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(54) **FOOT FOR A PUMP**

(57) A foot (106) for a pump (150). The foot (106) includes a base body (110), a coupling structure (112) and a front panel (114). The coupling structure (112) is coupled to the base body (110). The coupling structure (112) allows the foot (106) to pivotally move between a first stable position and a second stable position. The front panel (114) is coupled to the coupling structure (112). The front panel (114) is actuated by a user to move the foot (106) between the first stable position and the second stable position. The foot (106) is characterized in that it includes a first arm, a second arm and a third

arm. The second arm is coupled to the base body at a second end. Further, a third arm is positioned to actuate both the first arm and the second arm. Moreover, the first arm, the second arm and the third arm are cooperatively movable relative to each other between the first stable position and the second stable position, such that the front panel is adapted to actuate the third arm to move against the first arm and the second arm. Thereby in the first stable position and the second stable position of the foot (106) the front panel (114) is adapted for the pump (150) to rest on it.

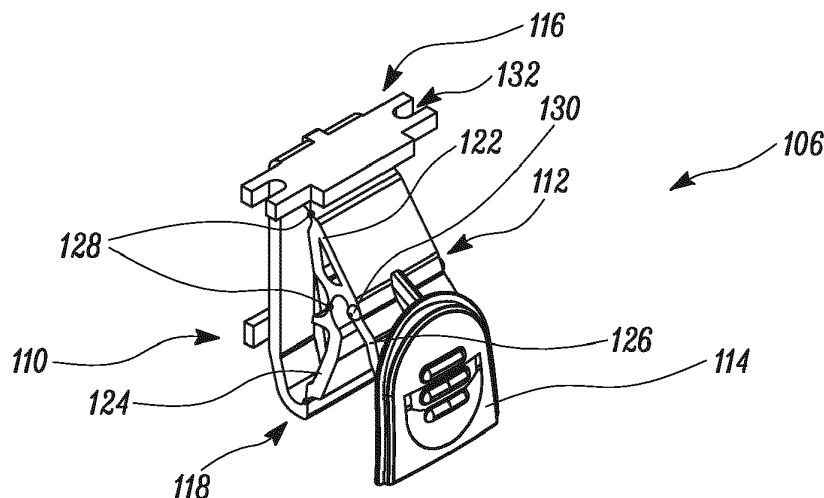


FIG. 2B

Description

TECHNICAL FIELD

[0001] The present disclosure relates to a foot for a pump. More specifically, the present disclosure relates to a foot for a pump which provides simple and convenient methods to adjust or manage different heights of the pump as per the requirements of common users.

BACKGROUND

[0002] A pump is a device that allows transport of fluids such as liquids or gases, or sometimes slurries, by mechanical actions. For example, a submersible pump is a device which has a hermetically sealed motor close-coupled to a pump body. The submersible pump may be submerged in a fluid to be pumped. Generally, the pumps are used to pump water from wells, or to filter aquariums, ponds, or may be used in car industries or energy industries for desired purposes. The pump may include a foot. The foot may help to attain desired heights depending on a liquid level in which the pump is submersed.

[0003] However, there may be instances where working with adjustment of pump heights with the help of feet of the pump may become troublesome process. Generally, an additional structure (such as base of a pump) may be coupled or uncoupled with the pump to get the desired height of the pump. Further, the coupling and uncoupling of additional parts to the pump may lead to formation of unrequired complex construction of the pump. Moreover, many technical issues may occur during assembly or disassembly of the additional structures with the pump.

[0004] The Chinese utility model CN 201 568 282 U describes a pump that has feet attached to its pump housing from underneath. The feet are connected to their respective base body via a hinge. The hinge and thus the coupling is sturdily secured by a securing element that is at the hinge screwed onto the base body after coupling. By accessing the pump housing from underneath in its non-operational position, the feet of the pump can be pivoted between a first stable position and a second stable position in respect to the base body. Doing this changes the height of the pumps water inlet in respect to the ground when the pump is back in its operational position. The feet of the pump are fixed in their pivotable position with the help of a screw connection of a fixing element to its hinges. This is pretty tedious during assembly and is not cost effective

[0005] Thus, there is a need for an improved pump which allows safe, convenient and trouble-free adjustments of heights of the pump.

