(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 July 2016 (21.07.2016)

WIPO | PCT

(10) International Publication Number
WO 2016/114907 A1

(51) International Patent Classification:
*A46B 13/02* (2006.01) *A46B 13/00* (2006.01)

(21) International Application Number:
PCT/US2015/067152

(22) International Filing Date:
21 December 2015 (21.12.2015)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
14/598,145 15 January 2015 (15.01.2015) US

(71) Applicant *(for all designated States except AL)*: **L'OREAL** [FR/FR]; 14 rue Royale, 75008 Paris (FR).

(72) Inventors; and

(71) Applicants *(for AL only)*: **SKIDMORE, Joseph, Eric** [US/US]; 2523 NW Alpine Crest Way, Issaquah, WA 98027 (US). **PAUL, JoHannes, D.** [US/US]; 26520 NE Valley Street, Duvall, WA 98019 (US). **BAYEH, Daniel** [US/US]; 7544 S Taft Street, Seattle, WA 98178 (US).

(74) Agent: **STALLMAN, Brandon, C.**; Christensen O'Connor Johnson Kindness, 1201 Third Avenue, Suite 3600, Seattle, WA 98101 (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, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, 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,

*[Continued on next page]*

(54) Title: HANDHELD PERSONAL CARE APPLIANCE

(57) Abstract: Personal care appliances, systems, and methods are provided. In certain embodiments, the appliances are have substantially linear shape and are sized to fit in a hand of a user. The appliances include a handle assembly, a motor assembly for driving a personal care end effector, and one or more treatment components configured to control the motor assembly via one or more protocols. Exemplary treatment protocols include a clean-shaven face protocol and a bearded protocol.

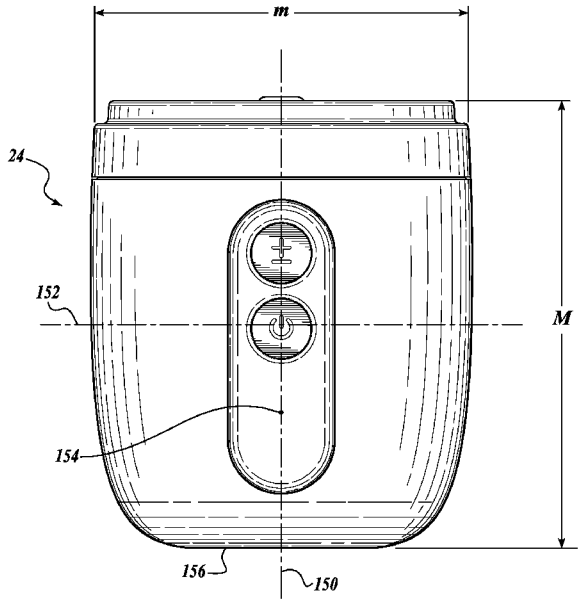


Fig. 8.

WO 2016/114907 A1

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))*

# HANDHELD PERSONAL CARE APPLIANCE

## 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.

In one aspect, a handheld appliance is provided. In an embodiment, the handheld appliance includes:

a handle assembly having a substantially linear shape with a major dimension:minor dimension ratio ranging from about 1 to about 1.4;

a motor assembly for driving a personal care end effector; and

a clean-shaven face component operably coupled to the motor assembly.

In an embodiment, the personal care end effector includes a brush assembly.

In an embodiment, the personal care end effector includes a periodically oscillating brush assembly.

In an embodiment, the clean-shaven face component includes circuitry configured to implement a clean-shaven face protocol.

In an embodiment, the clean-shaven face component includes circuitry configured to actuate the motor assembly to cyclically displace at least one moving contacting element of the personal care end effector bi-directionally about a neutral position relative to at least one adjacent contacting element, to produce alternating tension and compression of a region of skin.

In an embodiment, the clean-shaven face component includes circuitry configured to actuate the motor assembly to apply a cyclical mechanical strain to a region of skin.

In an embodiment, the clean-shaven face component includes circuitry configured to drive a periodically oscillating brush assembly responsive to one or more inputs associated with a clean-shaven face protocol.

In an embodiment, the clean-shaven face component includes circuitry configured to manage a duty cycle associated with a clean-shaven face protocol.

In an embodiment, the clean-shaven face component includes circuitry configured to manage a duty cycle associated with at least one of a daily cleanse protocol or a power cleanse protocol.

In an embodiment, the clean-shaven face component includes circuitry configured to manage a duty cycle comprising a plurality of cleanse phases separated by at least one pulse.

In an embodiment, the clean-shaven face protocol component includes circuitry configured to actuate a duty cycle having at least a daily cleanse phase and a power cleanse phase separated by a pulse.

In an embodiment, the clean-shaven face protocol component includes circuitry configured to actuate a duty cycle having at least a first daily cleanse phase and second daily cleanse phase separated by a pulse.

In an embodiment, the clean-shaven face protocol component includes circuitry configured to actuate a duty cycle having at least a first period and a second period separated by a pulse.

In an embodiment, the clean-shaven face component is operably coupled to one or more capacitive touch sensors configured to effectuate a user input.

In an embodiment, the clean-shaven face component is operably coupled to one or more haptic interface devices.

In an embodiment, the handheld appliance further includes a partial facial hair protocol component operably coupled to the motor assembly.

In an embodiment, the handheld appliance further includes a bearded protocol component operably coupled to the motor assembly.

In an embodiment, the handheld appliance further includes a deep cleansing protocol component.

In an embodiment, the handheld appliance further includes a daily cleansing protocol component.

In an embodiment, the handheld appliance further includes a post-workout cleansing protocol component.

In an embodiment, the major dimension:minor dimension ratio ranges from about 1.1 to about 1.2.

In an embodiment, the major dimension:minor dimension ratio is about 1.2.

In an embodiment, the major dimension ranges from about 60 millimeters to about 80 millimeters.

In an embodiment, the handheld appliance further includes a daily cleansing protocol component.

In an embodiment, the handheld appliance further includes a deep cleansing protocol component.

In an embodiment, the handheld appliance further includes a cleansing regimen communication interface having circuitry configured to initiate a discovery protocol that allows a client device and the handheld appliance to identify each other and negotiate one or more pre-shared keys.

In an embodiment, the handheld appliance further includes a cleansing regimen communication interface having circuitry configured to initiate a discovery protocol that allows a client device and the handheld appliance to identify each other and exchange control information. In a further embodiment, the control information includes one or more control commands associated with at least one of a duty cycle, a pulsing mode, pulse duration, and a pulse frequency.

In an embodiment, the handheld appliance further includes a cleansing regimen communication interface having circuitry configured to initiate a discovery protocol that allows an enterprise server and the handheld appliance to exchange cleansing regimen information.

In an embodiment, the handheld appliance is configured to withstand total submersion in water so as to satisfy a fluid ingress rating of IPX7.

In an embodiment, the handheld appliance is configured to satisfy a water ingress rating of IPX7.

In an embodiment, the handheld appliance is configured to satisfy an International Protection (IP) Rating of IP47.

## DESCRIPTION OF THE DRAWINGS

The foregoing aspects and many of the attendant advantages of this disclosure 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 an exploded isometric view of one embodiment of a personal care appliance;

FIGURE 2 is an exploded isometric view of one embodiment of a handle of the personal care appliance of FIGURE 1;

FIGURE 3 is a functional block diagram of several components of the personal care appliance of FIGURE 1;

FIGURES 4A-4D illustrate selected components of the oscillating motor of FIGURE 1;

FIGURES 5A-5C illustrate other selected components of the oscillating motor of FIGURE 1;

FIGURE 6 is a cross sectional view of the personal care appliance taken along lines 6-6 in FIGURE 1;

FIGURE 7 illustrates use of a handheld personal care appliance in accordance with embodiments disclosed herein;

FIGURE 8 is a front elevation view of a handle of a personal care appliance in accordance with embodiments disclosed herein; and

FIGURES 9-11 are functional block diagrams illustrating several components of the personal care appliance in accordance with embodiments disclosed herein.

## DETAILED DESCRIPTION

The detailed description set forth below in connection with the appended drawings, where like numerals reference like elements, is intended as a description of various embodiments of the disclosed subject matter and is not intended to represent the only embodiments. Each embodiment described in this disclosure is provided merely as an example or illustration and should not be construed as preferred or advantageous over other embodiments. The illustrative examples provided herein are not intended to be exhaustive or to limit the claimed subject matter to the precise forms disclosed.

The present disclosure relates generally to handheld personal care appliances, systems, and methods. Generally described, personal care appliances typically use an electric motor to produce a particular workpiece movement/action, which in turn produces desired functional results. Examples of such appliances include power skin brushes, power toothbrushes and shavers, among others. In some currently available personal care appliances, the electric motor produces an oscillating (back and forth) action rather than a purely rotational movement. Examples of such oscillating motors are disclosed in U.S. Patent Nos. 7,786,626, 7,386,906, and 8,740,917, or commercially available in Clarisonic® branded products, such as the Aria or the Mia personal skincare product. The disclosures of U.S. Patent Nos. 7,786,626, 7,386,906, and 8,740,917, and the Clarisonic® branded products are expressly incorporated by reference herein.

While such Clarisonic® branded products are designed with a handle portion disposed orthogonal to the workpiece attachment portion, other designs are desired in the industry. Such designs include ever decreasing handle sizes, "bullet" shaped handles (e.g., handles with the oscillation axis being parallel to or coaxial with the product handle), etc. However, as handles get smaller, conventional drive systems tend to not work as well to produce the desired workpiece movement. A combination of appropriate drive power, compactness, and easily hand held form factor have thus far been elusive.

To that end, a portion of the following discussion provides embodiments of oscillating motors that compensate for the effects on, for example, the natural resonant frequency of the appliance (device), available space, etc., caused by configuration changes, namely dimensional, in the handle in order to maintain a desired level of motor efficiency and workpiece movement. As will be described in more detail below, the oscillating motor in one embodiment is configured and arranged to be mounted within a small form factor handle (e.g., a small footprint). In one embodiment, the oscillating motor can provide the similar oscillation amplitude and shear as the prior art device of U.S. Patent No. 7,786,626 but with substantially reduced size. In other embodiments disclosed herein, the handheld appliance includes control circuitry configured to control the motor in a periodic or cyclically manner for effecting desired workpiece movement. In that regard, as will be described in more detail below, the handheld appliance is configured to provide one or more skin care regimens. In many of the embodiments set forth herein, the oscillating action generated by the oscillating motor is rotational, translational, or a combination thereof.

In the following description, numerous specific details are set forth in order to provide a thorough understanding of one or more embodiments of the present disclosure. It will be apparent to one skilled in the art, however, that many embodiments of the present disclosure may be practiced without some or all of the specific details. In some instances, well-known process steps have not been described in detail in order not to unnecessarily obscure various aspects of the present disclosure. Further, it will be appreciated that embodiments of the present disclosure may employ any combination of features described herein.

FIGURE 1 is a partially exploded isometric view of one representative embodiment of a personal care appliance, generally designated 20, formed in accordance with an aspect of the present disclosure. FIGURE 2 is an exploded view of the handle of

the personal care appliance 20 of FIGURE 1. As shown in FIGURE 1, the personal care appliance 20 includes a handle assembly 24 detachably coupled to a workpiece, such as brush head 28. FIGURE 2 is an exploded view of one embodiment of the handle assembly 24 shown in FIGURE 1. As shown in FIGURE 2, the handle assembly 24 includes a handle base 30, an oscillating motor 32, and a handle top 36.

As will be described in more detail below, the motor 32 in one embodiment is configured to provide oscillating motive force or torque to a workpiece, such as the brush head 28. As will be described in more detail below, the oscillating motor 32 is configured with a reduced motor envelope ME (see FIGURE 4C) as compared to conventional motors, such as the motor described in U.S. Patent No. 7,786,626, in order to be suitable for personal care appliances with smaller handles, such as the handle shown in FIGURE 7. The configuration of one embodiment of the oscillating motor provides, among other things, additional space for various associated components of the appliance 20.

A workpiece mount 40 is also included, and is coupled to the oscillating motor 32 for movement thereby. In one embodiment, the workpiece mount 40 together with the handle top 36 are configured to be detachably coupled to the brush head 28 (FIGURE 1). The workpiece is shown as a brush head in the embodiment of FIGURE 1, but can alternatively include a composition applicator, an exfoliating disc, shaving head, etc. Once attached, the workpiece in one embodiment is oriented coaxially with the handle assembly 24.

