



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**15.09.2021 Bulletin 2021/37**

(51) Int Cl.:  
**F04D 13/06** (2006.01) **F04D 29/62** (2006.01)  
**F04D 29/60** (2006.01)

(21) Application number: **21153817.8**

(22) Date of filing: **27.01.2021**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA ME**  
Designated Validation States:  
**KH MA MD TN**

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(30) Priority: **09.03.2020 IT 202000004909**

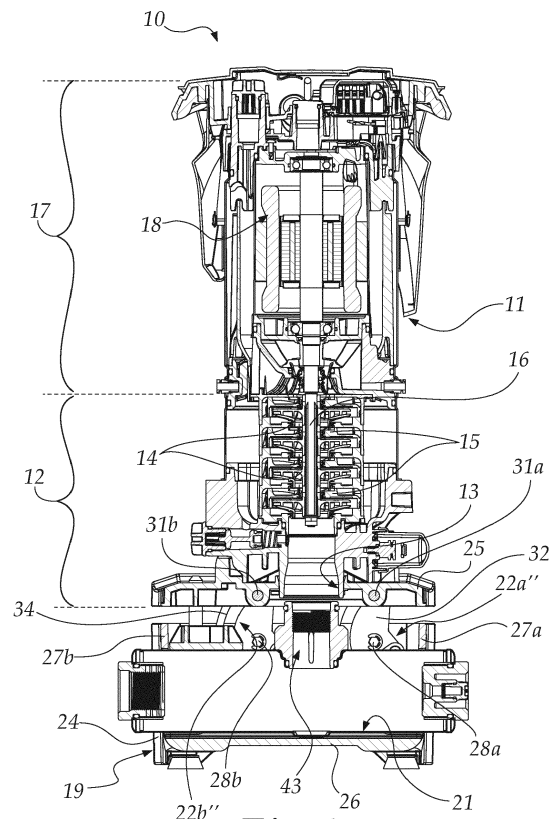
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(54) **ELECTRIC PUMP WITH FACILITATED ASSEMBLY AND MAINTENANCE**

(57) An electric pump (10, 110) comprising:  
- a pump body (11, 111) inside which there are:  
- a mechanical section (12), which comprises an intake port (13) and a delivery port (42, 442), and contains one or more impellers (14), interleaved by diffusers (15) and keyed on a driving shaft (16),  
- an electromechanical section (17), comprising an electric motor (18) for the movement of the driving shaft (16),  
- a footing (19, 119), inside which there are two manifolds (20, 21, 120, 121), a first delivery manifold (20, 120) connected to the delivery port (42, 442) and a second intake manifold (21, 121) connected to the intake port (13).

The electric pump (10, 110) comprises one or more means for detachable association between the pump body (11, 111) and the footing (19, 119) which can be actuated from a single point (23, 123) of the electric pump (10, 110).



**Fig. 4a**

## Description

**[0001]** The present invention relates to an electric pump with facilitated assembly and maintenance.

**[0002]** An electric pump is a device for moving a liquid, generally water, by drawing it from a first region, by means of an intake duct, and sending it to a second region, by means of a delivery duct.

**[0003]** The electric pump comprises a pump body inside of which there are:

- a mechanical section, which comprises an intake port and a delivery port, and contains one or more impellers, interleaved by diffusers which are keyed on a driving shaft adapted to rotate them, for the movement of the liquid,
- an electromechanical section, which comprises an electric motor for the movement of the driving shaft.

**[0004]** Some electric pumps are of the vertical type, i.e., they have a vertical configuration for use and a vertical axis of extension, with the mechanical section in the lower part of the electric pump and the electromechanical section in the upper part, above the mechanical section.

**[0005]** Some models of vertical electric pumps comprise a base footing, inside which there are two manifolds, a delivery manifold connected to the delivery port and an intake manifold connected to the intake port.

**[0006]** Usually, the pump body is stably associated with the footing by virtue of a plurality of means for mechanical fixing such as screws, bolts or pins.

**[0007]** This background art has some drawbacks.

**[0008]** Generally, in order to be able to assemble the electric pump it is necessary to place the pump body perfectly on the footing and then the mechanical fixing means have to be applied one by one.

**[0009]** Likewise, in order to remove the pump body from the footing during maintenance or for other needs, it is necessary to remove one by one all the mechanical fixing means and then it is possible to separate the pump body from the footing.

**[0010]** This leads to long and awkward assembly/disassembly operations, with repercussions also on the assembly/maintenance times of the electric pump.

**[0011]** Furthermore, in order to be able to associate the pump body with the footing it may be necessary to have and use a plurality of different tools in order to remove the various mechanical fixing means.

