil 142 or a receiver inductive plate 140. In some embodiments, the receiver inductive coil/plate provides heat to the thermal element 120.

Figure 2C is a detail view of the skincare device shown in Figure 2A. In some embodiments, the thermal filler 124 includes different components. For example, thermal filler 124-1 may have a relatively high thermal capacity, but also be relatively hard, while a thermal filler 124-2 may have relatively low thermal capacity, but low hardness and low specific weight. As a result, in some embodiments, a mixture of the thermal fillers 124-1 and 124-2 has an optimized set of thermo-mechanical attributes (e.g., thermal capacity, specific weight, softness, etc.).

In some embodiments, the thermal filler 124 is a phase-change material that undergoes a phase change at a specific temperature. For example, the phase-change temperature of the thermal filler 124 may be relatively close to the temperature of skin, for example within 1-5°C of the skin temperature. Therefore, a treatment may start with a solid thermal material at a temperature that is below skin temperature, and, as the phase-

change thermal filler 124 is heated in contact with skin of the user, the thermal filler 124 melts into a liquid phase. Conversely, the phase-change thermal filler 124 may initially be a liquid having a phase-change temperature above the temperature of skin. During the treatment, the phase-change thermal filler 124 solidifies as its temperature falls and
5 approaches the temperature of skin. In general, phase-change thermal fillers are characterized by a relatively high heat capacity at their phase-change temperature. Therefore, such materials may operate in contact with skin for prolonged periods of time before having to be cooled/heated to their initial set point. In some embodiments, the thermal filler 124-1 may have a phase-change temperature above the skin temperature,
10 and the thermal filler 124-2 may have a phase-change temperature below the skin temperature.

In some embodiments, the thermal filler 124 can be a component made of a non-phase changing material, such as a ceramic or metal ring having a sufficient heat capacity to keep the temperature of the thermal filler 124 within a narrow range while in use. Like
15 with the phase-change materials, such thermal filler 124 is brought to the set temperature using an external heater or cooler, or a built in Peltier device, etc., as described above. Such thermal filler 124 may be used alone or in combination with the phase-change materials.

Figure 3 is a front view of the skincare device in accordance with an embodiment
20 of the present technology. In the illustrated embodiment, a centrally located thermal element 120 is surrounded by the bristles 110, but in different embodiments different arrangements of the thermal elements and bristles are also possible. For example, the brush head 100 may include multiple thermal elements 120 distributed over the central portion of the brush head.

Figure 4 is a partial view of charging a skincare device 1000 in accordance with
25 an embodiment of the present technology. In some embodiments, a charging base 300 preheats or precools the thermal element 120. For example, the charging base 300 may include the thermal source 126 (e.g., an electrical heater, a Peltier element, a refrigeration circuit, etc.) that is powered from a source of electrical voltage 128 (e.g., a battery or a
30 line voltage). The charging base 300 may be shaped for securely receiving and holding the skincare device 1000 while the thermal element 120 is preheated or precooled.

Figure 5 is a cross-sectional view of a skincare device 1000 in accordance with an embodiment of the present technology. In operation, a motor 310 oscillates the shaft 320

that is connected with a hub 330. Oscillation of the shaft 320 is denoted by arrows OSC. In some embodiments, bristles 110 of the end effector 100 oscillate with the oscillation of the hub 300, while the thermal element 120 stays in a relatively fixed position in contact with skin of the user.

5 In some embodiments, the skincare device 1000 may include one or more temperature sensors 341 configured to sense temperature of the thermal element 120. Some examples of such temperature sensors 341 are thermocouples, thermistors, infrared sensors, etc. In operation, a controller 340 may start, end or time a skin treatment based on input from the temperature sensor 341. For example, when temperature of the thermal
10 element 120 falls below a predetermined threshold, a signal may be sent to user to thermally recharge the skincare device before continuing the treatment. In some embodiments, the controller 340 also controls actuation of the motor 310.

 Many embodiments of the technology described above may take the form of computer- or controller-executable instructions, including routines executed by a
15 programmable computer or controller. Those skilled in the relevant art will appreciate that the technology can be practiced on computer/controller systems other than those shown and described above. The technology can be embodied in a special-purpose computer, controller or data processor that is specifically programmed, configured or constructed to perform one or more of the computer-executable instructions described
20 above. Accordingly, the terms "computer" and "controller" as generally used herein refer to any data processor and can include Internet appliances and hand-held devices (including palm-top computers, wearable computers, cellular or mobile phones, multi-processor systems, processor-based or programmable consumer electronics, network computers, mini computers and the like).

25 From the foregoing, it will be appreciated that specific embodiments of the technology have been described herein for purposes of illustration, but that various modifications may be made without deviating from the disclosure. For example, in some embodiments the counter or controller may be based on a low-power buck regulator connected to a capacitor. Moreover, while various advantages and features associated
30 with certain embodiments have been described above in the context of those embodiments, other embodiments may also exhibit such advantages and/or features, and not all embodiments need necessarily exhibit such advantages and/or features to fall

within the scope of the technology. Accordingly, the disclosure can encompass other embodiments not expressly shown or described herein.

The present application may also reference quantities and numbers. Unless specifically stated, such quantities and numbers are not to be considered restrictive, but
5 exemplary of the possible quantities or numbers associated with the present application. Also in this regard, the present application may use the term "plurality" to reference a quantity or number. In this regard, the term "plurality" is meant to be any number that is more than one, for example, two, three, four, five, etc. The terms "about," "approximately," etc., mean plus or minus 5% of the stated value.

10 The principles, representative embodiments, and modes of operation of the present disclosure have been described in the foregoing description. However, aspects of the present disclosure, which are intended to be protected, are not to be construed as limited to the particular embodiments disclosed. Further, the embodiments described herein are to be regarded as illustrative rather than restrictive. It will be appreciated that
15 variations and changes may be made by others, and equivalents employed, without departing from the spirit of the present disclosure. Accordingly, it is expressly intended that all such variations, changes, and equivalents fall within the spirit and scope of the present disclosure as claimed.

CLAIMS

I/We claim:

1. A skincare device, comprising:
a brush head configured to contact a face of a user, the brush head comprising:
a plurality of bristles configured to oscillate about a center point; and
a thermal element configured to heat or cool skin of the user.
2. The device of Claim 1, wherein the thermal element comprises:
a thermal element vessel; and
a thermal element filler inside the thermal element vessel, wherein the thermal element filler comprises a granular material, a textile material or a phase-change material.
3. The device of Claim 2, wherein the phase-change material is a wax material.
4. The device of Claim 2, wherein the phase-change material is a first phase-change material configured to change its phase at a first temperature that is lower than a skin temperature, the thermal element further comprising a second phase-change material configured to change its phase at a second temperature that is higher than the skin temperature.
5. The device of Claim 1, wherein the thermal element comprises a Peltier element configured to lower a temperature of the thermal element.
6. The device of Claim 1, further comprising a handle configured to mate with the brush head, the handle comprising:
a motor;
a battery configured to provide electrical current to the motor; and
a shaft mechanically connected with the brush head, wherein the shaft is configured to impart an oscillatory motion onto the plurality of bristles.

7. The device of Claim 6, wherein the thermal element comprises a receiver coil and the handle comprises a transmitter coil, and wherein the receiver coil is configured to generate heat when electromagnetically coupled with the transmitter coil.

8. The device of Claim 1, further comprising a charging base configured to thermally charge the thermal element.

9. The device of Claim 8, wherein the charging base is further configured to electrically charge a battery of the device.

10. The device of Claim 1, wherein the thermal element at least partially surrounds the plurality of bristles or the plurality of bristles at least partially surround the thermal element.

11. A skincare device, comprising:

a brush head configured to contact a face of a user, the brush head comprising:

a plurality of bristles configured to oscillate about a center point, and

a thermal element configured to heat or cool skin of the user; and

a handle configured to mate with the brush head, the handle comprising:

a motor,

a battery configured to provide electrical current to the motor, and

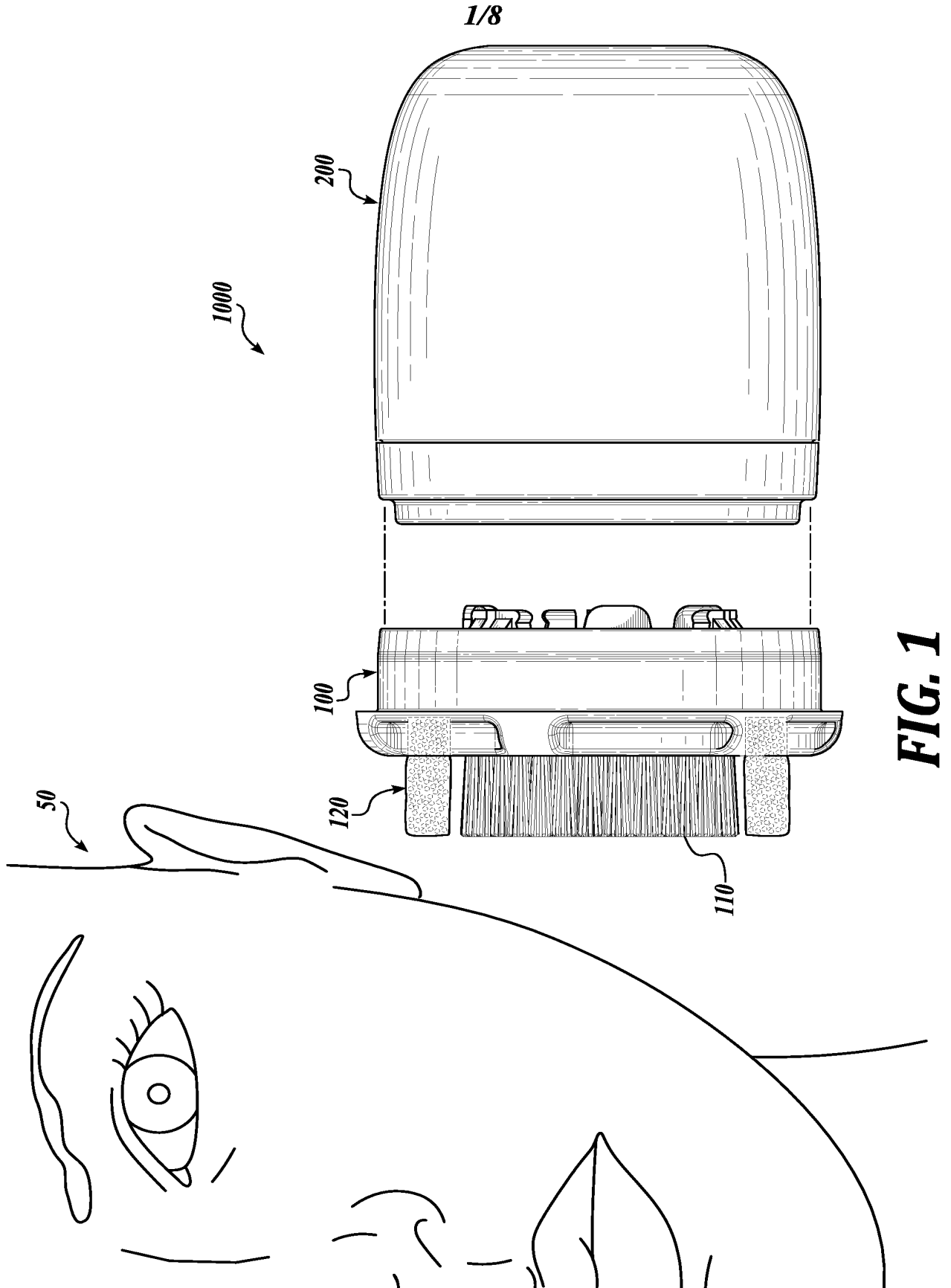
a shaft mechanically connected with the brush head.

12. The device of Claim 11, wherein the thermal element comprises a granular material.

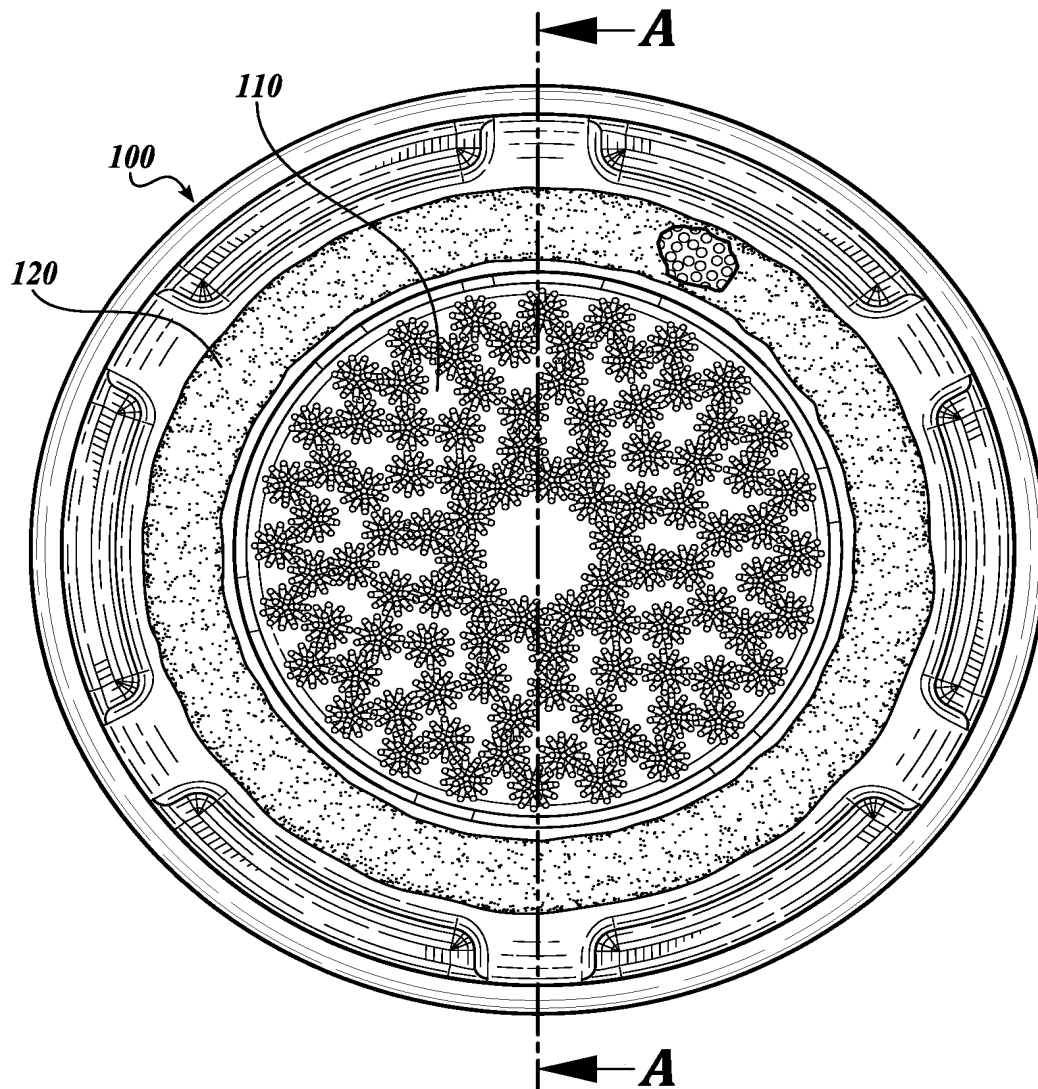
13. The device of Claim 11, wherein the thermal element vessel comprises a first phase-change material configured to change its phase at a first temperature that is lower than a skin temperature, and a second phase-change material configured to change its phase at a second temperature that is higher than the skin temperature.

14. The device of Claim 11, wherein the thermal element comprises a Peltier element configured to lower a temperature of the thermal element.

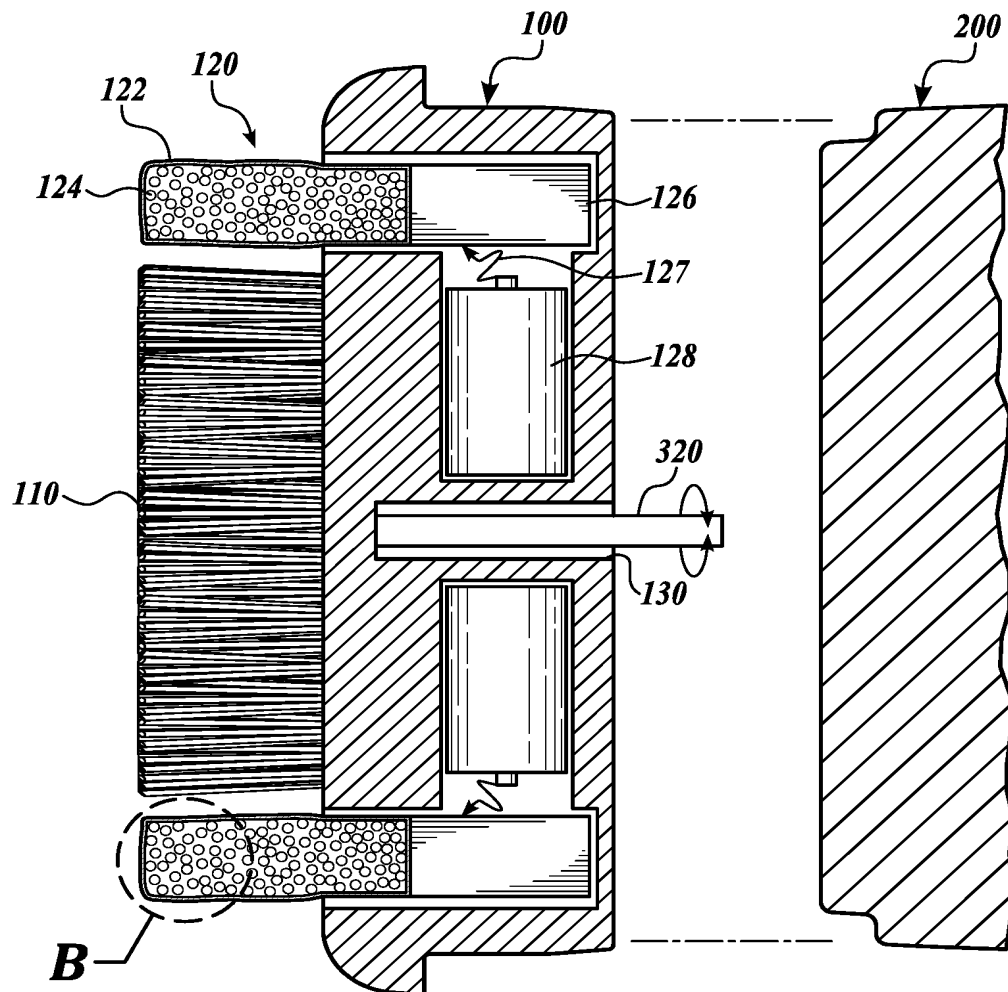
15. The device of Claim 11, wherein the thermal element comprises a receiver coil and the handle comprises a transmitter coil, and wherein the receiver coil is configured to generate heat when electromagnetically coupled with the transmitter coil.



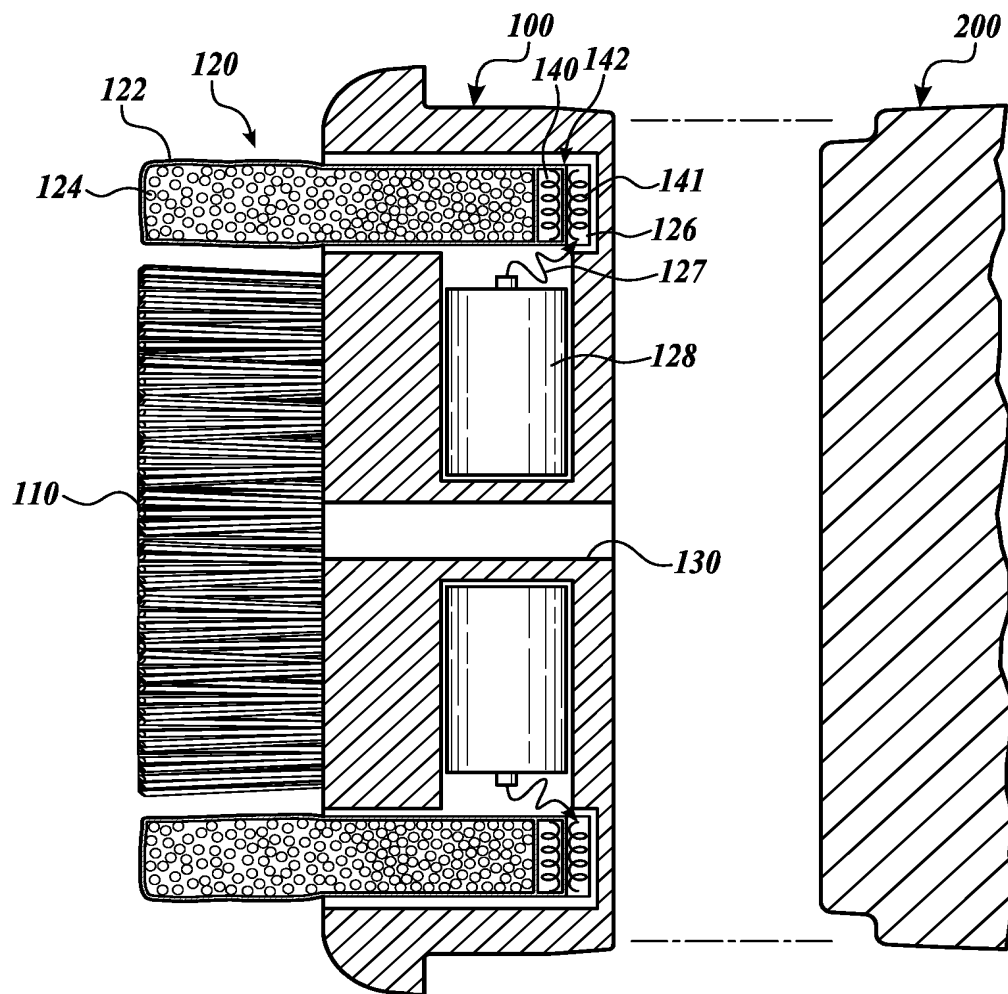
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**FIG. 2**

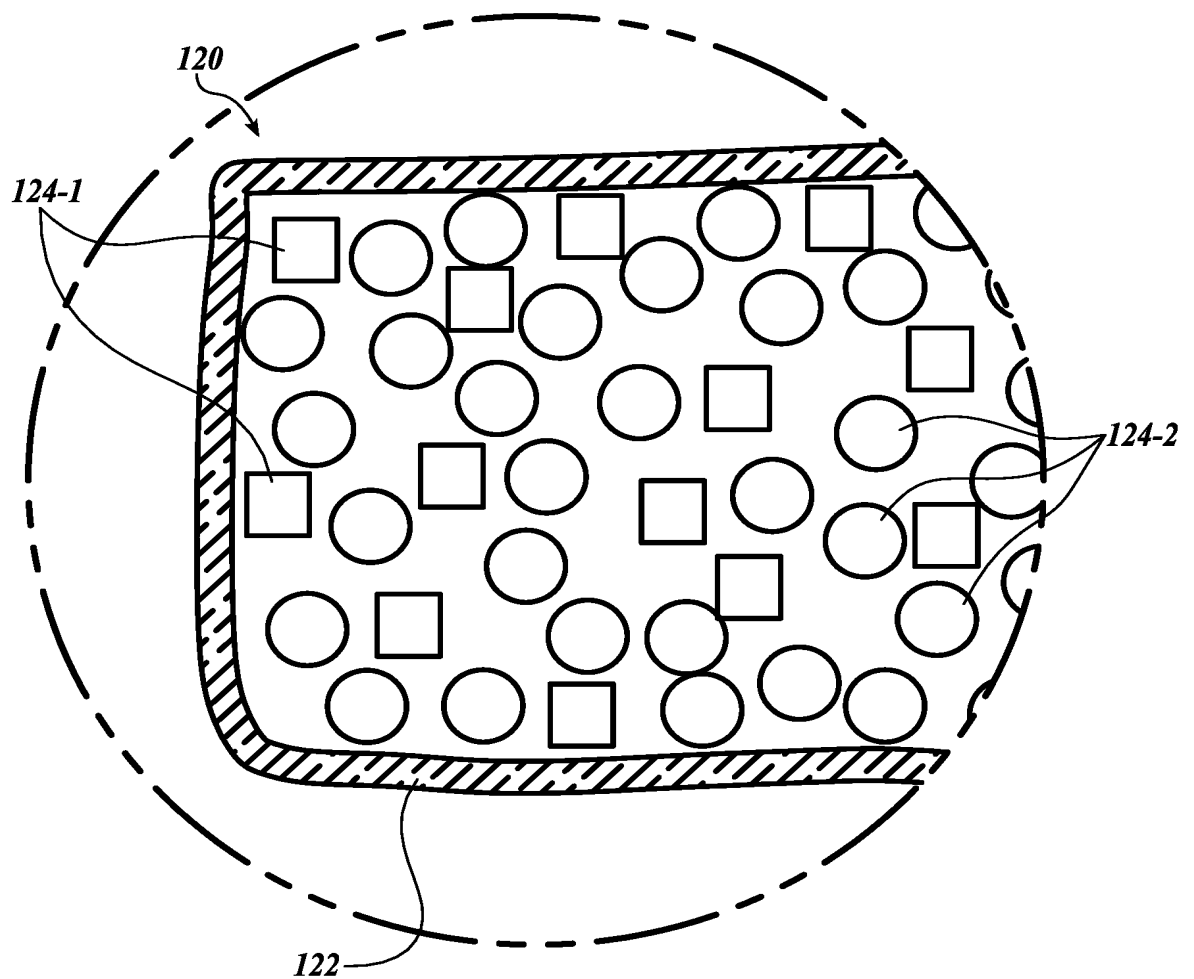
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CROSS-SECTION A-A**FIG. 2A**

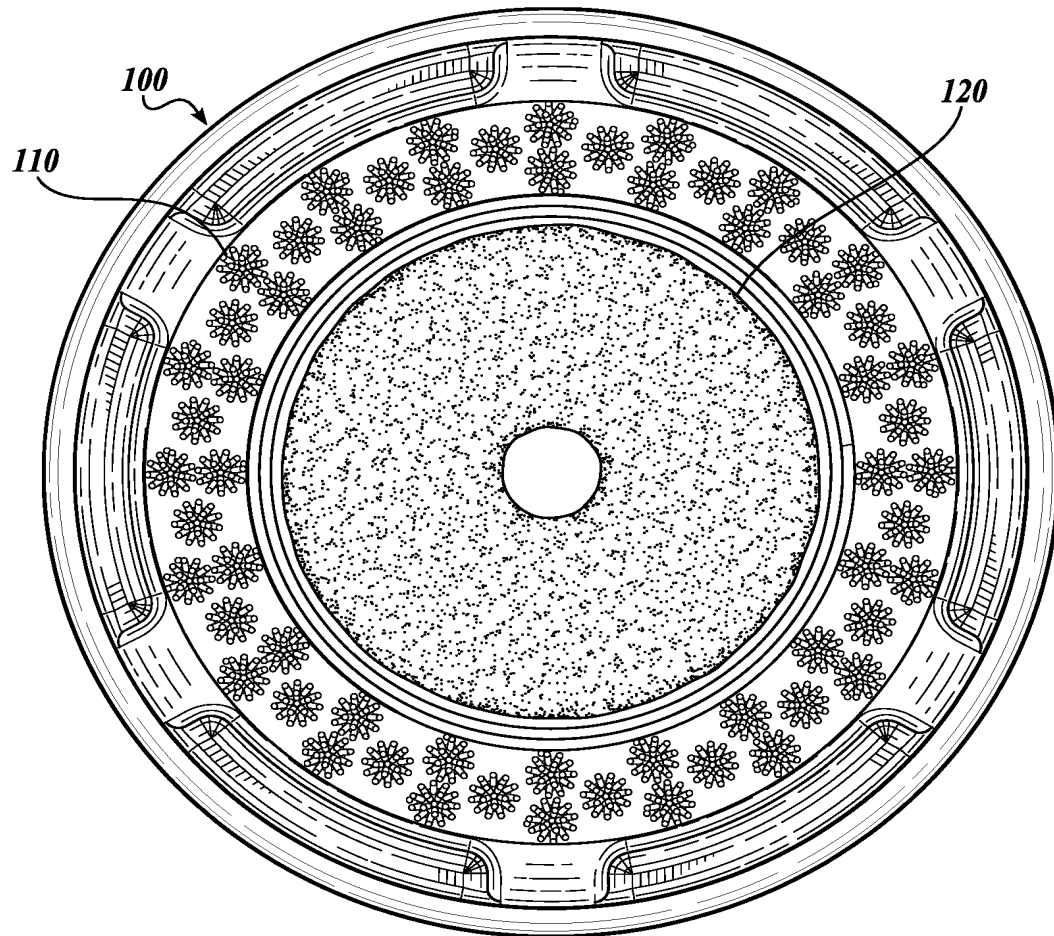
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CROSS-SECTION A-A**FIG. 2B**