Returning to FIGURE 2, the handle base 30 is generally cylindrical in one embodiment, and houses the operating structure of the appliance, as shown in FIGURE 6. In one embodiment, the handle base 30 is about two (2) inches in diameter or less. As shown in block diagrammatic form in FIGURE 3, the operating structure in one embodiment includes the oscillating motor 32, a power storage source, such as a battery 44, and a control circuit 48 configured and arranged to selectively generate alternating current at a selected duty cycle from power stored in the battery 44 and deliver alternating current to the oscillating motor 32. In this embodiment, the control circuit 48 includes a user input 49, such as an on/off button 50 (See FIGURE 1) and optionally includes power adjust or mode control, such as button 52 (See FIGURE 1), coupled to control circuitry. In one embodiment, the control circuitry includes a programmed

microcontroller, processor, or other programmable logic device(s) configured to control the delivery of alternating current to the oscillating motor 32.

Turning now to FIGURES 1, 4A-4D, and 5A-5C, one representative embodiment of the oscillating motor 32 will now be described in more detail. As shown in 1, 4A-4D, and 5A-5C, the oscillating motor 32 includes a motor base 60, a stator 64, and an armature assembly 66. The stator 64, sometimes referred to as an electromagnet or field magnet, is mounted against movement between the armature assembly 66 and the motor base 60. In the embodiment shown, the stator 64 includes an E-core 70 having a center leg 72 upon which a stator coil 74 is wound and two outer legs 76 and 78. In the embodiment shown, the coil is configured with a condensed winding and the center leg 72 is shorter than the two outer legs 76 and 78 (See FIGURE 4D). In one embodiment, the width SW of the E-core 70 is about one (1) inch and the length SL of the E-Core is about 0.75 inches. In another embodiment, the width SW of the E-core 70 is about one (1) inch, the length SL of the E-Core is about 0.75 inches, the length of the outer legs is about 0.625 inches, and the length of the center leg is about 0.4 inches.

As assembled, the coil 74 is connected to a source of alternating current, such as the battery powered control circuit 48. In operation, the coil 74 generates a magnetic field of reversing polarity when alternating current is passed through the coil 74 and around center leg 72.

Referring now to FIGURES 4A-4D, the armature assembly 66 includes a somewhat curved armature 80 mounted for movement about an axis 82. The armature 80 includes a back iron 84, which is made from a ferromagnetic material. Two or more spaced magnets 86 and 88 are magnetically coupled to the back iron 84, with magnetization in the radial direction. The magnets 86 and 88 are arranged such that the north pole of one magnet 86 faces outwardly while the north pole of the other magnet 88 faces inwardly. It should be understood, however, that the orientation could be reversed as long as the magnet poles point in opposite directions. In the embodiment shown, the armature 80 includes two surfaces disposed at an angle to one another onto which the two or more magnets 86 and 88 are mounted. As assembled, the position and orientation of the magnets 86 and 88 are such that a line normal to the face of the magnets passing through the midpoint of the magnet face also passes through the axis 82.

The armature assembly 66 also includes an armature mount 90, which is fixedly secured to the handle base 30 (See FIGURE 2) via motor base 60, thus becoming a

mechanical reference for the oscillating system. As shown in FIGURES 4C and 4D, the armature 80 is coupled to the armature mount 90 by a pair of fixture elements, shown as flexure elements 92 and 94, in a crossed or "X" configuration. In that regard, the flexure elements 92 and 94 overlap at axis 82 (see FIGURE 4A), which is the functional pivot point about which armature 80 oscillates.

Instead of orienting the flexure elements 92 and 94 perpendicular to one another and overlapping at the midpoint of each element like prior art devices, the flexure elements 92 and 94 in the embodiment of FIGURES 4C and 4D are oriented such that: (1) the angle $\alpha$ formed between the flexure elements 92 and 94 is between about 55 degrees and about 60 degrees; and (2) the flexure member 92 crosses the flexure element 94 in an overlapping manner at about $7/8^{th}$ (i.e., 0.875) of the length of each element. In an embodiment, the flexure member 92 crosses the flexure element 94 in an overlapping manner at a point greater than about 8/10, but less than 9/10, of the length of each element.

In one embodiment, the angle $\alpha$ formed between the flexure elements 92 and 94 is about 58 degrees. In one embodiment, the flexure elements 92 and 94 are made from spring steel material, and are about 0.016 inches thick and about 0.40 inches high. In one embodiment, the effective length L of each flexure element is about 0.95 inches, which is substantially similar to the motor of U.S. Patent No. 7,786,626.

By moving the cross point of the flexure elements and selecting the angle $\alpha$ in the range above, additional space, for example, is created within the reduced motor envelope ME for associated components of the appliance, as will be described in more detail below. Additionally or alternatively, to allow the use of flexure elements having an effective length described above but to fit the reduced motor envelope ME (See FIGURE 4C), first ends of the flexure elements 92 and 94 in one embodiment are mounted to the armature mount 90 with bent or angled ends 96 and 98, respectively, and second ends of the flexure elements 92 and 94 in this or another embodiment are mounted to the armature 80 with bent or angled ends (hidden in FIGURES 4C and 4D). In one embodiment, the oscillating motor 32 is configured such that the ratio of the effective length L of the flexure elements 92 and 94 to the diameter of the motor envelop is about 0.50 (i.e., 1:2).

In one embodiment, the armature mount 90 includes extensions 100 and 102 that extend from the ends of a cross member 106 outwardly around the flexure

elements 92 and 94 and terminate at ends positioned adjacent outer legs 76 and 78 of the E-core 70, as shown in FIGURES 4C and 4D. The bottom surface of extensions 100 and 102 forms an interface that is cooperatively matable with the top peripheral surface of the motor base 60 (See FIGURES 5A-5C). In one embodiment, the motor base 60 is fastened to the armature assembly 66 via removable fastening techniques, such as screws or press fittings, among others. Once mated, a battery socket is formed by aligned openings 120 and 122 formed in the mount extension 100 and the motor base 60, respectively. In one embodiment, the battery socket is positioned within the motor envelope ME and is sized and configured to either receive or retain the battery 44 (see FIGURE 4C). In another embodiment, the motor base 60 and the armature mount 90 are also configured to define an additional space 128 within the motor envelope ME to accommodate a printed circuit board 50 having the control circuit 48 disposed thereon as well as other structure, such as fastener mount 134. In one embodiment, the extension 102 and corresponding structure of the mounting base 60 define a notch as part of the additional space 128 for receiving a component of the appliance 20. The extension 100 also includes an opening 132 for receiving a corresponding fastener mount 136. In one embodiment, the fastener mounts 134 and 136 are used with screws to draw the handle top 36 together with structure associated with the handle base 30.

The armature assembly 66 further includes a mounting arm 116 extending from the side of armature 80. As can be seen in FIGURES 4A-4D, the mounting arm 116 extends outwardly from the armature 80 and then extends horizontally (orthogonal to the pivot axis of the workpiece) until it reaches the axis 82, where the mounting arm 116 extends outwardly again about coaxially with the axis 82. Mounted on the free end of mounting arm 116 is a workpiece, such as the brush head 28 (See FIGURE 1). The configuration of the mounting arm 116 is thus such that the workpiece oscillates about axis 82, which is parallel to the longitudinal axis of the personal care appliance. In some embodiments, the location/orientation of the mounting arm 116 can be changed, for instance, by moving the location of the tip away from axis 82, to produce a combined rotational/translational movement of the workpiece.

Handheld Appliances

In one aspect, handheld appliances are provided. In certain embodiments, the handheld appliances incorporate the aspects and embodiments described elsewhere herein. For example, FIGURE 1 illustrates a representative handheld appliance, a

personal care appliance 20, which incorporates a motor 32 and other components as shown and described.

In an embodiment, the handle assembly comprises a cylindrical, tubular, rectangular, polyhedral, spherical, square, pyramidal shape, regular shape, irregular shape, and the like, or combinations thereof, as well as other symmetrical and asymmetrical shapes.

In an embodiment, the handle assembly comprises a substantially cylindrical geometric shape with a major dimension:minor dimension ratio ranging from about 1 to about 1.4.

In an embodiment, the handle assembly comprises a cylindrical geometric having a cross-section of substantially any shape including, for example, circular, triangular, square, rectangular polygonal, and the like, as well as other symmetrical and asymmetrical shapes, or combinations thereof.

In an embodiment, the handheld appliance includes:

a handle assembly having a substantially linear shape (e.g., a cylindrical linear shape, a tubular linear shape, a rectangular linear shape, a polyhedral linear shape, etc.) with a major dimension:minor dimension ratio ranging from about 1 to about 1.4;

a motor assembly for driving a personal care end effector; and

a clean-shaven face component operably coupled to the motor assembly.

FIGURE 7 illustrates a representative handheld appliance 20 in use, applying a brush head 28 to the face of a user. The handheld appliance 20 fits easily within the user's hand and has a smaller overall volume than traditional personal care brush appliances, which arrange the brush head orthogonal to the handle. Instead, the handheld appliance 20 is substantially linear and compact.

This unique profile is made possible, in certain embodiments, by the motor disclosed herein (e.g., oscillating motor 32). The motor 32 is configured to drive a personal care end effector. Representative personal care end effectors include brushes, such as brush head 28 illustrated in FIGURE 1. Accordingly, in an embodiment, the personal care end effector includes a brush assembly. See e.g., U.S. Patent Nos. 7,786,626, 7,386,906, and 8,740,917.

While brushes are illustrated and described herein, other embodiments provide personal care end effectors such as applicators and mechanical end effectors. Brushes of any size and composition can be used. Exemplary brushes are those sold by Clarisonic®

for use with its cleansing appliances. Exemplary applicators include elastomeric applicators and formulation applicators. End effectors are specifically designed to apply a mechanical strain and can take the form of a massager, a circular-strain-inducing end effector, and the like.

In an embodiment, the he motor 32 is configured to drive the personal care end effector through a workpiece mount 40. The workpiece mount 40 provides a mechanical connection between the motor 40 and the end effector (e.g., brush head 28).

In an embodiment, the personal care end effector includes a periodically oscillating brush assembly. Such oscillating brush assemblies are described herein and exemplified by Clarisonic® branded products.

The motor 32 is contained within the handle assembly 24. The handle assembly 24 has a substantially linear shape. FIGURE 8 defines certain dimensions of the handle assembly 24. Both a longitudinal axis 150, bisecting a width of the handle assembly 24, and a latitudinal axis 152, bisecting a length of the handle assembly 24, are illustrated. The two axes 150 and 152 are perpendicular. A major dimension M is defined as the span of the handle assembly along the longitudinal axis 150. A minor dimension **m** is defined as the span of the handle assembly along the latitudinal axis 152.

For the purposes of user experience, stability, and ease of use, in an embodiment the hand held device has a center of mass 154 that is located between the latitudinal axis 152 and a base end 156 of the handle assembly 24, as illustrated in FIGURE 8. In an embodiment, the handle assembly 24 is configured to have a center of mass 154 located at a point located less than half the distance from the base end 156 along the major axis 150.

In certain embodiments incorporating oscillating brush assembly, the brush assembly oscillates with angular motion in a plane substantially perpendicular (e.g., plus or minus 5 degrees) to the longitudinal axis 150. In another embodiment, the brush assembly oscillates with angular motion in a plane perpendicular to the longitudinal axis 150.

In an embodiment, the major dimension:minor dimension ratio ranges from about 1 (i.e., 1:1) to about 1.4 (i.e., 1.4:1). In an embodiment, the major dimension:minor dimension ratio ranges from about 1.1 to about 1.2. In an embodiment, the major dimension:minor dimension ratio is about 1.2. In an embodiment, the major dimension

ranges from about 60 millimeters to about 80 millimeters. In an embodiment, the major dimension ranges from about 70 millimeters to about 80 millimeters.

In an embodiment, the handheld appliance is configured to withstand total submersion in water so as to satisfy a fluid ingress rating of International Protection (IEC standard 60529, also referred to as Ingress Protection) level 7 (IPX7). In an embodiment, the handheld appliance is configured to satisfy a water ingress rating of IPX7. In an embodiment, the handheld appliance is configured to satisfy an International Protection (IP) Rating of IP47.