**[0012]** This entails a considerable complexity of the assembly/disassembly of the electric pump besides the need for the installation technician/user to have conveniently such a plurality of tools at hand.

**[0013]** The aim of the present invention is to provide an electric pump that is capable of improving the background art in one or more of the aspects mentioned above.

**[0014]** Within this aim, an object of the invention is to provide an electric pump that allows an easier and quick-

er association/separation of the pump body and the footing.

**[0015]** Another object of the invention is to provide an electric pump that allows quicker and easier assembly/disassembly thereof with respect to similar electric pumps of the known type, with consequent improvements in terms of speed and ease of maintenance.

**[0016]** Another object of the invention is to provide an electric pump in which it is not necessary, during assembly/maintenance, to apply/remove individually the means for mechanical fixing between the pump body and the footing.

**[0017]** Another object of the invention is to provide an electric pump that does not require the use of a plurality of tools to fix the pump body to the footing or to remove it from said footing.

**[0018]** A further object of the present invention is to overcome the drawbacks of the background art in a manner that is alternative to any existing solutions.

**[0019]** Another object of the invention is to provide an electric pump that is highly reliable, relatively easy to provide and at competitive costs.

**[0020]** This aim and these and other objects which will become better apparent hereinafter are achieved by an electric pump comprising:

- a pump body inside which there are:
- a mechanical section, which comprises an intake port and a delivery port, and contains one or more impellers, interleaved by diffusers, keyed on a driving shaft,
- an electromechanical section, which comprises an electric motor for the movement of said driving shaft,
- a footing, inside which there are two manifolds, a first delivery manifold which is connected to said delivery port and a second intake manifold which is connected to said intake port,

said electric pump being characterized in that it comprises one or more means for detachable association between said pump body and said footing which can be actuated from a single point of said electric pump.

**[0021]** Further characteristics and advantages of the invention will become better apparent from the description of some preferred but not exclusive embodiments of the electric pump according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of an electric pump according to the invention in a first embodiment;  
 Figures 2a and 2b are two different views of a portion of the electric pump of Figure 1;  
 Figure 3 is an exploded view of the electric pump of Figure 1;  
 Figure 4 is a view of the electric pump of Figure 1 in a first configuration;  
 Figure 4a is a sectional view of the electric pump

shown in Figure 4;

Figure 5 is a view of the electric pump of Figure 1 in a second configuration;

Figure 5a is a sectional view of the electric pump shown in Figure 5;

Figure 6 is an exploded view of an electric pump according to the invention, in a second embodiment, in a first configuration;

Figure 7 is a sectional view of the electric pump of Figure 6 in a second configuration;

Figure 8 is an enlarged-scale view of a first detail of the electric pump of Figure 6;

Figure 9 is an enlarged-scale sectional view of a portion of the electric pump of Figure 6 in the first operating configuration;

Figure 10 is an internal detail view of an electric pump according to the invention in a first configuration;

Figure 11 is an internal detail view of an electric pump according to the invention in a second configuration;

Figure 12 is a sectional view of a detail of the electric pump according to the invention in a second embodiment.

**[0022]** With reference to the figures, an electric pump according to the invention, in a first embodiment, is generally designated by the reference numeral 10.

**[0023]** The electric pump 10 comprises a pump body 11 inside of which there are:

- a mechanical section 12, which comprises an intake port 13 and a delivery port 42 and contains one or more impellers 14, interleaved by diffusers 15 and keyed on a driving shaft 16,
- an electromechanical section 17, which comprises an electric motor 18 for the movement of the driving shaft 16.

**[0024]** The electric pump 10 is of the vertical type and comprises, below the pump body 11, a footing 19, inside which there are two manifolds:

- a delivery manifold 20 connected to the delivery port 42,
- an intake manifold 21 connected to the intake port 13.

**[0025]** The electric pump 10 is of the vertical type.

**[0026]** The manifolds 20 and 21 are coplanar, parallel and of the type described in Italian Patent Application 10202000001468, in the name of this same Applicant.

**[0027]** One of the particularities of the electric pump 10 is that it comprises a plurality of means for detachable association between the pump body 11 and the footing 19 which can be actuated from a single point 23 of the electric pump 10.

**[0028]** The footing 19 has a substantially tray-like body 24, made of plastic material, with the manifolds 20 and 21 that cross it, parallel to its base 26, by passing through two opposite first side walls 27a, 27b.

**[0029]** The pump body 11 is provided with a tray 25, made of plastic material, at the lower end of the mechanical section 12, which encloses the substantially tray-like body 24 of the footing 19.