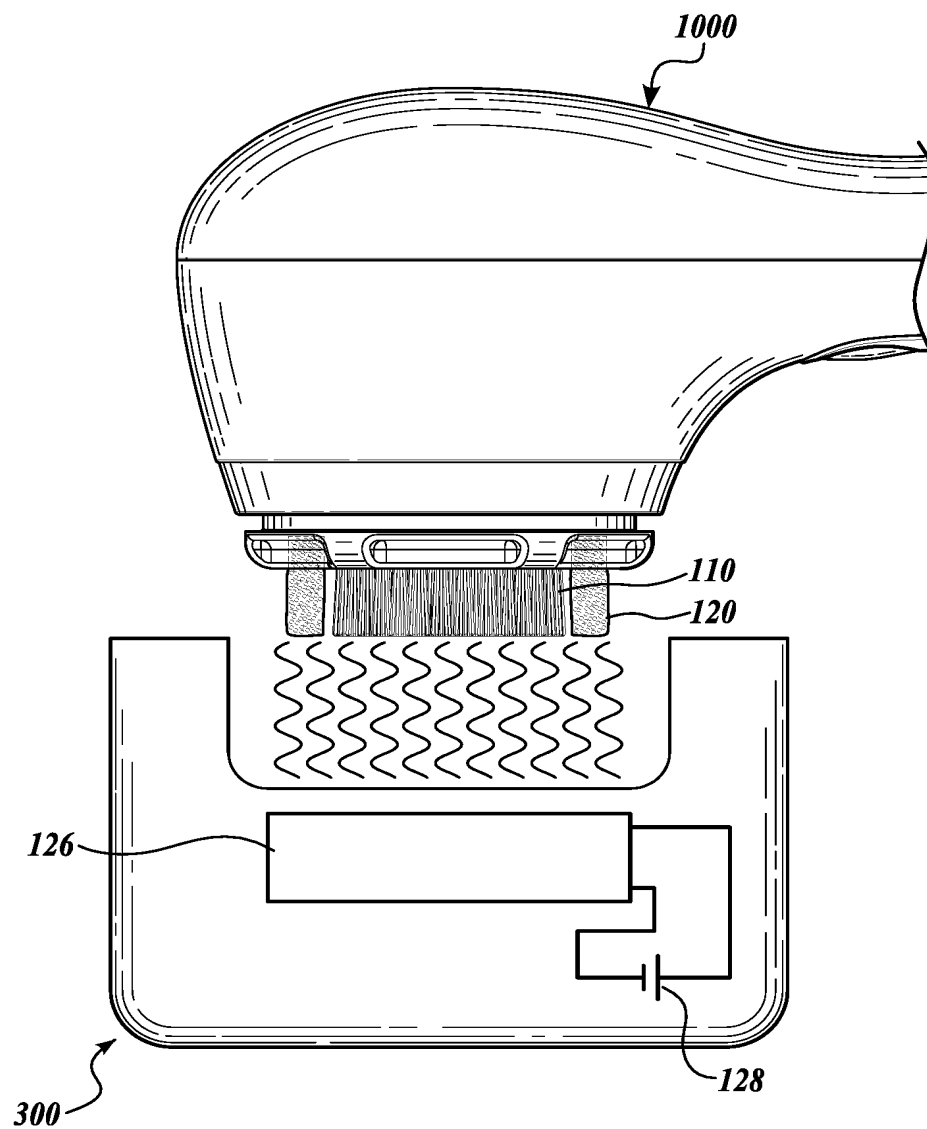
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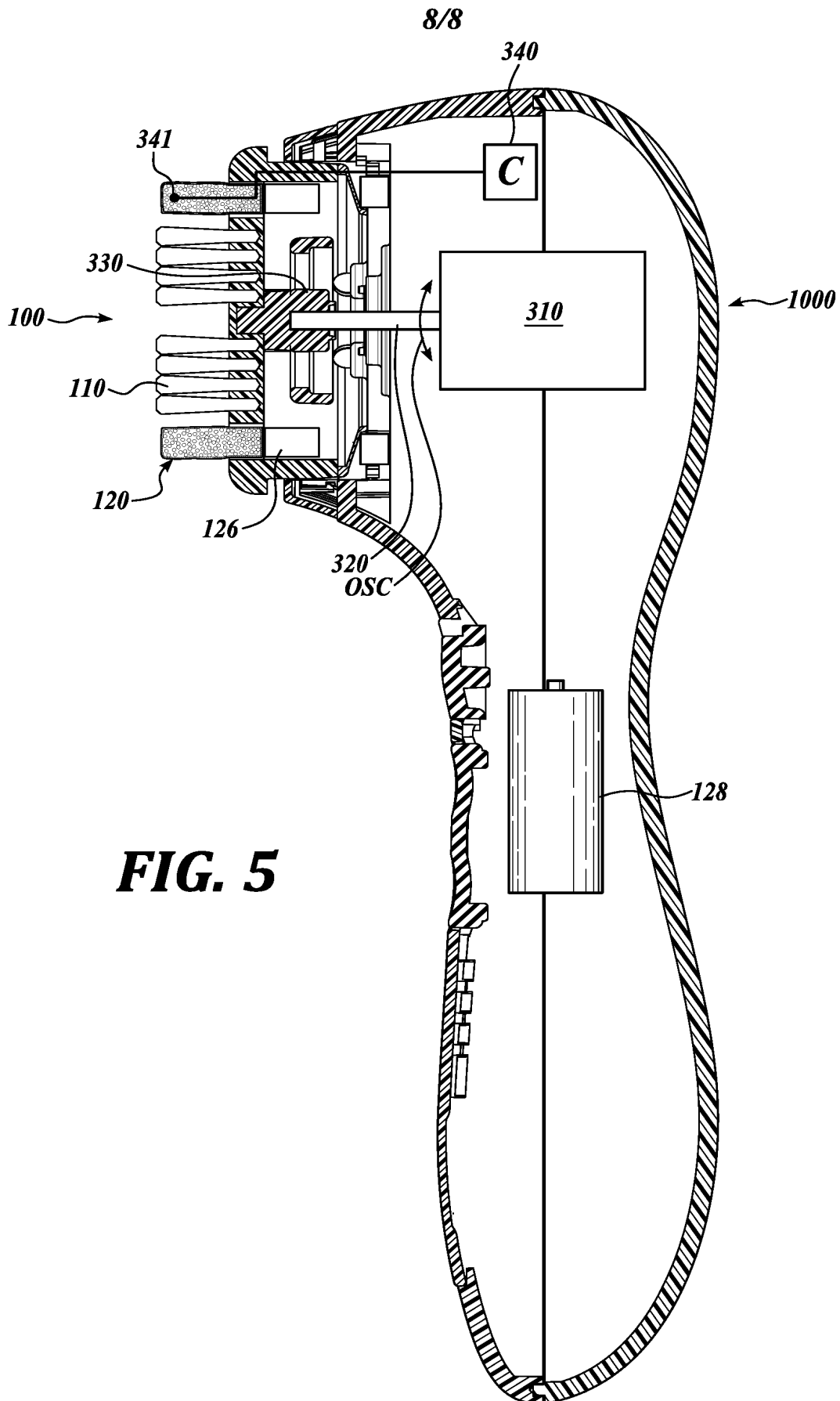
DETAIL B**FIG. 2C**

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**FIG. 3**

7/8

**FIG. 4**



INTERNATIONAL SEARCH REPORT

International application No

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A. CLASSIFICATION OF SUBJECT MATTER

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ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61H A61D A46B

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2017/064104 A1 (KONINKLIJKE PHILIPS NV [NL]) 20 April 2017 (2017-04-20)	1,5-7, 10-12, 14,15
Y	pages 16-20; figures	2,3
A	-----	4,13
X	US 2015/182290 A1 (GREZ JOSEPH W [US]) 2 July 2015 (2015-07-02) paragraphs [0021] - [0040]; figures	1,6,8,9, 11
Y	----- WO 2018/152068 A1 (DRONOV VASILY [US]; FLOREZ MARINO SYLVIA HELENA [US]) 23 August 2018 (2018-08-23) paragraphs [0012], [0013]; figures	2,3



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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WO 2018152068	A1	23-08-2018	NONE



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(54) Title: ENERGY REGENERATING END EFFECTOR, AND ASSOCIATED SYSTEMS AND METHODS

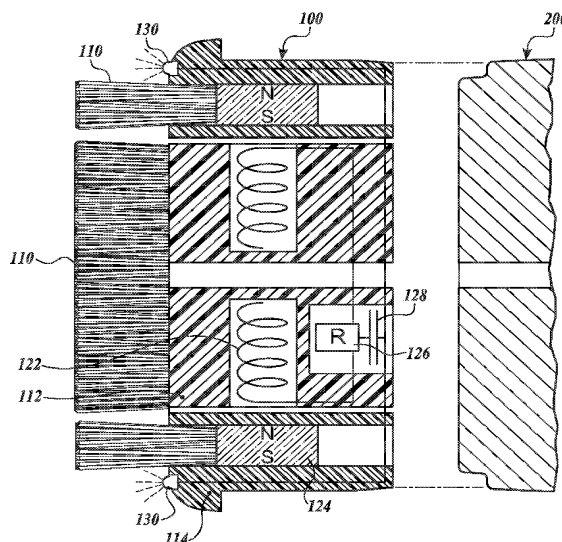


FIG. 3

(57) Abstract: A skincare device having energy regenerating end effector is presented. In one embodiment, an end effector includes an inner end effector structure configured to oscillate about a first axis. The inner end effector structure includes at least one magnet and a plurality of contacting elements configured to contact skin of a user. The end effector also includes an outer end effector structure comprising at least one induction coil. The at least one magnet and the at least one induction coil cooperate to generate electrical current in the at least one induction coil when the end effector structure oscillates about an axis.



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- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

ENERGY REGENERATING END EFFECTOR, AND ASSOCIATED SYSTEMS AND METHODS

5 CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of U.S. Application No. 16/262743, filed January 30, 2019; the contents of which is hereby incorporated by reference in its entirety.

10 SUMMARY

This summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

15 In one embodiment, an end effector includes an inner end effector structure configured to oscillate about a first axis. The inner end effector structure includes at least one magnet and a plurality of contacting elements configured to contact skin of a user. The end effector includes an outer end effector structure having at least one induction coil. The at least one magnet and the at least one induction coil cooperate to generate
20 electrical current in the at least one induction coil when the end effector structure oscillates about an axis.

In one aspect, the inner end effector structure is configured to oscillate with first oscillations about the axis, and the outer end effector structure is configured to oscillate with second oscillations about the axis.

25 In one aspect, the first oscillations of the inner end effector structure are generated by an oscillating shaft of the end effector, and the second oscillations of the outer end effector structure are generated at least in part by electromagnetic interactions between the at least one magnet and the at least one induction coil.

In another aspect, the first oscillations of the inner end effector structure and the
30 second oscillations of the outer end effector structure are directed in opposite directions at

least at some times during the operation of the end effector, and wherein the electrical current in the at least one induction coil increases with increased relative velocity between the at least one magnet of the inner end effector structure and the at least one induction coil of the outer end effector structure.

5 In one aspect, the end effector also includes a regulator configured to regulate voltage of the induction coil into a charging voltage of an energy storage device carried by the end effector structure. In one aspect, the energy storage device is a capacitor. In another aspect, the energy storage device is a rechargeable battery.

10 In one aspect, the end effector also includes an electrical device configured to receive electrical current from the energy storage device. In another aspect, the electrical device is configured to generate at least one of light, ultrasound, audible sound and heat toward the skin of the user. In one aspect, the electrical device is a light emitting diode (LED) configured to generate light toward the skin of the user.

15 In one aspect, the plurality of contacting elements of the inner end effector structure is a first plurality of contacting elements, and the outer end effector structure includes a second plurality of contacting elements configured to contact the skin of the user.

20 In one aspect, the end effector is a part of a skincare device, the skincare device further includes a handle connected with the end effector, where the handle includes: an electrical motor configured to impart oscillatory motion on an oscillating shaft connected with the inner end effector structure; and a battery configured to power the electrical motor.

25 In one embodiment, an end effector includes: an inner end effector structure configured to oscillate about an axis. The inner end effector structure includes at least one induction coil and a plurality of contacting elements configured to contact skin of a user, and an outer end effector structure includes at least one magnet. The at least one induction coil and the at least one magnet cooperate to generate electrical current in the at least one induction coil.

30 In one aspect, the inner end effector structure is configured to oscillate with first oscillations about the axis, and the outer end effector structure is configured to oscillate

with second oscillations about the axis. In another aspect, the first oscillations of the inner end effector structure are generated by an oscillating shaft of the end effector, and the second oscillations of the outer end effector structure are generated at least in part by electromagnetic interactions between the at least one magnet and the at least one
5 induction coil.

In one aspect, the plurality of contacting elements of the inner end effector structure is a first plurality of bristles, and the outer end effector structure includes a second plurality of bristles configured to contact the skin of the user.

In one aspect, the end effector includes a regulator configured to regulate voltage
10 of the induction coil into a charging voltage of an energy storage device carried by the end effector structure. In one aspect, the energy storage device is a capacitor or a rechargeable battery.

In one aspect, the end effector also includes an electrical device configured to receive electrical current from the energy storage device, where the electrical device is
15 configured to generate at least one of light, ultrasound, audible sound and heat toward the skin of the user.

In one aspect, the end effector is a part of a skincare device, and the skincare device also includes a handle connected with the end effector. The handle includes: an electrical motor configured to impart oscillatory motion on an oscillating shaft connected
20 with the inner end effector structure; and a battery configured to power the electrical motor.

In one embodiment, an end effector includes: an inner end effector structure configured to oscillate about an axis, where the inner end effector structure comprises at least one magnet; and an outer end effector structure. The outer end effector structure
25 includes: at least one induction coil, and a plurality of electrical devices configured to affect skin of a user. The at least one induction coil and the at least one magnet cooperate to generate electrical current in the at least one induction coil, and the electrical current at least partially powers the plurality of electrical devices.

In one embodiment, the inner end effector structure is configured to oscillate with
30 first oscillations about the axis, and the outer end effector structure is configured to

oscillate with second oscillations about the axis. In one aspect, the first oscillations of the inner end effector structure are generated by an oscillating shaft of the end effector, and the second oscillations of the outer end effector structure are generated at least in part by electromagnetic interactions between the at least one magnet and the at least one
5 induction coil.

In one embodiment, the plurality of electrical devices is a first plurality of electrical devices, the inner end effector structure comprises a second plurality of electrical devices configured to affect the skin of the user, and the electrical current at least partially powers the second plurality of electrical devices. In one aspect, the first
10 plurality of electrical devices and the second plurality of electrical devices comprise light emitting diodes (LEDs).

DESCRIPTION OF THE DRAWINGS

The foregoing aspects and the attendant advantages of the inventive technology
15 will become more readily appreciated as the same become better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a cross-sectional side view of a skincare device in accordance with an embodiment of the present technology;

20 FIGURE 2 is a front plan view of an end effector of the skincare device in accordance with an embodiment of the present technology;

FIGURES 2A and 2B are cross-sectional views of the embodiments of the skincare device shown in FIGURE 2;

25 FIGURE 3 is a cross-sectional side view of a skincare device in accordance with an embodiment of the present technology;

FIGURE 4 is a side view of a skincare device in accordance with an embodiment of the present technology; and

FIGURE 5 is a side view of a skincare device in accordance with an embodiment of the present technology.

30

DETAILED DESCRIPTION

The following disclosure describes energy regenerating end effectors, and associated systems and methods. A person skilled in the relevant art will also understand that the technology may have additional embodiments, and that the technology may be practiced without several of the details of the embodiments described below with reference to FIGURES 1-5.

Briefly described, skincare devices with energy regenerating end effectors are described herein. In some embodiments, a skincare device includes an end effector having an inner end effector structure and an outer end effector structure. The inner end effector structure (e.g., an inner brush head or an inner elastomeric portion) may carry one or more magnets, and the outer part (e.g., an outer brush head or an outer elastomeric portion) may carry one or more induction coils. When the inner end effector structure and the outer end effector structure of the end effector move relative to each other, for example, through oscillations, a travel of the induction coils through the magnetic field of the magnets induces electrical current in the induction coils. This current may be harvested into a storage element (e.g., a capacitor or a rechargeable battery) that, in turn, can power auxiliary devices of the end effector (e.g., light emitting diodes, sources of heat, sources of sound or ultrasound, etc.). These auxiliary device may be powered solely from the storage element, or from the storage element in conjunction with the main source of power (e.g., a battery in the handle of the skincare device). In some embodiments, the storage element may be lighter and smaller than the main source of power.

In some embodiments, the end effector structure (also referred to as the inner part) of the end effector is driven by an oscillating shaft connected to an electrical motor. The outer end effector structure (also referred to as the outer part) of the end effector may oscillate independently of the inner end effector structure. This relative motion of the inner part with respect to the outer part generates electrical current in the skincare device. In different embodiments, charging of the storage element is regulated by electrical networks that include one or more controllers, resistors, inductors, and/or other electrical components.

FIGURE 1 is a cross-sectional side view of a skincare device 1000 in accordance with an embodiment of the present technology. The illustrated skincare device 1000 includes an inner end effector structure 112 (inner part or inner portion) and an outer end effector structure 114 (outer part or outer portion). The inner end effector structure 112 is actuated by a motor 310 through a shaft 320. In some embodiments, the motor 310 provides an oscillating motion to the inner end effector structure 112. The motor 310 may be energized by a battery 330.

In some embodiments, the outer end effector structure 114 is capable of independently oscillating about the inner end effector structure 112, without being driven by the motor 310 and shaft 320. For example, the outer end effector structure 114 may be mechanically disconnected from the inner end effector structure 112 and slideably linked to a housing 105 of the skincare device 1000, thus being free to oscillate about the inner end effector structure 112. In other embodiments, the outer end effector structure 114 may be fixed onto the housing 105 of the skincare device 1000, thus being fixed with respect to the oscillations of the inner end effector structure 112.

In some embodiments, the inner end effector structure 112 carries one or more magnets 124. As the inner end effector structure 112 is driven into oscillatory motion by the motor 310, the magnet 124 also oscillates about the shaft (axis) 320. In some embodiments, the outer end effector structure 114 carries one or more induction coils 122 that are subjected to an oscillatory magnetic field generated by the oscillations of the magnet 124. As a result, an electrical current is generated in the induction coils 122. This electrical current may be directed to an energy storage element 128 (e.g., a capacitor or a rechargeable battery). Therefore, the end effector 100 may be referred to as an energy regenerating end effector. Charging of the energy storage element 128 may be controlled by a controller (e.g., a processor or regulator) 132, one or more resistors 126, and/or other electrical elements. In different embodiments, the inner end effector structure 112 may carry the induction coils 122, while the output of the brush head 114 may carry one or more magnets.

In some embodiments, the energy stored in the energy storage element 128 may power auxiliary devices 130, for example, light emitting diodes (LEDs). In other

embodiments, the auxiliary devices 130 may be sources of sound, sources of ultrasound, sources of heat, etc.

FIGURE 2 is a front plan view of an end effector 100 of the skincare device in accordance with an embodiment of the present technology. In the illustrated
5 embodiment, both the inner end effector structure 112 and the outer end effector structure 114 carry bristles 110. However, in different embodiments one of the brush heads 112/114 may carry the bristles 110, or may carry, for example, elements for massaging skin of the user or other elastomeric elements for contacting skin of the user. These elements 110 are collectively referred to as the contacting elements 110.

10 FIGURE 2A is a cross-sectional view A-A of the embodiments of the skincare device shown in FIGURE 2. In some embodiments, the end effector 100 mates with a handle 200. In some embodiments, the inner end effector structure 112 carries multiple magnets 124, and the outer end effector structure 114 carries multiple induction coils 122. In other embodiments, the locations of the magnets and the induction coils may be
15 switched.

FIGURE 2B is a cross-sectional view B-B of the embodiments of the skincare device shown in FIGURE 2A. Oscillations of the inner end effector structure 112 are indicated as arrows 112 – OSC, and oscillations of the outer end effector structure 114 are indicated as arrows 114 – OSC. In some embodiments, oscillations of the inner end
20 effector structure 112 are driven by the shaft 320 that is connected with the motor in the handle of the skincare device. In some embodiments, oscillations of the outer end effector structure 114 are driven by the electromagnetic forces exerted by the magnets 124 onto the induction coils 122 of the outer end effector structure 114. Without being bound to theory, it is believed that the additional oscillation of the outer end effector
25 structure 114 may result in an increased relative velocity of the induction coils 122 with respect to the magnetic field of the magnets 124, thus increasing electrical current in the induction coils 122. In other embodiments, the outer end effector structure 114 may be fixed with respect to the shaft 320 by being fixed, for example, to the handle of the skincare device.

FIGURE 3 is a cross-sectional side view of a skincare device in accordance with an embodiment of the present technology. In the illustrated embodiment, the magnets 124 are carried by the outer end effector structure 114, and the induction coils 122 are carried by the inner end effector structure 112. In operation, oscillations of the inner end effector structure 112 and/or of the outer end effector structure 114 cause inductive electrical current in the induction coils 122, which may be stored in the energy storage 128. In different embodiments, the energy storage 128 and/or other parts of the electrical circuitry are distributed through the inner end effector structure 112 and/or the outer end effector structure 114. The electrical energy stored in the energy storage 128 may be used to power the electrical devices 130. In other embodiments, the energy storage 128 may supplement electrical energy provided to the motor 310 or, in some embodiments, the energy storage 128 may, at least temporarily, provide all the power of the motor 310.

FIGURE 4 is a side view of a skincare device 1000 in accordance with an embodiment of the present technology. The skincare device 1000 includes the end effector 100 and the handle 200. In the illustrated embodiment, the inner end effector structure 112 and the outer end effector structure 114 include contacting elements 110. However, in other embodiments, one or both of the inner end effector structure and the outer end effector structure carry elements other than the contacting elements 110, for example, the elements for massaging skin of user, for a thermal treatment of skin, for dispensing skin lotion, etc. As explained above, power for the electrical devices 130 may come from the energy generated by (harvested from) from the oscillatory motion of the inner/outer end effector structures, and stored in the energy storage 128.

FIGURE 5 is a side view of a skincare device 1000 in accordance with an embodiment of the present technology. In some embodiments, the end effector 100 does not carry the contacting elements 110. In the illustrated embodiment, the end effector 100 carries an array of the electrical devices 130. The electrical devices 130 (e.g., sources of light, heat, sound, ultrasound, motion, pressure, etc.) may be distributed over the inner end effector structure 112 and/or the outer end effector structure 114. Without being bound to theory, it is believed that sources of light, heat, sound, ultrasound, motion, pressure, etc., may have therapeutic effects or may result in increased pleasure for the

user. Some or all of these devices may be energized from the energy storage 128 carried by the end effector 100.

Many embodiments of the technology described above may take the form of computer- or controller-executable instructions, including routines executed by a programmable computer or controller. Those skilled in the relevant art will appreciate that the technology can be practiced on computer/controller systems other than those shown and described above. The technology can be embodied in a special-purpose computer, controller or data processor that is specifically programmed, configured or constructed to perform one or more of the computer-executable instructions described above. Accordingly, the terms "computer" and "controller" as generally used herein refer to any data processor and can include Internet appliances and hand-held devices (including palm-top computers, wearable computers, cellular or mobile phones, multi-processor systems, processor-based or programmable consumer electronics, network computers, mini computers and the like).

From the foregoing, it will be appreciated that specific embodiments of the technology have been described herein for purposes of illustration, but that various modifications may be made without deviating from the disclosure. For example, in some embodiments the counter or controller may be based on a low-power buck regulator connected to a capacitor. Moreover, while various advantages and features associated with certain embodiments have been described above in the context of those embodiments, other embodiments may also exhibit such advantages and/or features, and not all embodiments need necessarily exhibit such advantages and/or features to fall within the scope of the technology. Accordingly, the disclosure can encompass other embodiments not expressly shown or described herein.

The present application may also reference quantities and numbers. Unless specifically stated, such quantities and numbers are not to be considered restrictive, but exemplary of the possible quantities or numbers associated with the present application. Also in this regard, the present application may use the term "plurality" to reference a quantity or number. In this regard, the term "plurality" is meant to be any number that is

more than one, for example, two, three, four, five, etc. The terms "about," "approximately," etc., mean plus or minus 5% of the stated value.

The principles, representative embodiments, and modes of operation of the present disclosure have been described in the foregoing description. However, aspects of
5 the present disclosure, which are intended to be protected, are not to be construed as limited to the particular embodiments disclosed. Further, the embodiments described herein are to be regarded as illustrative rather than restrictive. It will be appreciated that variations and changes may be made by others, and equivalents employed, without departing from the spirit of the present disclosure. Accordingly, it is expressly intended
10 that all such variations, changes, and equivalents fall within the spirit and scope of the present disclosure as claimed.

CLAIMS

1. An end effector, comprising:
an inner end effector structure configured to oscillate about a first axis, the inner end effector structure including at least one magnet and a plurality of contacting elements configured to contact skin of a user; and
an outer end effector structure comprising at least one induction coil,
wherein the at least one magnet and the at least one induction coil cooperate to generate electrical current in the at least one induction coil when the end effector structure oscillates about an axis.
2. The end effector of Claim 1, wherein the inner end effector structure is configured to oscillate with first oscillations about the axis, and wherein the outer end effector structure is configured to oscillate with second oscillations about the axis.
3. The end effector of Claim 2, wherein the first oscillations of the inner end effector structure are generated by an oscillating shaft of the end effector, wherein the second oscillations of the outer end effector structure are generated at least in part by electromagnetic interactions between the at least one magnet and the at least one induction coil, wherein the first oscillations of the inner end effector structure and the second oscillations of the outer end effector structure are directed in opposite directions at least at some times during the operation of the end effector, and wherein the electrical current in the at least one induction coil increases with increased relative velocity between the at least one magnet of the inner end effector structure and the at least one induction coil of the outer end effector structure.
4. The end effector of Claim 1, further comprising a regulator configured to regulate voltage of the induction coil into a charging voltage of an energy storage device carried by the end effector structure, wherein the energy storage device is a capacitor or a rechargeable battery.

5. The end effector of Claim 4, further comprising an electrical device configured to receive electrical current from the energy storage device, wherein the electrical device is configured to generate at least one of light, ultrasound, audible sound and heat toward the skin of the user.

6. The end effector of Claim 5, wherein the electrical device is a light emitting diode (LED) configured to generate light toward the skin of the user.

7. The end effector of Claim 1, wherein the end effector is a part of a skincare device, the skincare device further comprising a handle connected with the end effector, wherein the handle comprises:

an electrical motor configured to impart oscillatory motion on an oscillating shaft connected with the inner end effector structure; and

a battery configured to power the electrical motor.

8. An end effector, comprising:

an inner end effector structure configured to oscillate about an axis, the inner end effector structure including at least one induction coil and a plurality of contacting elements configured to contact skin of a user; and

an outer end effector structure comprising at least one magnet,

wherein the at least one induction coil and the at least one magnet cooperate to generate electrical current in the at least one induction coil.

9. The end effector of Claim 8, wherein the inner end effector structure is configured to oscillate with first oscillations about the axis, wherein the outer end effector structure is configured to oscillate with second oscillations about the axis, wherein the first oscillations of the inner end effector structure are generated by an oscillating shaft of the end effector, and wherein the second oscillations of the outer end effector structure are generated at least in part by electromagnetic interactions between the at least one magnet and the at least one induction coil.

10. The end effector of Claim 8, wherein the plurality of contacting elements of the inner end effector structure is a first plurality of bristles, and wherein the outer end

effector structure comprises a second plurality of bristles configured to contact the skin of the user.

11. The end effector of Claim 8, further comprising:

a regulator configured to regulate voltage of the induction coil into a charging voltage of an energy storage device carried by the end effector structure; and

an electrical device configured to receive electrical current from the energy storage device,

wherein the energy storage device is a capacitor or a rechargeable battery, and wherein the electrical device is configured to generate at least one of light, ultrasound, audible sound and heat toward the skin of the user.