As was described briefly above, the appliance 20 includes a control circuit 48 configured and arranged to selectively generate alternating current at a selected duty cycle from power stored in the battery 44 and to deliver alternating current to the oscillating motor 32. The control circuit 48 in one embodiment is coupled to a user input 49, such as an on/off button 50 (See FIGURE 1) and a power adjust or mode control 51, such as button 52 (See FIGURE 1).

The control circuit 48 includes circuits or circuitry components configured to receive the control signal from the buttons 50 and 52 and generate the appropriate drive signals to control the delivery of alternating current to the oscillating motor 32. In one embodiment, the drive signals are configured to delivery alternating current to the oscillating motor 32 at a predetermined duty cycle. As will be described in more detail below, the oscillating motor 32 can be controlled in various manners to provide one or more skin treatments.

While buttons 50 and 52 are illustrated herein, other input mechanisms can also be implemented to provide user input 49 according to FIGURES 3 and 9-11. In an embodiment, the clean-shaven face component is operably coupled to one or more capacitive touch sensors configured to effectuate a user input 49. In an embodiment, the clean-shaven face component is operably coupled to one or more haptic interface devices to effectuate a user input 49. Furthermore, in certain embodiments off-appliance signals are used to control the appliance control circuit 48, instead of or in addition to on-appliance controls. Such off-appliance controls are discussed in detail below.

In accordance with an aspect of the present disclosure, the appliance is configured to provide one or more treatment regimens, as illustrated in FIGURE 9. For example, the appliance 20 in one embodiment is configured with one or more drive modes that drive the end effector, such as brush head 28, in a manner that effectuates one or more of a

clean-shaven protocol 202, a daily cleanse protocol 204, or a facial hair cleanse protocol 206. In one embodiment, the daily cleanse protocol 204 includes one or more of a first daily cleanse, a second daily cleanse, a power cleanse, a deep cleanse, or a post-workout cleanse in any combination. In these or other embodiments, the facial hair protocol includes one or more of a partial-facial-hair cleanse or a bearded cleanse.

To carry out one or more of the modes of treatment discussed above, the appliance 20, and in one embodiment the control circuit 48, includes appropriately configured components, whether in hardware, software, or both hardware and software. In that regard, with reference to FIGURE 11, the handheld appliance 20, and in one embodiment the control circuit 48, includes a clean-shaven face protocol component 220 operably coupled to the motor assembly 32. In an embodiment, the handheld appliance 20, and in one embodiment the control circuit 48, includes a partial facial hair protocol component 222 operably coupled to the motor assembly 32. In an embodiment, the handheld appliance 20, and in one embodiment the control circuit 48, includes a bearded protocol component 224 operably coupled to the motor assembly 32. In an embodiment, the handheld appliance 20, and in one embodiment the control circuit 48, includes a deep cleansing protocol component 226 operably coupled to the motor assembly 32. In an embodiment, the handheld appliance 20, and in one embodiment the control circuit 48, includes a daily cleansing protocol component 228 operably coupled to the motor assembly 32. In an embodiment, the handheld appliance 20, and in one embodiment the control circuit 48, includes a post-workout cleansing protocol component 230 operably coupled to the motor assembly 32. In an embodiment, the handheld appliance, and in one embodiment the control circuit 48, includes a power cleansing protocol component operably coupled to the motor assembly 32 (not illustrated in FIGURE 11).

Any of the disclosed techniques, methodologies, methods, or processes can be implemented using circuitry in order to control the appliance 20. In an embodiment, the clean-shaven face component 220 includes circuitry configured to implement a clean-shaven face protocol. In an embodiment, the clean-shaven face component 220 includes circuitry configured to actuate the motor assembly to cyclically displace at least one moving contacting element of the personal care end effector bi-directionally about a neutral position relative to at least one adjacent contacting element, to produce alternating tension and compression of a region of skin. In an embodiment, the clean-shaven face

component 220 includes circuitry configured to actuate the motor assembly to apply a cyclical mechanical strain to a region of skin. In an embodiment, the clean-shaven face component 220 includes circuitry configured to drive a periodically oscillating brush assembly responsive to one or more inputs associated with a clean-shaven face protocol. In an embodiment, the clean-shaven face component 220 includes circuitry configured to manage a duty cycle associated with a clean-shaven face protocol 202 (FIGURE 9). In an embodiment, the clean-shaven face component 220 includes circuitry configured to manage a duty cycle associated with at least one of a daily cleanse protocol 204 (FIGURE 9) or a power cleanse protocol (not illustrated). In an embodiment, the clean-shaven face component 220 includes circuitry configured to manage a duty cycle comprising a plurality of cleanse phases 210, 212, 214 (FIGURE 10) separated by at least one pulse.

Referring to FIGURE 10, in an embodiment, the clean-shaven face component 220 includes circuitry configured to actuate a duty cycle having at least a daily cleanse phase 210, 212 and a power cleanse phase 214 separated by a pulse. In an embodiment, the clean-shaven face component 220 includes circuitry configured to actuate a duty cycle having at least a first daily cleanse phase 210 and second daily cleanse phase 212 separated by a pulse. In an embodiment, the clean-shaven face component 220 includes circuitry configured to actuate a duty cycle having at least a first period and a second period separated by a pulse.

In an embodiment, the handheld appliance 20 further includes a cleansing regimen communication interface 232 configured to link the appliance 20 with an associated client device 236, 238, 242, 244, 246, as shown in FIGURES 9-11. In an embodiment, the communication interface 232 is hard wired to a client interface, as discussed further below. In an embodiment, the communication interface 232 is wireless and connects to a client interface, as discussed further below.

Whether wired or wireless, a direct connection 234 can be made to any client interface, such as a personal computer (PC) 236 and/or a mobile device 238 (e.g., phone, PDA, or the like). Whether wired or wireless, the communication interface 232 can be connected to a network 240 that ultimately provides a connection to any client interface, such as a personal computer (PC) 242, the internet 246, a cloud computing system 244, or the like.

The client device in one embodiment is a server, a tablet, a mobile phone, or a laptop computer. In one embodiment, the communication interface 232 includes circuits or modules configured to enable communication with the client device via a Personal Area Network (PAN), Local Area Network (LAN; represented by 234) or a Wide Area Network (WAN; represented by 240). Accordingly, the communication interface 232 is configured to communicate with a client device using standard wireless protocols (e.g., WiFi, WiMax, Bluetooth, ZigBee, Cellular, Infrared, Nearfield, etc.) or wired protocols (Universal Serial Bus or other serial communications such as RS-234, RJ-45, etc., parallel communications bus, etc.).

In one embodiment, the communication interface 232 includes circuitry configured to initiate a discovery protocol that allows the client device and the handheld appliance to identify each other and exchange control information. In one embodiment, the control information includes one or more control commands associated with at least one of a duty cycle, a pulsing mode, pulse duration, and a pulse frequency. In an embodiment, alternatively or additionally the handheld appliance includes a cleansing regimen communication interface having circuitry configured to initiate a discovery protocol that allows a client device and the handheld appliance to identify each other and negotiate one or more pre-shared keys. In an embodiment, the cleansing regimen communication interface alternatively or additional includes circuitry configured to initiate a discovery protocol that allows an enterprise server and the handheld appliance to exchange cleansing regimen information.

In an embodiment, the appliance 20 includes circuitry having one or more modules optionally operable for communication with one or more input/output components that are configured to relay user output and/or input. In an embodiment, a module includes one or more instances of electrical, electromechanical, software-implemented, firmware-implemented, or other control devices. Such devices include one or more instances of memory; computing devices; antennas; power or other supplies; logic modules or other signaling modules; sensors, gauges or other such active or passive detection components; etc.

In an embodiment, the appliance 20 includes circuitry having one or more components operably coupled (e.g., communicatively, electromagnetically, magnetically, ultrasonically, optically, inductively, electrically, capacitively coupled, or the like) to each other.

Certain embodiments disclosed herein utilize circuitry in order to implement treatment protocols, operably couple two or more components, generate information, determine operation conditions, control an appliance or method, and/or the like. Circuitry of any type can be used. In an embodiment, circuitry includes, among other things, one or more computing devices such as a processor (e.g., a microprocessor), a central processing unit (CPU), a digital signal processor (DSP), an application-specific integrated circuit (ASIC), a field-programmable gate array (FPGA), or the like, or any combinations thereof, and can include discrete digital or analog circuit elements or electronics, or combinations thereof. In an embodiment, circuitry includes one or more ASICs having a plurality of predefined logic components. In an embodiment, circuitry includes one or more FPGA having a plurality of programmable logic components.

In an embodiment, circuitry includes hardware circuit implementations (e.g., implementations in analog circuitry, implementations in digital circuitry, and the like, and combinations thereof). In an embodiment, circuitry includes combinations of circuits and computer program products having software or firmware instructions stored on one or more computer readable memories that work together to cause a device to perform one or more methodologies or technologies described herein. In an embodiment, circuitry includes circuits, such as, for example, microprocessors or portions of microprocessor, that require software, firmware, and the like for operation. In an embodiment, circuitry includes an implementation comprising one or more processors or portions thereof and accompanying software, firmware, hardware, and the like. In an embodiment, circuitry includes a baseband integrated circuit or applications processor integrated circuit or a similar integrated circuit in a server, a cellular network device, other network device, or other computing device. In an embodiment, circuitry includes one or more remotely located components. In an embodiment, remotely located components are operably coupled via wireless communication. In an embodiment, remotely located components are operably coupled via one or more receivers, transmitters, transceivers, or the like.

In an embodiment, circuitry includes one or more memory devices that, for example, store instructions or data. Non-limiting examples of one or more memory devices include volatile memory (e.g., Random Access Memory (RAM), Dynamic Random Access Memory (DRAM), or the like), non-volatile memory (e.g., Read-Only Memory (ROM), Electrically Erasable Programmable Read-Only Memory (EEPROM),

Compact Disc Read-Only Memory (CD-ROM), or the like), persistent memory, or the like. Further non-limiting examples of one or more memory devices include Erasable Programmable Read-Only Memory (EPROM), flash memory, or the like. The one or more memory devices can be coupled to, for example, one or more computing devices by one or more instructions, data, or power buses.

In an embodiment, circuitry of the client device or the appliance 20 includes one or more computer-readable media drives, interface sockets, Universal Serial Bus (USB) ports, memory card slots, or the like, and one or more input/output components such as, for example, a graphical user interface, a display, a keyboard, a keypad, a trackball, a joystick, a touch-screen, a mouse, a switch, a dial, or the like, and any other peripheral device. In an embodiment, circuitry includes one or more user input/output components that are operably coupled to at least one computing device to control (electrical, electromechanical, software-implemented, firmware-implemented, or other control, or combinations thereof) at least one parameter associated with the application of cyclical movement by the appliance 20, for example, controlling the duration and peak cyclic or oscillation frequency of the workpiece of the appliance 20.

In an embodiment, circuitry of the client device or the appliance 20 includes a computer-readable media drive or memory slot configured to accept signal-bearing medium (e.g., computer-readable memory media, computer-readable recording media, or the like). In an embodiment, a program for causing a system to execute any of the disclosed methods can be stored on, for example, a computer-readable recording medium (CRMM), a signal-bearing medium, or the like. Non-limiting examples of signal-bearing media include a recordable type medium such as any form of flash memory, magnetic tape, floppy disk, a hard disk drive, a Compact Disc (CD), a Digital Video Disk (DVD), Blu-Ray Disc, a digital tape, a computer memory, or the like, as well as transmission type medium such as a digital and/or an analog communication medium (e.g., a fiber optic cable, a waveguide, a wired communications link, a wireless communication link (e.g., transmitter, receiver, transceiver, transmission logic, reception logic, etc.). Further non-limiting examples of signal-bearing media include, but are not limited to, DVD-ROM, DVD-RAM, DVD+RW, DVD-RW, DVD-R, DVD+R, CD-ROM, Super Audio CD, CD-R, CD+R, CD+RW, CD-RW, Video Compact Discs, Super Video Discs, flash memory, magnetic tape, magneto-optic disk, MINIDISC, non-volatile memory

card, EEPROM, optical disk, optical storage, RAM, ROM, system memory, web server, or the like.