SUMMARY

[0006] In view of the above, it is an objective of the present invention to solve or at least reduce the draw-

backs discussed above. The objective is at least partially achieved by a foot for a pump. The foot includes a base body. Further, the pump has a coupling structure coupled to the base body. The coupling structure allows the foot to pivotally move between a first stable position and a second stable position. Moreover, the foot further includes a front panel coupled to the coupling structure. The front panel can be actuated by a user to move the foot between the first stable position and the second stable position. The foot is characterized in that the foot includes a first arm, a second arm and a third arm. The first arm is coupled to the base body at a first end. The second arm is coupled to the base body at a second end. Further, third arm is positioned to actuate both the first arm and the second arm. Moreover, the first arm, the second arm and the third arm are cooperatively movable relative to each other between the first stable position and the second stable position, such that the front panel is adapted to actuate the third arm to move against the first arm and the second arm. Thus in the first stable position and the second stable position of the foot (106) the front panel (114) is adapted for the pump (150) to rest on it. Thus, the present disclosure provides a simple, efficient, and convenient foot to adjust different heights of the pump. And

it helps in engagement of the front panel with the base body. A general bistable mechanism is described by U. S. patent 6,215,081 whether naming any exemplary use, in particular not for use for the feet of pumps, nor describing any featural additions necessary for a certain use case.

[0007] According to an embodiment of the present invention, the foot includes a first end and a second end. The first end of a pivotable element adapted to be pivotally coupled to the base body. The pivotable element is engaged with at least one of a first structural feature and a second structural feature defined on the base body. The pivotable element engages with the first structural feature in the first stable position and the pivotable element engages with the second structural feature in the second stable position of the coupling structure. This provide the foot with an ability to stay in the first stable position and the second stable position without power input and despite small external disturbances.

[0008] According to an embodiment of the present invention, the front panel is coupled to the second end of the pivotable element. This allows free movement or actuation of the front panel by the common user.

[0009] According to an embodiment of the present invention, the first stable position corresponds to a first height of the pump base and the second stable position corresponds to a second height of the pump base. This may help in achieving the desired heights which are meant to suck/pump a large quantity of liquid in which the pump is submerged.

[0010] According to an embodiment of the present invention, the second height is greater than the second height. This may allow suction or pumping of liquid when

the liquid level is relatively high.

[0011] According to an embodiment of the present invention, the first height and the second height are 1mm and 5mm respectively. This may allow the pump to force the liquid entry at both desired liquid heights.

[0012] According to an embodiment of the present invention, the front panel include at least one tab. This may allow the front panel to get engaged with the base body.

[0013] According to an embodiment of the present invention, the base body is structurally integrated with the pump. This may prevent strength to the foot of the pump.

[0014] According to an embodiment of the present invention, the foot is manufactured by three-dimensional printing. Use of three-dimensional printing (alternatively, 3D printing) may provide versatility of using different materials along with lower lead-time in manufacturing and design of the foot.

[0015] According to an embodiment of the present invention, the foot is removably coupled with the pump. This may allow assembly of the foot to the pump as per the applicational requirements of the common users.

[0016] According to an embodiment of the present invention, the first arm and the second arm are coupled by flexible hinges. As durability of the flexible hinges may allow repetitional movements of the foot. The flexible hinges may experience little friction when the first arm, the second arm, and the third arm are actuated. Further, the flexible hinges may typically result in a long service life. Moreover, an integration of the flexible hinges may eliminate the need of extra components.

[0017] According to an embodiment of the present invention, the first arm and the third arm are coupled by a snap connection. The snap connection may provide simple and cost -effective ways to assemble different parts of the foot.

[0018] According to an embodiment of the present invention, the base body includes one or more recesses/grooves. This may allow assembly of the foot to the pump through the one or more recesses/grooves.

[0019] According to an embodiment of the present invention, the base body is engaged to the pump through the one or more recesses/grooves. This may connect the foot to the pump to form a single body. According to an embodiment of the present invention, the foot for a pump having a pump housing may be manufactured using a three-dimensional (3-D) printing process. A user of a pump having an according foot may be provided with a data file having prestored instructions to print the foot using a three-dimensional (3-D) printer. In order to do so, the foot may be presented in digital format. Use of three-dimensional printing (alternatively, 3D printing) may provide versatility of using different materials along with lower lead-time in manufacturing and design of the foot.

[0020] Other features and aspects of this invention will be apparent from the following description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The invention will be described in more detail with reference to the enclosed drawings, wherein:

FIG. 1 illustrates a pump base with one or more feet, in accordance with an aspect of the present disclosure;

FIG. 2A illustrates a side view of the foot for the pump in a first stable position, in accordance with an aspect of the present disclosure;

FIG. 2B illustrates a front view of the foot for the pump in the first stable position, in accordance with an aspect of the present disclosure;

FIGS. 3A and 3B illustrate side and front views of the foot in a second stable position respectively, in accordance with an aspect of the present disclosure;

FIG. 4 illustrates the pump base in the first stable position, in accordance with another aspect of the present disclosure; and

FIG. 5 illustrates the pump base in the second stable position, in accordance with another aspect of the present disclosure.

DESCRIPTION OF EMBODIMENTS

[0022] The present invention will be described more fully hereinafter with reference to the accompanying drawings, in which example embodiments of the invention incorporating one or more aspects of the present invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. For example, one or more aspects of the present invention may be utilized in other embodiments and even other types of structures and/or methods. In the drawings, like numbers refer to like elements.