12. The end effector of Claim 8, wherein the end effector is a part of a skincare device, the skincare device further comprising a handle connected with the end effector, wherein the handle comprises:

an electrical motor configured to impart oscillatory motion on an oscillating shaft connected with the inner end effector structure; and

a battery configured to power the electrical motor.

13. An end effector comprising:

an inner end effector structure configured to oscillate about an axis, wherein the inner end effector structure comprises at least one magnet; and

an outer end effector structure comprising:

at least one induction coil, and

a plurality of electrical devices configured to affect skin of a user,

wherein the at least one induction coil and the at least one magnet cooperate to generate electrical current in the at least one induction coil, and wherein the electrical current at least partially powers the plurality of electrical devices.

14. The end effector of Claim 13, wherein the inner end effector structure is configured to oscillate with first oscillations about the axis, wherein the outer end effector

structure is configured to oscillate with second oscillations about the axis, and wherein the first oscillations of the inner end effector structure are generated by an oscillating shaft of the end effector, and wherein the second oscillations of the outer end effector structure are generated at least in part by electromagnetic interactions between the at least one magnet and the at least one induction coil.

15. The end effector of Claim 13, wherein the plurality of electrical devices is a first plurality of electrical devices, wherein the inner end effector structure comprises a second plurality of electrical devices configured to affect the skin of the user, wherein the electrical current at least partially powers the second plurality of electrical devices, and wherein the first plurality of electrical devices and the second plurality of electrical devices comprise light emitting diodes (LEDs).

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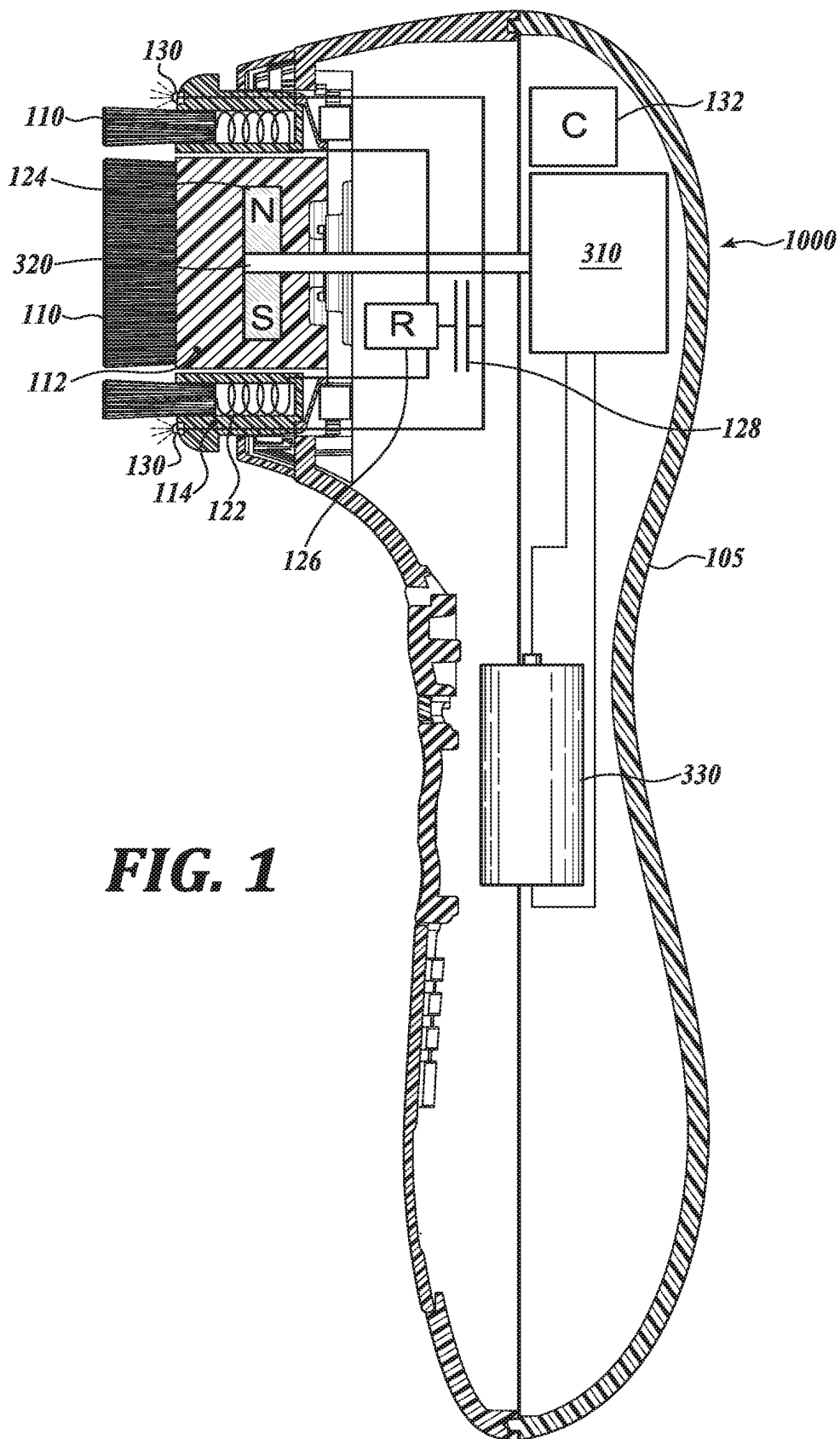
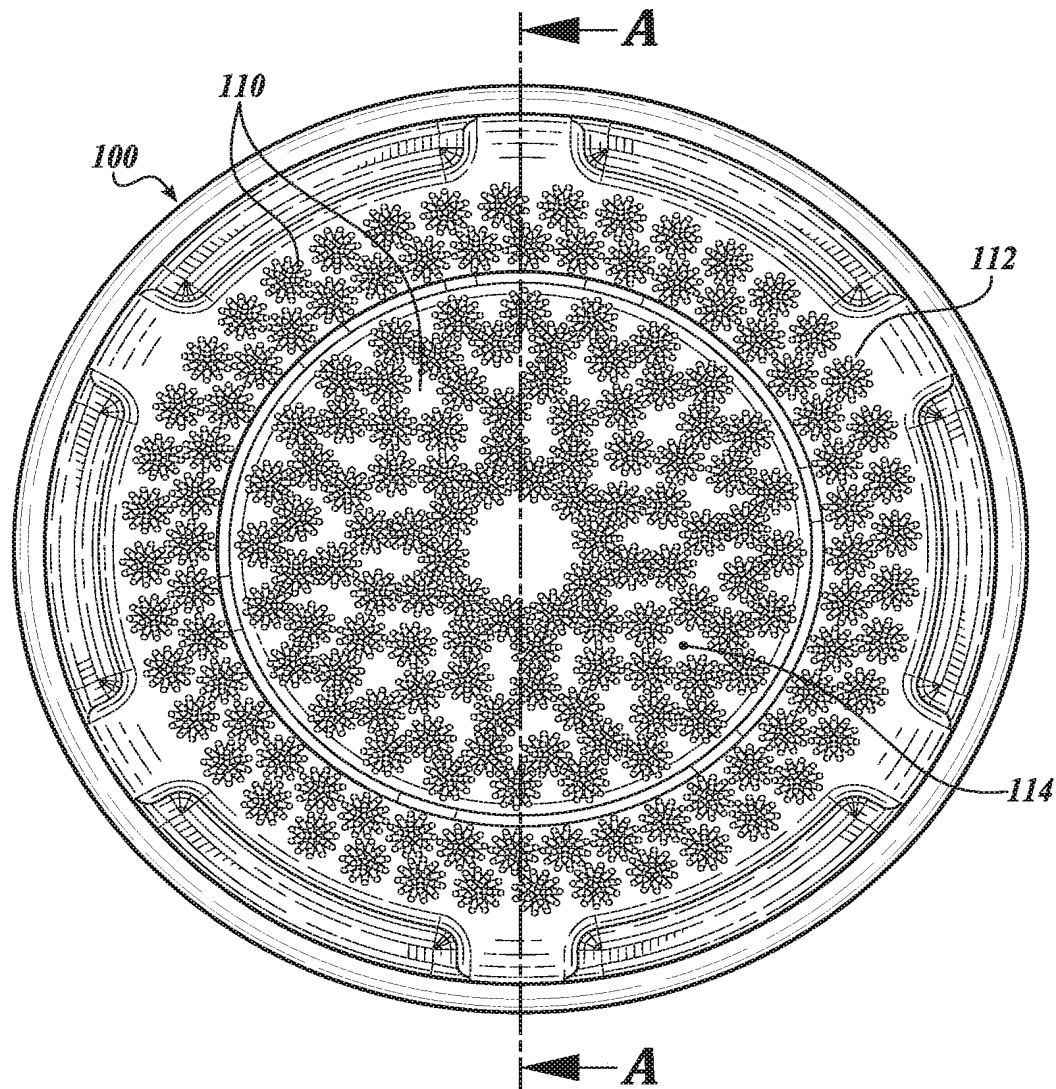
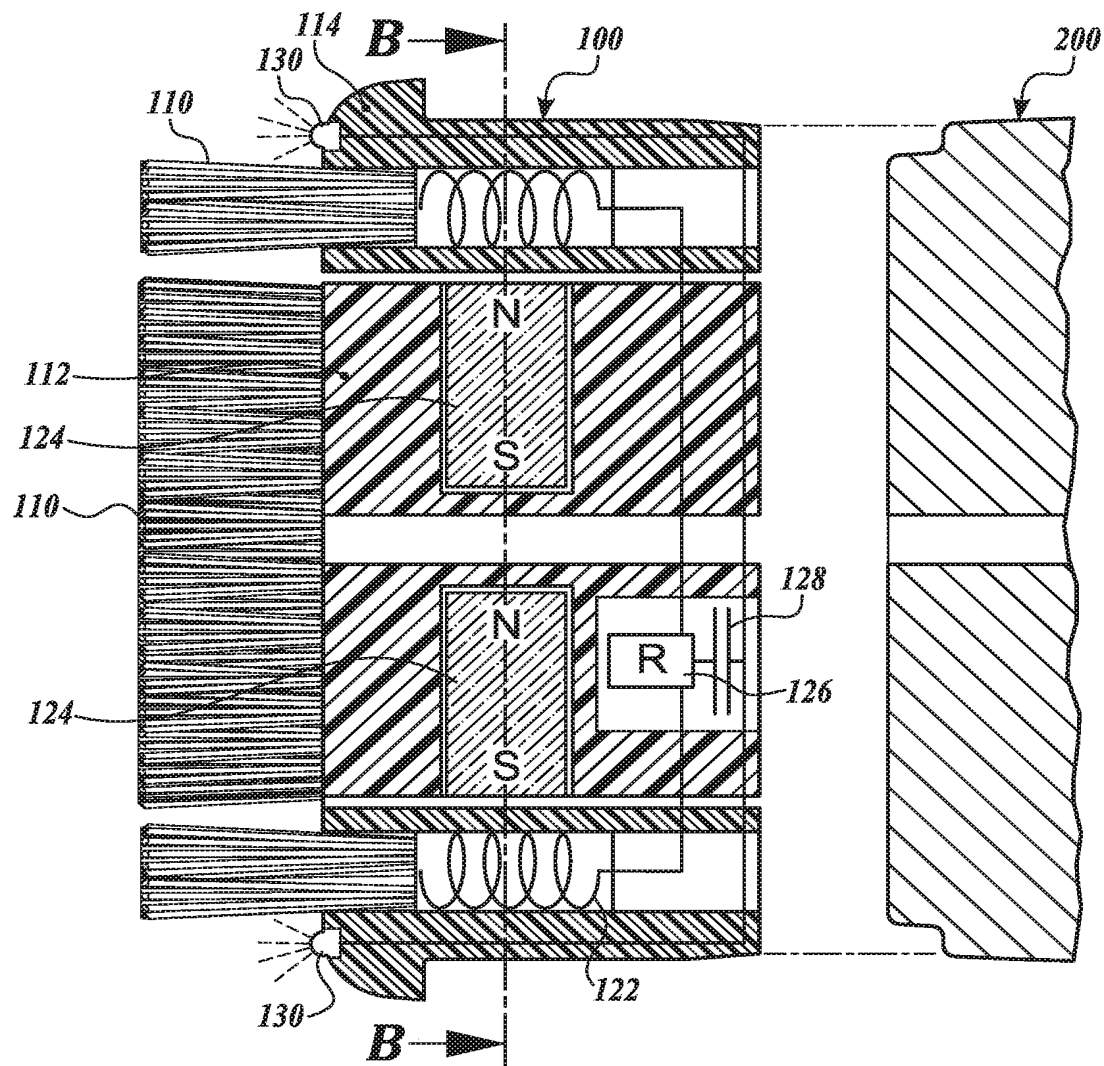


FIG. 1

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**FIG. 2**

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CROSS-SECTION A-A**FIG. 2A**

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CROSS-SECTION B-B

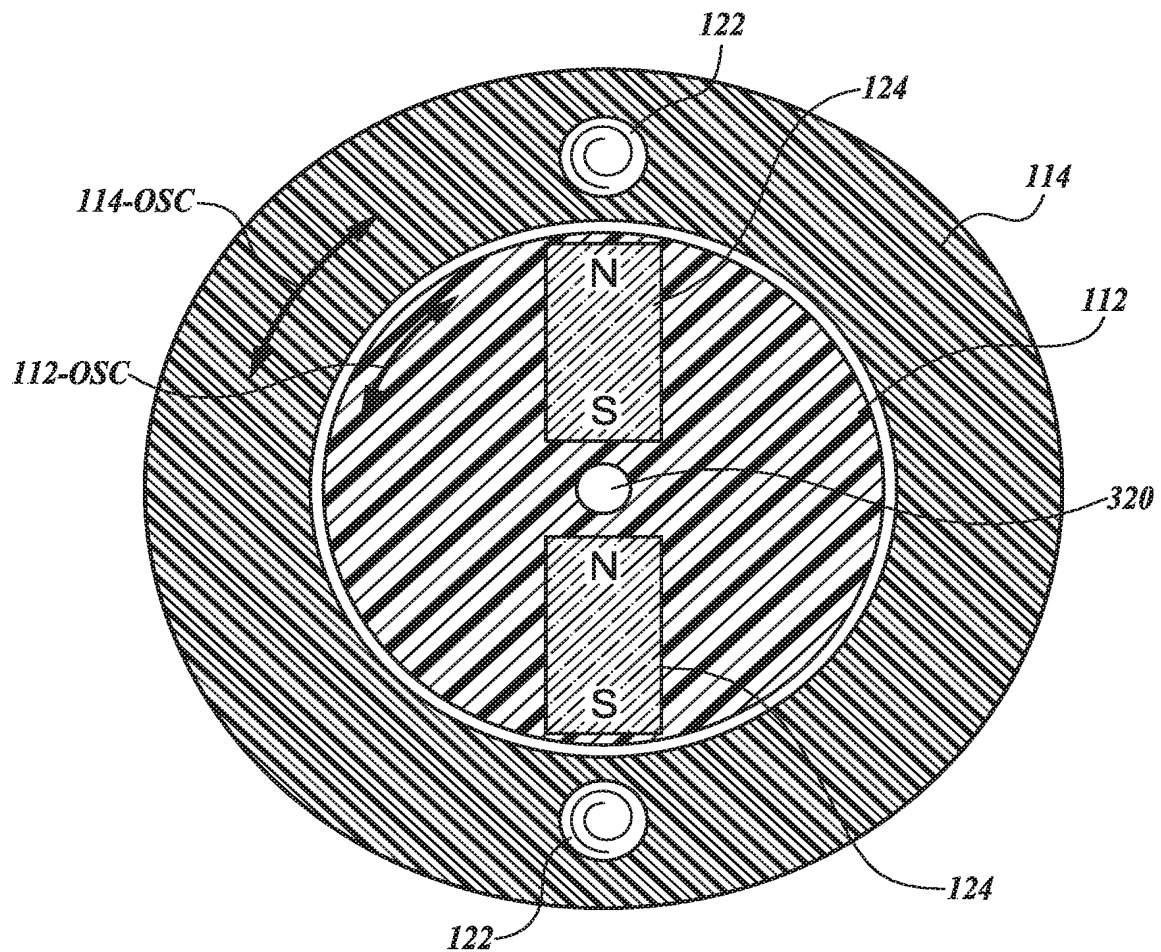
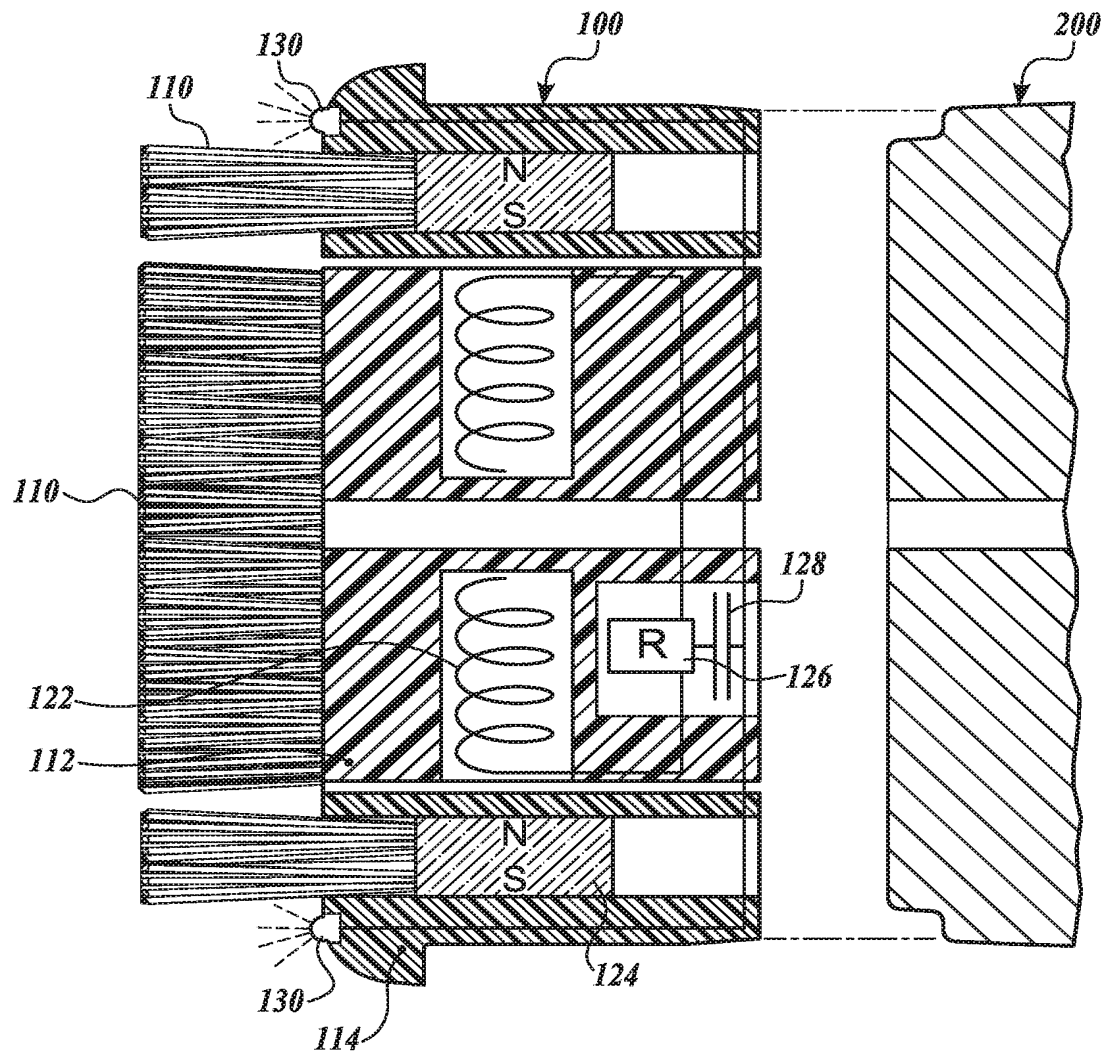


FIG. 2B

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**FIG. 3**

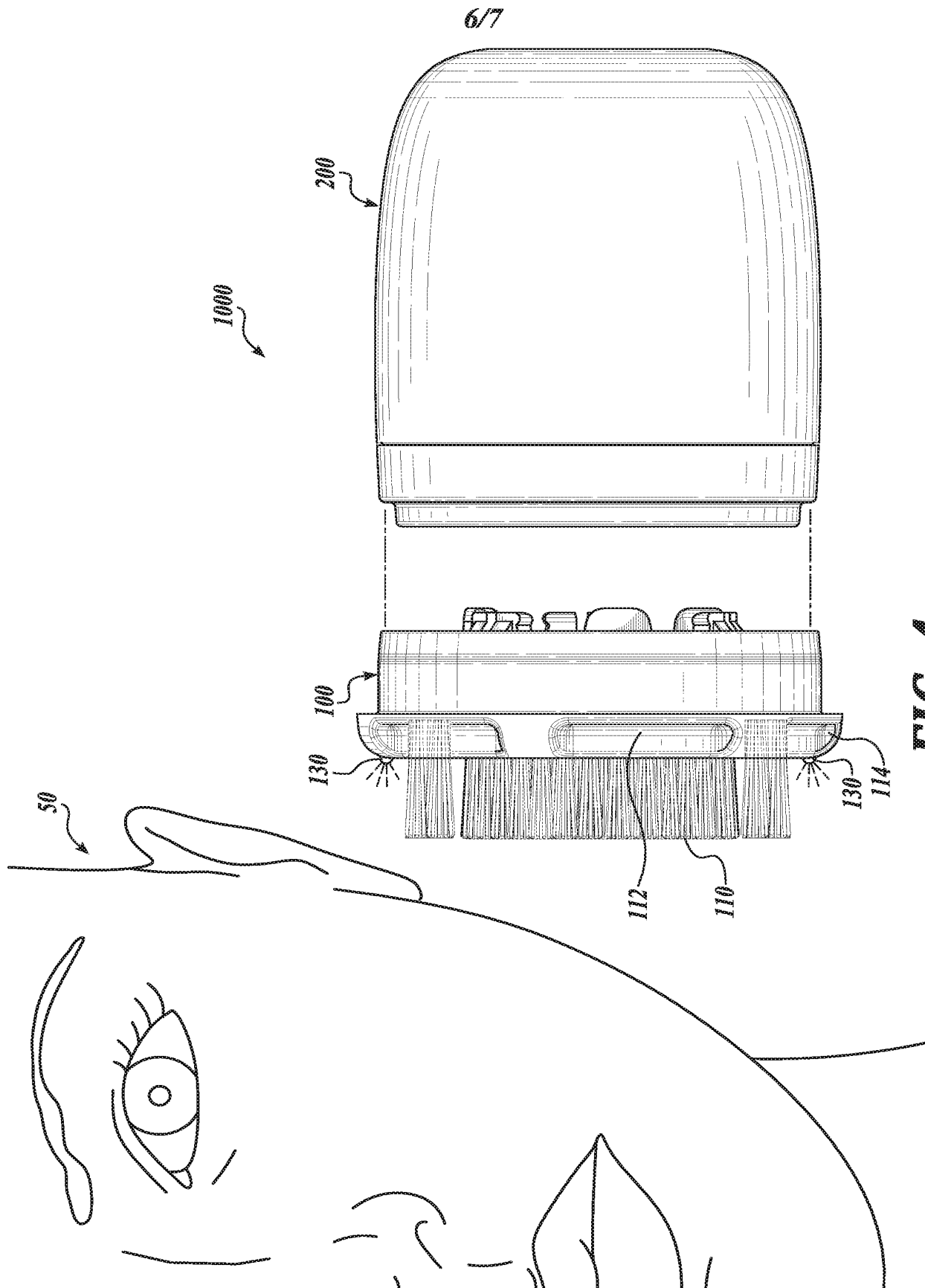
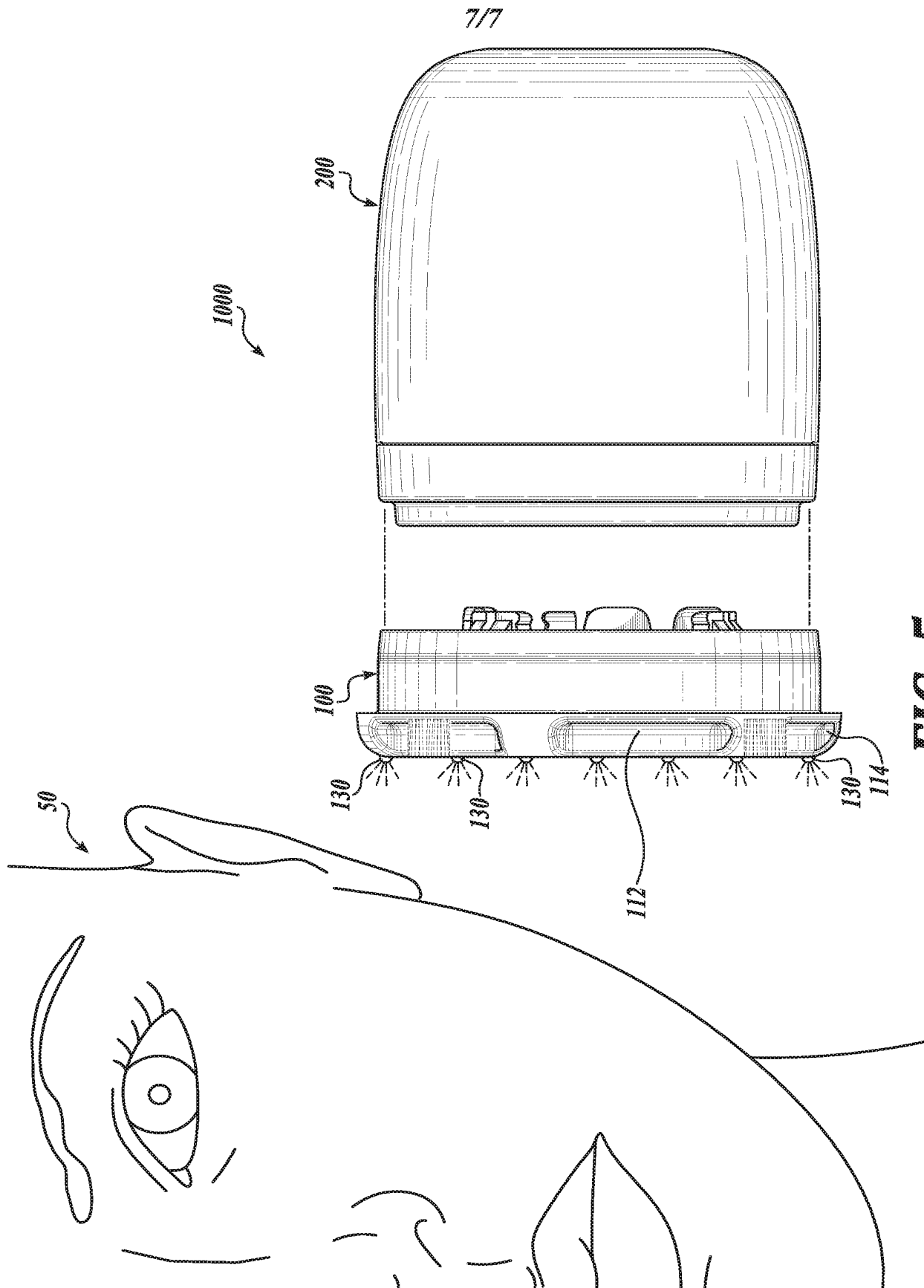


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2020/014116

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-12

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2020/014116

A. CLASSIFICATION OF SUBJECT MATTER

INV. A46B13/00 A46B13/02 A46B15/00 A46B5/00 A61C17/16
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A46B

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

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

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 3 391 793 A1 (KONINKLIJKE PHILIPS NV [NL]) 24 October 2018 (2018-10-24) figures 1, 2 paragraphs [0040], [0041], [0044] -----	1-12
A	WO 2005/006538 A1 (BRAUN GMBH [DE]; KRAUS BERNHARD [DE]) 20 January 2005 (2005-01-20) figures 9-12 -----	1-12
A	US 9 386 843 B2 (OREAL [FR]) 12 July 2016 (2016-07-12) figures 3-5 -----	1-12
A	WO 2004/026077 A1 (COLGATE PALMOLIVE CO [US]; KEMP JAMES HERBERT [US] ET AL.) 1 April 2004 (2004-04-01) figure 1 -----	1-12



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

8 May 2020

Date of mailing of the international search report

06/07/2020

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
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Authorized officer

Kun, Karla

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2020/014116

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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			WO 2004026077 A1	01-04-2004

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-12

The end effector comprising an inner structure with at least one magnet/one induction coil and an outer structure with at least one induction coil/one magnet, which magnet and induction coil cooperate to generate current in the induction coil,
wherein the end effector includes a plurality of contacting elements configured to contact skin of a user.
The technical effect is affecting the skin by physical touch.
The problem to be solved may therefore be regarded as to provide an end effector with means for massaging the skin.