In operation, an alternating current is supplied to the stator coil from the battery under control of control circuit 48, resulting in an arcuate movement of the armature about axis, due to the attractive/repulsive action between the E-core and the magnets of the armature. The particular arrangement of the stator E-core and the armature results in a substantially rotational oscillation of a selected angle about the axis. In some embodiments, the instantaneous center of rotation may move in a very small (approximately 0.010 inches) complex curve offset about the shaft center point when it is at rest. The angular range of oscillation can be varied, depending upon the configuration of the armature and the stator and the characteristics of the alternating drive current. In some embodiments, the motion in one of various settings (e.g., low, normal, high, pro, etc.) is within the range of 3 to 21 degrees about the pivot axis.

It should be noted that for purposes of this disclosure, terminology such as "upper," "lower," "vertical," "horizontal," "inwardly," "outwardly," "inner," "outer," "front," "rear," etc., should be construed as descriptive and not limiting the scope of the claimed subject matter. Further, the use of "including," "comprising," or "having" and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. Unless limited otherwise, the terms "connected," "coupled," and "mounted" and variations thereof herein are used broadly and encompass direct and indirect connections, couplings, and mountings. The term "about" means 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 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 that all such variations, changes, and equivalents fall within the spirit and scope of the present disclosure, as claimed.

CLAIMS

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A handheld appliance, comprising:

a handle assembly having a substantially linear shape with a major dimension:minor dimension ratio ranging from about 1 to about 1.4;

a motor assembly for driving a personal care end effector; and

a clean-shaven face component operably coupled to the motor assembly.

2. The handheld appliance of Claim 1, wherein the personal care end effector comprises a brush assembly.

3. The handheld appliance of Claims 1-2, wherein the personal care end effector comprises a periodically oscillating brush assembly.

4. The handheld appliance of Claims 1-3, wherein the clean-shaven face component includes circuitry configured to implement a clean-shaven face protocol.

5. The handheld appliance of Claims 1-4, wherein the clean-shaven face component includes circuitry configured to actuate the motor assembly to cyclically displace at least one moving contacting element of the personal care end effector bi-directionally about a neutral position relative to at least one adjacent contacting element, to produce alternating tension and compression of a region of skin.

6. The handheld appliance of Claims 1-5, wherein the clean-shaven face component includes circuitry configured to actuate the motor assembly to apply a cyclical mechanical strain to a region of skin.

7. The handheld appliance of Claims 1-6, wherein the clean-shaven face component includes circuitry configured to drive a periodically oscillating brush assembly responsive to one or more inputs associated with a clean-shaven face protocol.

8. The handheld appliance of Claims 1-7, wherein the clean-shaven face component includes circuitry configured to manage a duty cycle associated with a clean-shaven face protocol.

9. The handheld appliance of Claims 1-8, wherein the clean-shaven face component includes circuitry configured to manage a duty cycle associated with at least one of a daily cleanse protocol or a power cleanse protocol.

10. The handheld appliance of Claims 1-9, wherein the clean-shaven face component includes circuitry configured to manage a duty cycle comprising a plurality of cleanse phases separated by at least one pulse.

11. The handheld appliance of Claims 1-10, wherein the clean-shaven face protocol component includes circuitry configured to actuate a duty cycle having at least a daily cleanse phase and a power cleanse phase separated by a pulse.

12. The handheld appliance of Claims 1-11, wherein the clean-shaven face protocol component includes circuitry configured to actuate a duty cycle having at least a first daily cleanse phase and second daily cleanse phase separated by a pulse.

13. The handheld appliance of Claims 1-12, wherein the clean-shaven face protocol component includes circuitry configured to actuate a duty cycle having at least a first period and a second period separated by a pulse.

14. The handheld appliance of Claims 1-13, wherein the clean-shaven face component is operably coupled to one or more capacitive touch sensors configured to effectuate a user input.

15. The handheld appliance of Claims 1-14, wherein the clean-shaven face component is operably coupled to one or more haptic interface devices.

16. The handheld appliance of Claims 1-15, further comprising:
a partial facial hair protocol component operably coupled to the motor assembly.

17. The handheld appliance of Claims 1-16, further comprising:
a bearded protocol component operably coupled to the motor assembly.

18. The handheld appliance of Claims 1-17, further comprising:
a deep cleansing protocol component.

19. The handheld appliance of Claims 1-18, further comprising:

a daily cleansing protocol component.

20. The handheld appliance of Claims 1-19, further comprising:

a post-workout cleansing protocol component.

21. The handheld appliance of Claims 1-20, wherein the major dimension:minor dimension ratio ranges from about 1.1 to about 1.2.

22. The handheld appliance of Claims 1-21, wherein the major dimension:minor dimension ratio is about 1.2.

23. The handheld appliance of Claims 1-22, wherein the major dimension ranges from about 60 millimeters to about 80 millimeters.

24. The handheld appliance of Claims 1-23, further comprising:

a cleansing regimen communication interface having circuitry configured to initiate a discovery protocol that allows a client device and the handheld appliance to identify each other and negotiate one or more pre-shared keys.

25. The handheld appliance of Claims 1-23, further comprising:

a cleansing regimen communication interface having circuitry configured to initiate a discovery protocol that allows a client device and the handheld appliance to identify each other and exchange control information.

26. The handheld appliance of Claim 25, wherein the control information includes one or more control commands associated with at least one of a duty cycle, a pulsing mode, pulse duration, and a pulse frequency.

27. The handheld appliance of Claims 1-26, further comprising:

a cleansing regimen communication interface having circuitry configured to initiate a discovery protocol that allows an enterprise server and the handheld appliance to exchange cleansing regimen information.

28. The handheld appliance of Claims 1-27, wherein the handheld appliance is configured to withstand total submersion in water so as to satisfy a fluid ingress rating of IPX7.

29. The handheld appliance of Claims 1-27, wherein the handheld appliance is configured to satisfy a water ingress rating of IPX7.

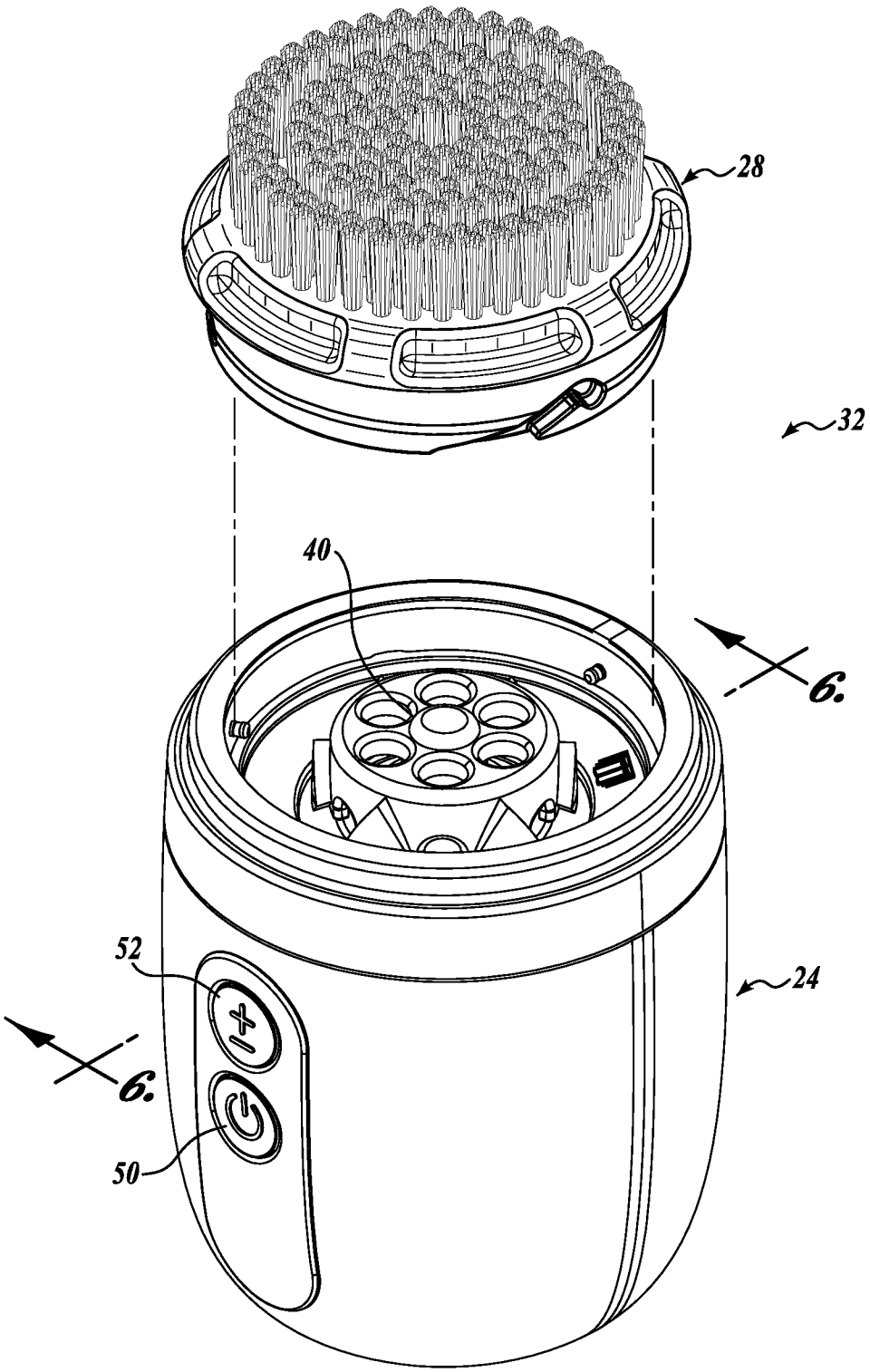


Fig. 1.

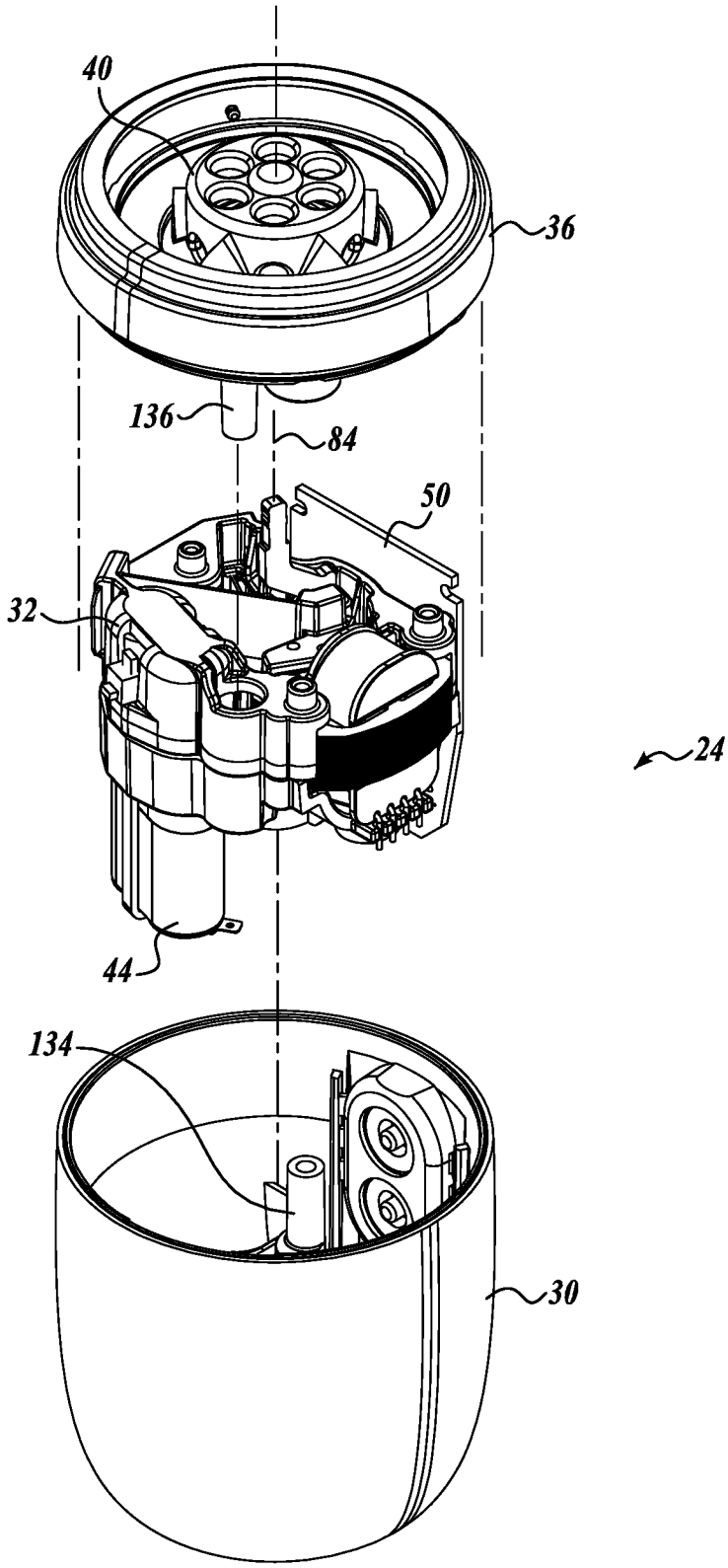


Fig.2.