[0023] Certain terminology is used herein for convenience only and is not to be taken as a limitation on the invention. For example, "upper", "lower", "front", "rear", "side", "longitudinal", "lateral", "transverse", "upwards", "downwards", "forward", "backward", "sideward", "left", "right", "horizontal", "vertical", "upward", "inner", "outer", "inward", "outward", "top", "bottom", "higher", "above", "below", "central", "middle", "intermediate", "between", "end", "adjacent", "proximate", "near", "distal", "remote", "radial", "circumferential", or the like, merely describe the configuration shown in the Figures. Indeed, the components may be oriented in any direction and the terminology, therefore, should be understood as encompassing

such variations unless specified otherwise.

[0024] FIG. 1 illustrates a pump base 100 of a pump 150. The pump 150 is a mechanical device which pumps fluids such as liquids, gases, or sometimes slurries. The pump 150 may be used indoors or outdoors according to applicational needs of a common user. In the depicted example the pump 150 includes a handle 103 to lift or displace the pump 150. The body includes an water inlet 102 (not visible). The water inlet 102 is present at the bottom of the pump housing 105, that is at the bottom of its pump base 100 and allows a liquid to be sucked by the pump 150. Further, the pump 150 has an outlet 104. The outlet 104 discharges the liquid. The discharged liquid may be used to different applications such as irrigation, washing etc.

[0025] FIG. 1 shows the pump 150 in its operational position that allows to suck water via its water inlet 102 (not visible) on the bottom of the pump housing 105 that find itself on the bottom of the pump 150 in its operational position. The pump housing 105 comprising a pump base 100 including one or more feet 106. The one or more feet 106 are accessible during the normal operation of pump 150 from side of the pump housing 105. This allows to adjust desired heights of the pump 150 being in its operational position. The common user may need the pump 150 to get adjusted at different heights. The pump 150 at different heights may cater to different application requirements. Pushing and pulling of the foot (106) moves it between its first stable position and its second stable position. The pump base 100 may be an integral part of the pump housing 105 or may be assembled or disassembled with a pump housing 105 through one or more pump base connectors 132 connecting the pump base 100 to the remainder part of the pump housing 105.

[0026] In some embodiments, the one or more feet 106 may be manufactured by three-dimensional printing. Use of three-dimensional printing (alternatively, 3D printing) may provide versatility of using different materials along with lower lead-time in manufacturing and design of the one or more feet 106.

[0027] In some embodiments, the one or more feet 106 may be made up of a material selected from steel, brass, stainless steel, aluminum or plastic. Nature of the material is chosen as per the requirements of the common user. The desired nature of the material provides the one or more feet 106 with certain characteristic features such as flexibility, elasticity, rigidity, heat or vibrations resistant properties.

[0028] FIG. 2A illustrates a side view of the foot 106 for the pump 150 in a first stable position. As from the point of clarity and consideration only one foot 106 is discussed in further figures. Another, one or more feet 106 may be similar or variant from the foot 106 described in the FIG. 2A. The foot 106 includes a base body 110. The foot 106 further includes a coupling structure 112. The coupling structure 112 is coupled to the base body 110. The base body 110 has a first end 116 and a second end 118. The coupling structure 112 allows the foot 106

to pivotally move between the first stable position and a second stable position (shown in FIGS. 3A and 3B respectively).

[0029] Moreover, the pump 150 further includes a front panel 114. The front panel 114 is actuated by a user to move the foot 106 between the first stable position and the second stable position. The front panel 114 includes a tab 120. The tab 120 allows an engagement (shown in FIGS. 3A and 3B) and disengagement of the front panel 114 with the second end 118 of the base body 110. The foot 106 further includes a first arm 122, a second arm 124 and a third arm 126. The first arm 122 is coupled to the base body 110 at the first end 116. Further, the second arm 124 is coupled to the base body 110 at the second end 118. Moreover, the third arm 126 is positioned to actuate both the first arm 122 and the second arm 124. The first arm 122, the second arm 124 and the third arm 126 are cooperatively movable relative to each other between the first stable position and the second stable position.

[0030] As illustrated in FIG. 2A, the first arm 122 and the second arm 124 are coupled by one or more flexible hinges 128. As durability of the one or more flexible hinges 128 may allow repetitional movements of the foot 106. The one or more flexible hinges 128 may experience little friction when the first arm 122, the second arm 124, and the third arm 126 are actuated. Further, the one or more flexible hinges 128 may typically result in a long service life. An integration of the one or more flexible hinges 128 may eliminate the need of extra components. The first arm 122 and the third arm 126 are coupled by a snap connection 130. Moreover, the snap connection 130 may provide simple and cost-effective ways to assemble different parts of the foot 106.