2. claims: 13-15

The end effector comprising an inner structure with at least one magnet/one induction coil and an outer structure with at least one induction coil/one magnet, which magnet and induction coil cooperate to generate current in the induction coil,
wherein the end effector includes a plurality of electrical devices configured to affect skin of a user.
The technical effect is affecting the skin without physical touch.
The problem to be solved may therefore be regarded as to provide an end effector with means for light therapy.



(51) International Patent Classification:

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PCT/US2020/017247

(22) International Filing Date:

07 February 2020 (07.02.2020)

(25) Filing Language:

English

(26) Publication Language:

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(30) Priority Data:

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(72) Inventor: ALEXANDER, Sam; 4302 Oakview Circle, Alpine, UT 84004 (US).

(74) Agent: OAKESON, Gary, P.; Thorpe North & Western, LLP, 8180 S. 700 E., Suite 350, Sandy, UT 84070 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP,

KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

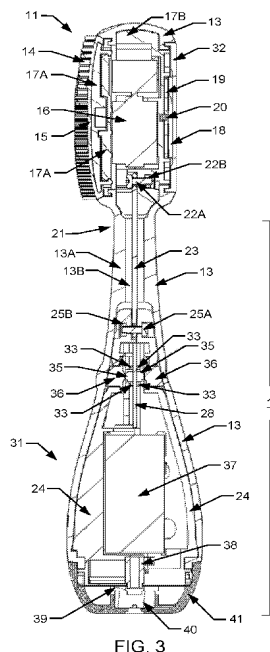
Declarations under Rule 4.17:

- as to the identity of the inventor (Rule 4.17(i))
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

Published:

- with international search report (Art. 21(3))

(54) Title: SKIN CARE DEVICES



(57) Abstract: The present disclosure is drawn to skin care devices. An example skin care device can include skin-rejuvenation head with a first external region including an array of skin-cleansing bristles and a second external region including an auxiliary skin-treatment appliance of a different type than the skin-cleansing bristles. The skin-rejuvenation head can include a vibrational motor positioned therein to provide vibratory oscillation to both the skin-cleansing bristles and the auxiliary skin-treatment appliance. A support rod can be mechanically coupled to the skin-rejuvenation head. A handle can include a neck portion and a grip portion, with the support rod also coupled to the handle. The neck portion can be proximal to the skin-rejuvenation head and the grip portion can be distal to the skin-rejuvenation head. The neck portion can include an energy dampening sleeve around the support rod, leaving a gap around the support rod.

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SKIN CARE DEVICES

BACKGROUND

Skin care is a rapidly evolving industry where treatment devices, skin care
10 formulations, and related treatment protocols are being developed on nearly a continuous
basis. Dermal treatment to promote or prolong the appearance of healthy skin, particularly
facial skin, can be complicated, as there are many choices available to consumers and some
approaches tend to work better than others for a given skin care goal. For example, skin
cleansing and treatment for antimicrobial purposes, e.g., acne, may demand a different
15 group of treatment protocols than skin tightening. With effective treatments sometimes
finding improvement with multifaceted approaches, providing skin care devices, systems,
and methods that are effective and convenient for achieving a given skin care goal can
be beneficial.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates multiple views of an example skin care device in accordance with
the present disclosure;

FIG. 2 illustrates an exploded view of an example skin care device in accordance
25 with the present disclosure;

FIG. 3 illustrates a cross-sectional view of an example skin care device in accordance
with the present disclosure;

FIGS. 4A and 4B illustrate multiple views of a skin-rejuvenation head and a neck
portion of a handle of an example skin care device in accordance with the present
30 disclosure;

FIGS. 5A and 5B illustrates multiple views of an alternative skin-rejuvenation head and a neck portion of a handle of an example skin care device in accordance with the present disclosure;

FIGS. 6A and 6B illustrates multiple views of an alternative skin-rejuvenation head and a neck portion of a handle of an example skin care device in accordance with the present disclosure;

FIGS. 7A and 7B illustrates multiple views of an alternative skin-rejuvenation head and a neck portion of a handle of an example skin care device in accordance with the present disclosure; and

FIGS. 8A and 8B illustrates multiple views of alternative skin-rejuvenation head and a neck portion of a handle of an example skin care device in accordance with the present disclosure.

DETAILED DESCRIPTION

The present disclosure is drawn to skin care devices, as well as related systems and methods. In one example, a skin care device can include a skin-rejuvenation head including a first external region and a second external region thereon. The first external region can include an array of skin-cleansing bristles and the second external region can include an auxiliary skin-treatment appliance of a different material and type than the skin-cleansing bristles. The skin-rejuvenation head can also include a vibrational motor providing vibratory oscillation to both the skin-cleansing bristles and the auxiliary skin-treatment appliance. The skin care device can also include a support rod mechanically coupled to the skin-rejuvenation head. The skin care device can also include a handle with a neck portion and a grip portion. The support rod can be coupled to the handle, with the neck portion being proximal to the skin-rejuvenation head and the grip portion being distal to the skin-rejuvenation head. The neck portion can include an energy dampening sleeve that surrounds the support rod, leaving a gap around the support rod. In one example, the energy dampening sleeve can surround the support rod leaving an air gap around the support rod within the neck portion, and the support rod can be connected to the handle within the grip portion. Thus, the mechanical connection support rod between the skin-

rejuvenation head and the grip portion of the handle can pass through the neck portion without contact or at least significant contact with the energy dampening sleeve. The energy dampening sleeve, thus, can be formed so that it does not provide enough structural support to support the skin-rejuvenation head in an upright position relative to the handle without the presence of the support rod. That is not to say that the energy dampening sleeve provides no structural support, but rather, its purpose is to provide energy dampening, such as with a soft rubber material, e.g., silicone rubber, and thus, may not be present entirely purposes of structural support. The combination of the support rod and the energy dampening sleeve, leaving a gap therebetween along at least part of the neck portion, can work together to provide good support between the handle and the skin-rejuvenation head, while provide acceptable energy dampening to the user holding the grip portion during use. This can be the case even in instances of high intensity or high frequency vibrational oscillation from the vibrational motor. In further detail, the skin care device can include a rubber sleeve that covers at least part of the grip portion, the neck portion, and at least part of the skin-rejuvenation head. In this configuration, the energy dampening sleeve at the neck portion can be part of the rubber sleeve, e.g., a continuous sleeve. However, in this example, the energy dampening sleeve can have an average outer wall thickness that is greater than the average outer wall thickness of rubber sleeve at the skin-rejuvenation head, the grip portion, or both. In further detail with regard to energy dampening between the vibrational motor in the skin-rejuvenation head and the grip portion of the handle, the neck portion can include a narrow a cross-sectional area compared to a cross-sectional area of the grip portion. For example. The cross-sectional area at least at one location along the neck portion can be from 4 to 15 times smaller in area than at least one a cross-sectional area of the grip portion.

In another example, a skin care device can include skin-cleansing bristles at a first external region, a semi-precious stone skin-treatment pad at a second external region, and a vibrational motor positioned to provide vibratory oscillation to both the skin-cleansing bristles and to the semi-precious skin-treatment stone pad. In one example, the semi-precious skin-treatment stone pad can be temperature controllable as a heating pad, a cooling pad, or both. In another example, the semi-precious skin-treatment stone pad can include quartz, e.g., rose quartz or another type of quartz that may be rich in metal and/or

mineral content. Thus, for example, a quartz stone pad, such as rose quartz, can be associated with a heat conductor to provide heat to a skin surface through the rose quartz stone pad. In another example, the semi-precious skin-treatment stone pad can include jade of any type, e.g., nephrite, jadeite, and/or xiuyan. In one example, a jade stone pad
5 can be associated with a cooling source to provide cooling to a skin surface through the jade stone pad. The skin-cleansing bristles, the semi-precious skin-treatment stone pad, and the vibrational motor can be integrated as part of a skin-rejuvenation head that is attached to a separate handle. In one example, the handle can be configured to dampen vibrational energy introduced at the skin-rejuvenation head, as described previously.

10 In another example, a skin care device can include skin-cleansing bristles at a first external region, a metal skin-treatment pad at a second external region, and a vibrational motor positioned to provide vibratory oscillation to both the skin-cleansing bristles and to the metal skin-treatment pad. The metal skin-treatment pad can include a metal selected from silver, gold, copper, or an alloy thereof. The metal skin-treatment pad can also be
15 temperature controllable as a heating pad, a cooling pad, or both, e.g., heat on/heat off, variable heat, cooling on/cooling off, variable cooling, heating on/cooling on/heat and cooling off, variable heating and/or cooling, etc. The metal skin-treatment pad includes a substrate, e.g., plastic, another metal or alloy, etc., that can be silver-plated, copper-plated, gold-plated, or plated with an alloy thereof. The metal skin-treatment pad can be
20 associated with a heat conductor to provide heat to a skin surface through the metal skin-treatment pad. In further detail, the metal skin-treatment pad can be associated with a cooling source to provide cooling to a skin surface through the metal skin-treatment pad. In another example, the skin-cleansing bristles, the metal heating pad, and the vibrational motor are all integrated as part of a skin-rejuvenation head, and wherein the head is
25 attached to a handle. In one example, the handle can be configured to dampen vibrational energy introduced at the skin-rejuvenation head, as described previously.

In another example, a skin care device can include skin-cleansing bristles at a first external region, an exfoliation pad at a second external region, and a vibrational motor positioned to provide vibratory oscillation to both the skin-cleansing bristles and to the
30 exfoliation pad. The exfoliation pad can include a substrate with aluminum oxide particulates embedded in the substrate. The aluminum oxide particulates can include

aluminum oxide crystals having an average particle size to provide an 80 grit to 300 grit exfoliation surface. The exfoliation surface can alternatively provide an exfoliation surface from 150 grit to 250 grit, or from 80 grit to 150 grit, for example. The substrate can, for example, be a plastic substrate, and the aluminum oxide particulates can be embedded therein by thermally softening the substrate and pressing the aluminum oxide particulates into the substrate, e.g., to hold the aluminum oxide particulates in place. The skin-cleansing bristles, the exfoliation pad, and the vibrational motor are all integrated as part of a skin-rejuvenation head, and wherein the head is attached to a handle. In one example, the handle can be configured to dampen vibrational energy introduced at the skin-rejuvenation head, as described previously.

In another example, a skin care device can include skin-cleansing bristles at a first external region, a soft porous scrubber at a second external region, and a vibrational motor positioned to provide vibratory oscillation to both the skin-cleansing bristles and to the soft porous scrubber. The soft porous scrubber can include an anti-microbial metal associated therewith. The anti-microbial metal can include elemental silver, elemental copper, elemental gold, alloys of silver, alloys of copper, alloys of gold, ionic silver, ionic copper, ionic gold, a silver compound, a copper compound, a gold compound, or combinations thereof. The anti-microbial metal can be adsorbed on a surface of the soft porous scrubber, and/or impregnated within the soft porous scrubber. In another example, the anti-microbial metal can be in the form of a silver salt that is applied as a silver salt solution and then dried. The soft porous scrubber can be, for example, a natural loofah or a natural sponge. In another example, the soft porous scrubber can be a synthetic loofah, a synthetic sponge, a synthetic pouf, or a synthetic mesh. The skin-cleansing bristles, the soft porous scrubber, and the vibrational motor are all integrated as part of a skin-rejuvenation head, and wherein the head is attached to a handle. In one example, the handle can be configured to dampen vibrational energy introduced at the skin-rejuvenation head, as described previously.

It is noted that when discussing the various skin care devices herein, and any kits, systems, methods, etc., related thereto, these various more specific discussions can be considered applicable to one another whether or not they are explicitly discussed in the context of that example. Thus, for example, when discussing the vibrational motor in the

context of one example, such disclosure is also relevant to and directly supported (but not limiting) in the context of other examples, and *vice versa*. It is also understood that terms used herein will take on their ordinary meaning in the relevant technical field unless specified otherwise. In some instances, there are terms defined more specifically throughout the specification or included at the end of the present specification, and thus, these terms have a meaning as described herein.

Turning now to one example, as shown in FIG. 1 with five (5) different views, e.g., front view (A), side view (B), back view (C), bottom view (D), and top view (E), a skin care device can include a handle 1 and skin-rejuvenation head 11. The handle in this example includes a neck portion 21 and a grip portion 31. In this example, as shown, the head includes a first external region with an array of skin-cleansing bristles 14 and the second external region with an auxiliary skin-treatment appliance 12, such as a heating pad or other appliance, of a different material and type than the skin-cleansing bristles. A power button 35 and an end cap 41 are also shown.

In further detail regarding skin-rejuvenation head 11, as mentioned, a first external region can include an array of skin-cleansing bristles 14 and a second external region can include an auxiliary skin-treatment appliance 12 of a different material and type than the skin-cleansing bristles. The skin-rejuvenation head can also include a vibrational motor (not shown in FIG. 1, but shown in FIGS. 2 and 3) to provide vibratory oscillation to both the skin-cleansing bristles and the auxiliary skin-treatment appliance.

The skin-cleansing bristles can have a length of from 1/16 inch to 3/8 inch, from 1/8 inch to 1/4 inch, from 1/16 inch to 1/4 inch, or from 1/8 inch to 3/8 inch, for example. The bristles can have a uniform density at the first external region, or can be arranged in multiple sub-regions within the first external region with corresponding different bristle densities, as shown in FIG. 1 (with a top fan-shaped region having a lower bristle density than the rest of the circular shaped "first external region"). An average bristle density at the first external region can be from 100 to 600, from 150 to 500, from 200 to 400 or from 250 to 400 bristles per square inch, regardless if there are multiple sub-regions with different densities. In further detail, however, if the first external region of bristles includes two discrete sub-regions of bristles, then the first sub-region can have a bristle density from 150 to 700, from 200 to 600, from 200 to 500, or from 250 to 400 bristles per square inch,

and furthermore, the second sub-region can have a bristle density from 40 to 300, from 50 to 250, from 75 to 250, or from 100 to 200 bristles per square inch, for example. Typically, the second sub-region in this example will have a lower bristle density than the first sub-region. The skin-cleansing bristles at the first external region can have a skin-contact
5 surface area of 2 square inches to 35 square inches, from 3 square inches to 30 square inches, from 3 square inches to 25 square inches, from 3.5 square inches to 20 square inches, from 3.5 square inches to 10 square inches, from 5 square inches to 35 square inches, or from 10 square inches to 35 square inches, for example.

In further detail, the skin-cleansing bristles can be constructed of a rubber material,
10 such as a polysiloxane or a silicone rubber. For example, the silicone rubber that can be hypoallergenic, e.g., medical grade, ultra-hypoallergenic, an ultra-hygienic, and/or odor-resistant silicone rubber. Silicone rubbers are an elastomer of silicone, carbon, hydrogen, and oxygen. Silicone rubbers can include fillers to modulate material properties and/or cost. If fillers are added, they can be added keeping in mind the use as a skin-cleansing
15 brush, and can be selected to be hypoallergenic, hygienic, etc. With this particular type of brush, e.g., a polysiloxanes or silicone rubber brush, the brush can be constructed so that it does not need to be replaced. That stated, it can also be constructed to be modular for periodic replacement, if desired. With these types of silicone rubbers, it can be gentle enough to use on nearly all types of skin, particularly healthy, unbroken skin. In some
20 instances, it can even be gentle enough to use on damaged or diseased skin. The skin-cleansing bristles can be constructed of either the same material or a different material than used as a sleeve over the handle and/or portions of the skin-rejuvenation head. Though silicone rubber can be used effectively, it is noted that other types of bristles brushes can be used as well, depending on the desired skin application and combination
25 with the auxiliary skin-treatment appliance.

The auxiliary skin-treatment appliance, shown generally at 12 in FIG. 1, but shown alternatively with different types of appliances at 32, 42, 52, 62, 72, and 82 by way of example. The auxiliary skin-treatment appliance can be any of a number of sizes at the second external region, for example having a skin-contact surface area of 2 to square
30 inches to 35 square inches, from 3.5 square inches to 30 square inches, from 5 square inches to 25 square inches, or from 10 square inches to 35 square inches, for example.

Further detail regarding the auxiliary skin-treatment appliances are described in greater detail hereinafter in the context of FIGS. 2 to 7B.

In this particular example with respect to the handle 1, note that the neck portion 21 includes a location that is narrower (shown at d1) than at a location of grip portion 31 (shown at d2). The diameter (converted to radius; $r = d/2$) in this example can be used to calculate the cross-sectional areas of the two respective locations. It is noted that if the cross-sectional areas are not defined by a round geometry (perpendicular to the axis of the handle), then other mathematical calculations can be used to determine the respective cross-sectional areas. In this example, as can be seen, the much narrower cross-sectional area (d1) at the neck portion (at least at one location) can be from 4 to 15 times smaller, from 6 to 12 times smaller, or from 8 to 10 times smaller, than a cross-sectional area (d2) of the grip portion (at least at one location). In this specific example, based on the relative diameters shown, the cross-sectional area at (d1) can be calculated to be from about 8 to 10 times smaller than at (d2).

Turning now to FIGS. 2 and 3, an exploded view and a cross-sectional view, respectively, are shown which illustrate aspects of the skin care device of the present disclosure. These two FIGS. will be described together, as they both show different perspectives of the same individual components that can be present in an example device. The example shown in FIGS. 2 and 3 is drawn to embodiments where the auxiliary skin-treatment appliance (shown and described generally in FIG. 1 at 12) is a heating pad 32, such as a metal heating pad. However, as explained in more detail herein, the auxiliary skin-treatment appliance can be other types of appliances. For example, as mentioned, the second external region (separate and distinct from the first external region where the skin-cleansing bristles 14 are located) can include the auxiliary skin-treatment appliance of a different material and type than the skin-cleansing bristles. In other words, the auxiliary skin-treatment appliance is not simply another area with the same material with a different configuration for the same purpose. Rather, it is a different appliance that is attached to the skin-rejuvenation head, typically of a material such as metal, stone, plastic, glass, ceramic, particulates, soft natural material, e.g., loofah, sponge, etc., soft synthetic material (other than the rubber used to form the bristles), etc. For example, the auxiliary skin-treatment appliance can be a thermal pad, e.g., heating pad and/or a cooling pad, an exfoliator, a

secondary scrubber (of a different type and material such as a soft porous scrubber), an electromagnetic energy appliance, e.g., phototherapy and/or radio frequency, an ionic infusion appliance, e.g., microcurrent, a massaging appliance, etc. More specific examples include metal heating pads of any metal or metal alloy material; metal heating pads including silver, gold, copper or alloy thereof or a plated substrate thereof, e.g., electroplating on plastic or other non-metallic surface and/or metal on metal plating; semi-precious heating and/or cooling pads, e.g., quartz (such as rose quartz) or jade; LED phototherapy appliances, e.g., red light, blue light, etc.; RF frequency skin tightening appliances; skin exfoliation pads or stones, e.g., particulates or crystals embedded in substrates, porous stones, etc.; soft porous scrubbers, e.g., loofahs, sponges, poufs, meshes, etc.; anti-microbial soft porous scrubbers; massaging appliances with massaging relief features; or the like.

In further detail, the skin-rejuvenation head 11 can include a head support shell, shown generally at 17, or more particularly by example in two parts as 17A and 17B, and can be snapped together or otherwise joined, or can be a single part formed around or providing an opening to allow for placement of the vibrational motor 16 that is powered by either direct current (DC) or alternating current (AC). For example, there is a battery 37 present in the handle 1 (within the grip portion 31 in this example) that can power the vibrational motor, though the battery could be placed anywhere that is practical. In this example, the vibrational motor is positioned between the skin-cleansing bristles 14 and the auxiliary skin-treatment appliance 12, shown as a heating pad in this example, but could be any of the auxiliary skin-treatment appliances describe herein. Thus, when in operation, the vibrational motor can deliver vibratory oscillation to both the skin-cleansing bristles and the auxiliary skin-treatment appliance, e.g., heating pad. The head support shell can provide housing and support to the vibrational motor, the skin-cleansing bristles, and the auxiliary skin-treatment appliance, either directly or indirectly through other structures. For example, the skin-cleansing bristles can be supported by a bristle support plate 15 that connects to the head support shell. Likewise, the heating pad can be supported by a heat conductor support 19 connected to the head support shell. The head support shell can also act to provide support directly to the skin-cleansing bristles and the heating pad, in some examples. The heat conductor support can provide support to a heat conductor 18,

which can be thermally coupled to the heating pad to transfer an appropriate level of heat to the heating pad.

The heat conductor 18 can be powered by either direct current (DC) or alternating current (AC), but can also be powered by a battery 37. The heat conductor can be a
5 resistive heating element or other type of heating element that can deliver heat to the heating pad, such as a flat and/or low profile coil heater, or a ceramic heating element. The heat of the heat conductor can be such that it delivers a therapeutic temperature to a surface of the heating pad that contacts the skin surface, e.g., from 36 °C to 44 °C or from 38 °C to 42 °C. If the heating pad is a good heat conductor, like metal, then the
10 temperature of the heat conductor can be about the same as the target temperature for skin contact by the heating pad. If the heating pad is not a good conductor of heat, such as a semi-precious stone, then the temperature at the heat conductor can be higher so that the surface of the semi-precious stone reaches the target skin therapeutic temperature, e.g., from 36 °C to 44 °C or from 38 °C to 42 °C. A temperature sensor 20 can also be
15 present to monitor and/or help control the temperature of the heat conductor and/or heating pad 32.

The skin-rejuvenation head 11 can be connected to a handle 1 using a support rod 23, for example. The support rod can be flexible, but rigid enough to provide support between the grasping portion of the handle and the skin-rejuvenation head. The support
20 rod in certain more specific examples can be a solid metal rod, a tube-like rod, or a spring-like rod. The support rod can have any cross-sectional shape, such as circular cross-section, a square cross-section, a rectangular cross-section, a triangular cross-section, a pentagonal cross-section, a hexagonal cross-section, and so forth. The support rod can be metal, polymer, e.g., plastic, rubber, etc., ceramic, etc. As mentioned, the cross-sectional
25 configuration can be solid, tubular, or a combination of both. As mentioned, the handle can include a neck portion 21 and a grip portion 31. In this example, the support rod is mechanically fastened to the skin-rejuvenation head at the head support shell 17A, 17B, adjacent to the vibrational motor 16, using a support rod head coupler 22A, 22B, which in this instance includes a screw and a nut, respectively, but could be any coupler available
30 to affix the support rod to the skin-rejuvenation head. The support rod is also affixed to the handle by a support rod handle coupler 25A, 25B, which is also a screw and a nut,

respectively, but could be any other coupling mechanism available to rigidly or semi-rigidly couple the skin-rejuvenation head to the handle. In this example, the coupling occurs at around a junction where the neck portion of the handle meets the grip portion of the handle. However, whether present in the neck portion or the handle region, there is at least
5 a portion of the neck portion between this coupling location (where the support rod is coupled to the handle) and the skin-rejuvenation head.

Also within the handle 1, particularly within the grip portion 31 of the handle in this example, are power and control mechanisms, such as the battery 37, e.g., polymer or other rechargeable battery; a printed circuit board (PCB) 28, e.g., to control the vibrational
10 motor, charging, indicator lights, etc.; a charging port 38; a power button 35, e.g., single vibratory oscillation speed or variable vibratory oscillation speeds; indicator lights 33; and/or various support structures to provide support to these power and control mechanisms, e.g., handle support shell 24 (shown in two pieces in FIG. 2), charging port support 39, power button support 36, etc.

15 The skin care device can also include an energy dampening sleeve 13 that is positioned as a “skin” over the device, covering a portion of the skin-rejuvenation head (except for the skin-cleansing bristles and the auxiliary skin-treatment appliance, e.g., heating pad or other appliance, in this example), most of the handle 1, e.g., the neck portion 21, and most of the grip portion 31. The energy dampening sleeve can be
20 constructed of a polysiloxanes or silicone rubber, for example. At a bottom end of the handle, in this example, there is an end cap 41, which is associated with a charging port opening 40. The end cap can be rigid, for example, and the charging port opening can be rubber to provide a water-tight or near water-tight seal, where a charging cable (not shown) can be passed through to become inserted into the charging port 38. With more
25 specific reference to the energy dampening sleeve, notably, at the neck portion, where the support rod is unconnected to either the skin-rejuvenation head or the handle, there is a thickened portion 13A of the energy dampening sleeve 13. The thickened portion of sleeve, e.g., silicone or other rubber sleeve, in this example provides a gap 13B. It is noted that the energy dampening sleeve does not need to extend to the skin-rejuvenation head
30 11 or the grip portion 31 go be effective at dampening energy; but in some examples, the energy dampening sleeve is a continuous polymeric or rubber sleeve that spans from the

grip portion onto the skin-rejuvenation head. Furthermore, as mentioned previously, the neck portion includes one or more locations where its cross-sectional area can be from 4 to 15 times smaller (or from 6 to 12 times smaller, or from 8 to 10 times smaller) than the cross-sectional area of at least one location in the grip portion. This combination of (i) having a support rod coupling and providing support between the handle and the skin-rejuvenation head, (ii) having a thickened portion of the energy dampening sleeve along the neck portion (compared to other areas such as may be present at the skin-rejuvenation head, and/or (iii) having a gap (or space) about the support rod between the thickened portion of the energy dampening sleeve and the support rod, transfer of vibrational energy from the skin-rejuvenation head to the grip portion of the handle can be reduced over other structures that do not have these mechanical vibration dampening features. Using one or two of these design features can likewise dissipate energy from the vibration of the head (relative to the grasping portion), but using two or three of these design features can provide added anti-vibrational properties. This vibrational dampening can be helpful with this type of device, as the presence of particularly the auxiliary skin-treatment appliance and associated structures that may be present to operate this appliance can add enough weight to the skin-rejuvenation head so as to make vibrational transference more noticeable to users. Furthermore, this can be particularly the case when the vibrational motor is potentially delivering a vibrational oscillation frequency from 7,000 vibrations per minute (VPM) to 12,000 VPM. With that stated, example VPM frequencies that can be implemented at a fixed frequency, or with multiple fixed frequency settings, e.g., 2 discrete settings, 3 discrete settings, 4 discrete settings, etc., or with variable frequency settings, e.g., frequencies dialed up and down as desired, can be from 2,000 VPM to 12,000 VPM, 4,000 VPM to 12,000 VPM, from 6,000, VPM to 12,000 VPM, from 7,000 VPM to 12,000 VPM, from 2,000 VPM to 10,000 VPM, 4,000 VPM to 10,000 VPM, from 6,000, VPM to 10,000 VPM, from 7,000 VPM to 10,000 VPM, from 2,000 VPM to 8,000 VPM, 4,000 VPM to 8,000 VPM, from 6,000, VPM to 8,000 VPM, from 7,000 VPM to 8,000 VPM, from 2,000 VPM to 6,000 VPM, from 4,000 VPM to 6,000 VPM, from 6,000 VPM to 10,000 VPM, from 7,000 VPM to 9,000 VPM, from 7,000 VPM to 8,000 VPM, or from 8,000 VPM to 12,000 VPM

In one example, from 7,000 VPM or more, e.g., 7,000 VPM to 12,000 VPM with respect to the skin-cleansing bristles, a deep cleaning can occur. With respect to either the first external region (skin-cleansing bristles) or the second external region (auxiliary skin-treatment appliance), these vibration energies can provide a way to lift, firm, and tone problem areas of the skin. For example, at 7,000+ VPM, the skin-cleansing bristles can assist with removing skin impurities and breaking down dirt and oil from within the pores. At these vibrational speeds, the bristles and/or the heating pad can act to deeply massage serums or moisturizer into the skin. Heat treatment can also provide the benefit of opening pores, promoting improved circulation, promoting skin care fluids to transdermally pass into or across the epidermis, relaxing underlying muscles, providing moist heat when used with a skin care fluid which may penetrate deeper than dry heat and may hydrate the skin, releasing acne-causing bacteria from skin pores, and/or other similar benefits. With some of the benefits associated with application of heat, particularly with respect to skin treatment, cleansing using the array of skin-cleansing bristles described herein can further contribute to skin health. For example, cleansing prior to application of heat can improve absorption of skin treatment fluids or even transdermal (into or even through the epidermis) transfer of some skin care fluids, e.g., moisturizer, serums, etc.