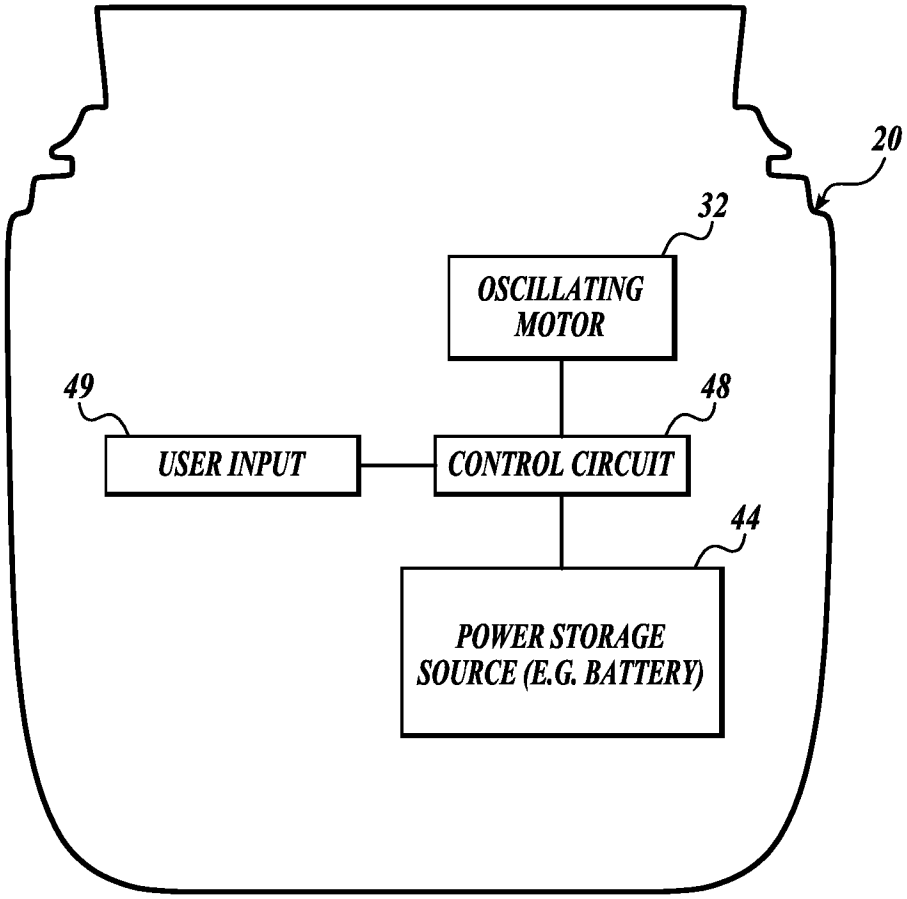
20
32
OSCILLATING MOTOR
49
48
USER INPUT
CONTROL CIRCUIT
44
POWER STORAGE SOURCE (E.G. BATTERY)

Fig.3.

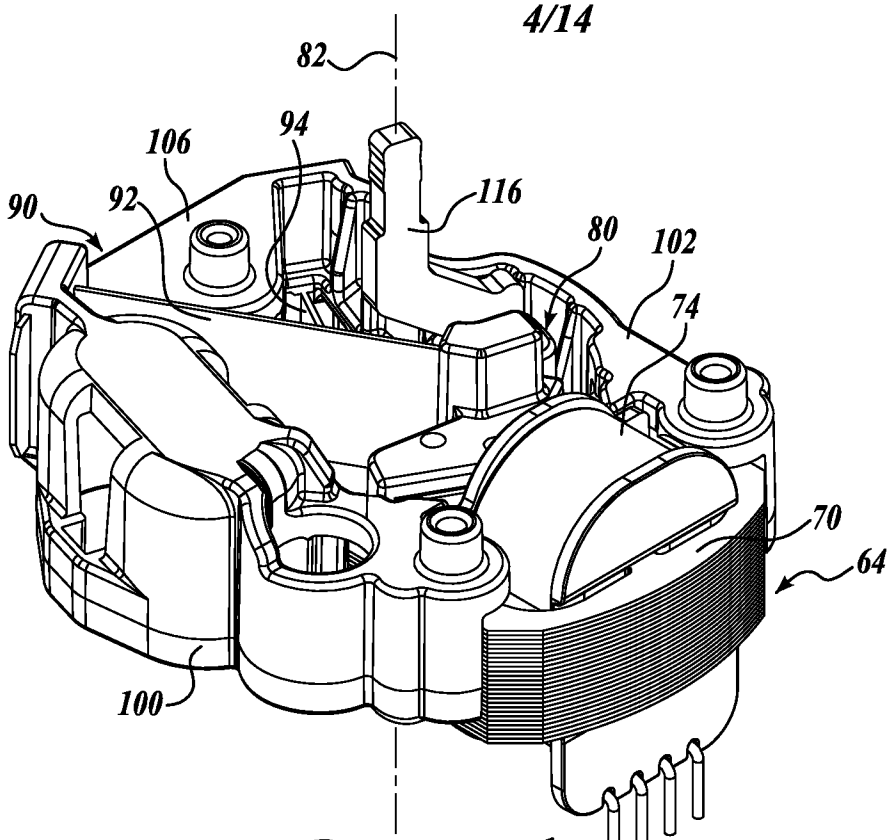
82
94
106
90
92
116
80
102
74
70
64
100

Fig. 4A.

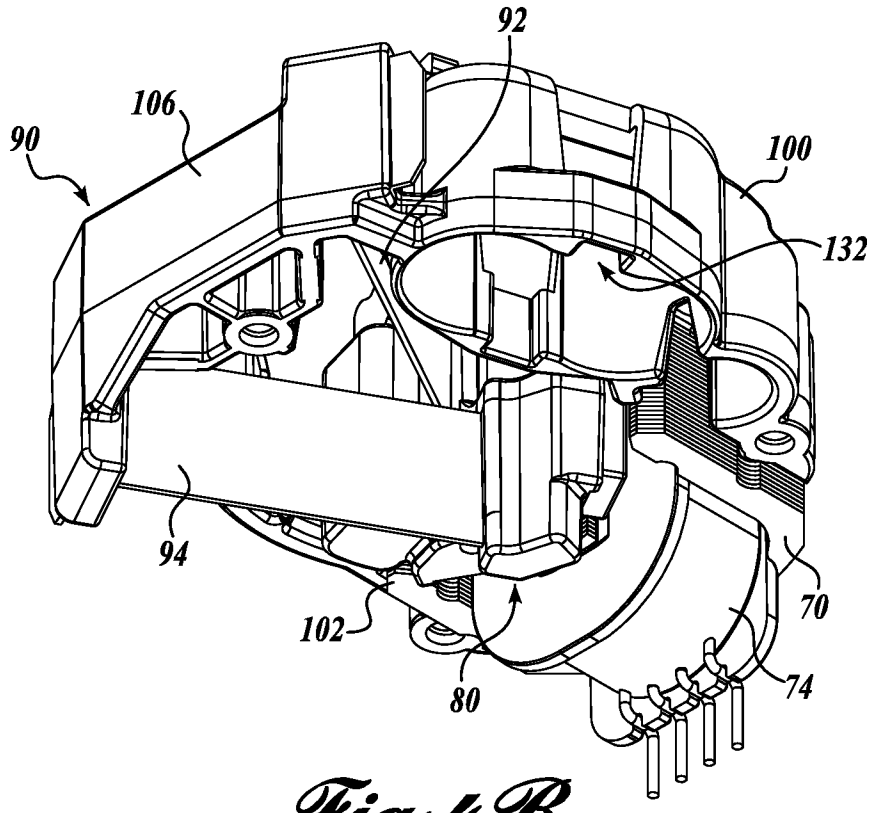
92
106
90
100
132
94
102
80
70
74

Fig. 4B.

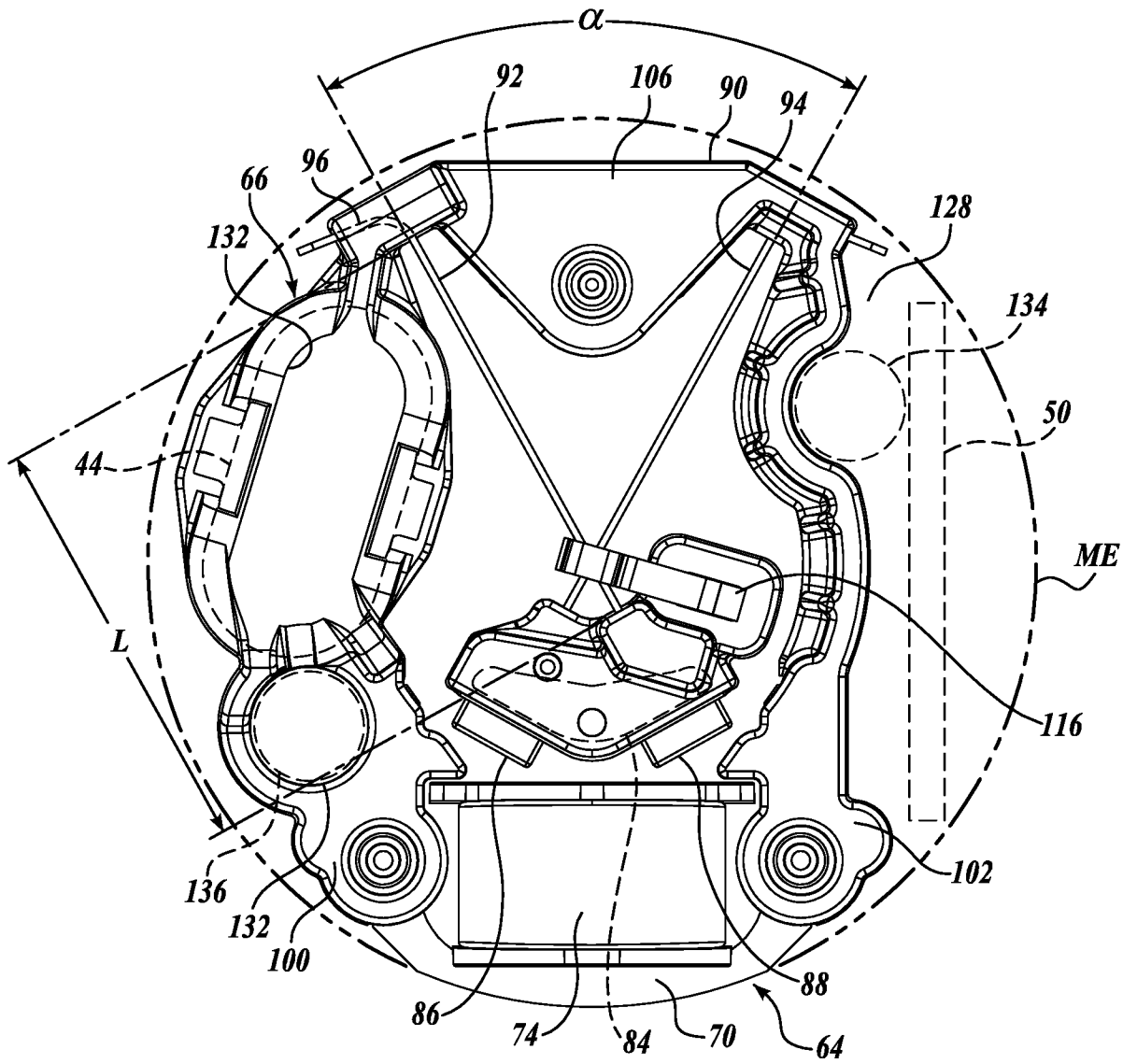
α
92
106
90
94
96
66
132
128
134
50
44
ME
L
116
102
136
132
100
88
86
74
84
70
64

Fig. 4C.

