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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
07 November 2019 (07.11.2019)

WIPO | PCT

(10) International Publication Number
WO 2019/211732 A1

(51) International Patent Classification:
A61M 1/00 (2006.01)

(21) International Application Number:
PCT/IB2019/053509

(22) International Filing Date:
29 April 2019 (29.04.2019)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
1806992.2 30 April 2018 (30.04.2018) GB

(71) Applicant: **SMITH & NEPHEW PTE. LIMITED** [SG/SG]; 50 Raffles Place, #32-01 Singapore Land Tower, Singapore 048623 (SG).

(72) Inventors: **BLACKBURN, Iain, Michael**; c/o Smith & Nephew, PO Box 81, 101 Hessle Road, Hull HU3 2BN (GB). **BRERETON, Simon, Francis**; c/o PA Consulting Services Limited, 10 Bressenden Place, London SW1E 5DN (GB). **CORREA, Tomas, Alexander, Ogg**; c/o PA Consulting Services Limited, 10 Bressenden Place, London SW1E 5DN (GB). **HARRISON, Frederick, Jethro**; c/o PA Consulting Services Limited, 10 Bressenden Place, London SW1E 5DN (GB). **MADRIZ, Camilo, Patrick**; c/o Smith & Nephew, PO Box 81, 101 Hessle Road, Hull HU3 2BN (GB). **SIMMONDS, Robert**; c/o PA Consulting Services Limited, 10 Bressenden Place, London SW1E 5DN (GB). **WARRINGTON, Nicholas**; c/o PA Consulting Services Limited, 10 Bressenden Place, London SW1E 5DN (GB).

(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,

(54) Title: EXHAUST VENT FOR A NEGATIVE PRESSURE WOUND THERAPY SYSTEM

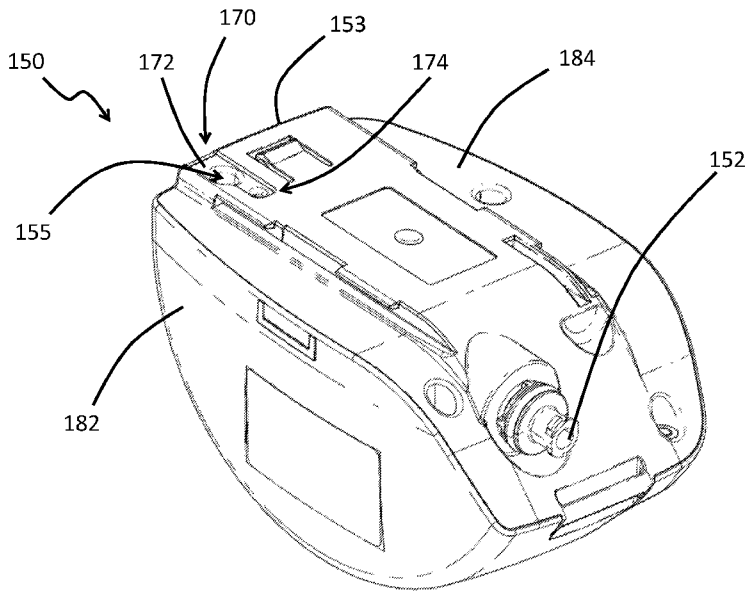


FIG. 3

(57) Abstract: Embodiments of negative pressure wound therapy systems, apparatuses, and methods for operating the systems and apparatuses are disclosed. In some embodiments, the apparatus includes a pump assembly having a negative pressure source enclosed within a casing. A canister-facing surface of the casing is adapted to releasably connect the pump assembly to a canister. The negative pressure source is configured to exhaust fluid to outside of the casing thorough an exhaust vent. The exhaust vent has an exhaust feed opening that is disposed on a recessed channel on the canister-facing surface of the casing.

WO 2019/211732 A1

[Continued on next page]

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))*

— *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

EXHAUST VENT FOR A NEGATIVE PRESSURE WOUND THERAPY SYSTEM

Field

[0001] Embodiments or arrangements disclosed herein relate to methods and apparatuses for dressing and treating a wound with topical negative pressure (TNP) therapy. For example, but without limitation, any embodiments disclosed herein may relate to treating a wound with reduced pressure provided from a pump kit.

Description of Related Art

[0002] Many different types of wound dressings are known for aiding in the healing process of a human or animal. These different types of wound dressings include many different types of materials and layers, for example, pads such as gauze pads or foam pads. TNP therapy, sometimes referred to as vacuum assisted closure, negative pressure wound therapy, or reduced pressure wound therapy, is widely recognized as a beneficial mechanism for improving the healing rate of a wound. Such therapy is applicable to a broad range of wounds such as incisional wounds, open wounds and abdominal wounds or the like.

[0003] TNP therapy assists in the closure and healing of wounds by reducing tissue edema; encouraging blood flow; stimulating the formation of granulation tissue; removing excess exudates, and may reduce bacterial load and thus reduce the potential for infection of the wound. Furthermore, TNP therapy permits less outside disturbance of the wound and promotes more rapid healing.

SUMMARY

[0004] Embodiments of the present disclosure relate to apparatuses and methods for wound treatment. Some of the wound treatment apparatuses described herein comprise a pump system or assembly for providing negative pressure to a wound site. Wound treatment apparatuses may also comprise wound dressings that may be used in combination with the pump assemblies described herein, and connectors for connecting the wound dressings to the pump assemblies.

[0005] In some embodiments, a negative pressure wound therapy apparatus is disclosed. The negative pressure wound therapy apparatus comprises a pump assembly comprising a negative pressure source that is configured to provide, via a fluid flow path, negative pressure to a wound. The pump assembly may be releasably connectable to a canister configured to store fluid aspirated from the wound. For example, the canister may be fluidically connected to a connector port on the pump assembly that is in fluid communication with an inlet of the negative pressure source such that the negative pressure source provides negative pressure to the wound through a fluid flow path that passes through the canister. The canister may be fluidically connected to a wound dressing positioned over the wound. The negative pressure source may also be configured to provide negative pressure to a wound dressing positioned over the wound without a canister between the wound dressing and the inlet of the negative pressure source.

[0006] The negative pressure source can be enclosed within a casing of the pump assembly. In certain arrangements, the pump assembly is adapted to vent the exhaust of the negative pressure source outside of the casing of the pump assembly. In some embodiments, the exhaust of the negative pressure source is routed through an exhaust vent that opens to the air space outside of the casing of the pump assembly. The exhaust vent can be arranged to reduce or eliminate the exhaust of the negative pressure source from disrupting a user of the pump assembly. In certain arrangements, the exhaust vent is adapted to direct the exhaust stream toward a bottom or base surface of the pump assembly so that the air current of the exhaust stream is not felt by a user of the pump. In certain arrangements, the exhaust vent is positioned on a canister-facing surface of the pump assembly such that when the pump assembly and canister are releasbly connected, the exhaust vent is covered by a pump-facing surface of the canister. In some arrangements, the exhaust vent is arranged to minimize moisture accumulation in the exhaust piping that directs the exhaust from the negative pressure source to the air space outside of the pump casing. In some variants, the shape of the exhaust vent is adapted to minimize the sound produced by the negative pressure source or the exhaust being emitted therefrom.

[0007] In one embodiment, a negative pressure wound therapy apparatus is provided. The apparatus may comprise a pump assembly and a canister configured to be

releasably connected to the pump assembly. The pump assembly comprises a negative pressure source enclosed within a casing, wherein the negative pressure source is configured to exhaust fluid to outside of the casing through an exhaust vent. When the pump assembly and the canister are releasably connected to each other, a canister-facing surface of the casing is at least partially covered by a pump-facing surface of the canister. The exhaust vent comprises an exhaust feed opening into a recessed channel on the canister-facing surface of the casing.

[0008] In the apparatus of any of the embodiments described herein, the recessed channel may extend from the exhaust feed to a side surface of the casing. The recessed channel may have a proximal portion including the exhaust feed and a distal portion extending away from the exhaust feed to the side surface of the casing. In one embodiment, the proximal portion has a smaller width than that of the distal portion.

[0009] In the apparatus of any of the embodiments described herein, the pump assembly may comprise a pump inlet on a front side of the casing, wherein the exhaust vent is located on a back side of the casing.

[0010] In the apparatus of any of the embodiments described herein, the canister-facing surface of the casing and the pump-facing surface of the canister are substantially flat.

[0011] In the apparatus of any of the embodiments described herein, the recessed channel has a planar shape.