As shown in FIGS. 2 and 3, the auxiliary skin-treatment appliance can be a heating pad 32, such as a metal heating pad, as shown. However, instead of (or in addition to) a heat conductor 18, cooling architecture or components can be included to thermally transfer cooling temperatures for cooling applications. Thus, in some examples, the "heating pad" can be referred to as a thermal skin-treatment pad, e.g., for heating and/or cooling. In this example, the thermal skin-treatment pad can be any metal or other material suitable for transferring thermal treatment properties to the skin surface. In one example, the thermal skin-treatment pad can be any thermally conductive material suitable for providing heat or cooling to the skin surface, without damaging the skin. For example, the thermal skin-treatment pad can be associated with a heat conductor to provide heat to a skin surface through the metal skin-treatment pad. Alternatively, the metal skin-treatment pad can be associated with a cooling source to provide cooling to a skin surface through the metal skin-treatment pad. These temperatures (heating and/or cooling) can be used with or without serums and/or moisturizers, for example. With respect to heating,

temperatures can be used that will not burn the skin, e.g., 36 °C to 44 °C or from 38 °C to 42 °C can be suitable. Temperatures outside of this range can be used but may cause safety concerns. With respect to cooling, temperatures from -10 °C to 20 °C, from -5 °C to 15 °C, or from 0 °C to 15 °C, or from 0 °C to 10 °C can be used, taking user safety into
5 account, as the mean temperature where frostnip can occur with prolonged exposure may be at about -10 °C for many subjects. Thus, temperature and time of application can be considered when using cooling pads in accordance with the present disclosure.

Heating can be provided as described in connection with FIGS. 2 and 3, as mentioned. With respect to cooling architectures that can be used, cooling coils with
10 refrigerant or expanding gas can be used in thermal communication with the thermal skin-treatment pad, for example. In one example, an electrocaloric cooling device or a thermoelectric cooler can be used. As an illustration, a polymer layered between a heat sink and a heat source can generate cooling when electric current is applied to the polymer touching the heat sink. The polymer may, for example, be such that the polymer
15 molecules become aligned to some degree, forcing heat into the heat sink, and then when the electrical current is turned off and the molecules relax, the temperature drops. Repetition of this type can lead to cooling using a small device that could be included in a hand-held device as described herein. There are also thermal chemical reactions that can be leveraged to generate cooling. In another example, cooling can be provided by
20 ammonium nitrate in water. For example, a particulate ammonium nitrate can be reacted with water to generate water cooling, which can be circulated to the thermal skin-treatment pad to provide cooling thereto. Alternatively, the cooling reaction chamber can be located just beneath the thermal skin-treatment pad. Either way, when the ammonium nitrate has been spent, the device can include a mechanism for replacement of the reactant, such as
25 by using a cartridge or other similar mechanism.

Whether heating or cooling, if a metal thermal skin-treatment pad is used, in one example, it can be constructed to include a metal selected from silver, gold, copper, or an alloy thereof. The thermal skin-treatment pad can be, in one example, plated with the metal or metal alloy, e.g., silver-plated, gold-plated, copper-plated, or plated with an alloy
30 of silver, gold and/or copper. These metals can be used for multiple purposes, including anti-microbial treatment of the skin and/or delivery of metal ions to the surface of the skin

in some examples. The metals can be in the form of elemental metals, or can be alloys, as mentioned. The alloys can include combinations of silver, gold, and/or copper, but can also include other elements, such as multivalent metals, e.g., e.g., zinc, iron, calcium, magnesium, manganese, , chromium, etc.; monovalent metals, e.g., potassium, sodium; 5 dopant such as alloys with silicon, oxygen, sulfur, phosphorus, etc.; and/or antioxidant compounds.

If a semi-precious stone skin-treatment pad is used, stone pads constructed from quartz and/or jade, for example, can be used. If quartz is used, in one specific example, the quartz can be rose quartz, which is pink in color and can display diasterism or star-like 10 concentrations of reflective and/or refractive properties. The color of rose quartz may often be due to the presence of trace amounts of titanium, iron, and/or manganese embedded or formed within the crystalline structure of the quartz material, but may also be due to the microscopic fibers of dumortierite, which is a variably colored aluminum boro-silicate material. The pink color may be due to the substitution of some iron and/or other trivalent 15 metals for some of the aluminum. The presence of some of these metals, and other elements and/or complexes in rose quartz, may be the reason rose quartz can provide a therapeutic effect when used on the surface of skin. In another example, there is also a type of pink quartz, sometimes called crystalline rose quartz, which can be used, though this material is rarer than rose quartz. The pink color may be caused by trace 20 concentrations of phosphate or aluminum. Both types of rose quartz, e.g., rose quartz and crystalline rose quartz, are considered to be "rose quartz" in accordance with the present disclosure. In further detail, rose quartz includes many different metals and minerals that can assist with healthy skin, including silicium, magnesium, iron, sodium, and oxygen. Rose quartz can also reduce inflammation as well as provide improved cellular renewal 25 and rejuvenation. The presence of oxygen rose quartz can act to enhance circulation and improve skin tone, luster, and glow. Other types of quartz that can be used for the thermal skin-treatment pad include colorless quartz crystals, such as Herkimer diamond or rock crystal; amethysts (rich in iron); amentrines; chalcedonies, such as agate, jasper, onyx, etc.; carnelian, milky, smoky, tiger's eye, citrine, prasiolite; dumortierite; aventurine; or the 30 like. These other types of quartz bring different levels of metals and other minerals to the skin surface, and can be used with similar effectiveness in many instances.

If jade is used, then any of the various types of jade can be selected for use, including nephrite, jadeite, and/or xiuyan jade semi-precious stones. There are more types of jades than these three green-types of jade stones, e.g., white jade. Jade can be used with heat and/or cooling to help improve skin elasticity, encourage lymphatic drainage, and/or help prevent wrinkles. Jade can also be used to introduce metals in trace amounts to the skin surface. The metal content of jade can include magnesium and calcium, which can be beneficial for treating the skin in accordance with examples of the present disclosure. The metal content of nephrite, for example, includes calcium, magnesium, and iron. These elements can be present in the form of the magnesium-iron rich amphibole mineral series tremolite, e.g., (calcium-magnesium)-ferroactinolite (calcium-magnesium-iron). One example chemical formulation for nephrite-type jade is $\text{Ca}_2\text{Mg}_5(\text{OH})_2(\text{Si}_4\text{O}_{11})_2$. Thus, like quartz, there can be a considerable concentration of silicon and oxygen. However, nephrite also includes relatively large concentrations of calcium and magnesium, as well as iron. These metals can, in some instances, be beneficial to skin treatment as described herein. Jadeite, on the other hand, is rarer than nephrite and often more desirable for use with jewellery, but in the context of the present disclosure, may not deliver as much metal content to the skin during use. That stated, it can still be used effectively. Jadeite is sometimes referred to as “elemental stone,” which is a misnomer because it is made up of several elements. Jadeite is a pyroxene with metal content including sodium, aluminum, and iron. An example general formula for jadeite is $\text{Na}(\text{Al}, \text{Fe}^{3+})\text{Si}_2\text{O}_6$. Thus, jadeite can be useful for delivery of particularly trivalent iron to the skin surface, along with sodium and aluminum. Xiuyan, on the other hand, is often rich in serpentine formations of metal and other mineral content, and can also include a particularly high concentration of magnesium, with a relatively small concentration of calcium, e.g., MgO at about 40 wt% to 44 wt%, SiO at about 42 wt% to about 45 wt%, Ca at about 0.13 wt%. If the intent is to use a jade with minimal metal interaction with the skin surface, than white jade can be selected for use, as it typically includes lower metal content than some of the green jades previously described. Regardless of the jade chosen for use, the application of heat and or cooling to the jade can provide beneficial properties to the skin surface, and can be used to conduct thermal heating and/or cooling as well as to introduce serums, moisturizers, or other fluids to the skin surface. For

example, jade can have the effect of flattening wrinkles and assist with reducing inflammation by clearing fluid congestion, e.g., lymphatic drainage. When used cold, it can help tighten pores and skin. Jade applied to the skin as described herein can also act to tone up facial muscles, increase circulation, and aid in the absorption of serums and/or moisturizers in some instances.

In other examples, there are auxiliary skin-treatment appliances that can be used that deliver treatments to the skin other than heat. Examples include ionic infusion therapy appliances such as that shown in FIGS. 4A and 4B, phototherapy appliances such as that shown in FIGS. 5A and 5B, radio frequency (RF) therapy appliances (not shown, but can be similar in configuration as that shown in FIGS. 5A and 5B but with RF emitters rather than LED phototherapy emitters), exfoliation therapy appliances such as a pumice stone or the microdermabrasion appliance shown in FIGS. 6A and 6B or the soft porous scrubber with an anti-microbial metal embedded or infused therein as shown in FIGS. 7A and 7B, massage therapy appliances for massaging the skin and underlying muscles as well as to provide a surface for working skin care fluids onto or into the skin as shown in FIGS. 8A and 8B. These various appliances are described in further detail hereinafter.

As shown in FIGS. 4A and 4B, the skin care device can, in some specific examples, include some of the same features described previously with respect to the skin-rejuvenation head 11, the neck portion 21, the grip portion (not shown), the energy dampening sleeve 13 including the thickened portion 13A, the support rod 23, the vibrational motor 16, the skin-cleansing bristles 14, etc. However, in this example, rather than a heating pad or a cooling pad, the auxiliary skin-treatment appliance can be an ionic infusion appliance 42 that conducts electrical current. The ionic infusion appliance can deliver a microcurrent, for example, from the same battery (not shown in these FIGS.) or power source that operates the vibrational motor, or by a separate power source or supply. The printed circuit board (not shown in these FIGS.) can thus be used to control the microcurrent applied to the ionic infusion appliance, or a separate control device can be used to control the microcurrent (separate from operation of the vibrational motor). In this example, there are microcurrent electrodes 48 that can be used to receive and transfer the microcurrent to the ionic infusion appliance. These electrodes are shown as a single pair of electrodes that are spaced apart at either end of the ionic infusion appliance (in cross-

section), but this is exemplary only, as the electrodes could be in the form of any number of electrodes in any number of configurations suitable for delivering the microcurrent to the conductive ionic infusion appliance, e.g., interdigitated finger electrodes, concentric ring electrodes, etc.

5 Microcurrent therapy, or ionic infusion therapy, can be used to delivery microcurrent to the skin of a user, using electrical current at from about 5 μ A up to about 1,000 μ A (1 mA), from about 10 μ A up to about 750 μ A, from about 10 μ A up to about 500 μ A, or from about 50 μ A up to about 400 μ A, for example. The microcurrent setting can be fixed, or can be provided at various levels, continuous variability or stepped/fixed μ A levels. The application of microcurrent can, in some applications, increase adenosine triphosphate (ATP), which is a source of energy synthesized from nutrients during cellular respiration. By increasing ATP at the skin, ion exchange across the cellular membrane can improve nerve conductivity, for example. Microcurrent can also promote fibroblast production, which correlate positively to collagen and elastin levels within the skin. Visible results can include wrinkle reduction (building collagen and elastin though the production of fibroblasts), reduced skin sagging, and in some instances can promote wound healing. Microcurrent can also have a positive impact on muscles underlying the skin, further contributing to skin firmness. In cases where there may be skin inflammation, microcurrent can in some instances promote healing with a reduction in swelling through the stimulation of lymphatic drainage. Microcurrent can also promote cellular uptake of nutrients, for example. Treatment for 3 to 15 minutes every day, twice a week, every week, every two weeks, every month, etc., can provide benefits. In further detail, by combining this type of therapy with the use of the skin-cleansing bristles and vibratory oscillation can provide a good combination of treatment that promotes healthy skin.

25 Alternatively, the device shown in FIGS. 4A and 4B can be constructed similarly, except that rather than an ionic infusion appliance, auxiliary skin-treatment appliance can be a radio frequency appliance for applying RF energy to a skin surface. RF energy can be used, for example, for skin tightening similar to that described with respect to ionic infusion therapy. The frequency of RF signals applied can be from about 350 kHz to about 550 kHz, or from about 400 kHz to about 500 kHz, for example, though other electromagnetic frequencies can be used as appropriate for a given skin treatment regimen. In one

example, skin tightening can be effective with frequencies of about 450 kHz. RF treatment can provide multiple functions, including providing heat to the treated tissues, as well as stimulating subdermal collagen production. This can result in skin tightening and wrinkle reduction, for example. As with ionic infusion, collagen and elastin building can occur, but in addition, RF treatment can cause apoptosis of fat cells, which results in reduced fat in the treated areas. Lax skin can thus be treated on the face, but also on other problematic areas, such as the stomach, thighs, upper arms, jowls, etc.

In FIGS 5A and 5B, the skin care device can, in some specific examples, include some of the same features described previously with respect to the skin-rejuvenation head 11, the neck portion 21, the grip portion (not shown), the energy dampening sleeve 13 including the thickened portion 13A, the support rod 23, the vibrational motor 16, the skin-cleansing bristles 14, etc. However, in this example, the auxiliary skin-treatment appliance can be a phototherapy appliance 52, such as an LED phototherapy appliance with LED sources 53, 54. The photo therapy appliance can be used for applying UV-light, visible light, or IR-light to a skin surface. There can be one type of LED light source present, or multiple types of light sources present, as shown in FIG. 5A. In some examples, the side of the skin care device with the skin-cleansing bristles may also include LED light sources, shown by example in FIG. 5B. More specific examples of LED light sources that can be used include blue light sources and/or red light sources. Blue light therapy, for example, can be used for treating acne and/or other similar conditions. This is because it can kill bacterial growth at the surface of the skin, and in some instances, just beneath the surface of the skin. Blue light can also calm inflammation in some instances. Red light therapy, on the other hand, can penetrate deeper into the skin than the blue light due to it having a longer light wavelength. By reaching layers deeper in the skin, red light therapy can reach where collagen and elastin are located at a greater concentration. Thus, red light therapy can rejuvenate damaged skin with broken or slowed metabolic activity, and can also rejuvenate capillaries, enhancing blood flow, bringing with that enhanced oxygen and nutrient levels. Application of both blue light and red light can be carried out simultaneously. Phototherapy can be carried out daily, weekly, bi-monthly, monthly, etc., taking into account the time of treatment, the intensity of light, and the condition being treated.

In another example as shown in FIGS. 6A and 6B, the skin care device can, in some specific examples, include some of the same features described previously with respect to the skin-rejuvenation head 11, the neck portion 21, the grip portion (not shown), the energy dampening sleeve 13 including the thickened portion 13A, the support rod 23, the vibrational motor 16, the skin-cleansing bristles 14, etc. However, in this example, the auxiliary skin-treatment appliance can be an exfoliation appliance 62, such as a porous stone, e.g., pumice stone (now shown), or alternatively, a substrate 63 embedded with particulates 64, such as aluminium oxide particulates or crystals. For example, as shown in this FIG., a polymeric substrate can include aluminium oxide particles (or crystals) that are embedded therein. The embedding can be by a thermal process, where a polymeric substrate, e.g., plastic substrate, is warmed to a softening temperature so that the aluminium oxide particles can be pressed or otherwise sink into the softened plastic substrate. As an alternative method, the polymeric substrate, e.g., plastic substrate, can be dipped in a mixture of the aluminum oxide particles and a softening solvent vehicle, such as methyl ethyl ketone (MEK) for a short period of time, e.g., 10 seconds to 2 minutes, 10 seconds to 50 seconds, etc., and then the substrate is removed for hardening. In this example, the MEK softens the plastic of the substrate, allowing aluminum oxide particles to become embedded. After it plastic hardens again they are embedded within the plastic. In preparation of the exfoliation appliance of this type, aluminium oxide crystals can be selected to at a particle size and added at a density to provide an 80 grit to 300 grit, a 150 grit to 250 grit, or an 80 grit to 150 grit exfoliation surface. Notably, the aluminum oxide particles, e.g., crystals, can be present as one of multiple types of particulates included on the exfoliation appliance. For example, the particulates can be a combination of aluminum oxide crystals mixed with a second type(s) of particles.

In another example as shown in FIGS. 7A and 7B, the skin care device can, in some specific examples, include some of the same features described previously with respect to the skin-rejuvenation head 11, the neck portion 21, the grip portion (not shown), the energy dampening sleeve 13 including the thickened portion 13A, the support rod 23, the vibrational motor 16, the skin-cleansing bristles 14, etc. However, in this example, the auxiliary skin-treatment appliance can be a soft porous scrubber 72 selected from a natural loofah, a natural sponge, a synthetic mesh loofah, a synthetic sponge, for example. The

soft-porous scrubber can likewise be a pouf or a nylon (or other type) mesh. The nylon mesh, for example, can be configured or bunched in a manner to provide increased cleaning surface are compared to a flat mesh. In one example, the soft porous scrubber can include an anti-microbial metal 74 associated therewith. For example, the anti-

5 microbial metal can include elemental silver, elemental copper, elemental gold, alloys of silver, alloys of copper, alloys of gold, ionic silver, ionic copper, ionic gold, a silver compound, a copper compound, a gold compound, or combinations thereof.

To provide an example, the soft porous scrubber can be a synthetic mesh loofah that can be treated with a silver. The silver can be applied using anti-bacterial solution or

10 dispersion to provide a source of silver ions to the loofah. Example silver sources include colloidal silver (elemental silver particles or colloids, e.g., nanoparticles or microparticles), silver chloride (AgCl_2), silver nitrate (AgNO_3), silver sulfadiazine, silver zeolite (e.g., aluminosilicate with silver ions carried by micropores), etc. Silver and/or other anti-

15 microbial metals can be used in combination as alloys, or as alloys with other metals, oxidizers, or even UV light for anti-microbial effect with added effectiveness in some examples. In an alternative example, with respect to the natural loofahs, these can be naturally harvested materials used for cleansing the skin. For example, a natural loofah can be harvested naturally from the fibrous interior of a mature loofah fruit that resembles a marrow, and then is dried for uses as a natural sponge for cleaning the body. A loofah

20 (synthetic or natural), or any of the other soft porous scrubbers described herein, can be loaded with an anti-microbial metal, such as by metal or metal compound adsorption on a surface, impregnation into pores or openings, or infused into a material of the soft porous scrubber, etc.

An example of a technology where silver salt is loaded onto or into fabrics/textiles to

25 prevent bacterial odors and to provide other antimicrobial properties is available under the trade name Polygiene®, from Polygiene AB (Sweden). Polygiene® has been used primarily for fabrics associated with sportswear. This type of silver treatment, or any other type of anti-bacterial metal treatment described herein can thus be used to provide antimicrobial activity to the soft porous scrubbers of the present disclosure, including when

30 used as the auxiliary skin-treatment appliance described herein.

In one example where a particulate silver source is used to provide silver ions to the soft porous scrubber, particularly when wetted and in use, the particulate silver source can be one to two orders of magnitude larger than many conventional nanoparticles, e.g., from hundreds of nanometers in size to particles in the micron range, e.g., 250 nm to 10 μ m, 500 nm to 10 μ m, 750 nm to 10 μ m, from 1 μ m to 10 μ m, from 250 nm to 1 μ m, from 500 nm to 5 μ m, etc. As larger particles, they may be too large to penetrate the skin, but rather, simply be used as an effective surface antimicrobial ion source.

In another example as shown in FIGS. 8A and 8B, the skin care device can, in some specific examples, include some of the same features described previously with respect to the skin-rejuvenation head 11, the neck portion 21, the grip portion (not shown), the energy dampening sleeve 13 including the thickened portion 13A, the support rod 23, the vibrational motor 16, the skin-cleansing bristles 14, etc. However, in this example, the auxiliary skin-treatment appliance can be a massaging appliance 82 with massaging relief features 84, e.g., ridges, bumps, valleys, divots, or the like. In one example, the massaging appliance (including massaging relief features) can be of the same material as the energy dampening sleeve large. For example, the massaging features can be constructed of thickened portions of raised features such as ridges, bumps, etc., or thickened portions can defined thinner portions of recessed features such as voids, valleys, divots, etc. These massaging relief features can be formed using the material of the energy dampening sleeve, e.g., part of a continuous energy dampening sleeve that provides the massaging features. In another example, the massaging features can be constructed beneath the energy dampening sleeve, and the sleeve can act to cover the features constructed therebeneath. In another example, the massaging appliance can be of a different material than the energy dampening sleeve, if present at the skin-rejuvenation head. Regardless of how constructed, with raised or recessed features, these features can have a height or depth suitable so that when massaging the skin, skin care fluid, e.g., serums, can collect or become pooled where the massaging appliance does not contact the skin, thus providing a reservoir to draw from during application, thus prolonging the amount of time that massaging with serum or other skin care fluid can occur. Example relief feature height or depth, notated in FIG. 8B as "H," comparing the highest point to the lowest point on the

massaging appliance, can be from about 1/32 inch to about 3/8 inch, from 1/16 inch to 1/4 inch, from 1/32 to 1/8 inch, or from 1/8 inch to 3/8 inch, for example.

In accordance with examples of the present disclose, the devices herein can be used as part of a system or kit, where the skin care device is co-packaged or used
5 together with any of a number of skin care fluids, such as serums, essences, ampoules, moisturizers, creams or ointments, topical pharmaceuticals, topical nutricosmetics or cosmeceutics, or the like. These types of skin care fluids can carry compounds to the skin, and can include a liquid carrier, e.g., aqueous carrier or oil-based carrier, which carry an active ingredient to (or into) the epidermis. Example oils can include argan oil, rose oil,
10 vitamin oil, seed oil, e.g., pomegranate seed oil, rose hip see oil, etc., jojoba oil, nut oil, e.g., macadamia nut oil, kukui nut oil, etc., oil from fruit or flowers, e.g., apricot kernal oil, orange oil, lemon oil, neroli flower oil, jasmine oil, coconut oil, etc., aloe, hemp oil, or the like. The oil can act as the active ingredient in part, or can be merely a carrier for an active ingredient. Active ingredients, on the other hand, can include metal(s) and other minerals,
15 antioxidant(s), fatty acids, vitamins, e.g., vitamin E, vitamin C, vitamin A, etc., drugs, other anti-aging compounds, anti-inflammatory agents, e.g., aloe, green tea, etc., organic acids, e.g., mandelic acid, malic acid, hyaluronic acid, salicylic acid, etc., skin-brightening compounds, anti-acne compounds, e.g., salicylic acid, antimicrobial compounds, e.g., colloidal or ionic silver compounds, hydrating compounds, proteins, peptides, amino acids,
20 amino acid chelates or other chelates, or the like. In one example, the skin care devices described herein can include an anti-aging or an anti-wrinkle serum, such as a serum with mandelic acid and/or malic acid. In another example, the serum can include a peptide.

In accordance with another example, method of skin rejuvenation can include using any of the devices described herein for cleansing the skin using the skin-cleansing bristles with a solvent,
25 such as water or other solvent, and optionally a surfactant or other skin cleanser. The various methods can further include, depending on which device is being used, treating the skin using the auxiliary skin-treatment appliance. The step of treating the skin can include, for example, using the auxiliary skin-treatment appliances found on the same skin-rejuvenation head as the skin cleansing bristles (used in the first step). Examples of using such an appliance may include heating and/or
30 cooling the skin using a metal thermal skin-treatment pad, e.g., metal or metal alloy or plated metal or plated metal alloy which may include silver, gold, copper, etc. Another example may include heating and/or cooling the skin using a semi-precious stone pad as described on the skin care

devices herein, e.g., quartz skin-treatment pad and/or jade skin-treatment pad, etc. Using the auxiliary skin-treatment appliance may likewise include working serums or other skin care fluids into the skin using the appliance (with or without heat and/or cooling, e.g., metal or semi-precious stone pads); exfoliating the skin using an exfoliation pad described herein; treating the skin with phototherapy using a phototherapy appliance described herein, e.g., blue light, red light, alternating blue light and red light, simultaneous blue light and red light, UV light (such as for antimicrobial treatment), IR light (such as for deep skin penetration), etc; treating the skin with RF energy at frequencies to promote skin tightening; scrubbing the skin with one of the soft porous scrubbers (with or without the antimicrobial metal); etc. Other methods may include using an auxiliary skin-treatment appliance to transfer beneficial metal and/or minerals to or into the skin surface. For example, metal ions can be transferred to the skin surface using metal skin-treatment pads, e.g., ionic silver or other metal transfer from metal skin treatment pads with or without the use of serums or other fluids, metal or mineral transfer from mineral rich quartz or jade skin-treatment stone pads, e.g., rose quartz or nephrite jade, etc. These methods can be implemented with vibrational energy to one or both steps, namely the step of cleansing the skin using the skin-cleansing bristles and/or the step of treating the skin using the auxiliary skin-treatment appliance (of any of the types described herein). Vibratory oscillation can be at any frequency described herein, but in one example, can be at least 7,000 VPM, from 7,000 VPM to 12,000 VPM, or from 8,000 VPM to 10,000 VPM.

It is noted that, as used in this specification and the appended claims, the singular forms “a,” “an,” and “the” include plural referents unless the context clearly dictates otherwise. In describing and claiming the teachings of the present disclosure, the following terminology will be used in accordance with the definitions set forth below.

Dimension, amounts, concentrations, and other numerical data may be expressed or presented herein in a range format. It is to be understood that such a range format is used merely for convenience and brevity and thus should be interpreted flexibly to include not only the numerical values explicitly recited as the limits of the range, but also to include all the individual numerical values or sub-ranges encompassed within that range as if each numerical value and sub-range is explicitly recited.

As an illustration, a numerical range of “about 10 to about 50” should be interpreted to include not only the explicitly recited values of about 10 to about 50, but also to include individual values and sub-ranges within the indicated range. Thus, included in this numerical range are individual values such as 20, 30, and 40 and sub-ranges such as from

10-30, from 20-40, and from 30-50, etc. This same principle applies to ranges reciting only one numerical value. Furthermore, such an interpretation should apply regardless of the breadth of the range or the characteristics being described.

5 It is to be understood that the above-referenced arrangements are only illustrative of the application of the principles of the present disclosure. Numerous modifications and alternative arrangements can be devised without departing from the present disclosure. While the present disclosure has been shown in the drawings and fully described above with particularity and detail in connection with what is presently deemed to be the most practical embodiment(s) of the disclosure, it will be apparent to those of ordinary skill in the art that numerous modifications can be made without departing from the principles and concepts of the disclosure as set forth herein.

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CLAIMS

What is claimed is:

- 5 1. A skin care device, comprising:
a skin-rejuvenation head including a first external region and a second external
region, the first external region including an array of skin-cleansing bristles and the second
external region including an auxiliary skin-treatment appliance of a type than the skin-
cleansing bristles, wherein the skin-rejuvenation head includes a vibrational motor
10 positioned therein to provide vibratory oscillation to both the skin-cleansing bristles and the
auxiliary skin-treatment appliance;
a support rod mechanically coupled to the skin-rejuvenation head; and
a handle including a neck portion and a grip portion, the support rod also coupled to
the handle, wherein the neck portion is proximal to the skin-rejuvenation head and the grip
15 portion is distal to the skin-rejuvenation head, the neck portion including an energy
dampening sleeve that surrounds the support rod, leaving a gap around the support rod.
2. The skin care device of claim 1, wherein the energy dampening sleeve surrounds
the support rod and leave an air gap around the support rod within the neck portion, the
20 support rod connecting to the handle within the grip portion.
3. The skin care device of claim 2, wherein the energy dampening sleeve does not
provide enough structural support to support the skin-rejuvenation head in an upright
position relative to the handle without the presence of the support rod.
- 25 4. The skin care device of claim 1, wherein the skin care device includes a rubber
sleeve that covers at least part of the grip portion, the neck portion, and at least part of the
skin-rejuvenation head, wherein the energy dampening sleeve at the neck portion is part of
the rubber sleeve, and wherein the energy dampening sleeve has an average outer wall
30 thickness that is greater than the average outer wall thickness of rubber sleeve at the skin-
rejuvenation head, the grip portion, or both.

5. The skin care device of claim 1, wherein the neck portion includes a narrow a cross-sectional area that is from 4 to 15 times smaller in area than at least one a cross-sectional area of the grip portion.

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6. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance is a metal skin-treatment pad thermally coupled to a heating source or cooling source.

7. The skin care device of claim 6, wherein the metal skin-treatment pad includes
10 silver, gold, copper, or alloys thereof.

8. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance includes a semi-precious stone pad selected from quartz or jade.