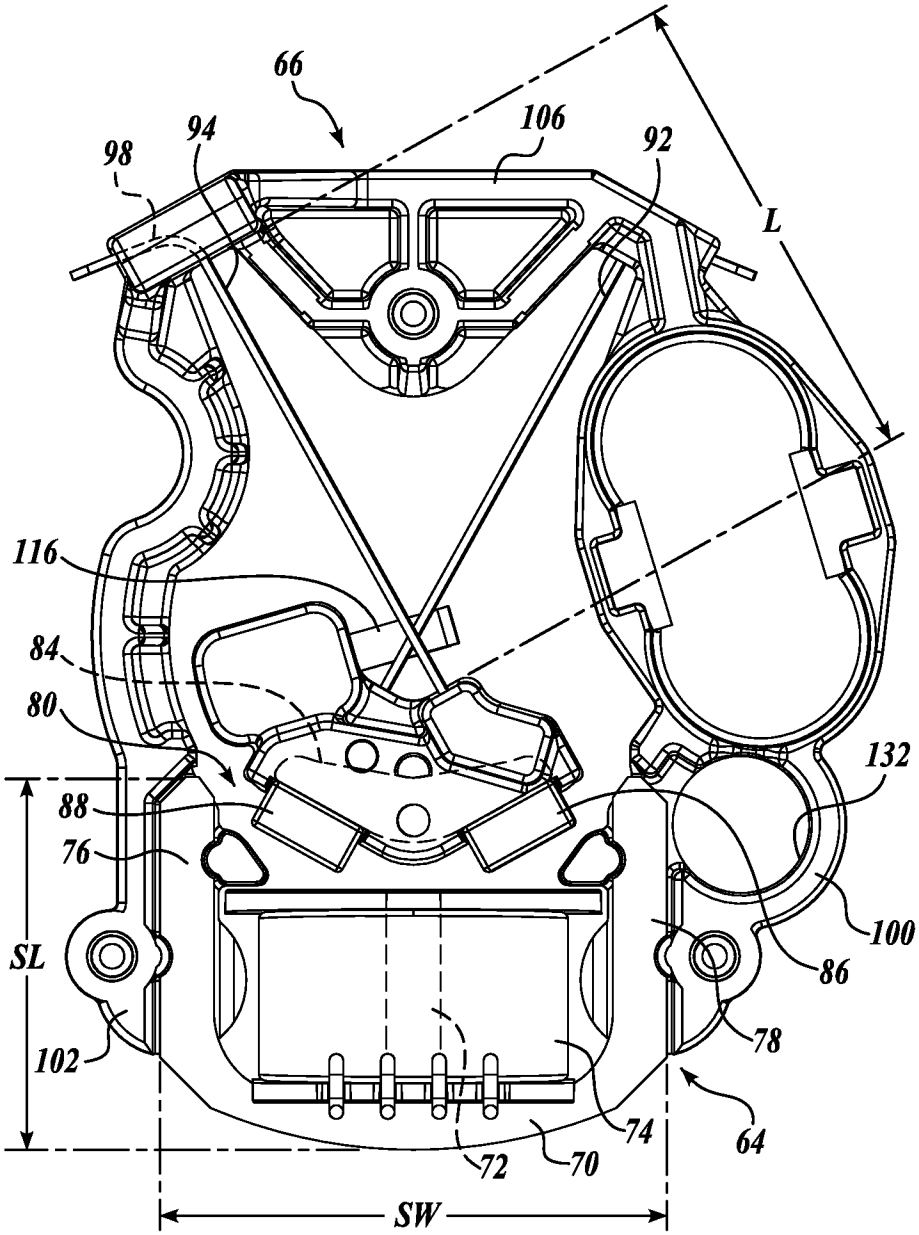


Fig. 4D.

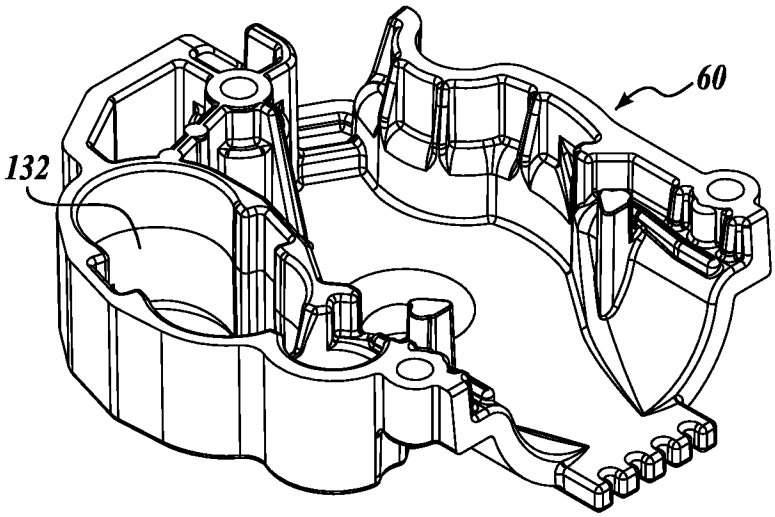


Fig.5A.

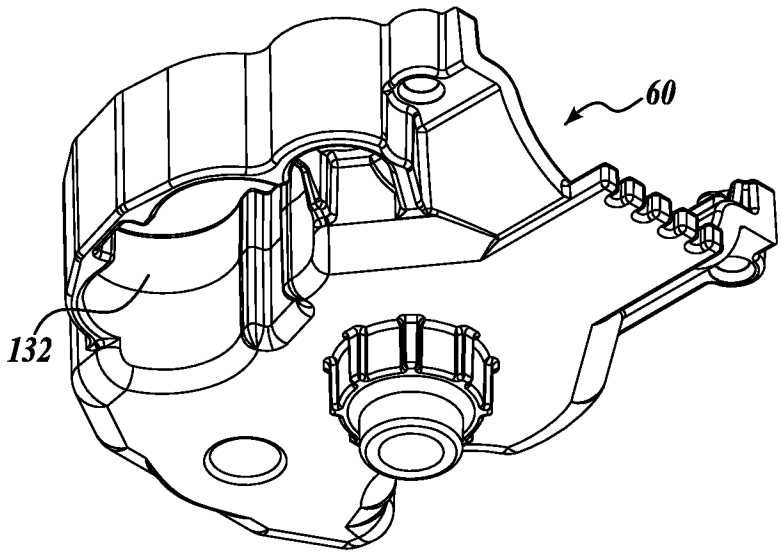


Fig.5B.

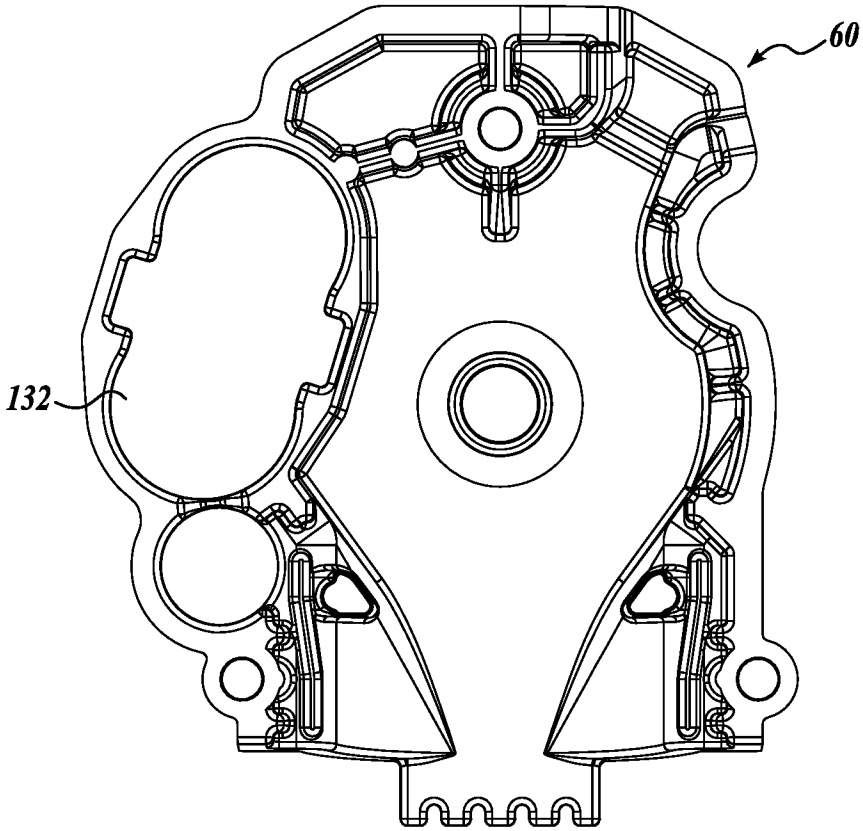


Fig.5C.

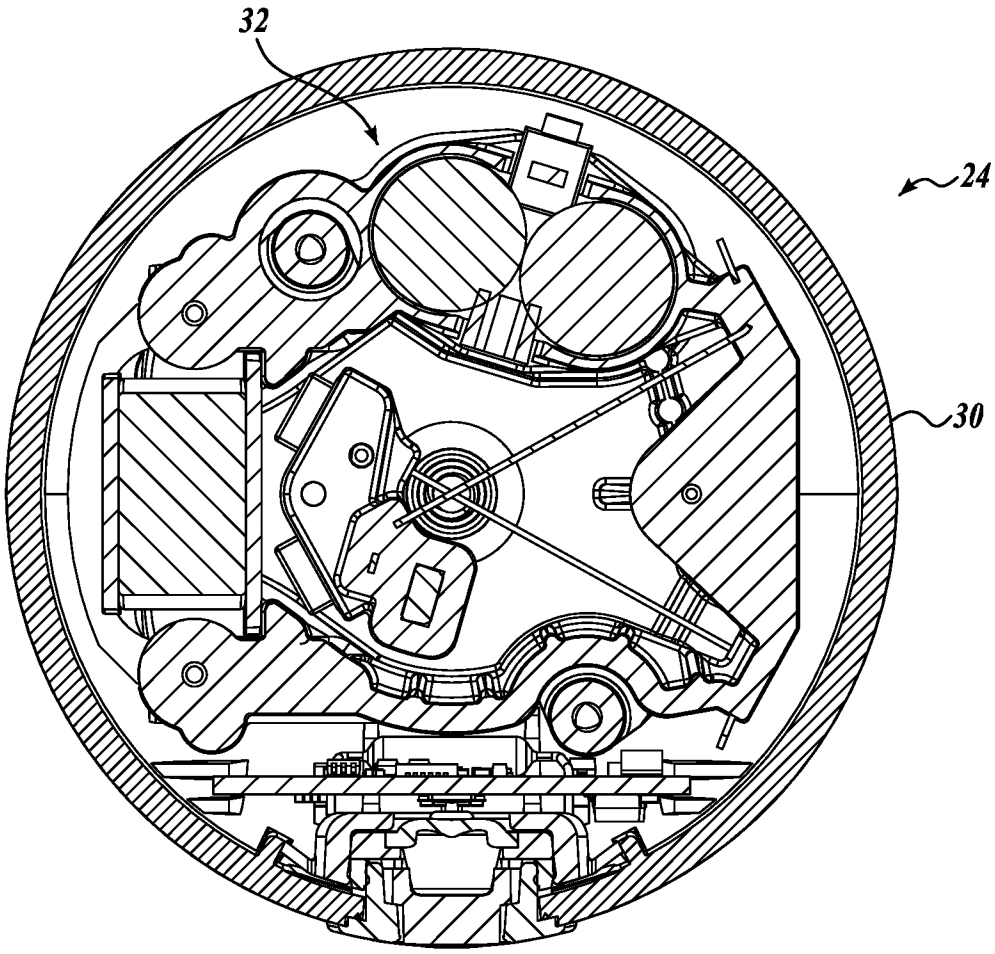


Fig. 6.