[0012] Any of the features, components, or details of any of the arrangements or embodiments disclosed in this application, including without limitation any of the pump embodiments and any of the negative pressure wound therapy embodiments disclosed below, are interchangeably combinable with any other features, components, or details of any of the arrangements or embodiments disclosed herein to form new arrangements and embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Embodiments of the present disclosure will now be described hereinafter, by way of example only, with reference to the accompanying drawings in which:

[0014] Figure 1 illustrates an embodiment of a reduced pressure wound therapy system having a pump assembly assembled with a canister.

[0015] Figure 2 illustrates the reduced pressure wound therapy system of Figure 1 with the pump assembly disengaged from the canister.

[0016] Figure 3 is a bottom perspective view the pump assembly of Figure 2.

[0017] Figure 4 is a side perspective view the pump assembly of Figure 3 with the top housing removed to show the internal components of the pump assembly.

[0018] Figure 5 is a backside view of the pump assembly of Figure 4.

[0019] Figure 6 is a top view of the negative pressure source and bottom housing of the pump assembly of Figure 5.

[0020] Figure 7 is a side cross-sectional view of the bottom housing of Figure 6.

[0021] Figure 8 is a bottom view of the bottom housing of Figure 5.

[0022] Figure 9 is backside perspective view of the bottom of the housing of Figure 8.

DETAILED DESCRIPTION

[0023] **Figure 1** illustrates an embodiment of a negative or reduced pressure wound treatment (or TNP) system 100 comprising a pump assembly 150 and a canister 160. As shown in Figure 1, the pump assembly 150 can be releasably connected to the canister 160. When connected to the canister 160, the pump assembly 150 can be adapted to create a negative pressure within the canister 160 to draw wound exudate from a wound into the canister 160. The wound exudate can be drawn into the canister 160 through a canister inlet 161. The canister inlet 161 can be connected to the wound by a flow path (e.g., tubing) that extends from the canister inlet 161 to a wound dressing (not shown) positioned over a wound. In some arrangements, the pump assembly 150 can be disconnected from the canister 160 and can operate in a cansiterless mode in which the pump assembly draws wound exudate into an absorbent dressing positioned over the wound and in fluid communication with the pump assembly 150 without having a separate canister positioned there between. The pump assembly 150 can include a strap anchor 159. The pump assembly 150 can be suspended from a strap (not shown) attached to the strap anchor 159, for example, when the

pump assembly is utilized without the canister 160. Any of the embodiments disclosed herein can be used with one or more features disclosed in International Application No. PCT/IB2018/000229, filed February 15, 2018, and entitled "NEGATIVE PRESSURE WOUND THERAPY APPARATUSES AND METHODS FOR USING THE SAME," and in International Application No. PCT/IB2018/000220, filed February 15, 2018, and entitled "NEGATIVE PRESSURE WOUND THERAPY APPARATUSES AND METHODS FOR USING THE SAME," and in International Application No. PCT/IB2018/000204, filed February 15, 2018, and entitled "NEGATIVE PRESSURE WOUND THERAPY APPARATUSES AND METHODS FOR USING THE SAME," and in United Kingdom Patent Application No. GB1806992.2, filed April 30, 2018, and entitled "EXHAUST VENT FOR A NEGATIVE PRESSURE WOUND THERAPY SYSTEM," each of which is incorporated by reference herein in its entirety. Additional details of a TNP system that has a pump assembly configured to operate with our without a canister 160 can be found International Application Number PCT/US2016/046903, filed August 12, 2016, entitled "SYSTEMS AND METHODS FOR APPLYING REDUCED PRESSURE THERAPY," published February 16, 2017, as International Publication Number WO 2017/027850 A1.

[0024] **Figure 2** shows the pump assembly 150 slid back to disengage the pump assembly 150 from the canister 160. As shown in Figure 2, the pump assembly 150 can include a pump connector 152 located at a front or forward side of the pump assembly. The pump connector 152 can be adapted to form a fluidic connection with a canister connector 162. As described in International Application No. PCT/IB2018/000229, the pump connector 152 can also be adapted to form a fluidic seal with a connector that is coupled directly to an absorbent wound dressing (not shown), allowing the TNP system 100 to operate in a canister or canisterless mode. In the canister mode of operation, the pump assembly 150 creates a negative pressure within the canister 160 by drawing air out of the canister 160 through the canister connector 162 and into the pump assembly 150 through the pump connector 152. As described below, the pump assembly 150 vents to the air space surrounding the pump assembly 150 the air that has been drawn from the canister 160.

[0025] **Figure 3** is a bottom view of the pump assembly 150. In some embodiments, a lower surface of the pump assembly has flat or substantially flat portions so

that the pump assembly can be placed on a flat surface such as a table. As shown in Figure 3, the pump assembly 150 can have an exhaust vent 170 provided on the lower surface of the pump assembly. The exhaust vent 170 can be adapted to provide a flow path for a negative pressure source (e.g., pump) within the casing of the pump assembly 150 to vent the pump exhaust outside of the casing of the pump assembly 150, as described more fully below. The casing of the pump assembly 150 can have an upper housing 182 and a lower housing 184. As shown in Figure 2, when the pump assembly 150 is assembled onto the canister 160, the lower housing 184 is disposed between the upper housing 182 and the canister 160.

[0026] As described herein, terms such as "upper," "lower," "top," "bottom," "front," "forward", "rear" and "back," unless otherwise specified, refer to the orientation of the pump assembly as shown in Figures 1 and 2, where the pump assembly, when not connected to the canister, can be placed on a flat, supporting surface such as a table with the lower surface of the pump assembly contacting the supporting surface. Thus, as shown in Figures 1-3, the pump assembly 150 is above the canister 160, and the pump connector 152 is forward of the exhaust vent 170. When the pump assembly 150 is suspended from a strap using the strap anchor 159, when not attached to the canister 160, the connector 152 will be located at an upper end of the pump assembly 150, and the exhaust vent will be located at a lower end of the pump assembly.

[0027] With continued reference to Figure 3, the exhaust vent 170 can include a channel 172 that is recessed relative to the surrounding portions of the bottom surface of the lower housing 184. In the illustrated embodiment, the exhaust vent 170 has an exhaust feed 174 that opens downward to the channel 172. The exhaust feed 174 conducts pump exhaust from inside the pump casing to the channel 172. The channel 172 can extend from the exhaust feed 174 rearwardly to a backside surface 153 of the pump assembly 150, providing a flow path for pump exhaust to flow from the exhaust feed 174 to the airspace that surrounds the pump assembly 150. In some embodiments, the pump assembly 150 can include one or more housing anchors 155 that secure together the upper housing 182 and the lower housing 184. As shown in Figure 3, the pump assembly 150 can have a housing anchor 155 disposed in the channel 172 of the exhaust vent 170. In some arrangements, the pump assembly 150 does not have a housing anchor 155 disposed in the channel 172.

[0028] **Figure 4** is a side view of the pump assembly 150 with the upper housing 182 disassembled from the lower housing 184 in order to show the internal components of the pump assembly 150. As shown in Figure 4, the pump assembly 150 can have a negative pressure source 190 that is fluidically connected to the pump connector 152. The negative pressure source 190 can draw air through the connector 152 and into the negative pressure source 190. The pump assembly 150 can be arranged so that the negative pressure source 190 vents to the airspace outside of the casing of the pump assembly 150. In some embodiments, the pump assembly 150 is arranged so that the negative pressure source 190 does not release any pump exhaust into the internal space of the pump assembly 150, i.e., the space enclosed by upper housing 182 and lower housing 184 when the pump assembly 150 is assembled.

[0029] **Figure 5** is a backside view of the pump assembly 150, i.e., a view of the surface that is opposite of the pump connector 152 (shown in Figure 2), when the pump assembly is releasably connected to the canister 160. As shown in Figure 5, the pump assembly 150 and the canister 160 can form a seam 165 between one another when the pump assembly 150 is mounted onto the canister 160. The exhaust vent 170 is located on a canister-facing surface of the pump assembly, such that a pump-facing surface of the canister 160 at least partially covers the exhaust vent 170. As illustrated, the pump-facing surface of the canister 160 that at least partially covers the exhaust vent 170 is preferably flat, thereby giving the channel 172 a planar shape with a flat lower surface when the pump assembly 150 is connected to the canister 160. Similarly, when the pump assembly 150 is not connected to the canister 160 but is placed with its lower surface on a flat supporting surface, the channel 172 will have a similar planar shape with a flat lower surface. In the illustrated embodiment, because the channel 172 is recessed relative to surrounding portions of the bottom surface of the lower housing, the exhaust vent 170 includes an exit opening 171 disposed at the seam 165 that opens to the backside surface 153 of the pump assembly 150. As illustrated, the exit opening 171 may have a rectangular shape.