15 9. The skin care device of claim 8, wherein the semi-precious stone pad is thermally coupled to a heating source or cooling source.

10. The skin care device of claim 8, wherein the semi-precious stone pad includes
20 rose quartz.

11. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance is an ionic infusion appliance for applying a microcurrent to a skin surface.

12. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance
25 is an LED phototherapy appliance for applying UV-light, visible light, or IR-light to a skin surface.

13. The skin care device of claim 12, wherein the LED phototherapy appliance is
30 configured to deliver blue light, red light, or both to the skin surface.

14. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance is a radio frequency device for applying RF energy to a skin surface.

15. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance
5 is a soft porous scrubber selected from a natural loofah, a natural sponge, a synthetic loofah, a synthetic sponge, a pouf, or a mesh

16. The skin care device of claim 15, wherein the soft porous scrubber includes an anti-microbial metal associated therewith, the antimicrobial metal in the form of elemental
10 silver, elemental copper, elemental gold, alloy of silver, alloy of copper, alloy of gold, ionic silver, ionic copper, ionic gold, silver compound, copper compound, gold compound, or combinations thereof.

17. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance
15 is a skin exfoliator including a pumice stone.

18. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance is a skin exfoliator including aluminum oxide crystals embedded in a support substrate.

20 19. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance is a massaging appliance including massaging relief features.

20. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance is constructed of the same material as the skin-cleansing bristles.

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21. The skin care device of claim 20, wherein the auxiliary skin-treatment appliance and the skin-cleansing bristles are both constructed from silicone rubber.

22. The skin care device of claim 1, wherein the vibrational motor is oscillatable at
30 one or more setting from 7,000 VPM to 12,000 VPM.

23. The skin care device of claim 1, wherein the support rod is a rigid spring or includes a spring.

24. The skin care device of claim 1, wherein the support rod includes a flexible
5 metal or plastic rod.

25. The skin care device of claim 1, wherein the skin-cleansing bristles are constructed of a hypoallergenic polysiloxanes or silicone rubber material.

10 26. The skin care device of claim 1, wherein the skin-cleansing bristles are from 1/16 inch to 3/8 inch in length on average, and are present on the head at a density from 100 bristles per square inch to 500 bristles per square inch.

15 27. The skin care device of claim 1, wherein the skin-cleansing bristles at the first external region have a skin-contact surface area of 2 square inches to 35 square inches.

28. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance at the second external region has a skin-contact surface area of 2 square inches to 35 square inches.

20 29. The skin care device of claim 1, wherein the skin-cleansing bristles include two discrete locations of bristles, wherein the first external region includes bristles at a first bristle density and a second external region includes bristles at a second bristle density.

25 30. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance is of a different material than the skin-cleansing bristles.

31. The skin care device of claim 1, wherein the auxiliary skin-treatment appliance is of the same material than the skin-cleansing bristles.

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32. A skin care device, comprising:

skin-cleansing bristles at a first external region;

a metal skin-treatment pad at a second external region, wherein the metal skin-treatment pad includes a metal selected from silver, gold, copper, or an alloy thereof, and
5 wherein metal skin-treatment pad is temperature controllable as a heating pad, a cooling pad, or both; and

a vibrational motor positioned to provide vibratory oscillation to both the skin-cleansing bristles and to the metal skin-treatment pad.

10 33. The skin care device of claim 32, wherein the metal skin-treatment pad includes silver or a silver alloy.

34. The skin care device of claim 32, wherein the metal skin-treatment pad includes gold or a gold alloy.

15 35. The skin care device of claim 32, wherein the metal skin-treatment pad includes copper or a copper alloy.

20 36. The skin care device of claim 32, wherein the metal skin-treatment pad includes a substrate that is silver-plated, gold-plated, copper-plated, or plated with an alloy thereof.

37. The skin care device of claim 32, wherein the metal skin-treatment pad is associated with a heating source to provide heat to a skin surface through the metal skin-treatment pad.

25 38. The skin care device of claim 32, wherein the metal skin-treatment pad is associated with a cooling source to provide cooling to a skin surface through the metal skin-treatment pad.

39. The skin care device of claim 32, wherein the skin-cleansing bristles, the metal heating pad, and the vibrational motor are all integrated as part of a skin-rejuvenation head, and wherein the head is attached to a handle.

5 40. A skin care device, comprising:
skin-cleansing bristles at a first external region;
a semi-precious stone skin-treatment pad at a second external region; and
a vibrational motor positioned to provide vibratory oscillation to both the skin-cleansing bristles and to the semi-precious skin-treatment stone pad.

10 41. The skin care device of claim 40, wherein semi-precious skin-treatment stone pad is thermally coupled to a heating source, a cooling source, or both.

15 42. The skin care device of claim 40, wherein the semi-precious skin-treatment stone pad is a quartz stone pad.

 43. The skin care device of claim 42, wherein the quartz stone pad is a rose quartz stone pad.

20 44. The skin care device of claim 43, wherein the rose quartz stone pad is thermally coupled to a heating source, a cooling source, or both to provide heat to a skin surface through the rose quartz stone pad.

25 45. The skin care device of claim 40, wherein the semi-precious skin-treatment stone pad is a jade stone pad.

 46. The skin care device of claim 45, wherein the jade stone pad is thermally coupled to a heating source, a cooling source, or both.

47. The skin care device of claim 40, wherein the skin-cleansing bristles, the semi-precious skin-treatment stone pad, and the vibrational motor are all integrated as part of a skin-rejuvenation head, and wherein the head is attached to a handle.

5 48. A skin care device, comprising:
skin-cleansing bristles at a first external region;
an exfoliation pad at a second external region, the exfoliation pad including a
substrate with aluminum oxide particulates attached thereto; and
a vibrational motor positioned to provide vibratory oscillation to both the skin-
10 cleansing bristles and to the exfoliation pad.

49. The skin care device of claim 48, wherein the exfoliation pad includes 80 grit to 300 grit exfoliation surface.

15 50. The skin care device of claim 48, wherein the substrate is a plastic substrate, and the aluminum oxide particulates are embedded therein by softening the substrate and pressing the aluminum oxide particulates therein.

20 51. The skin care device of claim 48, wherein the skin-cleansing bristles, the exfoliation pad, and the vibrational motor are all integrated as part of a skin-rejuvenation head, and wherein the head is attached to a handle.

25 52. A skin care device, comprising:
skin-cleansing bristles at a first external region;
a soft porous scrubber a second external region; and
a vibrational motor positioned to provide vibratory oscillation to both the skin-
cleansing bristles and to the soft porous scrubber.

30 53. The skin care device of claim 52, wherein the soft porous scrubber includes an anti-microbial metal associated therewith.

54. The skin care device of claim 53, wherein the anti-microbial metal includes elemental silver, elemental copper, elemental gold, alloys of silver, alloys of copper, alloys of gold, ionic silver, ionic copper, ionic gold, a silver compound, a copper compound, a gold compound, or combinations thereof.

5

55. The skin care device of claim 53, wherein the anti-microbial metal includes a portion being adsorbed on a surface of the soft porous scrubber.

56. The skin care device of claim 53, wherein the anti-microbial metal includes a portion being impregnated into pores of the soft porous scrubber, infused into a material of the soft porous scrubber, or both.

10

57. The skin care device of claim 53, wherein the anti-microbial metal is in the form of a silver salt that is applied as a silver salt solution and then dried.

15

58. The skin care device of claim 53, wherein the anti-microbial metal is in the form of silver particles having a particle size from 250 nm to 10 μ m.

20

59. The skin care device of claim 52, wherein the soft porous scrubber is a natural loofah or a natural sponge.

60. The skin care device of claim 52, wherein the soft porous scrubber is a synthetic loofah, a synthetic sponge, a synthetic pouf, or a synthetic mesh.

25

61. The skin care device of claim 52, wherein the skin-cleansing bristles, the soft porous scrubber, and the vibrational motor are all integrated as part of a skin-rejuvenation head, and wherein the head is attached to a handle.

30

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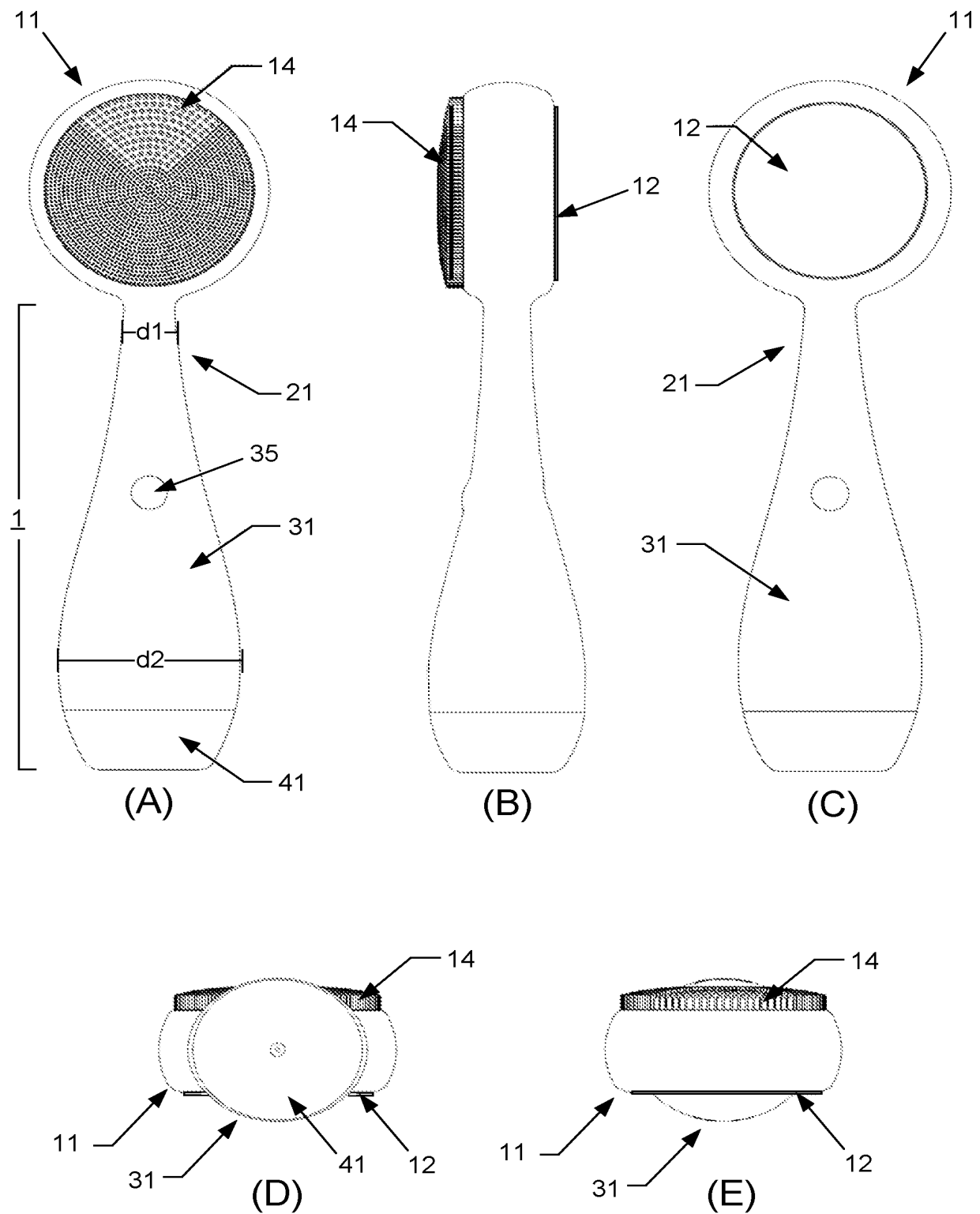
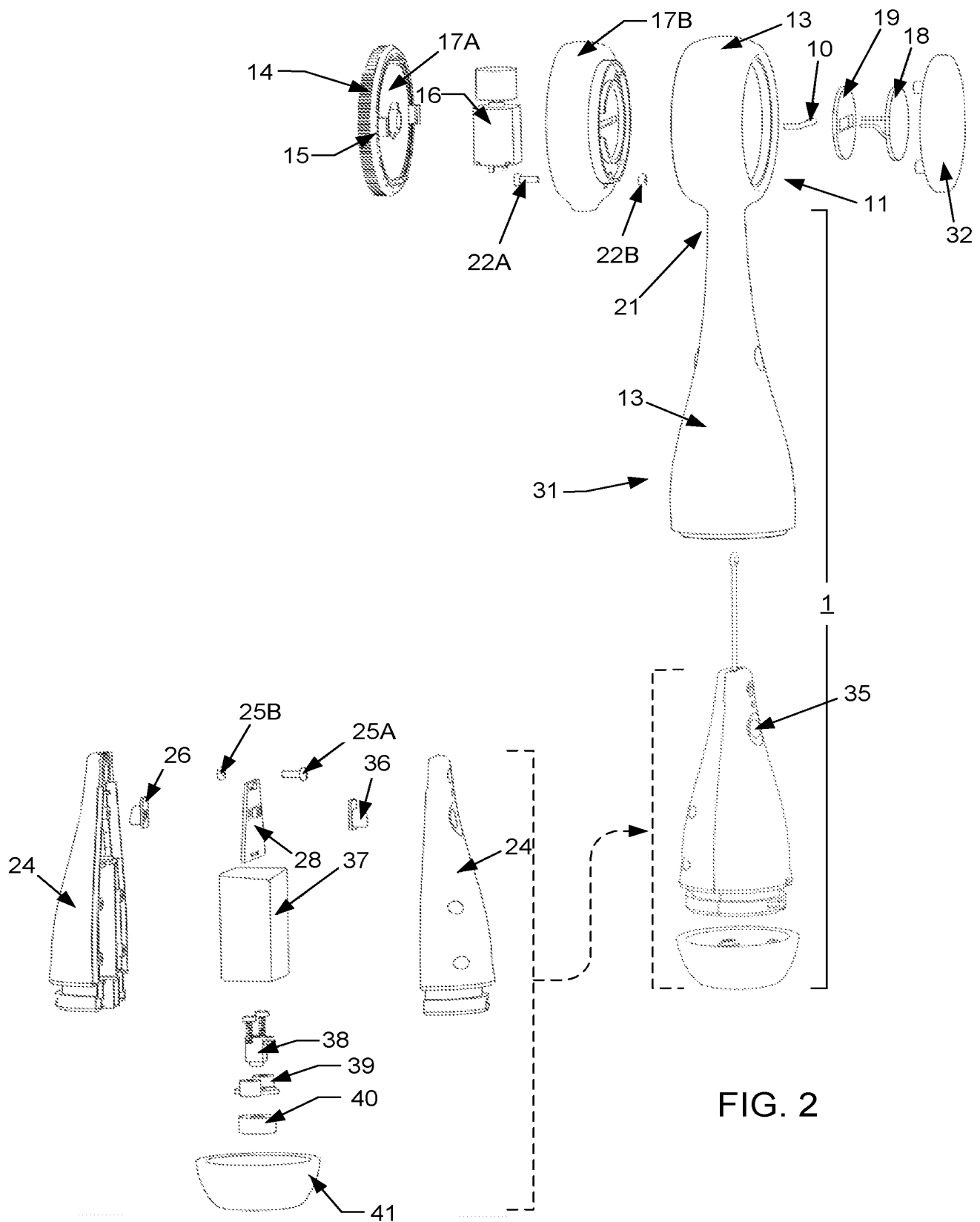


FIG. 1

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3/6

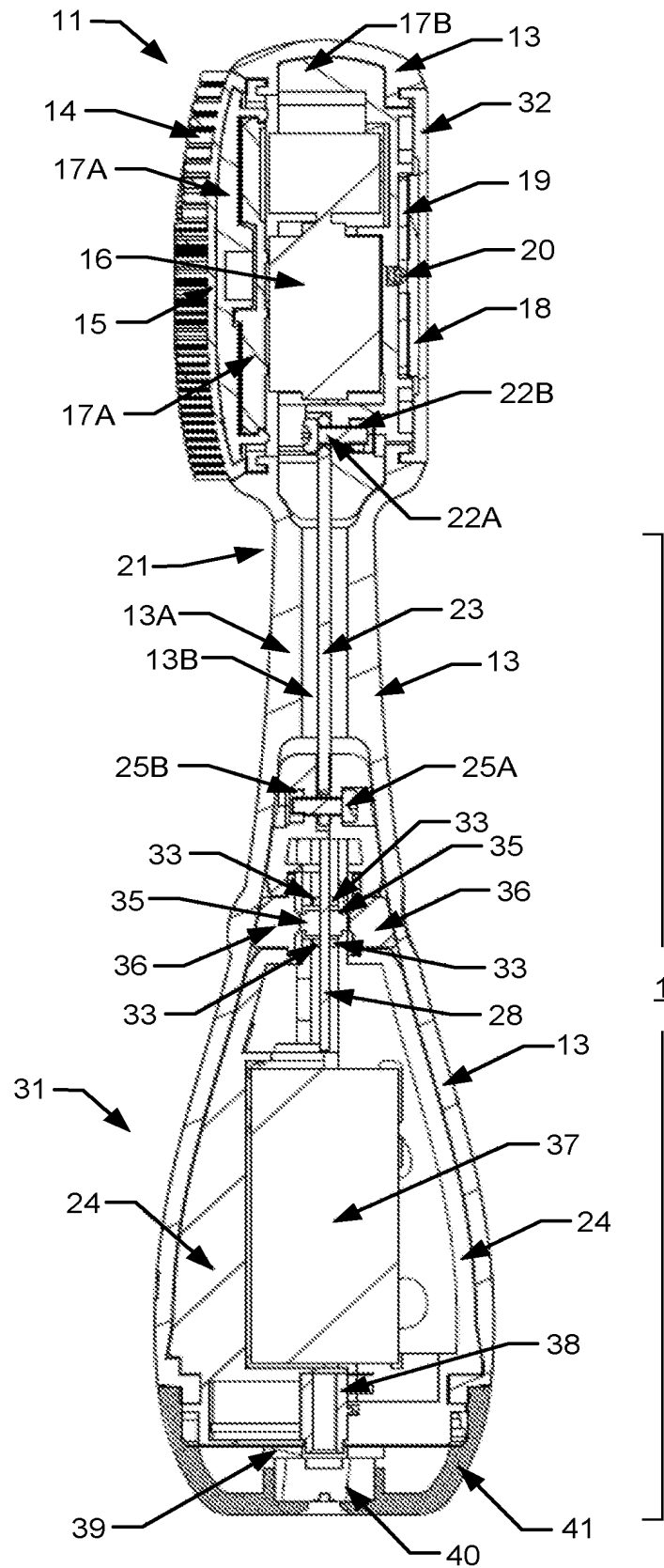


FIG. 3

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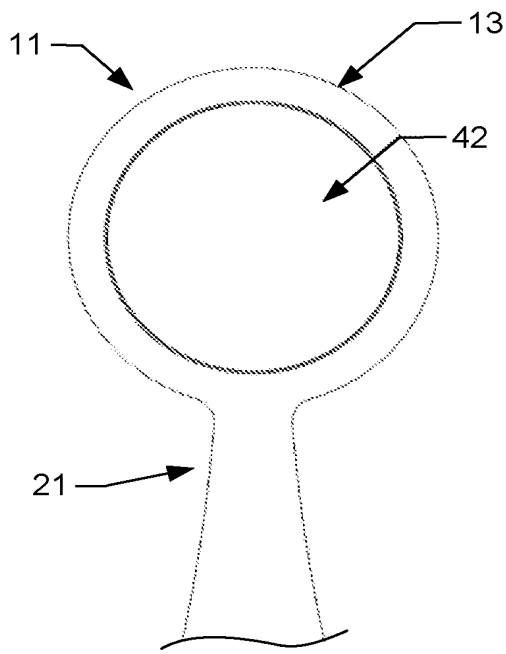


FIG. 4A

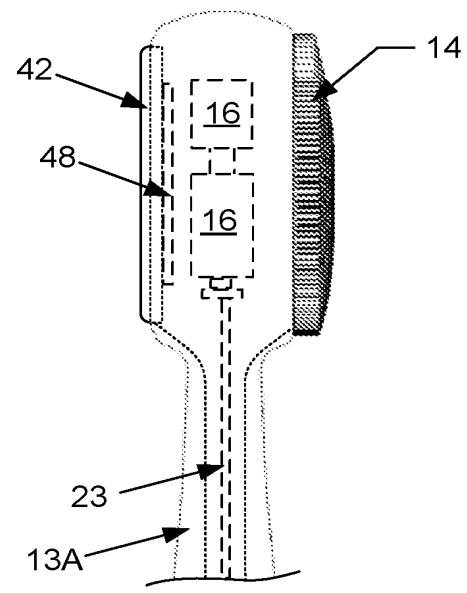


FIG. 4B

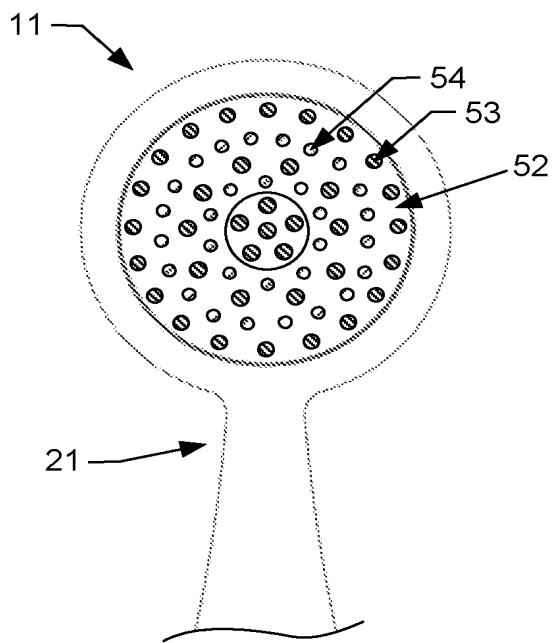


FIG. 5A

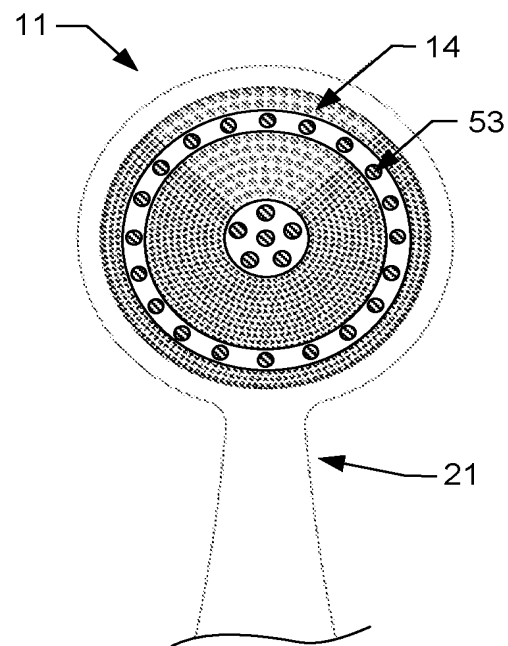


FIG. 5B

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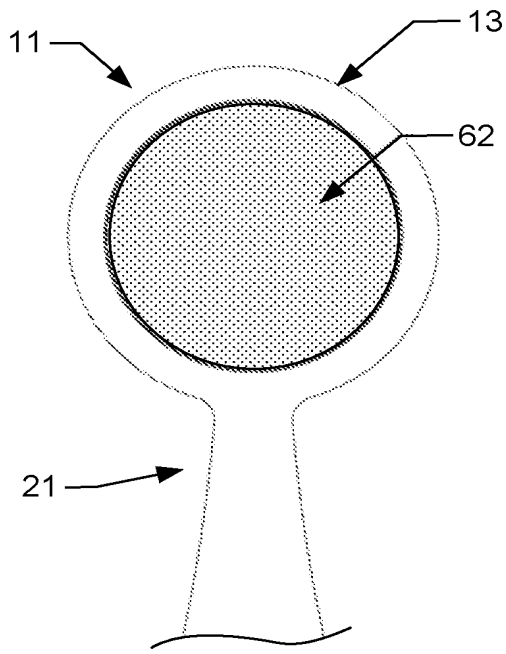


FIG. 6A

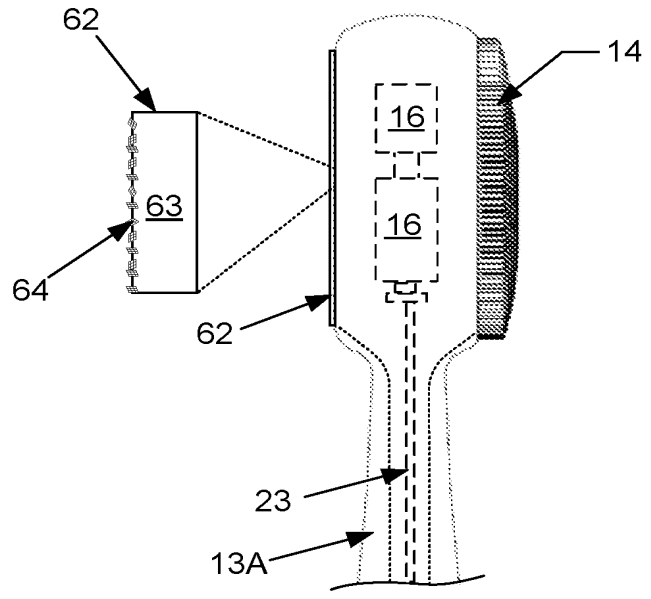


FIG. 6B

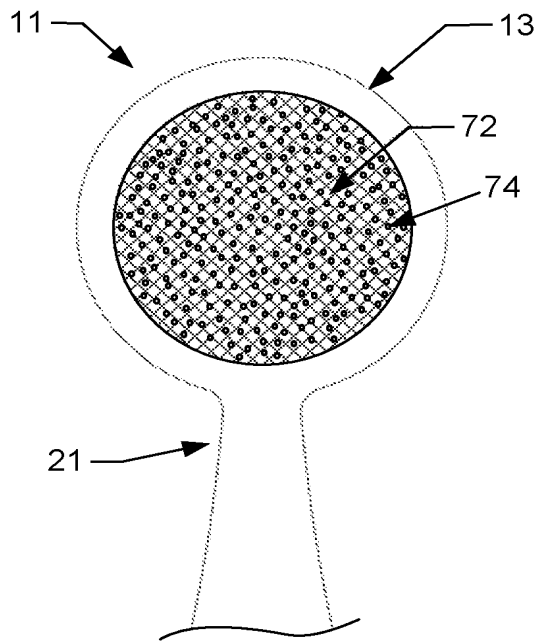


FIG. 7A

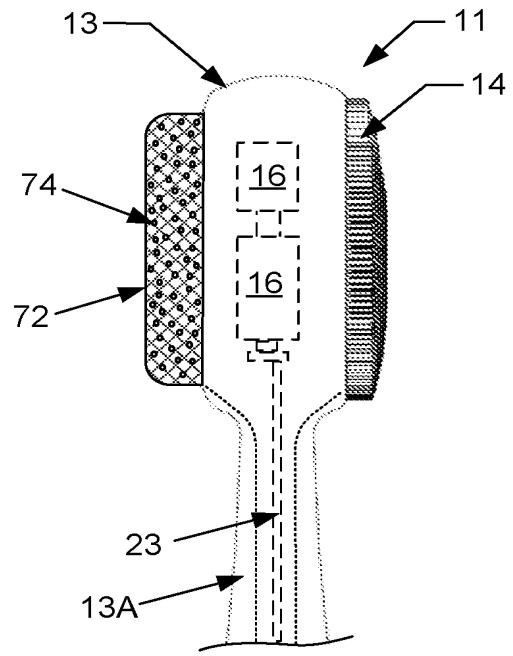


FIG. 7B

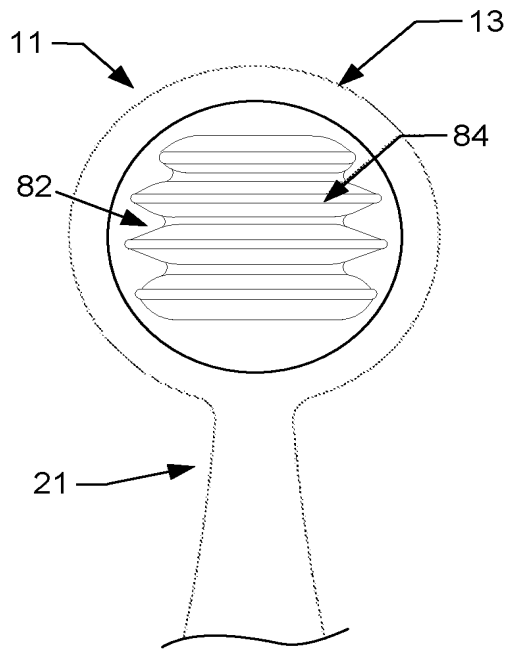


FIG. 8A

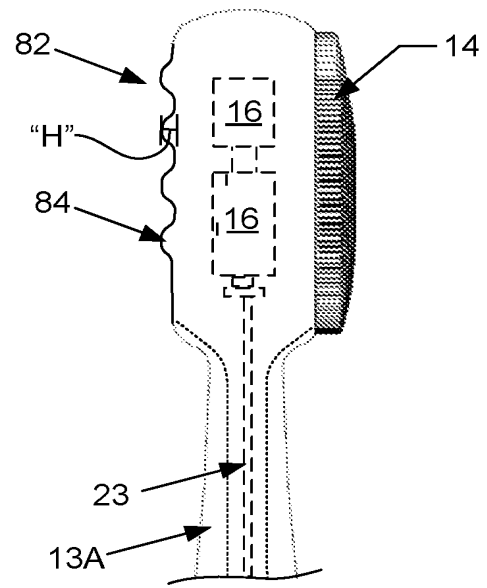


FIG. 8B

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 20/17247

A. CLASSIFICATION OF SUBJECT MATTER

IPC - A47K 7/04, A61H 23/02 (2020.01)