[0031] FIG. 2B illustrates a front view of the foot 106 in the first stable position. The base body 110 is directly coupled to the pump 150. The foot 106 includes one or more recesses/grooves 132. This may connect the foot 106 to the pump 150 to form a single body. In some embodiments, the base body 110 is structurally integrated with the pump base 100. This may provide strength/ rigidity to the foot 106 of the pump 150. In some other embodiments, the foot 106 is removably coupled with the pump base 100. This may allow assembly or disassembly of the foot 106 with the pump base 100 as per the applicational requirements of the common users.

[0032] The base body 110 may engage with the pump base 100 through the one or more recesses/grooves 132. The base body 110 of the foot 106 may be engaged with the pump base 100 by both temporary and permanent means. The temporary connection may be done by gluing, screwing, tying with threads and the like. The permanent connection may be done by welding, riveting and any other fabrication technique which is used or known in the art. Alternatively, and additionally, the base body 110 and the pump base 100 may be connected by snap connections.

[0033] FIGS. 3A and 3B illustrate side and front views

of the foot **106** in the second stable position respectively. The front panel **114** is adapted to actuate the third arm **126** to move against the first arm **122** and the second arm **124**. This helps in engagement of the front panel **114** with the base body **110**. The actuation of the front panel **114** engages the tab **120** with the second end **118** of the base body **110**. The front panel **114** may engage with the base body **110** by pressing or pushing the front panel **114** towards the base body **110**. The front panel **114** may be actuated by pressing a top portion **133** of the front panel **114**. The front panel **114** may engage with the base body **110** manually or by using simple tools. The second stable position of the front panel **114** with the base body **110** increases height of the pump **150** (shown in **FIG. 8**).

[0034] In some embodiments, the front panel **114** may be provided by some grooves. The grooves may help to actuate the front panel **114**. The user may actuate the front panel **114** by inserting fingers into the grooves or by using some simple tool to actuate the front panel **114**.

[0035] In some embodiments, the tab **120** may be made up of any material selected from one or more of a plastic, steel, nylon, rubber etc. The tab **120** may provide support to the front panel **114** to stay engaged with the second end **118** of the base body **110**. In some embodiments, the second end **118** of the base body **110** may have some protrusions which may lock or engage with grooves present on the front panel **114**. This arrangement may also provide firmness to the second stable position. Alternatively, or additionally, some designed structures may be present on the front panel **114**. The designed structures may get engaged with complementary designed structures present on the second end **118** of the base body **110**.

[0036] **FIG. 4** illustrates the pump base **100** in the first stable position. The first stable position is attained by the pump **150**, whenever the liquid level is quite low. The first stable position corresponds to a first height of the pump base **100**. In an embodiment, the first height is 1mm. The first height of the pump **150** may help in sucking or pumping of water, even when the water level is quite low. **FIGS. 2A, 2B** and **5A, 5B** corresponds to **FIG. 7**. The movement of the front panel **114** between the first stable position and the second stable position may eliminate need of external resources to lift or drop the pump **150**.

[0037] The front panel **114** may stay only in the first stable position and the second stable position. The front panel **114** may not stay in any intermediate position between the first stable position and the second stable position. Therefore, the front panel **114** may follow a bi-stable mechanism. This may provide stability to the front panel **114** to stay in the first stable position and the second stable position without much power input and despite small external disturbances.

[0038] **FIG. 5** illustrates the pump base **100** in the second stable position. The second stable position is attained by the pump **150**, whenever the liquid level is quite high. With the feet of the pump in this second stable position that particles of a size by 5 mm can pass the pump.

The second stable position corresponds to a second height of the pump base **100**. In an embodiment, the second height is 5mm. The second height of the pump **150** may help in sucking or pumping of water, even when the water level is quite high. **FIGS. 3A, 3B** corresponds to **FIG. 5**. The second height is greater than the first height. The first height and the second height may allow the pump **150** to force the liquid entry at both desired liquid heights.

[0039] In the drawings and specification, there have been disclosed preferred embodiments and examples of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for the purpose of limitation of the scope of the invention being set forth in the following claims.

LIST OF ELEMENTS

[0040]

100	Pump Base
102	Inlet
103	Handle
104	Outlet
105	Pump Body
106	Foot/ One or more feet
108	One or more protrusions
110	Base Body
112	Coupling Structure
114	Front Panel
116	First end
118	Second end
120	Tab
122	First Arm
124	Second Arm
126	Third Arm
128	One or more flexible hinges
130	Snap Connection
132	One or more recesses/grooves
133	Top Portion
134	Pivotable Element
136	First End
138	Second End
140	First Portion
142	Second Portion
144	First structural feature
146	Second structural feature
148	Slanting Portion
150	Pump