[0030] **Figure 6** is a top view of the negative pressure source 190 and lower housing 184 of the pump assembly 150. As shown in Figure 6, the negative pressure source 190 can have a spigot 192. The negative pressure source 190 can discharge pump exhaust through the spigot 192. The negative pressure source 190 can exhaust through the spigot 192

the air that has been drawn into the negative pressure source 190 to establish a negative pressure at the wound site, as discussed above. As shown in Figure 6, the exhaust feed 174 can include a hollow tube portion that extends from the top surface of the lower housing 184 toward the spigot 192 of the negative pressure source 190. The pump outlet 192 can be connected to the exhaust feed 174 by a conduit (e.g., silicone tubing). For the sake of clarity, the conduit is not shown. A non-limiting, illustrative example of a suitable conduit is a short piece of silicone tubing that has one end fitted over the spigot 192 and the other end fit over the exhaust feed 174. Figure 6 also shows that the lower housing 184 can include a plurality of housing anchors 155 that extend from the top surface of the lower housing 184. The housing anchors 155 can be adapted to secure together the upper housing 182 (shown in Figure 4) and the lower housing 184, as discussed previously.

[0031] **Figure 7** is a side cross-sectional view of the lower housing 184 of the pump assembly 150. As shown in Figure 7, the lower housing 184 can have a connector port opening 186 through which the pump connector 152 (shown in Figure 4) extends. Figure 7 illustrates that the exhaust feed 174 can be arranged as a hollow tube that provides a flow path across the lower housing 184. The exhaust feed 174 can provide a flow path from the internal space of the pump assembly 150 to the channel 172 of the exhaust vent 170. As shown in Figure 7, the channel 172 can extend from the vent outlet 174 to a backside surface 153 of the lower housing 184.

[0032] **Figure 8** is a canister-side view of the lower housing 184 of the pump assembly 150. As shown in Figure 8, the channel 172 can have an elongate shape that extends generally from the exhaust feed 174 rearwardly to a back surface of the casing. The channel 172 can have a width 176 that extends from a lateral side of the channel 172 to a medial side of the channel 172. In the illustrated embodiment, the width 176 of the channel 172 expands as the channel 172 extends from the exhaust feed 174 to the backside edge 183 of the lower housing 184. The channel 172 can have a proximal portion 173 and a distal portion 175. In the illustrated embodiment, the proximal portion 173 has a width 176 that is smaller than the width 176 of the distal portion 175.

[0033] **Figure 9** is a backside view of the canister-facing surface of the lower housing 184. With brief reference to Figure 5, the pump assembly 150 can have a central rail

portion 156 that is positioned over a bed portion 166 of the canister 160 when the pump assembly 150 is connected to the canister 160. The rail portion 156 of the pump assembly is disposed between a pair of wing portions 158, as shown in Figure 5. The bed portion 166 of the canister 160 is disposed between a pair of rail portions 168.

[0034] Referring back to Figure 9, the lower housing 184 can be contoured to form the rail portion 156 and the wing portions 158 of the pump assembly 150. The channel 172 can be disposed on the canister-facing surface 188 of the lower housing 184. As shown in Figure 9, the channel 172 can be disposed entirely within the rail portion 156 of the lower housing 184. When the pump assembly 150 is connected to the canister 160, the channel 172 can sit on top of the pump-facing surface of the bed portion 166 (see, e.g., Figure 5) of the canister 160. The channel 172 can form a planar chamber as a sort of plenum chamber through which the pump exhaust is conveyed from the exhaust feed 174 to the exit opening 171 (shown in Figure 5). In some arrangements, the channel 172 and the pump-facing surface of the canister 160 can form an enclosed airflow passageway or duct that extends from the exhaust feed 174 to the backside edge 153 of the pump assembly 150. When the pump assembly 150 is used without a canister 160, the channel 172 can form an enclosed airflow passageway or duct with a surface that supports the lower housing 184 of the pump assembly 150. For example, the lower housing 184 of the pump assembly 150 can rest on a horizontal surface (e.g., table) when the pump assembly 150 is used without a canister 160, thereby forming an enclosed airflow passageway or duct between the channel 172 and the horizontal surface upon which the lower housing 184 rests.

[0035] The exhaust vent 170 can be arranged to minimize the noise of the pump exhaust and to avoid the pump exhaust contacting a user of the pump assembly 150. The exhaust feed 174 is directed toward an opposing surface (e.g., top surface of the canister 160 when the pump assembly 150 is attached to the canister 160). By directing the pump exhaust toward an opposing surface, the exhaust vent 170 is adapted to dissipate jets of air and sound waves that are created by the pump assembly 150. The channel 172 of the exhaust vent 170 forms a planar, plenum-like structure with the opposing surface, creating a rectangular duct. The channel 172 can be designed to promote laminar flow through the plenum-like structure of the exhaust vent 170, thereby reducing sound and jet forces produced by the pump

exhaust. In the illustrated embodiment, the channel 172 will form a substantially rectangular duct with the opposing surface that overlays the channel 172, with the proximal portion near the exhaust feed 174 having a smaller cross-sectional area than the distal portion near the exit opening 171 (shown in Figure 5). Increasing the cross-sectional area of the plenum-like structure of the exhaust vent 170 can reduce the flow velocity of the pump exhaust and thereby reduce sound and jet forces produced by the pump exhaust.

[0036] The pump exhaust can include moisture that is drawn from the wound along with the air that the negative pressure source 190 aspirates from underneath the wound dressing to create a negative pressure under the wound dressing. By venting the pump exhaust to outside of the casing of the pump assembly 150, the internal components of the pump assembly 150 (e.g., electronics, sensors, valves, etc.) can be protected from fouling due to moisture and aerosol debris that can be drawn into pump assembly by the negative pressure source 190.

[0037] The exhaust vent 170 can be adapted to blow the pump exhaust in a direction that avoids the pump exhaust contacting the user. In this way, the exhaust vent 170 can avoid a user feeling the force of the pump exhaust or being contacted by moisture drawn from the wound. The exhaust vent 170 can further be adapted to minimize the audible level of the pump assembly 150 that is detected by the user. For example, the exhaust vent 170 can direct the sound produced by the pump assembly away from the user. As shown in Figure 5, the exhaust vent 170 can be directed to blow the pump exhaust out of a backside surface 153 of the pump assembly 150. Blowing the pump exhaust out the backside surface 153 can direct moisture, exhaust forces, and pump sounds away from the user.

[0038] The exhaust vent 170 can be arranged so that moisture from the pump exhaust drains out of the pump assembly 150. For example, the conduit that connects the pump outlet 192 to the vent outlet 174 can be arranged so that moisture within the conduit flows in a direction from the pump outlet 192 to the vent outlet 174 when the pump assembly 150 is in a horizontal orientation (i.e., supported by lower housing 184) or in suspended orientation (i.e, suspended from the strap anchor 159).

[0039] All of the features disclosed in this specification (including any accompanying exhibits, claims, abstract and drawings), and/or all of the steps of any method

or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive. The disclosure is not restricted to the details of any foregoing embodiments. The disclosure extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

[0040] Those skilled in the art will appreciate that in some embodiments, the actual steps taken in the processes illustrated or disclosed may differ from those shown in the figures. Depending on the embodiment, certain of the steps described above may be removed, others may be added. For example, the actual steps or order of steps taken in the disclosed processes may differ from those shown in the figure. Depending on the embodiment, certain of the steps described above may be removed, others may be added

[0041] Conditional language, such as "can," "could," "might," or "may," unless specifically stated otherwise, or otherwise understood within the context as used, is generally intended to convey that certain embodiments include, while other embodiments do not include, certain features, elements, or steps. Thus, such conditional language is not generally intended to imply that features, elements, or steps are in any way required for one or more embodiments or that one or more embodiments necessarily include logic for deciding, with or without user input or prompting, whether these features, elements, or steps are included or are to be performed in any particular embodiment. The terms "comprising," "including," "having," and the like are synonymous and are used inclusively, in an open-ended fashion, and do not exclude additional elements, features, acts, operations, and so forth. Also, the term "or" is used in its inclusive sense (and not in its exclusive sense) so that when used, for example, to connect a list of elements, the term "or" means one, some, or all of the elements in the list. Likewise the term "and/or" in reference to a list of two or more items, covers all of the following interpretations of the word: any one of the items in the list, all of the items in the list, and any combination of the items in the list. Further, the term "each," as used herein, in addition to having its ordinary meaning, can mean any subset of a set of elements to which the term "each" is applied. Additionally, the words "herein," "above," "below," and words of

similar import, when used in this application, refer to this application as a whole and not to any particular portions of this application.