CPC - A47K 7/04, A61H 7/005, A61H 23/02, A61H 2201/0207, A61H 2201/5035, A61H 2205/022, A61H 7/002, A61H 2201/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

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

See Search History document

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

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y --- A	US 2008/0243039 A1 (Rhoades) 2 October 2008 (02.10.2008), entire document, especially Fig. 1-3, 4A-4B, para [0021], [0022], [0034], [0048], [0054], [0059], [0080], [0081], [0084]	40-42, 47-49, 51-52, 59-61 ----- 1-3, 5-39, 43-46, 50 ----- 4, 55-57
Y	US 9,364,649 B2 (Amorepacific Corporation) 14 June 2016 (14.06.2016), entire document, especially Fig. 2, col. 4 ln. 2, 7-11	7, 32-39
Y	US 6,514,132 B2 (Park) 4 February 2003 (04.02.2003), entire document, especially abstract	36
Y --- A	US 9,533,479 B2 (Yao et al.) 3 January 2017 (03.01.2017), entire document, especially col. 3 ln. 15-17, 37-39	16, 53-54, 58 ----- 55-57
Y	US 2004/0197419 A1 (Cole et al.) 7 October 2004 (07.10.2004), entire document, especially para [0007], [0009]	10, 43-46
Y	US 2005/0107806 A1 (Greenberg) 19 May 2005 (19.05.2005), entire document, especially para [0049]	18, 50

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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9 April 2020

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 20/17247

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y --- A	US 4,149,530 A (Gow) 17 April 1979 (17.04.1979), entire document, especially Fig. 1-4, col. 3 ln. 19-20, col. 4 ln. 38, 44	1-3, 5-31 ----- 4
Y	WO 2014/106812 A2 (Sedic) 10 July 2014 (10.07.2014), entire document, especially Fig. 2-3, para [0017]; para[0020];	29
Y	US 9,675,407 B2 (Chongqing Peninsula Medical Technology Co. Ltd.) 13 June 2017 (13.06.2017), entire document, especially abstract	14
Y	US 7,434,288 B2 (Gavney, Jr.) 14 October 2008 (14.10.2008), entire document, especially col. 10 ln. 6-8	21, 25
A	US 5,495,632 A (Baker) 5 March 1996 (05.03.1996), entire document	1-61
A	US 2007/0198031 A1 (Kellogg) 23 August 2007 (23.08.2007), entire document	1-61
A	US 3,906,940 A (Kawada) 23 September 1975 (23.09.1975), entire document	1-61
A	US 3,467,080 A (McNair) 16 September 1969 (16.09.1969), entire document	1-61
A	US 9,801,448 B1 (Jakubow) 31 October 2017 (31.10.2017), entire document	1-61
A	EP 3 254 584 A1 (Compaselect GmbH) 10 June 2016 (10.06.2016), entire document	1-61

Form PCT/ISA/210 (continuation of second sheet) (July 2019)



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CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO,

DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,
HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP,
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Declarations under Rule 4.17:

- as to the identity of the inventor (Rule 4.17(i))
- as to applicant's entitlement to apply for and be granted a
patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the
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(54) Title: ABRASIVE SKIN CARE APPLIANCES

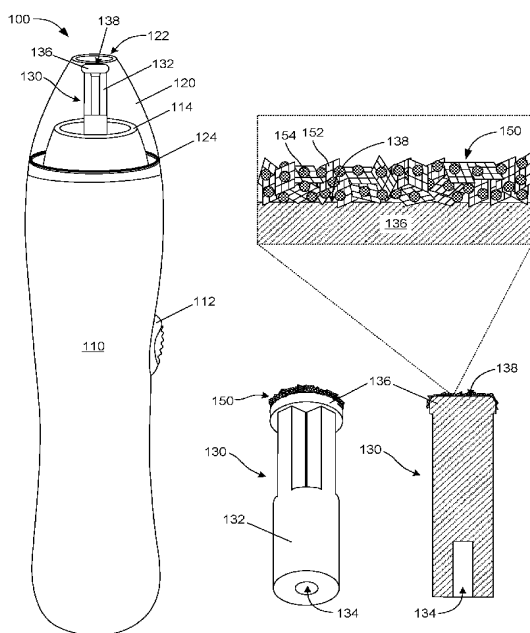


FIG. 1

(57) Abstract: The present disclosure is drawn to an abrasive skin care
appliance, which can include a facial surface having an abrasive matrix
attached thereto, wherein the abrasive matrix comprises abrasive crystals
having an average particle size from 25 μm to 250 μm and a plurality of
metal-containing particles having an average particle size from 5 nm to 2
 μm associated with surfaces of the abrasive crystals.

Published:

- *without international search report and to be republished
upon receipt of that report (Rule 48.2(g))*

5

ABRASIVE SKIN CARE APPLIANCES

BACKGROUND

Skin care is a rapidly evolving industry where treatment devices, skin care
10 formulations, and related treatment protocols are being developed on nearly a continuous
basis. Dermal treatment to promote or prolong the appearance of healthy skin, particularly
facial skin, can be complicated for consumers, as there are many choices available and
some approaches tend to work better than others for a given skin care goal and skin type.
For example, skin cleansing and treatment for antimicrobial purposes (e.g., acne), may
15 demand a different group of treatment protocols than skin tightening or
microdermabrasion, and even within a narrower category of treatment, there can be many
choices.

BRIEF DESCRIPTION OF THE DRAWINGS

20

FIG. 1 illustrates a schematic view of an example microdermabrasion skin care
device with multiple views of an example abrasive skin care appliance attached or
attachable thereto in accordance with the present disclosure;

25 FIG. 2 illustrates schematic views of alternative example abrasive skin care
appliances and associated example interchangeable vacuum chambers in accordance
with the present disclosure;

FIG. 3 illustrates a schematic view of an example manual abrasive skin care
appliance in accordance with the present disclosure;

30 FIG. 4 illustrates multiple views of an example vibratory skin care device with an
example abrasive skin care appliance attached thereto in accordance with the present
disclosure;

FIG. 5 illustrates a more detailed view of a side view of the example skin care device of FIG. 4 in accordance with the present disclosure; and

FIG. 6 provides various magnified images of example abrasive matrices applied to facial surfaces of abrasive skin care appliances in accordance with the present disclosure.

5

DETAILED DESCRIPTION

The present disclosure is drawn to abrasive skin care appliances, which can be in the form of skin care devices, attachments for skin care devices, inserts for skin care devices, or the like. In one example, an abrasive skin care appliance can include a facial surface having an abrasive matrix attached thereto, wherein the abrasive matrix comprises abrasive crystals having an average particle size from 25 μm to 250 μm and a plurality of metal-containing particles having an average particle size from 5 nm to 2 μm associated with surfaces of the abrasive crystals. The abrasive crystals can include aluminum oxide particles, magnesium oxide particles, sodium chloride particles, sodium bicarbonate particles, or diamond particles, for example. In one example, the abrasive crystals can have an average particle size from 40 μm to 180 μm and/or the grit count of the abrasive matrix can be from 80 to 280. In one example, the metal-containing particles can have an average particle size from 15 nm to 1 μm in some examples. The metal-containing particles can include gold particles or gold alloy particles, silver particles or silver alloy particles, copper particles or copper alloy particles, zinc particles or zinc alloy particles, platinum particles or platinum alloy particles, or a combination thereof. Alternatively, the metal-containing particles can be a metal salt of gold, silver, copper, zinc, and/or platinum. The abrasive crystals and the metal-containing particles can be present in the abrasive matrix at a weight ratio from 3:1 to about 500:1. In one example, the abrasive skin care appliance can be an insert or a pad shaped for associating with a microdermabrasion device, or the abrasive skin care appliance can be attached to a microdermabrasion device. In one example, the microdermabrasion device can be a rotational microdermabrasion device including a rotational motor to rotate the insert or pad and can further include a vacuum to remove skin debris away from the abrasive matrix. The rotational motor can be rotatable at one or more settings from 2,000 RPM to 7,000 RPM,

from 3,000 RPM to 6,000 RPM, or from 3,400 RPM to 5,010 RPM. In another example, the microdermabrasion device can be a vibrational microdermabrasion device with a vibrational motor positioned within a head where the abrasive matrix contacts a skin surface. The vibrational motor can be oscillatable at one or more settings from 2,000 VPM to 12,000 VPM, or from 3,000 VPM to 6,000 VPM, for example. In some examples, the microdermabrasion device can include a secondary appliance associated therewith, such as a skin-cleansing appliance, a heating appliance, a cooling appliance, a massaging appliance (vibratory or unpowered), electromagnetic energy appliance, an ionic infusion appliance, a phototherapy appliance, a porous scrubbing appliance, or a combination thereof.

In another example, a method of making an abrasive skin care appliance can include combining abrasive crystals with metal-containing particles at a weight ratio from 3:1 to about 500:1 to form an abrasive particulate blend. The abrasive crystals can have an average particle size from 25 μm to about 250 μm and the metal-containing particles can have an average particle size from 5 nm to 2 μm . The method can further include softening a facial surface of an appliance substrate and pressing the facial surface into the abrasive particulate blend while the facial surface is in a softened state to form an abrasive matrix partially embedded in the facial surface. The abrasive crystals can include aluminum oxide particles, magnesium oxide particles, sodium chloride particles, sodium bicarbonate particles, or diamond particles, for example. The abrasive crystals can have an average particle size from 40 μm to 180 μm and/or the abrasive matrix can have a grit count of 80 to 280. The metal-containing particles can include gold particles or gold alloy particles, silver particles or silver alloy particles, copper particles or copper alloy particles, zinc particles or zinc alloy particles, platinum particles or platinum alloy particles, or a combination thereof. Alternatively, the metal-containing particles can be a metal salt of gold, silver, copper, zinc, and/or platinum. The facial surface of the appliance substrate can include a solvent-softenable plastic material wherein softening is by chemical softening. Chemical softening may include contacting the facial surface with a solvent selected from 1,2-dichloroethane, acetone, cyclohexanone, dichloromethane, methyl ethyl ketone (MEK), methyl benzene, tetrahydrofuran, or a combination thereof. The solvent-softenable plastic material can be selected from acrylic polymer, methacrylic polymer (e.g.,

polymethyl methacrylate), acrylonitrile butadiene styrene, polyacetal, cellulose acetate butyrate, polyethylene (e.g., LDPE, HDPE, UHDPE, PEX, etc.), polycarbonate, polyethylene terephthalate, polyethylene terephthalate glycol, polypropylene, polystyrene, polyvinyl chloride, or combinations thereof. The facial surface of the appliance substrate
5 can alternatively (or additionally) be a thermally-softenable plastic material and softening can be carried out by thermal softening. The thermally-softenable plastic material can be a thermoplastic, such as one or more selected from acrylic polymer, methacrylic polymer (e.g., polymethyl methacrylate), acrylonitrile butadiene styrene, polyester, polyamide, polytetrafluoroethylene, polyacetal, cellulose acetate butyrate, polyethylene (e.g., LDPE,
10 HDPE, UHDPE, PEX, etc.), polycarbonate, polyethylene terephthalate, polyethylene terephthalate glycol, polypropylene, polystyrene, or polyvinyl chloride.

In another example, a method of rejuvenating a skin surface can include applying a machine-actuated abrasive matrix on a skin surface, wherein the abrasive matrix comprises abrasive crystals having an average particle size from 25 μm to 250 μm and a
15 plurality of metal-containing particles having an average particle size from 5 nm to 2 μm associated with surfaces of the abrasive crystals. The method can further include the step of depositing a plurality of the metal-containing particles on the skin surface while the machine-actuated abrasive matrix is in contact with the skin surface. The abrasive crystals can include aluminum oxide particles, magnesium oxide particles, sodium chloride
20 particles, sodium bicarbonate particles, or diamond particles and/or can have an average particle size from 40 μm to 180 μm . The abrasive matrix can have a grit count of 80 to 280, for example. The metal-containing particles can include gold particles or gold alloy particles, silver particles or silver alloy particles, copper particles or copper alloy particles, zinc particles or zinc alloy particles, platinum particles or platinum alloy particles, or a
25 combination thereof. Alternatively, the metal-containing particles can be a metal salt of gold, silver, copper, zinc, and/or platinum.

In another example, a method of therapeutically treating a skin surface can include abrading a skin surface with an abrasive matrix of an abrasive skin care appliance. The abrasive matrix in this example includes abrasive crystals having an average particle size
30 from 25 μm to about 250 μm and a plurality of metal-containing particles having an average particle size from 5 nm to 2 μm associated with surfaces of the abrasive crystals.

In some examples, abrading the skin surface includes contacting the abrasive matrix with the skin surface while the abrasive matrix is rotating at from 2,000 RPM to 7,000 RPM, from 3,000 RPM to 6,000 RPM, or from 3,400 RPM to 5,010 RPM. In another example, abrading the skin surface includes contacting the abrasive matrix with the skin surface
5 while the abrasive matrix is vibrationally oscillating at from 2,000 VPM to 12,000 VPM, or from 3,000 VPM to 6,000 VPM. In another example, abrading the skin surface includes manually abrading the skin surface by contacting the abrasive matrix with the skin surface without the use of electrical power.

It is noted that when discussing the various abrasive skin care appliances herein, and any kits, systems, methods, etc., related thereto, these various more specific
10 discussions can be considered applicable to one another whether or not they are explicitly discussed in the context of that example. Thus, for example, when discussing the metal-containing particles in the context of one example, such disclosure is also relevant to and directly supported (but not limiting) in the context of other examples, and *vice versa*. It is
15 also understood that terms used herein will take on their ordinary meaning in the relevant technical field unless specified otherwise. In some instances, there are terms defined more specifically throughout the specification or included at the end of the present specification, and thus, these terms have a meaning as described herein.

Turning now to one example, as shown in FIG. 1, a microdermabrasion device 100
20 is shown that includes an abrasive insert 130. In one example, the microdermabrasion device with an attached abrasive insert can be the abrasive skin care appliance as described herein, and in other modular examples, the abrasive insert can be the abrasive skin care appliance. In further detail regarding the microdermabrasion device, this device can include, for example, a microdermabrasion controller 110, which in this example is in
25 the form of a handle, including a switch 112. The switch can be multi-modal, meaning it can control revolutions per minute (RPMs) of the abrasive insert within a range or RPM value, or at a predetermined or fixed RPM, etc. The switch can further control suction intensity, for example. The switch can operate control circuitry, such as a printed circuit board, and the device as a whole can be powered by either direct current (e.g., a
30 rechargeable battery or other battery pack), or by alternating current (e.g., 110 V, 220 V, etc.). The motor and/or vacuum pumps that control abrasion insert RPMs and suction are

not shown as they are contained within an outer shell of the microdermabrasion controller. Example revolutions per minute (RPM) that can be used can be from 2,000 RPM to 7,000 RPM, from 3,000 RPM to 6,000 RPM, or from 3,400 RPM to 5,010 RPM, for example. As mentioned, the microdermabrasion device can further include a suction head 114, which
5 can include an opening sized to provide a desired suction profile. The opening can also be used to receive the abrasive insert and connect it to a rotational motor (not shown). Also not shown, the vacuum pump and suction head can also be associated with a replaceable filter to prevent skin debris from clogging the suction mechanism (e.g., the filter can be replaced or washed/rinsed for further use). Suction can be applied at any level that is
10 suitable for removing skin debris from the skin surface during the microdermabrasion process.

The microdermabrasion device 100 in this example can also include a suction cap 120 (shown as a clear suction cap in this example) that is fitted, threaded, or otherwise joined with the microdermabrasion controller 110 and in some examples, sealed by an O-
15 ring 124. The cap can include a suction nozzle that is sized to be slightly larger or otherwise similarly sized relative to a disc head facial surface 138 of the abrasive insert 130. The abrasive insert is shown as attached to the microdermabrasion controller through the suction head but could be connected in various other ways to the rotational motor. Further detail related to the abrasive insert is shown in FIG. 1 in lower perspective and
20 cross-sectional views. The abrasive insert can include, for example, an insert body 132 which defines an insert engagement portion 134. The insert engagement portion can be shaped to be received by a rotational rod (not shown) within the microdermabrasion controller, for example. Thus, upon rotating the rotational rod, the abrasive insert spins accordingly. The abrasive insert can also include a disc head substrate 136 that provides
25 the disc head facial surface 138 to which an abrasive matrix 150 can be applied, or as shown in this example, embedded. As an abrasive matrix, the abrasive crystals and the metal-containing particles can be present at a weight ratio from 3:1 to 500:1, from 5:1 to 250:1, from 10:1 to 200:1, from 20:1 to 125:1, for example. The abrasive matrix can also be prepared to have a grit count from 80 to 280, from 80 to 160, from 160 to 280, from 100
30 to 200, from 120 to 240, or from 120 to 200, for example. As mentioned, the abrasive matrix in these examples include abrasive crystals 152 and metal-containing particles 154.

The abrasive crystals 152 can include, for example, aluminum oxide particles, magnesium oxide particles, sodium chloride particles, sodium bicarbonate particles, diamond particles, and/or the like. The abrasive crystals can have an average particle size from 25 μm to 250 μm , from 30 μm to 200 μm , from 40 μm to 180 μm , from 50 μm to 150 μm , or from 60 μm to 120 μm , for example. In one example, the abrasive crystals can be selected or prepared to be inert relative to the skin surface in that they do not interact with the skin surface chemically, but rather only physically interact with the skin during use as an abrasive. For example, the abrasive crystals can be hypoallergenic, or even considered to be medical grade, ultra-hypoallergenic, and/or ultra-hygienic, in some examples.

The metal-containing particles 154 can include gold particles or gold alloy particles, silver particles or silver alloy particles, copper particles or copper alloy particles, zinc particles or zinc alloy particles, platinum particles or platinum alloy particles, or a combination thereof. Alternatively, the metal-containing particles can be a metal salt of gold, silver, copper, zinc, and/or platinum. The metal-containing particles can have an average particle size from 5 nm to 2 μm , from 5 nm to 500 nm, from 10 nm to 2 μm , from 10 nm to 1 μm , from 10 nm to 500 nm, from 15 nm to 350 nm, from 10 nm to 100 nm, from 100 nm to 500 nm, or from 200 nm to 1 μm , for example. In one example, the metal-containing particles can be elemental gold or an elemental gold alloy of at least 50 wt% gold and may have an average particle size from 5 nm to 150 nm. In another example, the metal-containing particles can be elemental silver or an elemental silver alloy of at least 50 wt% silver and may have an average particle size from 50 nm to 250 nm. In another example, the metal-containing particles can be elemental copper or an elemental copper alloy of at least 50 wt% copper and may have an average particle size from about 100 nm to about 500 nm. In another example, the metal-containing particles can be elemental platinum or an elemental platinum alloy of at least 50 wt% platinum and may have an average particle size from about 50 nm to about 500 nm. In another example, the metal-containing particles can be zinc oxide, zinc pyrithione, or elemental zinc nanoparticles or zinc alloys of at least 50 wt% zinc and may have an average particle size from about 50 nm to about 500 nm. Thus, the metal-containing particles can be elemental metal, elemental metal alloys, or can be a salt of a metal as described above. As an alloy, the metals selected for use can include one of gold, silver, copper, zinc, or platinum; or the

metals selected for use can be two or more of gold, silver, copper, zinc, or platinum. Thus, there can be other metals present in the alloys, and in some instances, even non-metals, such as semi-metals or dopants (e.g., silicon, oxygen, etc.). Furthermore, the metal-containing particles can likewise be in the form of a salt, as mentioned.

5 In further detail regarding the metal-containing particles 154, they may be used for their antimicrobial effect to the surface of the abrasive matrix 150, but these metals can additionally or alternatively provide a therapeutic benefit to the skin surface as well. For example, gold is an antioxidant and an antimicrobial, and can assist with the reduction of acne and in some instances, allergies. Gold can also stimulate skin cells and increase
10 elasticity in the skin. Thus, when used in conjunction with microdermabrasion, by contacting the skin with gold particles and further, by leaving some residual gold particles on the skin, cellular stimulation and skin elasticity can be promoted as the abraded skin regenerates. Likewise, silver particles can benefit the skin due to its antimicrobial properties, which can be beneficial in preventing blackheads, acne, and the like at the
15 abraded skin surface. Copper, on the other hand, unlike silver that is typically antimicrobial via ion diffusion, is a good contact killer of microbes, such as bacteria, viruses, fungus, etc. Furthermore, copper helps develop collagen and elastin, assists with repair of skin, and can promote the production of hyaluronic acid. Zinc can help generally with acne, heal cuts and wounds, treat topical irritations, itches, etc., and can be used to treat injuries, skin
20 sores, rashes, seborrheic dermatitis, psoriasis, eczema, dandruff, etc. Zinc can also promote skin regeneration and provide a protective coating from the sun. Platinum can also be used for its antioxidant activity, reducing inflammation and free-radical damage that may otherwise occur at the outermost layer of the skin after treatment. Platinum can also promote healthier or stronger skin having a brighter appearance.

25 Furthermore, the abrasive matrix can likewise be formulated to include other metals or metal salts in addition to the metal-containing particles 154 described above (e.g., gold, silver, copper, zinc, platinum, alloys thereof, salts thereof, etc.) that may or may not be therapeutically beneficial or antimicrobial. For example, the abrasive matrix can be formulated to include from 0.01 wt% to 20 wt% of zinc, iron, calcium, magnesium,
30 manganese, chromium, potassium, sodium, or the like. Likewise, the abrasive matrix can include alloys of metals with oxygen, silicon, sulfur, phosphorus, etc. Other antioxidant

compounds can likely be included in relatively small concentrations as well (e.g., 0.01 wt% to 5 wt%).

In further detail, the abrasive matrix 150 can be positioned on and affixed to the disc head facial surface 138 (or pad facial surface 142 as shown in FIGS. 3-5) by any of a number of attachment mechanisms, depending to some degree on the substrate material selected and configured to support the adhesive matrix. Example materials that can be used for the disc head substrate 136 shown in FIGS. 1-2, or pad substrate 140 shown in FIGS. 3-5, or other substrate configuration, include any of a number of materials such as plastic, metal, glass, stone, fabric, composites thereof, or the like. With these or other materials, the abrasive matrix can be applied using an adhesive, applied by embedding the abrasive matrix in the substrate material, applied by fastening a coupon of the abrasive matrix to the substrate, or by any other methodology.

In one specific example, the disc head substrate 136 of FIGS. 1-2, or the pad substrate 140 of FIGS. 3-5, or other substrate configuration, can be a polymeric (e.g., plastic), substrate material that is thermally or chemically softenable. Thus, the abrasive matrix 150 can be embedded in the plastic substrate material by a thermal process, where the substrate is warmed to a softening temperature so that the aluminium oxide particles can be pressed or otherwise sunk into the softened plastic substrate at the disc head facial surface 138 (FIGS. 1-2) or the respective pad facial surface 142 (FIGS. 3-5). As an alternative method, the disc head facial surface or the pad facial surface of the respective polymeric substrate can be chemically softened and dipped into a powder bed of the abrasive matrix particles (abrasive crystals 152 and metal-containing particles 154) with some pressure, and then allowed to dry, leaving the abrasive matrix embedded therein. Application of the chemical or solvent used to soften the polymeric substrate and pressing the plastic substrate into the powder bed of the abrasive matrix particles can be done sequentially or simultaneously, for example. If done sequentially, then chemical softening solvent can be applied to the substrate surface first, followed by pressing the softened plastic surface into the powder bed of abrasive matrix particles. If done simultaneously, then a mixture of the chemical softening solvent and the abrasive matrix particles can be used, provided there is enough chemical softening solvent present to sufficiently soften the substrate surface for embedding the particles into the surface. Contact between the

substrate surface and the chemical softening solvent can be for a relatively short period of time, such as from 10 seconds to 2 minutes, 10 seconds to 50 seconds, etc., and then the substrate can be removed for hardening.

Thus, the facial surface 138 or 142 of the respective substrate 136 or 140 can
5 include a softenable plastic material, such as a solvent-softenable plastic material and/or a thermal-softenable plastic material. In some instances, the same plastic material can be thermally and/or solvent-softenable, and thus, the process may include both solvent softening and thermal softening in combination. Example materials that can be selected for use include acrylic polymer, methacrylic polymer (e.g., polymethyl methacrylate),
10 acrylonitrile butadiene styrene, polyacetal, cellulose acetate butyrate, polyethylene (e.g., LDPE, HDPE, UHDPE, PEX, etc.), polycarbonate, polyethylene terephthalate, polyethylene terephthalate glycol, polypropylene, polystyrene, polyvinyl chloride, or combinations thereof. These materials can all be chemically softened and/or thermally softened. Materials such as polyamides (or nylons) or polytetrafluoroethylene (e.g., Teflon)
15 may be more suitable for thermal softening than chemical softening, but to the extent softenable with solvent and/or heat, any plastic or polymeric material can be used.

For thermal softening examples, this can be carried out by bringing the temperature of the facial surface of the substrate to a temperature where the polymeric material is softened, but typically is not fully melted. In some examples, the point at which the
20 substrate material is softened can be defined by its softening temperature, sometimes referred to as the Vicat softening temperature. The Vicat softening temperature can be determined, for example, by determining the temperature at which a flat-ended needle with a 1 mm² circular cross-section can penetrate 1 mm of the polymer sample under a load of 10 Newtons for the Vicat A test or a load of 50 Newtons for the Vicat B test. Likewise,
25 standards that can be used include ASTM D 1525 and ISO 306, which are essentially an equivalent test. To the extent multiple methodologies provide different results, an average can be used to provide the softening temperature for a given plastic material.

On the other hand, if softening the facial surface of the polymeric substrate with a solvent (or chemical), example solvents that can be selected for use include 1,2-
30 dichloroethane, acetone, cyclohexanone, dichloromethane, methyl ethyl ketone (MEK), methyl benzene, tetrahydrofuran, or a combination thereof. The solvent selected can be

matched with the plastic material selected and can be applied at a concentration and for a time period to soften the substrate sufficiently to embed the abrasive matrix therein.

Turning now more specifically to FIG. 2, two different top portions of the microdermabrasion device 100 are shown. The structures shown in these two alternative examples have the same features shown in FIG. 1, but this FIG. shows that the disc head substrate 136 and associated disc head facial surface 138 can be of multiple sizes or configurations, and furthermore, that the suction cap 120 and/or suction nozzle 122 can be alternatively sized, shaped, positioned, etc., to accommodate the size, location, configuration, etc., of the disc head facial surface.

Referring now to FIG. 3, a manually actuatable microdermabrasion device 200 is shown, which in this instance is in the form of an abrasive brush with a handle portion 210 and a head portion 220. The handle portion can be gripped by a user to manually actuate (circular motion, side to side motion, or otherwise) the head portion. The head portion can include a pad substrate 140 with an abrasive matrix 150 associated with a pad facial surface 142 thereof. Again, the abrasive matrix can include abrasive crystals and metal-containing particles, as previously described. The head portion, or more specifically, the pad substrate, can be of any size (e.g., facial surface area) or shape (e.g., circular, square, oval, geometric shape, elongated shape, etc.) suitable for a given microdermabrasion application (e.g., from 1 cm² to 50 cm², from 4 cm² to 25 cm², from 10 cm² to 50 cm², or from 2 cm² to 10 cm²). In some examples, there may be larger or smaller skin-contact surface areas.