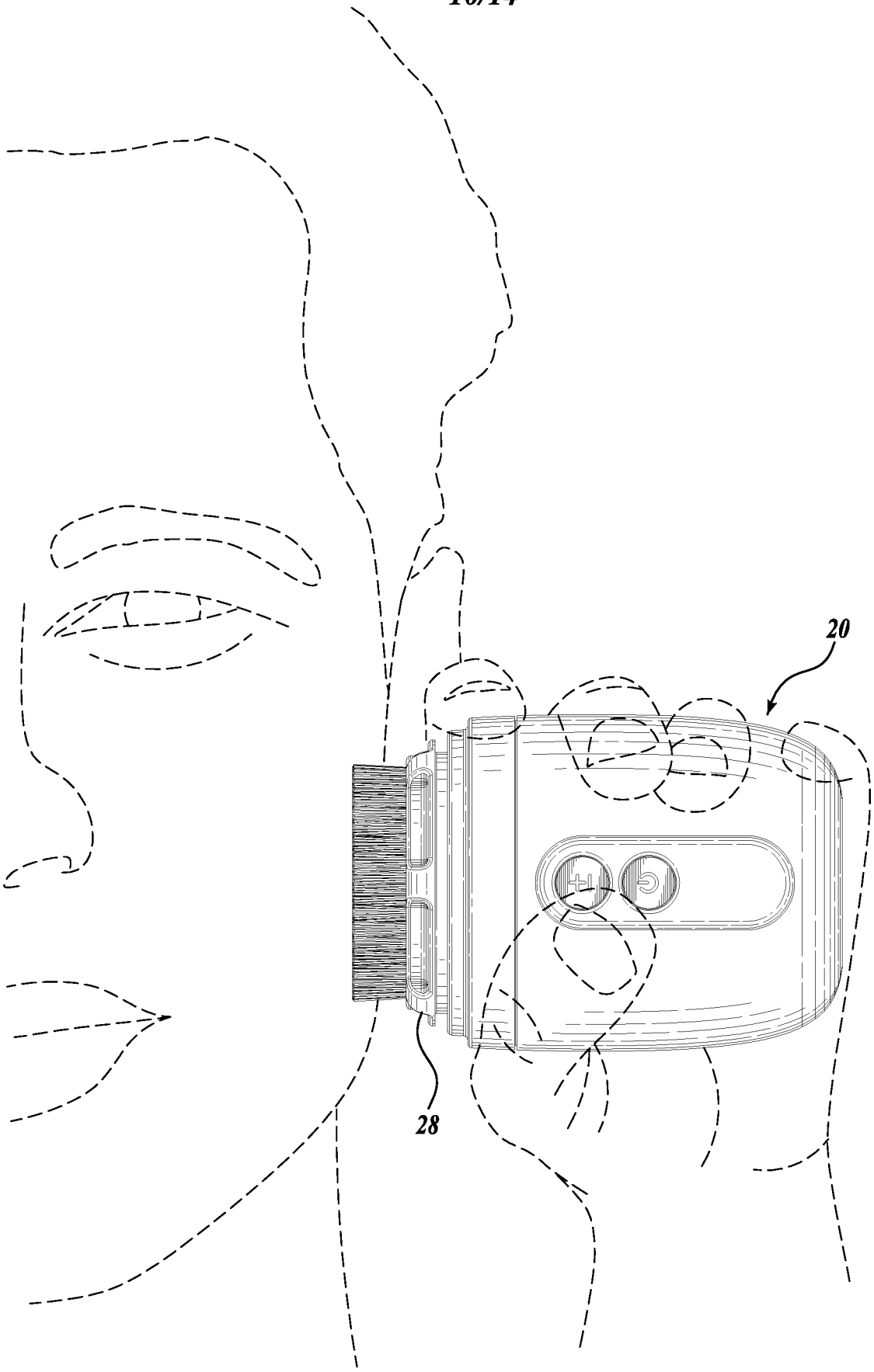


Fig. 7.

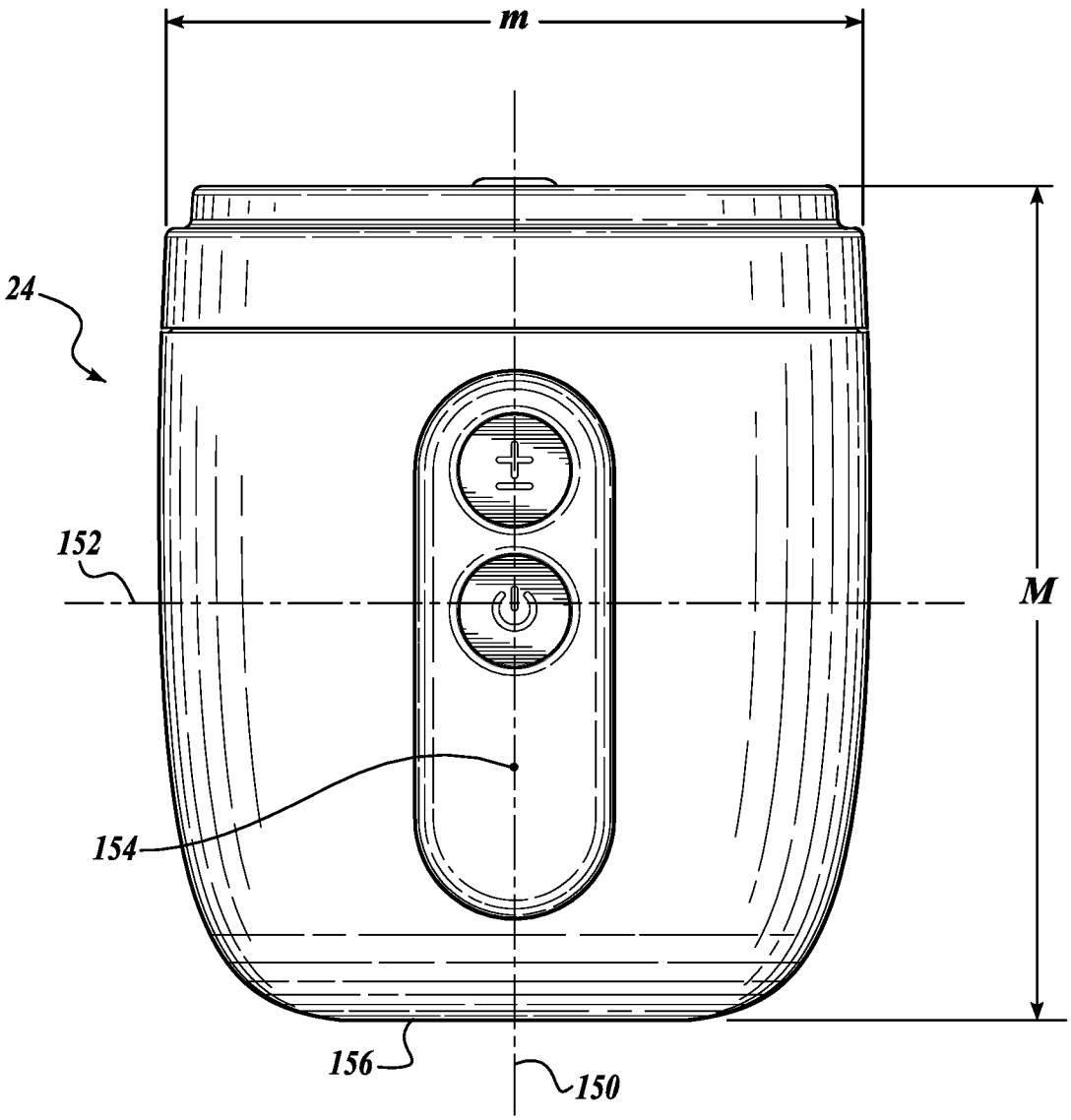


Fig.8.

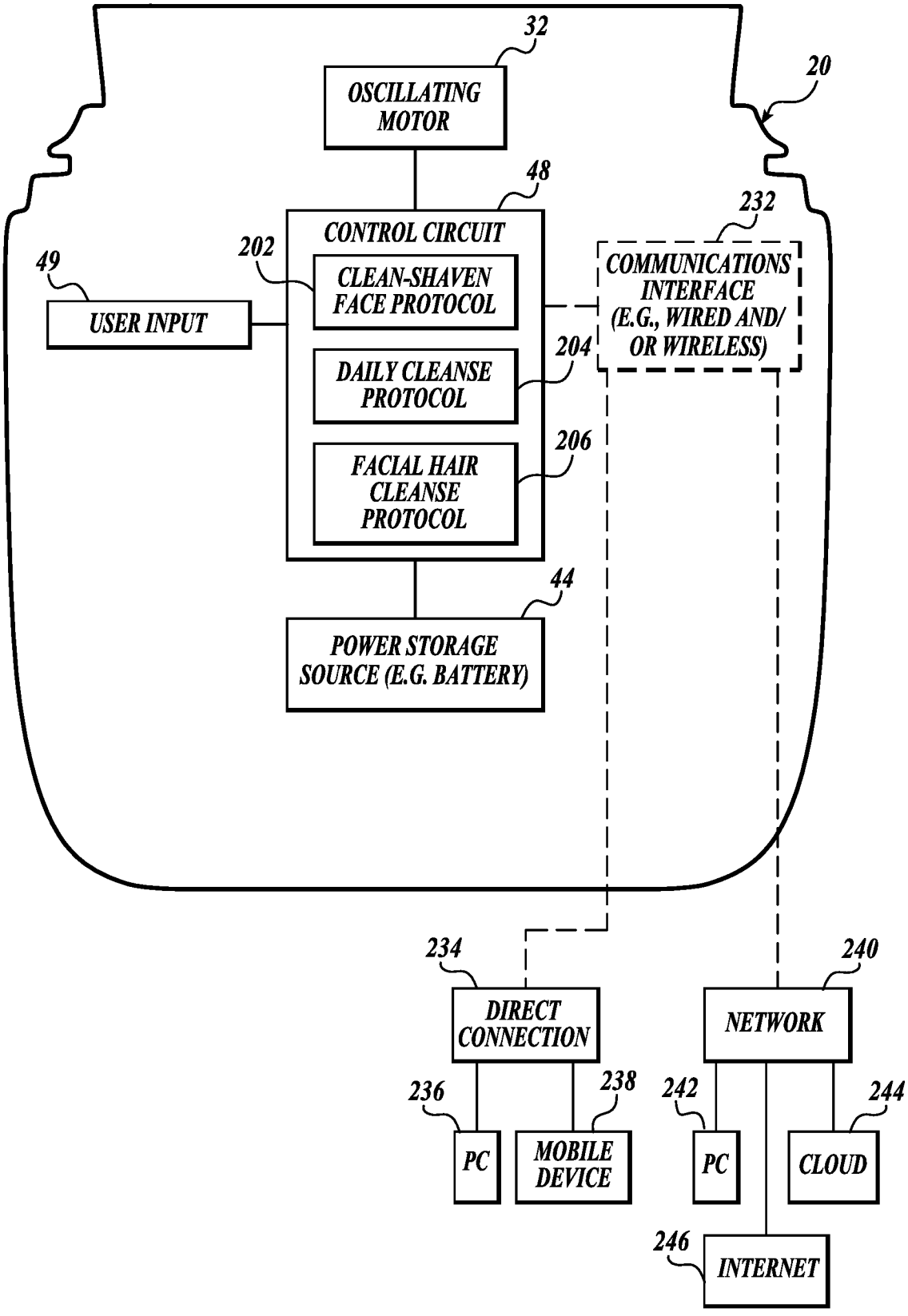
32
OSCILLATING MOTOR
20
48
CONTROL CIRCUIT
232
202
CLEAN-SHAVEN FACE PROTOCOL
COMMUNICATIONS INTERFACE (E.G., WIRED AND/ OR WIRELESS)
49
USER INPUT
204
DAILY CLEANSE PROTOCOL
206
FACIAL HAIR CLEANSE PROTOCOL
44
POWER STORAGE SOURCE (E.G. BATTERY)
234
240
DIRECT CONNECTION
NETWORK
236
238
242
244
PC
MOBILE DEVICE
PC
CLOUD
246
INTERNET

Fig.9.