[0042] Conjunctive language such as the phrase "at least one of X, Y, and Z," unless specifically stated otherwise, is otherwise understood with the context as used in general to convey that an item, term, etc. may be either X, Y, or Z. Thus, such conjunctive language is not generally intended to imply that certain embodiments require the presence of at least one of X, at least one of Y, and at least one of Z.

[0043] Language of degree used herein, such as the terms "approximately," "about," "generally," and "substantially" as used herein represent a value, amount, or characteristic close to the stated value, amount, or characteristic that still performs a desired function or achieves a desired result. For example, the terms "approximately", "about", "generally," and "substantially" may refer to an amount that is within less than 10% of, within less than 5% of, within less than 1% of, within less than 0.1% of, and within less than 0.01% of the stated amount. As another example, in certain embodiments, the terms "generally parallel" and "substantially parallel" refer to a value, amount, or characteristic that departs from exactly parallel by less than or equal to 15 degrees, 10 degrees, 5 degrees, 3 degrees, 1 degree, or 0.1 degree.

[0044] Various modifications to the implementations described in this disclosure may be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other implementations without departing from the spirit or scope of this disclosure. Thus, the disclosure is not intended to be limited to the implementations shown herein, but is to be accorded the widest scope consistent with the principles and features disclosed herein. Certain embodiments of the disclosure are encompassed in the claim set listed below or presented in the future.

WHAT IS CLAIMED IS:

1. A negative pressure wound therapy apparatus, comprising:

a pump assembly comprising a negative pressure source enclosed within a casing, wherein the negative pressure source is configured to exhaust fluid to outside of the casing through an exhaust vent; and

a canister configured to be releasably connected to the pump assembly, wherein when the pump assembly and the canister are releasably connected to each other, a canister-facing surface of the casing is at least partially covered by a pump-facing surface of the canister;

wherein the exhaust vent comprises an exhaust feed opening into a recessed channel on the canister-facing surface of the casing.

2. The apparatus of Claim 1, wherein the recessed channel extends from the exhaust feed to a side surface of the casing.

3. The apparatus of Claim 2, wherein the recessed channel has a proximal portion including the exhaust feed and a distal portion extending away from the exhaust feed to the side surface of the casing.

4. The apparatus of Claim 3, wherein the proximal portion has a smaller width than that of the distal portion.

5. The apparatus of any one of the preceding claims, wherein the pump assembly comprises a pump inlet on a front side of the casing, and wherein the exhaust vent is located on a back side of the casing.

6. The apparatus of any one of the preceding claims, wherein the canister-facing surface of the casing and the pump-facing surface of the canister are substantially flat.

7. The apparatus of any one of the preceding claims, wherein the recessed channel has a planar shape.

8. A negative pressure wound therapy apparatus comprising one or more of the features of the foregoing description.

9. A method of operating a negative pressure wound therapy apparatus comprising one or more of the features of the foregoing description.