Claims

1. A foot (**106**) for a pump (**150**), the foot (**106**) comprising:
 - a base body (**110**);
 - a coupling structure (**112**) coupled to the base

body (110), the coupling structure (112) allowing the foot (106) to pivotally move between a first stable position and a second stable position; and a front panel (114) coupled to the coupling structure (112), wherein the front panel (114) is actuated to move the foot (106) between the first stable position and the second stable position; **characterized in that:**

the foot (106) includes:

a first arm (122) adapted to be coupled to the base body (110) at a first end (116);
a second arm (124) adapted to be coupled to the base body (110) at a second end (118); and

a third arm (126) positioned to actuate both the first arm (122) and the second arm (124);

wherein the first arm (122), the second arm (124) and the third arm (126) are cooperatively movable relative to each other between the first stable position and the second stable position, such that the front panel (114) is adapted to actuate the third arm (126) to move against the first arm (122) and the second arm (124),

and wherein in the first stable position and the second stable position of the foot (106) the front panel (114) is adapted for the pump (150) to rest on it.

2. The foot (106) of claim 1, wherein the front panel (114) is coupled to a second end (138) of the pivotable element (134).

3. The foot (106) of claim 1 or 2, wherein the first stable position corresponds to a first height of the pump base (100) and the second stable position corresponds to a second height of the pump base (100).

4. The foot (106) of claim 3, wherein the second height is greater than the first height.

5. The foot (106) of claims 3 or 4, wherein the first height and the second height are 1mm and 5mm respectively.

6. The foot (106) of any of the preceding claims, wherein the front panel (114) include at least one tab (120).

7. The foot (106) of any of the preceding claims, wherein the base body (110) is structurally integrated with the pump (150).

8. The foot (106) of any of the preceding claims, wherein the first arm (122) and the second arm (124) are coupled by flexible hinges.

9. The foot (106) of any of the preceding claims, wherein the first arm (122) and the third arm (126) are coupled by a snap connection (130).

10. The foot (106) of any of the preceding claims, wherein the base body (110) includes one or more recesses/grooves (132).

11. The foot (106) of claim 10, wherein the base body (110) is engaged to the pump (150) through the one or more recesses/grooves (132).