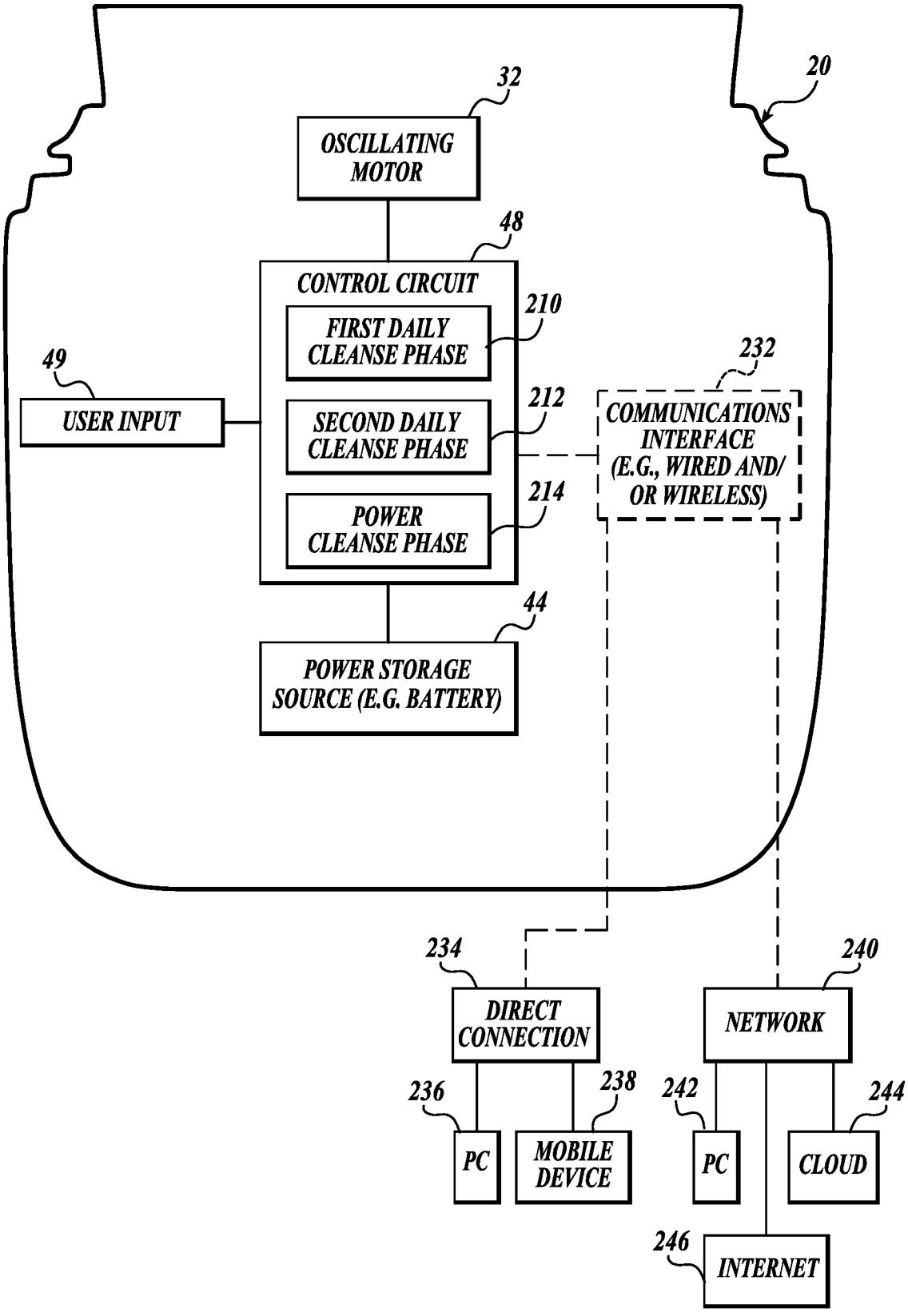
20
32
OSCILLATING MOTOR
48
CONTROL CIRCUIT
210
FIRST DAILY CLEANSE PHASE
212
SECOND DAILY CLEANSE PHASE
214
POWER CLEANSE PHASE
49
USER INPUT
232
COMMUNICATIONS INTERFACE (E.G., WIRED AND/ OR WIRELESS)
44
POWER STORAGE SOURCE (E.G. BATTERY)
234
DIRECT CONNECTION
240
NETWORK
236
PC
238
MOBILE DEVICE
242
PC
244
CLOUD
246
INTERNET

Fig. 10.

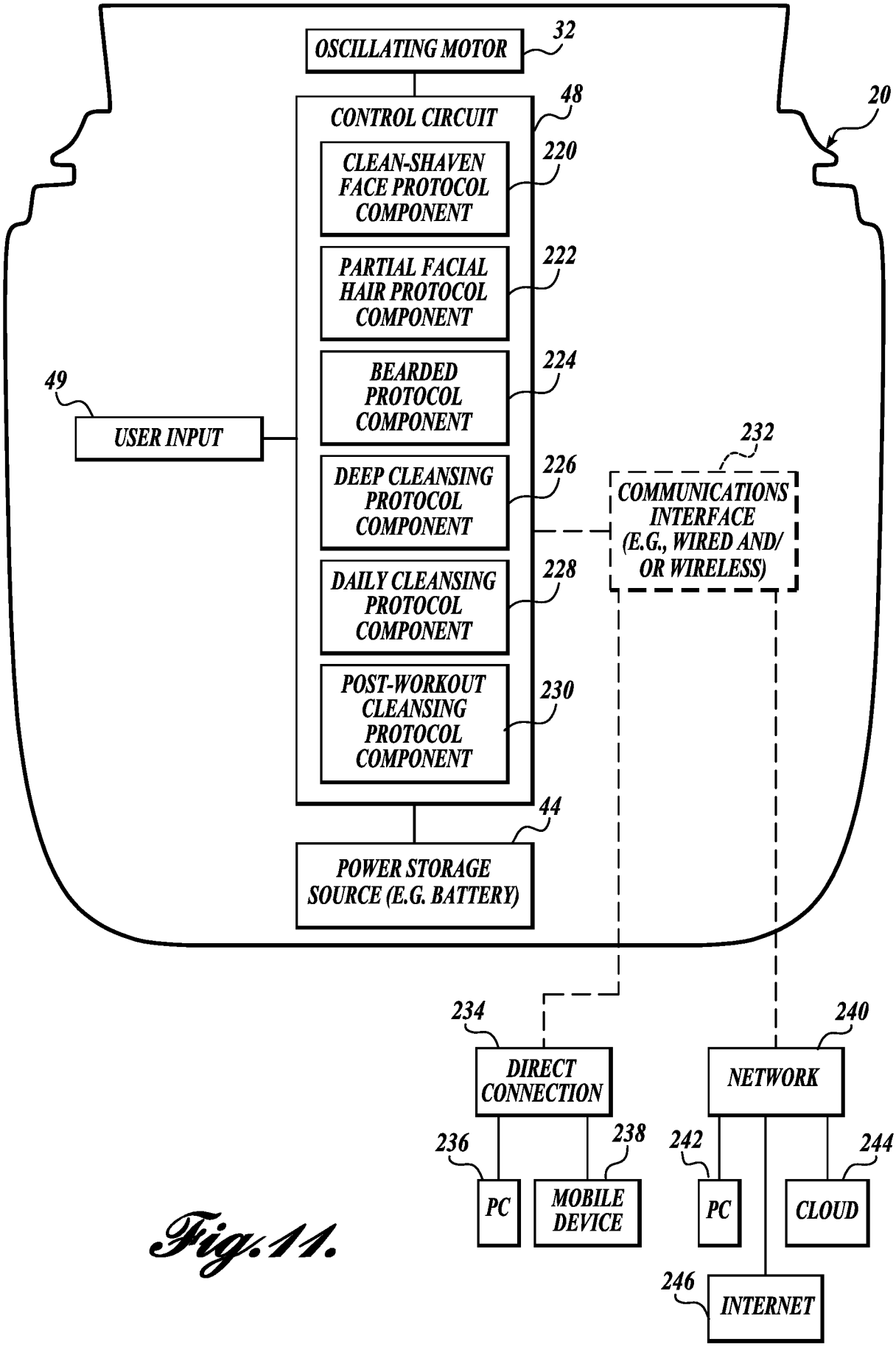
OSCILLATING MOTOR
32
20
CONTROL CIRCUIT
48
CLEAN-SHAVEN FACE PROTOCOL COMPONENT
220
PARTIAL FACIAL HAIR PROTOCOL COMPONENT
222
BEARDED PROTOCOL COMPONENT
224
49
USER INPUT
232
DEEP CLEANSING PROTOCOL COMPONENT
226
COMMUNICATIONS INTERFACE (E.G., WIRED AND/ OR WIRELESS)
DAILY CLEANSING PROTOCOL COMPONENT
228
POST-WORKOUT CLEANSING PROTOCOL COMPONENT
230
44
POWER STORAGE SOURCE (E.G. BATTERY)
234
240
DIRECT CONNECTION
NETWORK
236
238
242
244
PC
MOBILE DEVICE
PC
CLOUD
246
INTERNET

Fig. 11.

# INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/067152

A. CLASSIFICATION OF SUBJECT MATTER
INV. A46B13/02 A46B13/00
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 A61B

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 | EP 2 382 893 A1 (JOHNSON & JOHNSON CONSUMER [US])<br>2 November 2011 (2011-11-02)<br>paragraphs [0012] - [0016], [0018], [0024] - [0026], [0029] - [0031]<br>figures 4B, 4C, 5, 6<br>----- | 1-29 |
| X | EP 2 022 420 A2 (JOHNSON & JOHNSON CONSUMER [US])<br>11 February 2009 (2009-02-11)<br>paragraphs [0024] - [0027], [0031], [0040] - [0042], [0065]<br>figures 1-7<br>-----<br>-/-- | 1-3, 21-23, 28,29 |

[X] Further documents are listed in the continuation of Box C. [X] 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 | Date of mailing of the international search report |
|---|---|
| 29 March 2016 | 06/04/2016 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040,<br>Fax: (+31-70) 340-3016 | Chabus, Hervé |

1

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

# INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/067152

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 3 733 634 A (GOLBE A)<br>22 May 1973 (1973-05-22)<br><br>column 1, line 45 - column 2, line 40<br>figures 2, 3<br>----- | 1,2,<br>21-23,<br>28,29 |
| A | WO 2014/148710 A1 (AMOREPACIFIC COPORATION [KR]; SENTRONIX CO LTD [KR])<br>25 September 2014 (2014-09-25)<br>-& EP 2 957 204 A1 (AMOREPACIFIC CORP [KR]; SENTRONIX CO LTD [KR])<br>23 December 2015 (2015-12-23)<br>paragraphs [0020], [0077]<br>figures 4, 5<br>----- | 1,24-27 |

1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2015/067152

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| EP 2382893 A1 | 02-11-2011 | BR PI1101576 A2 | 29-04-2014 |
| | | CA 2738347 A1 | 30-10-2011 |
| | | CN 102274065 A | 14-12-2011 |
| | | EP 2382893 A1 | 02-11-2011 |
| | | KR 20110121586 A | 07-11-2011 |
| | | US 2011270274 A1 | 03-11-2011 |
| | | US 2013103052 A1 | 25-04-2013 |
| | | US 2014249548 A1 | 04-09-2014 |
| EP 2022420 A2 | 11-02-2009 | AR 068799 A1 | 09-12-2009 |
| | | AU 2008203452 A1 | 19-02-2009 |
| | | BR PI0802412 A2 | 05-05-2009 |
| | | CA 2638424 A1 | 31-01-2009 |
| | | CN 101366683 A | 18-02-2009 |
| | | EP 2022420 A2 | 11-02-2009 |
| | | JP 2009131598 A | 18-06-2009 |
| | | KR 20090013134 A | 04-02-2009 |
| | | US 2010168626 A1 | 01-07-2010 |
| US 3733634 A | 22-05-1973 | CA 944110 A | 26-03-1974 |
| | | US 3733634 A | 22-05-1973 |
| WO 2014148710 A1 | 25-09-2014 | AU 2013383517 A1 | 29-10-2015 |
| | | CN 105228497 A | 06-01-2016 |
| | | EP 2957204 A1 | 23-12-2015 |
| | | KR 101304932 B1 | 17-09-2013 |
| | | SG 11201507855S A | 29-10-2015 |
| | | TW 201436754 A | 01-10-2014 |
| | | WO 2014148710 A1 | 25-09-2014 |
| EP 2957204 A1 | 23-12-2015 | AU 2013383517 A1 | 29-10-2015 |
| | | CN 105228497 A | 06-01-2016 |
| | | EP 2957204 A1 | 23-12-2015 |
| | | KR 101304932 B1 | 17-09-2013 |
| | | SG 11201507855S A | 29-10-2015 |
| | | TW 201436754 A | 01-10-2014 |
| | | WO 2014148710 A1 | 25-09-2014 |