10. A method of treating a wound comprising one or more of the features of the foregoing description.

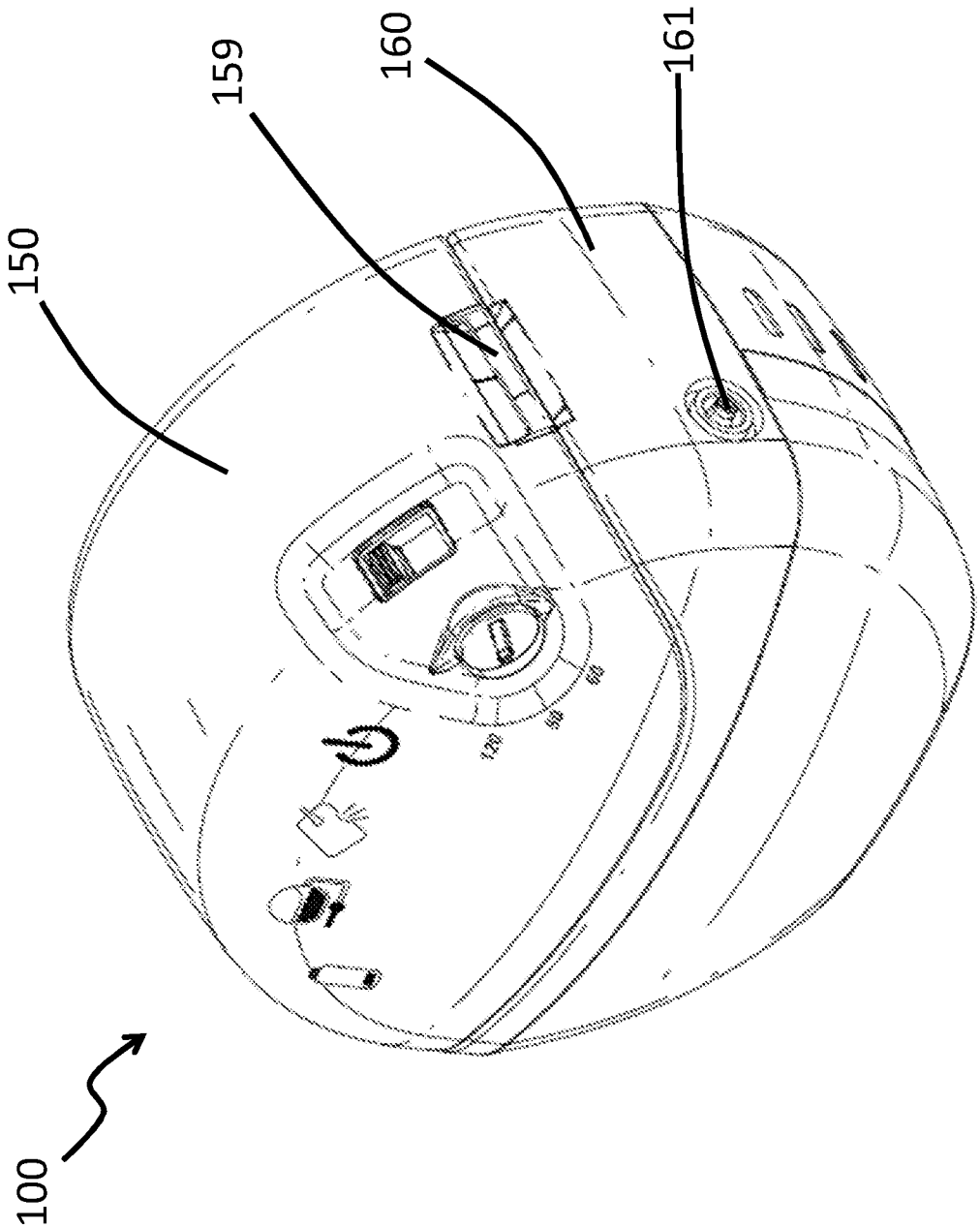


FIG. 1

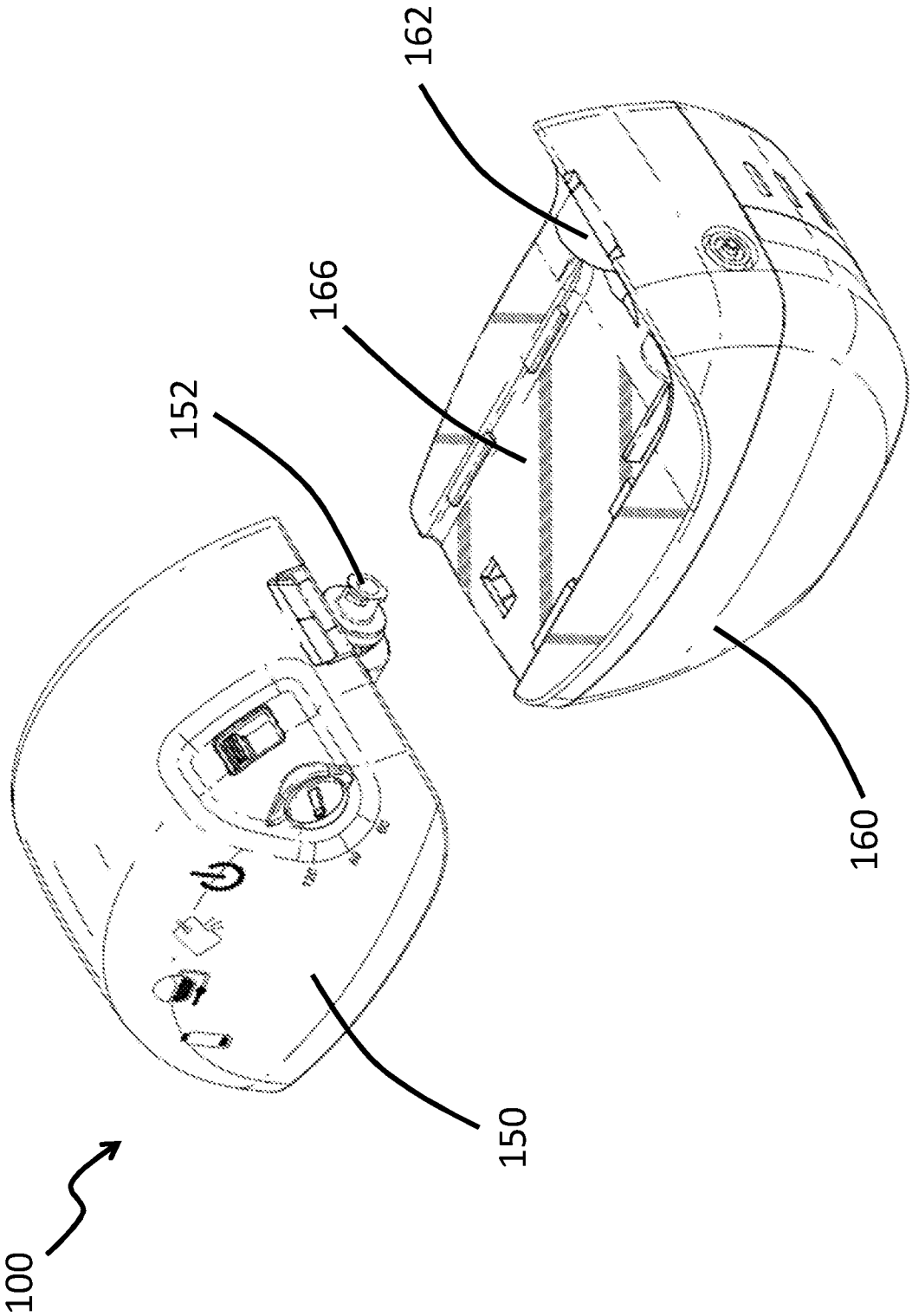


FIG. 2

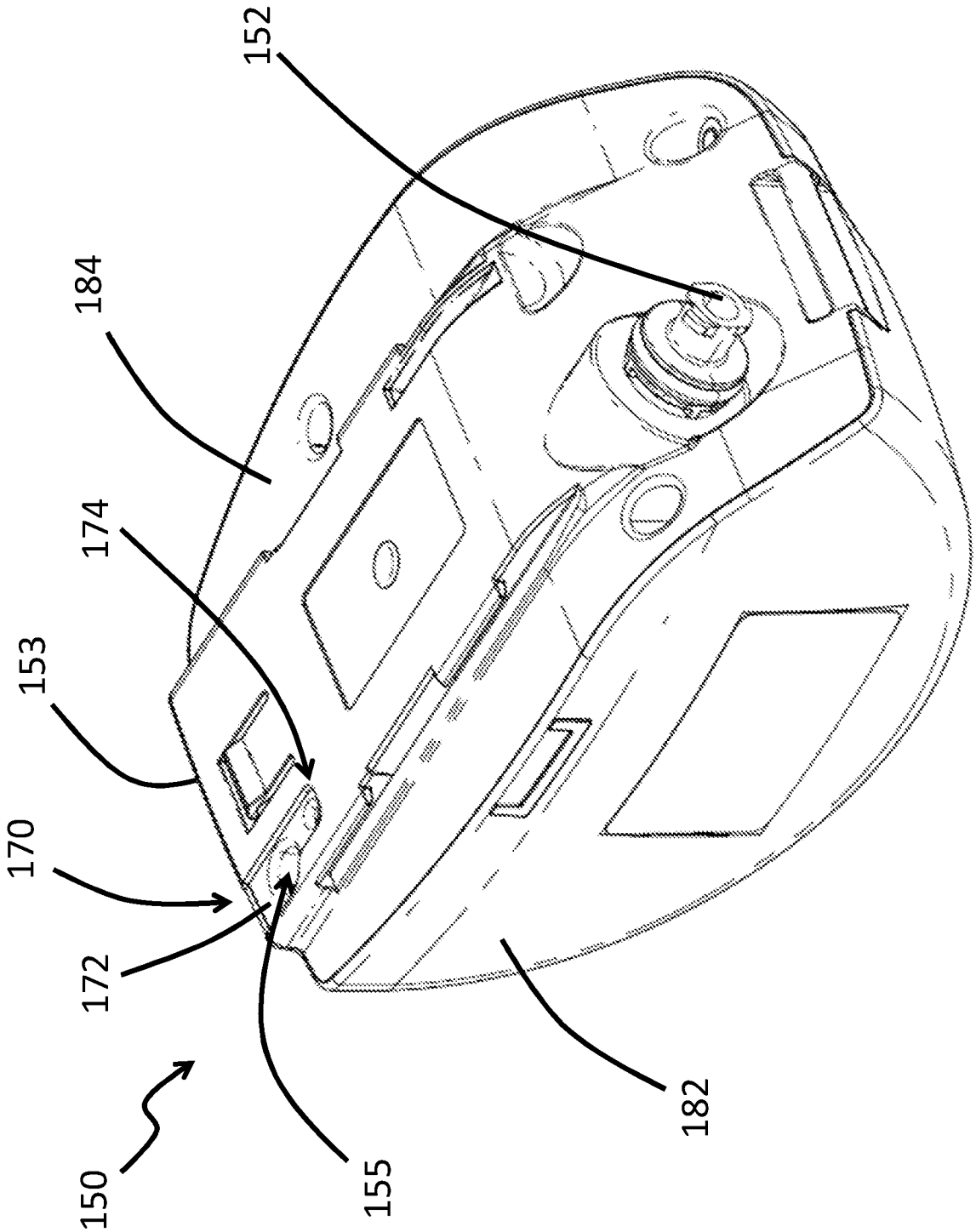


FIG. 3

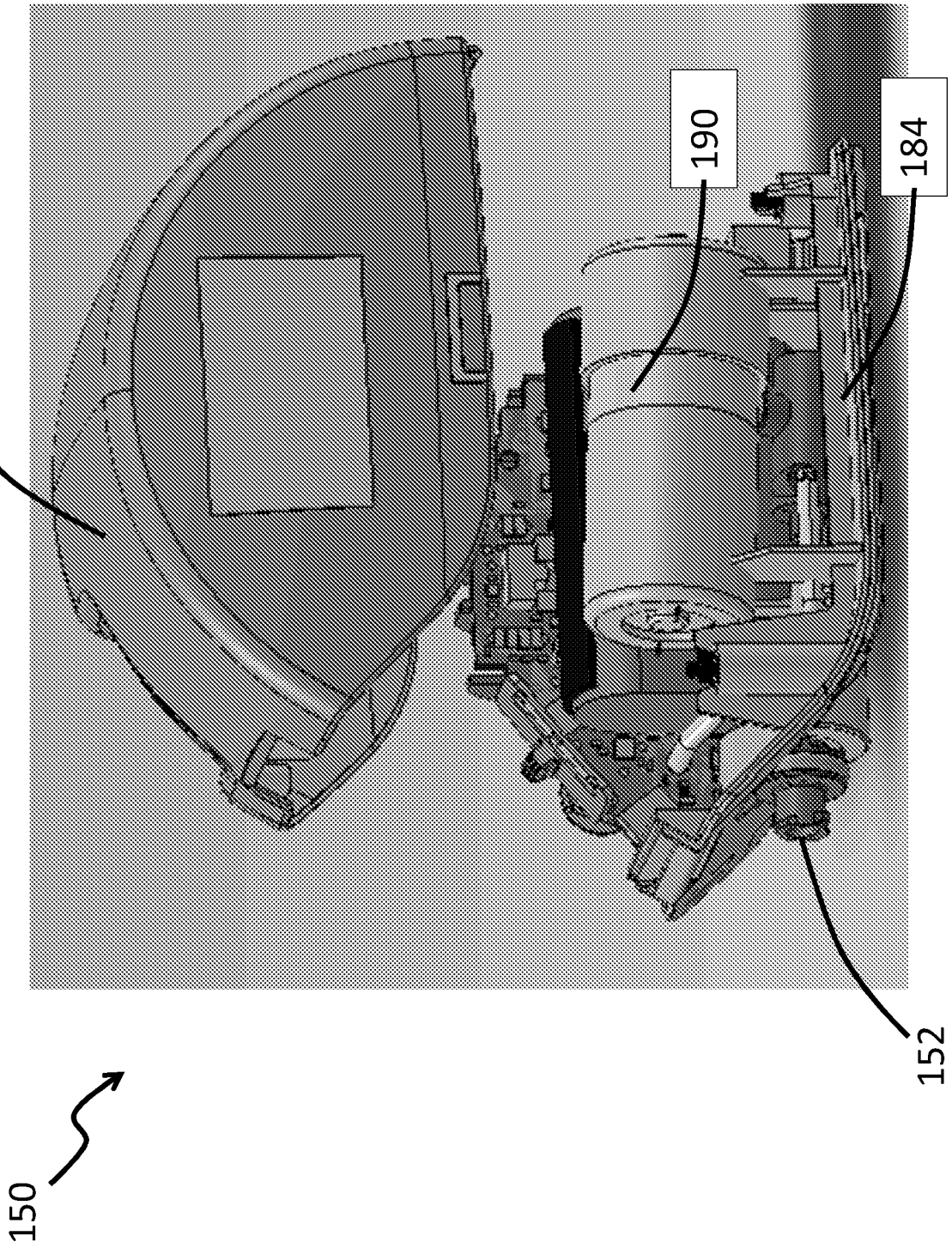


FIG. 4

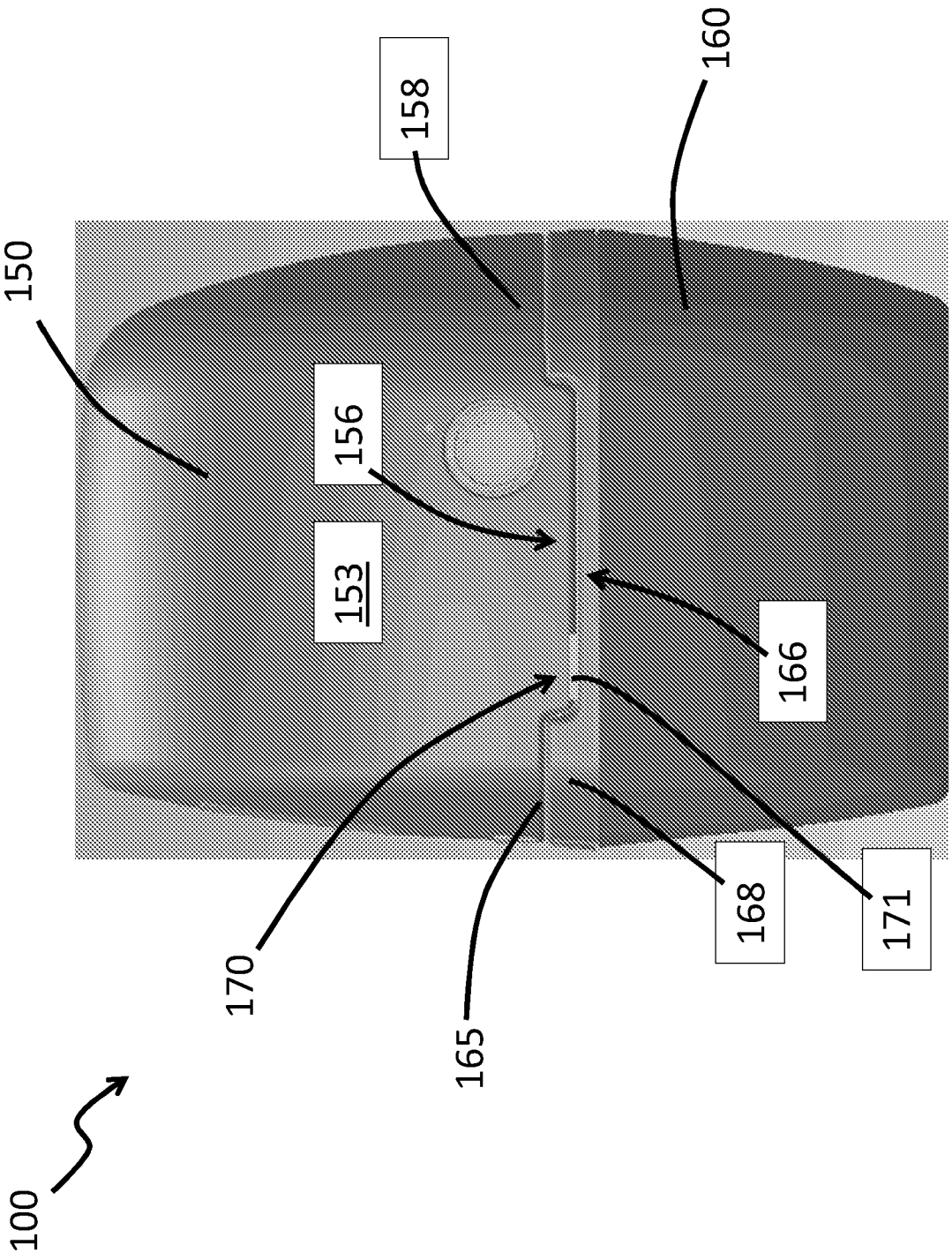


FIG. 5

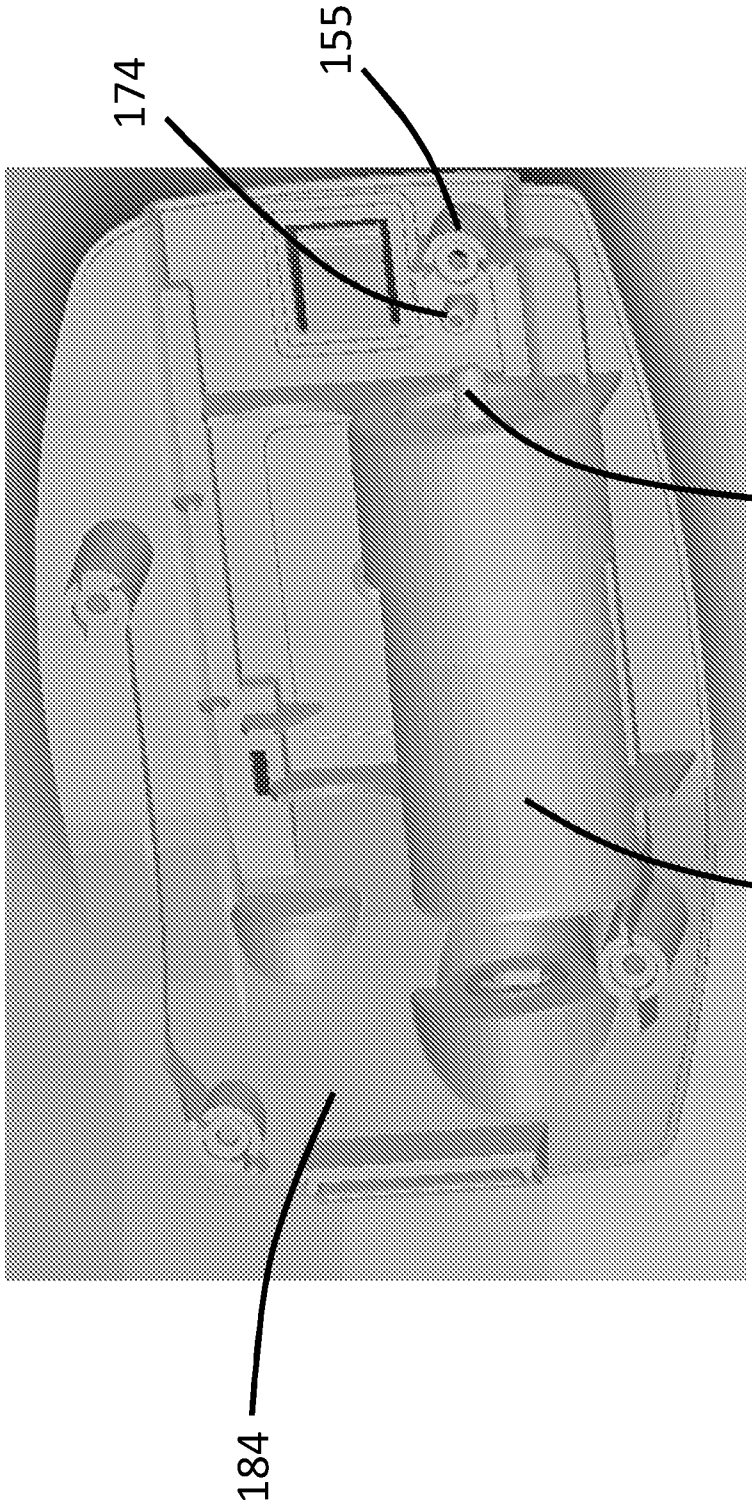


FIG. 6

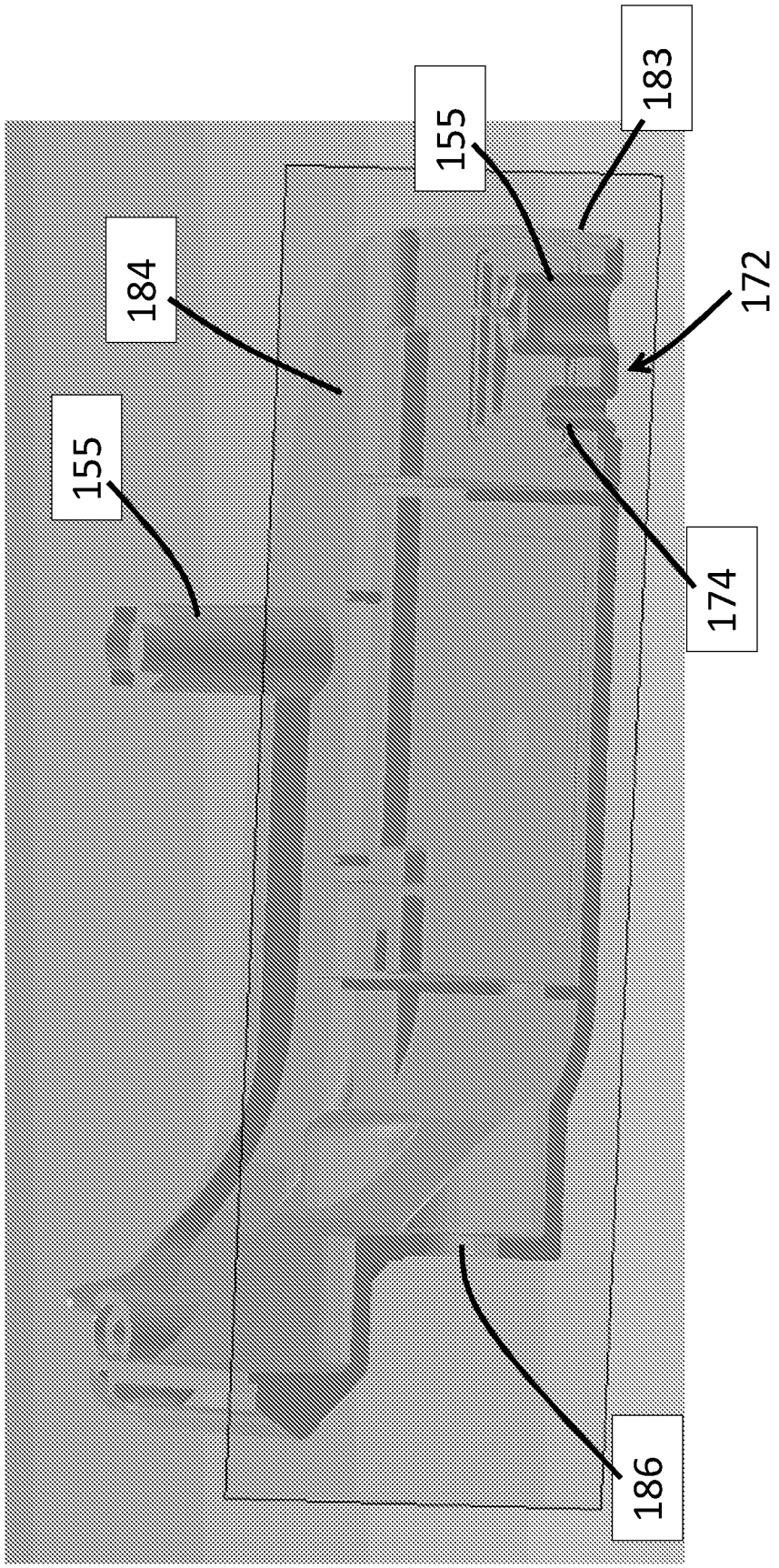


FIG. 7

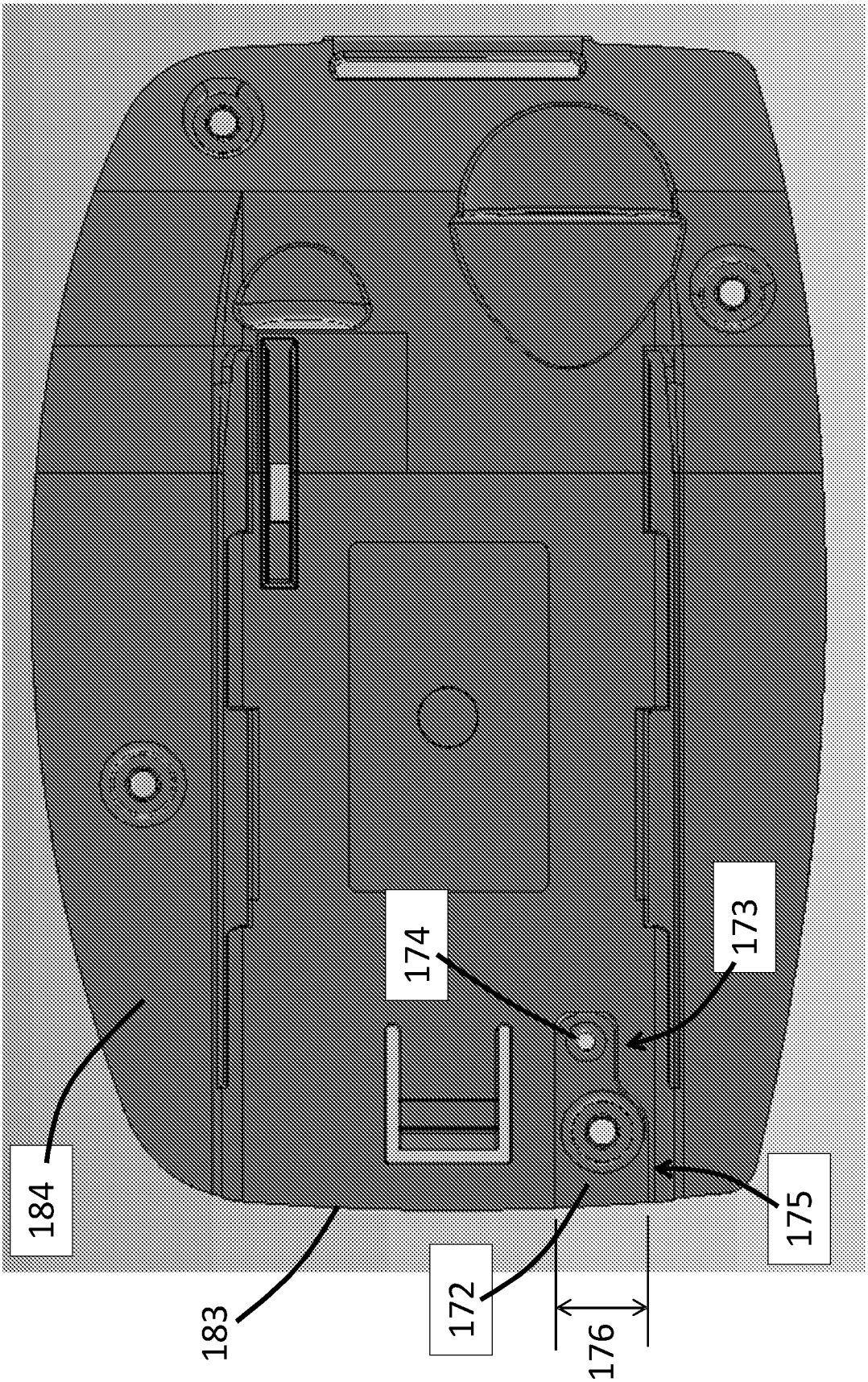


FIG. 8

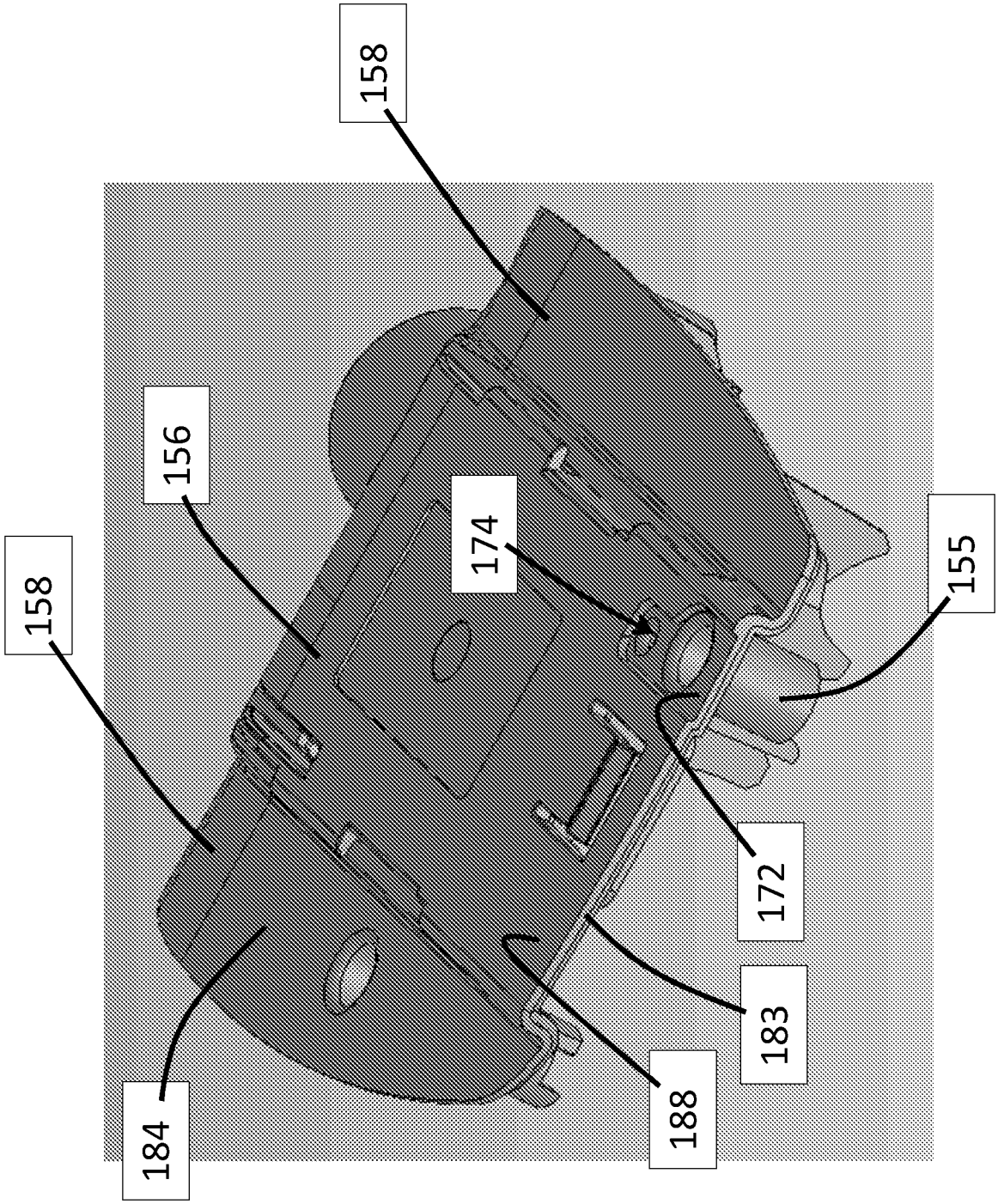


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2019/053509

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61M1/00
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)
A61M 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)
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 2013/171585 A2 (SMITH & NEPHEW [GB]) 21 November 2013 (2013-11-21) paragraphs 0022, 0390, 0498, 0499, 0552, 0553; figures 72-75, 90-93	1-7
A	US 8 641 693 B2 (LOCKE CHRISTOPHER BRIAN [GB]; JAEB JONATHAN PAUL [US] ET AL.) 4 February 2014 (2014-02-04) paragraph 0048, figures 1, 2	1-7