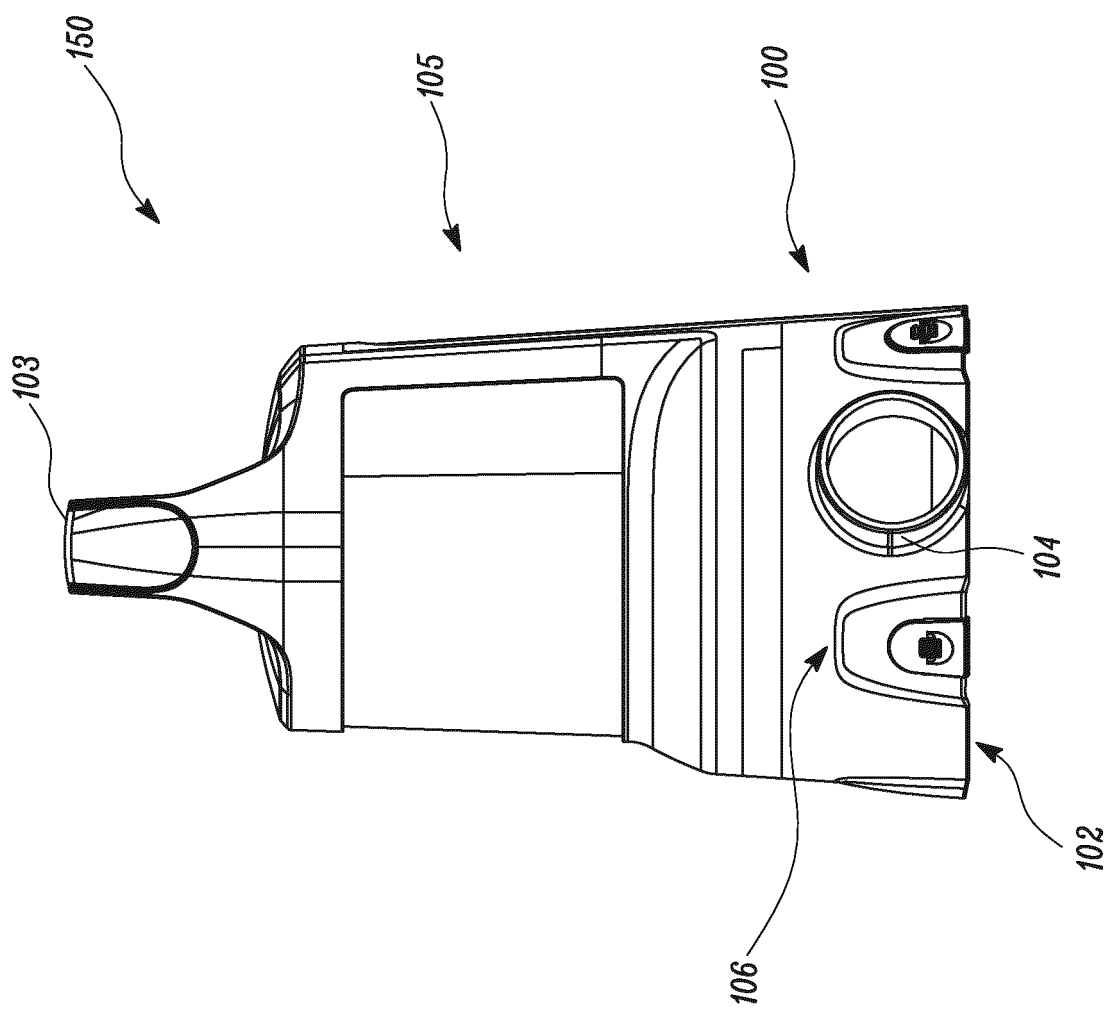


FIG. 1

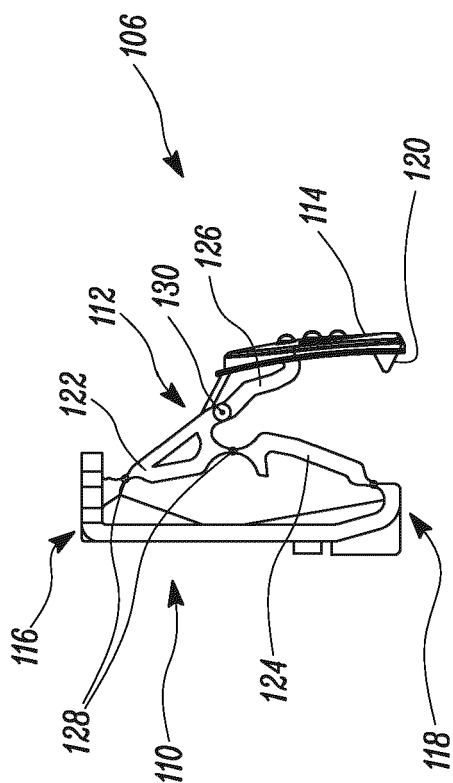


FIG. 2A

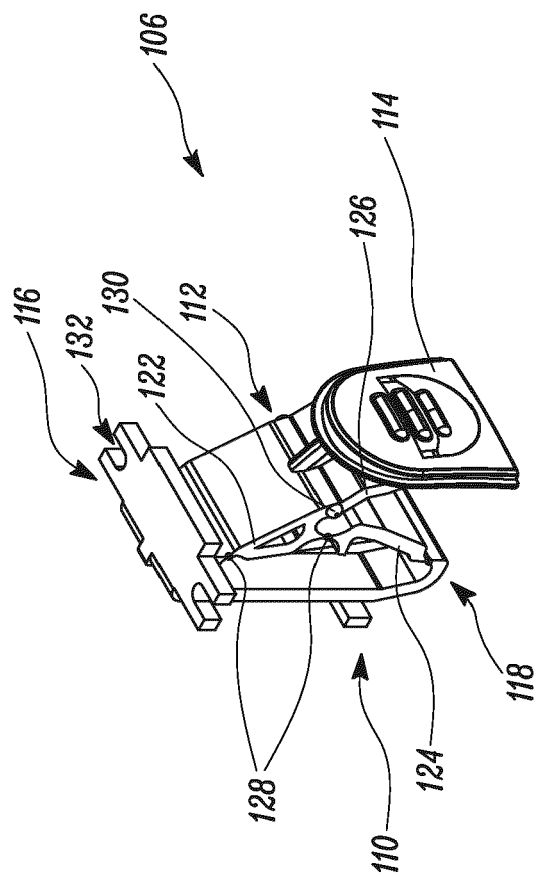


FIG. 2B

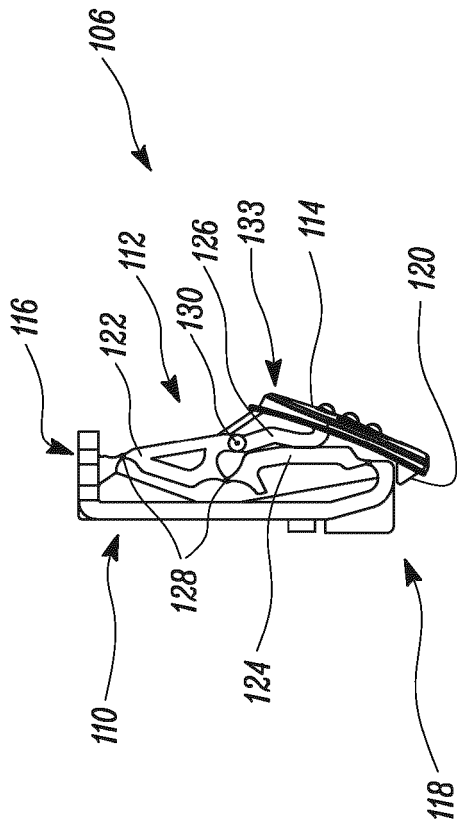


FIG. 3A