Turning now to FIGS. 4 and 5, five (5) different views of a microdermabrasion device 300 are shown in FIG. 4 (e.g., front view (A), side view (B), back view (C), bottom view (D), and top view (E)), as well as a more detailed view in FIG. 5. In this example, the microdermabrasion device includes multiple skin care surfaces, including the microdermabrasion surface on one side and a skin cleansing surface on the other side. This is provided by example only, as the device could be a dedicated microdermabrasion device, or alternatively, could include two surfaces that are both for microdermabrasion (each side of a different size, shape, and/or abrasive grit count, for example). With this in mind, the microdermabrasion device shown in FIG 4 includes a microdermabrasion controller 110, which in this example is in the form of a handle which includes a switch

112, which can be a multifunctional switch (e.g., on/off, variable oscillation, variable temperature, etc.). The switch can operate control circuitry (not shown, but shown at 162 in FIG. 5), such as a printed circuit board, and the device as a whole can be powered by either direct current (e.g., a rechargeable battery or other battery pack), or by alternating
5 current (e.g., 110 V, 220 V, etc.). The handle portion in this example includes a neck portion 118 and a grip portion 116. As mentioned, in this example, the handle supports a head that includes both a microdermabrasion appliance and a skin cleansing appliance. The skin cleansing appliance can include, for example, an array of skin-cleansing bristles 146. The microdermabrasion surface can include a microdermabrasion portion including a
10 pad substrate 140 having a pad facial surface 142 with an abrasive matrix 150 associated therewith. As can be seen in more detail in FIG. 5, the abrasive matrix can include abrasive crystals 152 and metal-containing particles 154, as previously described.

In some examples, the microdermabrasion device can include a vibrational motor 160 (not shown in FIG. 4 but shown in FIG. 5) to provide vibratory oscillation to a head of
15 the microdermabrasion device. The motor can be within the head, adjacent to the pad substrate 140, for example. The motor can be supported, in one example, by a support rod 164, for example. The support rod can be flexible, but rigid enough to provide support between the grasping portion of the handle and the head. The support rod in certain more specific examples can be a solid metal rod, a tube-like rod, or a spring-like rod. The
20 support rod can have any cross-sectional shape, such as a circular cross-section, a square cross-section, a rectangular cross-section, a triangular cross-section, a pentagonal cross-section, a hexagonal cross-section, and so forth. The support rod can be metal, polymer (e.g., plastic, rubber, etc.), ceramic, etc. As mentioned, the cross-sectional configuration can be solid, tubular, or a combination of both. The support rod and/or vibrational motor
25 can be mechanically fastened to the head at the head support shell, for example, and the support rod can be mechanically fastened to a location within the grip portion.

In this particular example with respect to the microdermabrasion controller 110 (handle portion), note that the neck portion 18 includes a location that is narrower (shown at d_1) than at a location of the grip portion 16 (shown at d_2). The diameter (converted to
30 radius; $r = d/2$) in this example can be used to calculate the cross-sectional areas of the two respective locations. It is noted that if the cross-sectional areas are not defined by a

round geometry (perpendicular to the axis of the handle), then other mathematical calculations can be used to determine the respective cross-sectional areas. In this example, as can be seen, the much narrower cross-sectional area (d1) at the neck portion (at least at one location) can be from 4 to 15 times smaller, from 6 to 12 times smaller, or from 8 to 10 times smaller, than a cross-sectional area (d2) of the grip portion (at least at one location). In this specific example, based on the relative diameters shown, the cross-sectional area at (d1) can be calculated to be from about 8 to 10 times smaller than at (d2). In accordance with examples herein, by using a narrowed neck portion in conjunction with a support rod, and having space between the support rod and the material that defines the narrowed neck portion, the vibrational energy at the head of the microdermabrasion device can be dampened so that the handle exhibits less vibrational energy. In some examples, the material used to provide the body or shape to the grip portion and the neck portion can be a rubber or other soft material that can act to assist with vibrational dampening.

Vibrational dampening can be helpful with this type of device, as the presence of particularly the secondary skin care appliance and associated structures that may be present to operate this appliance can add enough weight to the head so as to make vibrational transference more noticeable to users. Furthermore, this can be particularly the case when the vibrational motor is potentially delivering a vibrational oscillation frequency from 2,000 vibrations per minute (VPM) to 12,000 VPM. With that stated, example VPM frequencies can be implemented at a fixed frequency, or with multiple fixed frequency settings (e.g., 2 discrete settings, 3 discrete settings, 4 discrete settings, etc.), or with variable frequency settings (e.g., frequencies dialed up and down), as designed. Example frequency ranges can be from 2,000 VPM to 12,000 VPM, from 4,000 VPM to 12,000 VPM, from 6,000 VPM to 12,000 VPM, from 7,000 VPM to 12,000 VPM, from 2,000 VPM to 10,000 VPM, from 4,000 VPM to 10,000 VPM, from 6,000 VPM to 10,000 VPM, from 7,000 VPM to 10,000 VPM, from 2,000 VPM to 8,000 VPM, from 4,000 VPM to 8,000 VPM, from 6,000 VPM to 8,000 VPM, from 7,000 VPM to 8,000 VPM, from 2,000 VPM to 6,000 VPM, from 3,000 VPM to 6,000 VPM, from 4,000 VPM to 6,000 VPM, from 6,000 VPM to 10,000 VPM, from 7,000 VPM to 9,000 VPM, from 7,000 VPM to 8,000 VPM, or from 8,000 VPM to 12,000 VPM.

If there are multiple types of skin care appliances, as shown by example in FIGS. 4 and 5, the secondary skin care appliance can be a skin-cleansing appliance, a heating appliance, a cooling appliance, a massaging appliance (vibratory or unpowered), electromagnetic energy appliance, an ionic infusion appliance, a phototherapy appliance, a porous scrubbing appliance, or a combination thereof. The secondary skin care appliance can likewise be another microdermabrasion appliance of a different size, shape, grit level, abrasive matrix composition, etc. For example, one side may include gold particles and the other side may include copper particles, or one side may include silver particles and the other side may include non-metal-containing particle, or one side may include gold particles and the other side may be a different type of microdermabrasion appliance altogether (e.g., etched metal surface). In further detail, there can be multiple skin care appliances on the rotational microdermabrasion device shown in FIGS. 1 and 2, as well as the manually actuatable microdermabrasion device shown in FIG. 3, but this feature is shown by example only in FIGS. 4 and 5 so as to not obscure the description related to the microdermabrasion appliances described herein, but it is noted that any of the microdermabrasion devices shown and described herein or otherwise configured can include multiple skin care appliances. Furthermore, a microdermabrasion device may include a microdermabrasion appliance that is operated with a motor (rotation or vibration) and a second microdermabrasion appliance may be manually operated, or a microdermabrasion device may include one rotational appliance and one vibratory appliance, etc.

Regarding skin-cleansing appliance examples, there can be (as the secondary skin care appliance) an appliance with skin-cleansing bristles 146, as shown in FIGS. 4 and 5 by example. These bristles can have a length of from 1/16 inch to 3/8 inch, from 1/8 inch to 1/4 inch, from 1/16 inch to 1/4 inch, or from 1/8 inch to 3/8 inch, for example. The bristles can have a uniform density at the first external region, or can be arranged in multiple sub-regions within the first external region with corresponding different bristle densities, as shown in FIG. 4 (with a top fan-shaped region having a lower bristle density than the rest of the circular shaped "first external region"). An average bristle density at the first external region can be from 100 to 600, from 150 to 500, from 200 to 400 or from 250 to 400 bristles per square inch, regardless if there are multiple sub-regions with different

densities. In further detail, however, if the first external region of bristles includes two discrete sub-regions of bristles, then the first sub-region can have a bristle density from 150 to 700, from 200 to 600, from 200 to 500, or from 250 to 400 bristles per square inch, and furthermore, the second sub-region can have a bristle density from 40 to 300, from 50 to 250, from 75 to 250, or from 100 to 200 bristles per square inch, for example. Typically, the second sub-region in this example will have a lower bristle density than the first sub-region. The skin-cleansing bristles at the first external region can have a skin-contact surface area of from 2 square inches to 35 square inches, from 3 square inches to 30 square inches, from 3 square inches to 25 square inches, from 3.5 square inches to 20 square inches, from 3.5 square inches to 10 square inches, from 5 square inches to 35 square inches, or from 10 square inches to 35 square inches, for example.

In further detail, the skin-cleansing bristles can be constructed of a rubber material, such as a polysiloxane or a silicone rubber. For example, the silicone rubber can be hypoallergenic (e.g., medical grade, ultra-hypoallergenic, ultra-hygienic, and/or odor-resistant silicone rubber). Silicone rubbers are an elastomer of silicone, carbon, hydrogen, and oxygen. Silicone rubbers can include fillers to modulate material properties and/or cost. If fillers are added, they can be added keeping in mind the use as a skin-cleansing brush, and can be selected to be hypoallergenic, hygienic, etc. With this particular type of brush (e.g., a polysiloxanes or silicone rubber bush), the brush can be constructed so that it does not need to be replaced. That stated, it can also be constructed to be modular for periodic replacement, if desired. With these types of silicone rubbers, it can be gentle enough to use on nearly all types of skin, particularly healthy, unbroken skin. In some instances, it can even be gentle enough to use on damaged or diseased skin. The skin-cleansing bristles can be constructed of either the same material or a different material than used as a sleeve over the handle and/or portions of the head. Though silicone rubber can be used effectively, it is noted that other types of bristle brushes can be used as well, depending on the desired skin application. The skin-contact surface area of the skin-cleansing brushes can be, for example, from 1 square inch to 35 square inches, from 2 square inches to 30 square inches, from 5 square inches to 25 square inches, or from 10 square inches to 35 square inches, for example.

It is noted that the microdermabrasion device 300 shown in FIGS. 4 and 5 include skin cleansing bristles on an opposite surface relative to the abrasive matrix 150. However, as mentioned, the second side need not be functional, or it can be another microdermabrasion appliance, or it can include another alternative secondary skin care appliance. Examples of other secondary skin care appliances may include a skin treatment appliance, which may be a heat treatment appliance, a cooling treatment appliance, a massaging appliance (e.g., used without heat or cooling). If using a heat treatment appliance, heating can be carried out, for example, using a heat treatment appliance that contacts the skin surface at a temperature from 36 °C to 44 °C or from 38 °C to 42 °C. If the heat treatment appliance is a good heat conductor, like metal, then the temperature of the heat conductor can be about the same as the target temperature for skin contact by the heating pad. If the heat treatment appliance is not a good conductor of heat, such as a semi-precious stone, then the temperature at the heat conductor can be higher so that the surface of the semi-precious stone reaches the target skin therapeutic temperature (e.g., from 36 °C to 44 °C or from 38 °C to 42 °C). Cooling treatment appliance temperatures may be used at temperatures from -10 °C to 20 °C, from -5 °C to 15 °C, or from 0 °C to 15 °C, or from 0 °C to 10 °C, taking user safety into account, as the mean temperature where frostnip can occur with prolonged exposure may be at about -10 °C for many subjects. A temperature sensor can be present to monitor and/or help control the temperature of the heating and/or cooling pad, for example. If used, therapeutic pads may provide a therapeutic effect relative to the skin via temperature, via application of serums or other compounds to the skin, and/or by contact of the material itself to the skin. Some materials, temperatures, and or application compounds, for example, may be therapeutic when used before and/or after microdermabrasion treatment. Example skin treatment pads can be of any material, such as rubber (e.g., silicone rubber), metal (e.g., gold, silver, copper, zinc, platinum, alloys thereof, salts thereof, etc.), therapeutic semiprecious stones (e.g., quartz, such as rose quartz, or jade), porous stones (e.g., pumice stone), plastic, electroplated plastic, glass, ceramic, soft natural material (e.g., loofah, sponge, etc.), soft synthetic material, etc.

Other secondary skin care appliances may likewise be used (instead of or in addition to the skin-cleansing bristles shown in FIGS. 4 and 5). Such appliances may

include electromagnetic energy appliances (e.g., phototherapy and/or radio frequency), ionic infusion appliances (e.g., microcurrent, a massaging appliance, etc.), LED phototherapy appliances (e.g., red light, blue light, etc.), soft porous scrubbers (e.g., loofahs, sponges, poufs, meshes, etc.), anti-microbial soft porous scrubbers, massaging
5 appliances with massaging relief features, or the like.

In accordance with examples of the present disclose, the devices herein can be used as part of a system or kit, where the skin care device is co-packaged or used together with any of a number of skin care fluids, such as serums, essences, ampoules, moisturizers, creams or ointments, topical pharmaceuticals, topical nutricosmetics or
10 cosmeceutics, or the like. These types of skin care fluids can carry compounds to the skin, and can include a liquid carrier (e.g., aqueous carrier or oil-based carrier), which carry an active ingredient to (or into) the epidermis. Example oils can include argan oil, rose oil, vitamin oil, seed oil (e.g., pomegranate seed oil, rose hip see oil, etc.), jojoba oil, nut oil (e.g., macadamia nut oil, kukui nut oil, etc.), oil from fruit or flowers (e.g., apricot kernal oil,
15 orange oil, lemon oil, neroli flower oil, jasmine oil, coconut oil, etc.), aloe, hemp oil, or the like. The oil can act as the active ingredient in part or can be merely a carrier for an active ingredient. Active ingredients, on the other hand, can include metal(s) and other minerals, antioxidant(s), fatty acids, vitamins (e.g., vitamin E, vitamin C, vitamin A, etc.), drugs, other anti-aging compounds, anti-inflammatory agents (e.g., aloe, green tea, etc.), organic acids,
20 e.g., mandelic acid, malic acid, hyaluronic acid, salicylic acid, etc., skin-brightening compounds, anti-acne compounds (e.g., salicylic acid), antimicrobial compounds (e.g., colloidal or ionic silver compounds), hydrating compounds, proteins, peptides, amino acids, amino acid chelates or other chelates, or the like. In one example, the skin care devices described herein can include an anti-aging or an anti-wrinkle serum, such as a
25 serum with mandelic acid and/or malic acid. In another example, the serum can include a peptide.

In accordance with another example, a method of making an abrasive skin care appliance can include combining abrasive crystals with metal-containing particles at a weight ratio from 3:1 to 500:1, or from 5:1 to 250:1, to form an abrasive particulate blend,
30 wherein the abrasive crystals have an average particle size from 25 μm to 250 μm , or from 30 μm to 200 μm , and the metal-containing particles have an average particle size from 5

nm to 5 μ m. The method can also include softening a facial surface of an appliance substrate and pressing the facial surface into the abrasive particulate blend while the facial surface is in a softened state to form an abrasive matrix partially embedded in the facial surface.

5 In another example, a method of therapeutically treating a skin surface can include abrading a skin surface with an abrasive matrix of an abrasive skin care appliance. The abrasive matrix in this example includes abrasive crystals having an average particle size from 25 μ m to 250 μ m, or from 30 μ m to 200 μ m, and a plurality of metal-containing particles having an average particle size from 5 nm to 5 μ m associated with surfaces of the
10 abrasive crystals. In certain examples, abrading the skin surface includes contacting the abrasive matrix with the skin surface while the abrasive matrix is rotating at from 2,000 RPM to 7,000 RMP, from 3,000 RPM to 6,000 RPM, or from 3,400 RPM to 5,010 RPM. In another example, abrading the skin surface includes contacting the abrasive matrix with the skin surface while the abrasive matrix is vibrationally oscillating at from 2,000 VPM to
15 12,000 VPM, or in one example, from 3,000 VPM to 6,000 VPM. In another example, abrading the skin surface includes manually abrading the skin surface by contacting the abrasive matrix with the skin surface without the use of electrical power.

Notably, the details described herein related to the microdermabrasion device and related appliances can be used or prepared in conjunction with these and other methods.

20 It is noted that, as used in this specification and the appended claims, the singular forms “a,” “an,” and “the” include plural referents unless the context clearly dictates otherwise. In describing and claiming the teachings of the present disclosure, the following terminology will be used in accordance with the definitions set forth below.

Dimension, amounts, concentrations, and other numerical data may be expressed
25 or presented herein in a range format. It is to be understood that such a range format is used merely for convenience and brevity and thus should be interpreted flexibly to include not only the numerical values explicitly recited as the limits of the range, but also to include all the individual numerical values or sub-ranges encompassed within that range as if each numerical value and sub-range is explicitly recited.

30 As an illustration, a numerical range of “about 10 to about 50” should be interpreted to include not only the explicitly recited values of about 10 to about 50, but also to include

individual values and sub-ranges within the indicated range. Thus, included in this numerical range are individual values such as 20, 30, and 40 and sub-ranges such as from 10-30, from 20-40, and from 30-50, etc. This same principle applies to ranges reciting only one numerical value. Furthermore, such an interpretation should apply regardless of the breadth of the range or the characteristics being described.

EXAMPLES

Example 1 – *Preparation of Microdermabrasion Discs with Gold Nanoparticles*

Two different microdermabrasion inserts with disc-shaped facial surfaces were used in this example which were configured similar to that shown in FIG. 2, one having a 6 mm diameter facial surface and one having a 12 mm diameter facial surface. The microdermabrasion inserts, and particularly the facial surfaces thereof, were constructed from a solvent-softenable plastic. Both facial surfaces were treated with aluminum oxide crystals and gold particles. The aluminum oxide crystals and the gold particles individually had a surface morphology as shown in FIG. 2, and the abrasive matrix had a particlized face at about 120 grit.

In this example, the two facial surfaces were dipped in solvent for 20 seconds to soften the facial surfaces, which were then wet pressed into a homogenous blend of the aluminum oxide crystals and the gold particles at a weight ratio of about 40:1. Notably, a thermally-softenable plastic, such as a thermoplastic, can likewise be used to soften the plastic with heat, but in this example, the plastic used was selected for solvent-softenable softening properties. After removing the facial surfaces from the homogenous blend of aluminum oxide crystals and gold particles, the microdermabrasion discs were then allowed to dry overnight to form the microdermabrasion discs which included both the aluminum oxide crystals and the gold particles. The homogenous blend of the aluminum oxide crystals and gold particles on both microdermabrasion discs were visually sampled under magnification and confirmed to have been applied at weight ratios of about 49:1. Thus, a slightly higher ratio of aluminum oxide crystals to gold particles ended up in the abrasive matrix applied to the facial surface of the appliance. This may be due to the fact that the larger aluminum oxide crystals become embedded into the facial surface of the

appliance, whereas the gold particles tend to become part of the matrix as being primarily applied to surfaces of the aluminum oxide crystals.

Example 2 – Retention of Gold Nanoparticles in Microdermabrasion Discs

Using X-ray Photoelectron Spectroscopy (XPS) imaging at 400x power, imagery was collected from portions of the large microdermabrasion disc particlized face and portions of the small microdermabrasion disc particlized face. The first few (outermost) micrometers of depth was captured in the imagery. The two microdermabrasion discs were then each used 5 times on a subject's facial skin according to manufacturer instructions, and the two microdermabrasion discs were then similarly reimaged using XPS imaging at 400x power. The parts by weight of the aluminum oxide crystals and the gold particles are provided in Tables 1A and 1B, as follows:

Table 1A

Large Disc	Before Use (parts by weight)	After Use (parts by weight)	% Change (by weight)
Aluminum Oxide Crystals	100	88	-12%
Gold Nanoparticles	2	1.7	-15%

Table 1B

Small Disc	Before Use (parts by weight)	After Use (parts by weight)	% Change (by weight)
Aluminum Oxide Crystals	108	96	-11%
Gold Nanoparticles	2.1	1.8	-14%

FIG. 6 shows XPS images before use (one at 400x power and one at a lower power level), as well as one 400x XPS image after use. It is noted that these images are not necessarily of the same quadrants of a common disc or even from the same disc before and after use, but rather were selected merely to show clear quadrants from various discs and/or quadrants that could be used to collect the actual data shown in Tables 1A and 1B.

As evident from the data in Tables 1A and 1B, and in connection with imagery approximated by that shown by example in FIG. 2, after use, both large and small discs showed essentially proportional loss of aluminum oxide crystals and gold particles. As can be seen also in the “after use” image of FIG. 6, residue of skin debris becomes deposited
5 on the surface of the disc, obscuring some of the crystals and gold particles. However, the microscope imagery does show that to some extent, gold particles can assemble in clumps or groups on the surface of the aluminum oxide crystals when applied. Furthermore, gold particles are also visible both on the outermost aluminum oxide crystals as well as underlying crystals visible between the outermost aluminum oxide crystals. For
10 comparison, even after use, the gold nanoparticle clusters on the aluminum oxide crystals remain visible, indicating that for the most part, they remained intact during 5 uses. Thus, the overall conclusion may be that as a subject uses these microdermabrasion discs over time, and as aluminum oxide crystals become removed from the facial surface, new layers of aluminum oxide crystals and gold particles become exposed, thus allowing the gold
15 particles to continue to provide continued effectiveness.

It is to be understood that the above-referenced arrangements and examples are only illustrative of the application of the principles of the present disclosure. Numerous modifications and alternative arrangements can be devised without departing from the present disclosure. While the present disclosure has been shown in the drawings and fully
20 described above with particularity and detail in connection with what is presently deemed to be the most practical embodiment(s) of the disclosure, it will be apparent to those of ordinary skill in the art that numerous modifications can be made without departing from the principles and concepts of the disclosure as set forth herein.

CLAIMS

What is claimed is:

5 1. An abrasive skin care appliance, comprising a facial surface having an abrasive matrix attached thereto, wherein the abrasive matrix comprises abrasive crystals having an average particle size from about 25 μm to about 250 μm and a plurality of metal-containing particles having an average particle size from 5 nm to 2 μm associated with surfaces of the abrasive crystals.

10 2. The abrasive skin care appliance of claim 1, wherein the abrasive crystals include aluminum oxide particles.

15 3. The abrasive skin care appliance of claim 1, wherein the abrasive crystals include magnesium oxide particles, sodium chloride particles, or sodium bicarbonate particles.

 4. The abrasive skin care appliance of claim 1, wherein the abrasive crystals include diamond particles.

20 5. The abrasive skin care appliance of claim 1, wherein the abrasive crystals have an average particle size from 40 μm to 180 μm .

 6. The abrasive skin care appliance of claim 1, wherein the abrasive matrix has a grit count of 80 to 280.

25 7. The abrasive skin care appliance of claim 1, wherein the metal-containing particles include gold particles or gold alloy particles.

30 8. The abrasive skin care appliance of claim 1, wherein the metal-containing particles include silver particles or silver alloy particles.

9. The abrasive skin care appliance of claim 1, wherein the metal-containing particles include copper particles or copper alloy particles.

10. The abrasive skin care appliance of claim 1, wherein the metal-containing
5 particles include zinc particles or zinc alloy particles.

11. The abrasive skin care appliance of claim 1, wherein the metal-containing particles include platinum particles or platinum alloy particles.

10 12. The abrasive skin care appliance of claim 1, wherein the metal-containing particles include salt particles of gold, silver, copper, zinc, or platinum.

13. The abrasive skin care appliance of claim 1, wherein the metal-containing particles have an average particle size 15 nm to 1 μ m.
15

14. The abrasive skin care appliance of claim 1, wherein the abrasive crystals and the metal-containing particles are present in the abrasive matrix at a weight ratio from about 3:1 to about 500:1.

20 15. The abrasive skin care appliance of claim 1, wherein the abrasive skin care appliance is an insert or a pad shaped for associating with a microdermabrasion device, or wherein the abrasive skin care appliance is attached to a microdermabrasion device.

25 16. The abrasive skin care appliance of claim 15, wherein the microdermabrasion device is a rotational microdermabrasion device including a rotational motor to rotate the insert or pad and a vacuum to remove skin debris away from the abrasive matrix.

17. The abrasive skin care appliance of claim 16, wherein the rotational motor is rotatable at one or more setting from 2,000 RPM to 7,000 RPM.
30

18. The abrasive skin care appliance of claim 15, wherein the microdermabrasion device is a vibrational microdermabrasion device a vibrational motor positioned within a head where the abrasive matrix contacts a skin surface.

5 19. The abrasive skin care appliance of claim 18, wherein the vibrational motor is oscillatable at one or more setting from 2,000 VPM to 12,000 VPM.

20. The abrasive skin care appliance of claim 1, wherein the microdermabrasion device includes a secondary appliance associated therewith.

10 21. The abrasive skin care appliance of claim 1, wherein the secondary appliance is skin-cleansing appliance, a heat treatment appliance, a cooling treatment appliance, a massaging appliance, electromagnetic energy appliance, an ionic infusion appliance, a phototherapy appliance, a porous scrubbing appliance, or a combination thereof.

15 22. A method of making an abrasive skin care appliance, comprising:
 combining abrasive crystals with metal-containing particles at a weight ratio from 3:1 to about 500:1 to form an abrasive particulate blend, wherein the abrasive crystals have an average particle size from 25 μm to about 250 μm and the metal-containing
20 particles have an average particle size from 5 nm to 2 μm ;
 softening a facial surface of an appliance substrate; and
 pressing the facial surface into the abrasive particulate blend while the facial surface is in a softened state to form an abrasive matrix partially embedded in the facial surface.

25 23. The method of claim 22, wherein the abrasive crystals include aluminum oxide particles, magnesium oxide particles, sodium chloride particles, sodium bicarbonate particles, or diamond particles.

30 24. The method of claim 22, wherein the abrasive crystals have an average particle size from 40 μm to 180 μm , and the abrasive matrix has a grit count of 80 to 280.

25. The method of claim 22, wherein the metal-containing particles include gold, silver, copper, zinc, platinum, an alloy thereof, a salt thereof, or a combination thereof.

5 26. The method of claim 22, wherein the facial surface of the appliance substrate includes a solvent-softenable plastic material, and wherein softening is by chemical softening.

10 27. The method of claim 26, where chemical softening includes contacting the facial surface with a solvent selected from 1,2-dichloroethane, acetone, cyclohexanone, dichloromethane, methyl ethyl ketone (MEK), methyl benzene, tetrahydrofuran, or a combination thereof.

15 28. The method of claim 27, wherein the solvent-softenable plastic material selected from acrylic polymer, methacrylic polymer, acrylonitrile butadiene styrene, polyacetal, cellulose acetate butyrate, polyethylene, polycarbonate, polyethylene terephthalate, polyethylene terephthalate glycol, polypropylene, polystyrene, polyvinyl chloride, or combinations thereof.

20 29. The method of claim 22, wherein the facial surface of the appliance substrate includes a thermally-softenable plastic material, and wherein softening is by thermal softening.

25 30. The method of claim 29, wherein the heat-softenable plastic material is a thermoplastic selected from acrylic polymer, methacrylic polymer, acrylonitrile butadiene styrene, polyester, polyamide, polytetrafluoroethylene, nylon, polyacetal, cellulose acetate butyrate, polyethylene, polycarbonate, polyethylene terephthalate, polyethylene terephthalate glycol, polypropylene, polystyrene, polyvinyl chloride, or combinations thereof.

30

31. A method of rejuvenating a skin surface, comprising applying a machine-actuated abrasive matrix on a skin surface, wherein the abrasive matrix comprises abrasive crystals having an average particle size from 25 μm to about 250 μm and a plurality of metal-containing particles having an average particle size from 5 nm to 2 μm associated with surfaces of the abrasive crystals.

32. The method of claim 31, further comprising depositing a plurality of the metal-containing particles on the skin surface while the machine-actuated abrasive matrix is in contact with the skin surface.

33. The method of claim 31, wherein the abrasive crystals include aluminum oxide particles, magnesium oxide particles, sodium chloride particles, sodium bicarbonate particles, or diamond particles.

34. The method of claim 31, wherein the abrasive crystals have an average particle size from 40 μm to 180 μm , and the abrasive matrix has a grit count of 80 to 280.

35. The method of claim 31, wherein the metal-containing particles include gold, silver, copper, zinc, platinum, an alloy thereof, a salt thereof, or a combination thereof.

36. A method of therapeutically treating a skin surface, comprising abrading a skin surface with an abrasive matrix of an abrasive skin care appliance, wherein the comprises abrasive crystals having an average particle size from 25 μm to about 250 μm and a plurality of metal-containing particles having an average particle size from 5 nm to 2 μm associated with surfaces of the abrasive crystals.

37. The method of claim 36, wherein abrading the skin surface includes contacting the abrasive matrix with the skin surface while the abrasive matrix is rotating at from 2,000 RPM to 7,000 RPM.