A	WO 2016/103033 A2 (SMITH & NEPHEW [GB]) 30 June 2016 (2016-06-30) paragraphs 0163-01354, figure 22	1-7

☐ 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	Date of mailing of the international search report
8 July 2019	15/07/2019

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

1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2019/053509

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. [X] Claims Nos.: 9, 10
because they relate to subject matter not required to be searched by this Authority, namely:

see FURTHER INFORMATION sheet PCT/ISA/210

2. [X] Claims Nos.: 8-10
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:

see FURTHER INFORMATION sheet PCT/ISA/210

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:

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.:

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

Continuation of Box II.1

Claims Nos.: 9, 10

Claims 9, 10 relate to subject-matter considered by this Authority to be covered by the provisions of Rule 39.1(iv) PCT. The methods disclosed therein comprise the treatment of a wound with negative pressure. Hence they are considered a method for treatment of the human or animal body by therapy/surgery.

Continuation of Box II.2

Claims Nos.: 8-10

Claims 8-10 contain references to the description. According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2019/053509

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2013171585 A2	21-11-2013	AU 2013261164 A1	04-12-2014
		BR 112014028417 A2	24-04-2018
		CA 2873660 A1	21-11-2013
		CN 104470551 A	25-03-2015
		EP 2849812 A2	25-03-2015
		ES 2710400 T3	24-04-2019
		RU 2014149280 A	10-07-2016
		US 2013331823 A1	12-12-2013
		US 2015100045 A1	09-04-2015
		US 2016367737 A1	22-12-2016
		US 2017181894 A1	29-06-2017
		WO 2013171585 A2	21-11-2013
		ZA 201408307 B	27-01-2016
US 8641693 B2	04-02-2014	AU 2011256217 A1	25-10-2012
		AU 2011256218 A1	18-10-2012
		CA 2795232 A1	24-11-2011
		CA 2795233 A1	24-11-2011
		CN 102869406 A	09-01-2013
		CN 102883772 A	16-01-2013
		EP 2571557 A1	27-03-2013
		EP 2571558 A2	27-03-2013
		EP 3085407 A1	26-10-2016
		JP 5939646 B2	22-06-2016
		JP 2013526373 A	24-06-2013
		JP 2013526942 A	27-06-2013
		TW 201200178 A	01-01-2012
		TW 201210644 A	16-03-2012
		US 2011288511 A1	24-11-2011
		US 2011288535 A1	24-11-2011