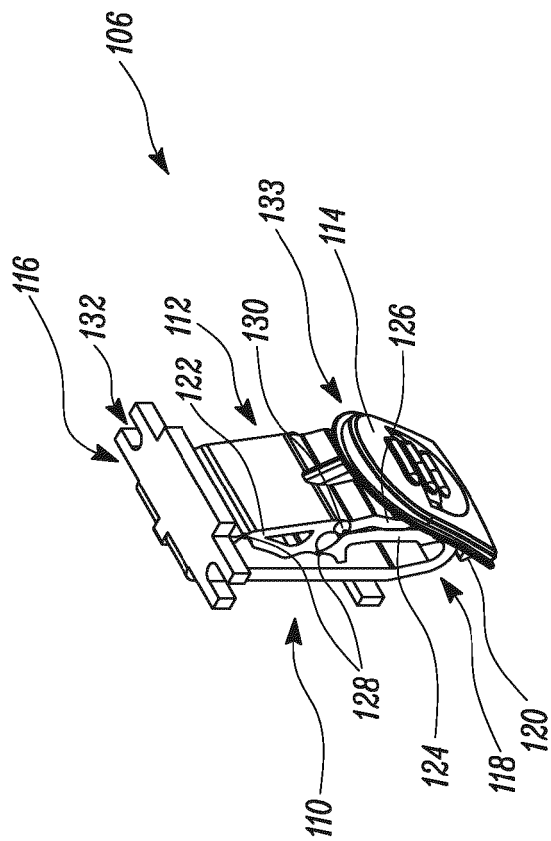


FIG. 3B

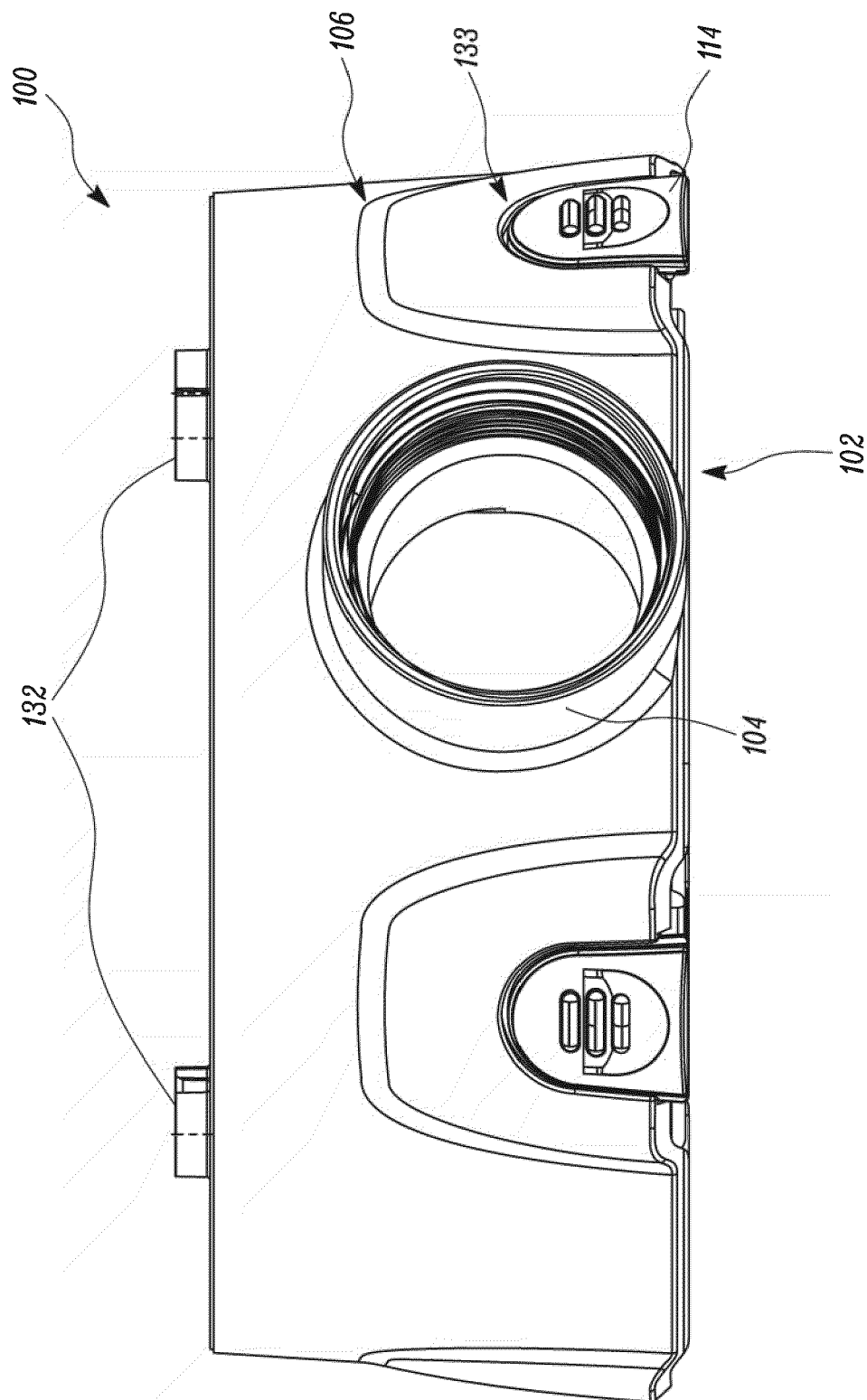


FIG. 4

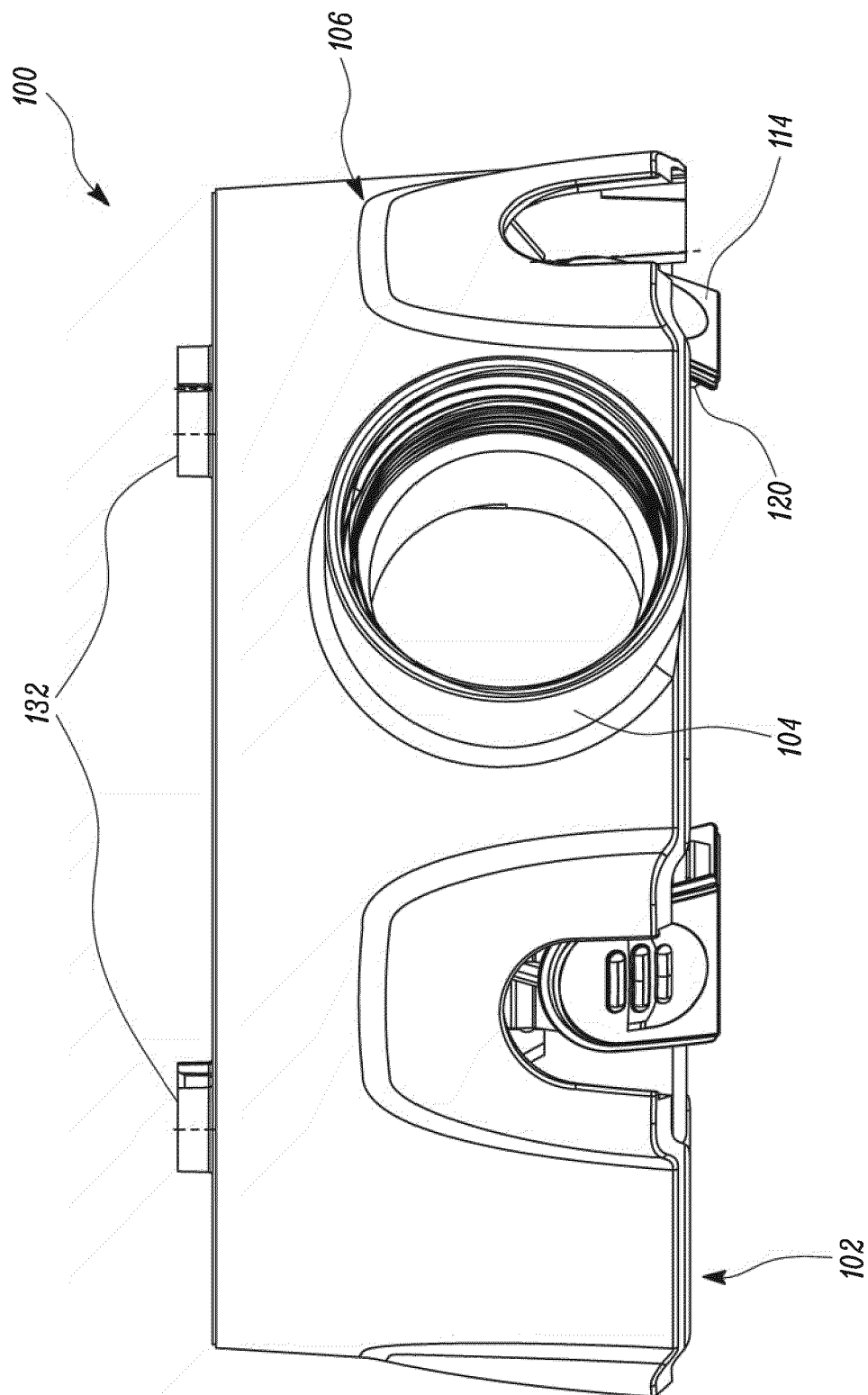


FIG. 5



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 16 0315

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 August 2020	Examiner Oliveira, Damien
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
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