		US 2014121617 A1	01-05-2014
		WO 2011146532 A2	24-11-2011
		WO 2011146533 A1	24-11-2011
WO 2016103033 A2	30-06-2016	AU 2015370582 A1	15-06-2017
		AU 2015370583 A1	15-06-2017
		AU 2015370584 A1	15-06-2017
		AU 2015370586 A1	15-06-2017
		CA 2971790 A1	30-06-2016
		CA 2971796 A1	30-06-2016
		CA 2971797 A1	30-06-2016
		CA 2971799 A1	30-06-2016
		CN 107249524 A	13-10-2017
		CN 107249659 A	13-10-2017
		CN 107249660 A	13-10-2017
		CN 107708758 A	16-02-2018
		EP 3236902 A2	01-11-2017
		EP 3237030 A1	01-11-2017
		EP 3237031 A1	01-11-2017
		EP 3237032 A2	01-11-2017
		JP 2018501054 A	18-01-2018
		JP 2018501055 A	18-01-2018
		JP 2018502682 A	01-02-2018
		JP 2018507076 A	15-03-2018
		SG 11201704250T A	28-07-2017
		SG 11201704253V A	28-07-2017
		SG 11201704254X A	28-07-2017
		SG 11201704255W A	28-07-2017

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2019/053509

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 2017368239 A1	28-12-2017
		US 2018133378 A1	17-05-2018
		US 2018318476 A1	08-11-2018
		US 2018326129 A1	15-11-2018
		WO 2016103031 A1	30-06-2016
		WO 2016103032 A1	30-06-2016
		WO 2016103033 A2	30-06-2016
		WO 2016103035 A2	30-06-2016