**[0030]** On top of the manifolds 20 and 21, the footing 19 comprises two rotatable bars:

- a first rotatable bar 28a,
- a second rotatable bar 28b.

**[0031]** The rotatable bars 28a, 28b have a cross-section which is:

- polygonal, for example hexagonal and/or square,
- and/or oval,

and they are extended between the two second side walls 29a, 29b, which are perpendicular to the first side walls 27a, 27b of the substantially tray-like body 24 of the footing 19.

**[0032]** In particular, at least the first rotatable bar 28a has a portion 39 that protrudes from the body 24 of the footing 19 and can be accessed, for its rotation, from the point 23 of the electric pump 10, mentioned above.

**[0033]** The second rotatable bar 28b also has a portion that protrudes from the body 24 of the footing 19, not shown in the figures, which is covered by a cap 70.

**[0034]** The cap 70 is arranged on the same second side wall 29a in which said point 23 is present.

**[0035]** In failure and/or emergency conditions, the cap 70 can be removed: in this manner, the disconnection between the pump body 11 and the footing 19 can be performed by actuating only the second rotatable bar 28b or by actuating both rotatable bars 28a and 28b simultaneously.

**[0036]** In the footing 19, elements for engagement with the tray 25 are keyed on each one of the rotatable bars 28a and 28b, respectively:

- two first engagement elements 22a' and 22a" on the first rotatable bar 28a,
- two second engagement elements 22b' and 22b" on the second rotatable bar 28b.

**[0037]** Each engagement element 22a', 22a", 22b', 22b" is engaged with a corresponding bar 31a, 31b of the tray 25 in the configuration for use of the electric pump 10.

**[0038]** In particular:

- the first engagement elements 22a' and 22a" are engaged with a first bar 31a of the tray 25,
- the second engagement elements 22b' and 22b" are engaged with a second bar 31b of the tray 25.

**[0039]** The bars 31a, 31b of the tray 25 are made of metal, at least partially embedded in the plastic material of which the tray 25 is composed, and are extended on

the surface of this tray 25 that is directed toward the footing 19.

**[0040]** Preferably, the bars 31a, 31b of the tray 25 are embedded in the plastic material of the tray 25 except in the regions for engagement with the corresponding engagement elements 22a', 22a", 22b', 22b".

**[0041]** In this manner a significant structural stiffness is given to the tray and the risks of formation of any cracks is reduced.

**[0042]** Each one of the first engagement elements 22a', 22a", is coplanar with a corresponding second engagement element 22b', 22b".

**[0043]** Furthermore, each one of the first engagement elements 22a', 22a", is connected mechanically to a corresponding second engagement element 22b', 22b" by means of a linkage element 30.

**[0044]** The linkage element 30 allows to transmit the rotary motion imparted to the first rotatable bar 28a to the second rotatable bar 28b and to coordinate and synchronize the movement of all the engagement elements 22a', 22a", 22b', 22b".

**[0045]** Specifically, each engagement element 22a', 22a", 22b', 22b", comprises a plate 32, which is keyed on a corresponding rotatable bar 28a, 28b at right angles thereto.

**[0046]** The plate 32 has a rounded edge 33; moreover, an arc-like tab 34 extends from said plate 32, with an extension that is substantially parallel to the extension of the rounded edge 33.

**[0047]** The tab 34 is extended substantially starting from one end of the rounded edge 33.

**[0048]** An opening 35 for the sliding of a corresponding bar 31a, 31b of the tray 25 is present between the rounded edge 33 and the tab 34 of the plate 32.

**[0049]** Depending on the rotation of the engagement element 22a', 22a", 22b', 22b", the sliding of the bar 31a, 31b of the tray 25 leads to engagement or disengagement between the footing 19 and the tray 25.

**[0050]** Figure 10 shows the configuration of two corresponding engagement elements 22a' and 22b' and of the linkage element 30 that connects them, in a configuration for disengagement of the tray 25 from the footing 19.

**[0051]** Figure 11 shows the configuration of two corresponding engagement elements 22a' and 22b' and of the linkage element 30 that connects them, in a configuration for engagement of the tray 25 with the footing 19.

**[0052]** At the end of the rounded edge 33 of the plate 32 that lies opposite the end from which the tab 34 extends there is a shaped portion 36 which duplicates at least partially the profile of the bar 31a, 31b of the tray 25.

**[0053]** The shaped portion 36 is adapted for the stable resting of the tray 25 on the footing 19 in the configuration for disengagement of the pump body 11 from the footing 19.

**[0054]** The expression "stable resting", in the present description, is understood to mean a resting that needs an external force in order to allow the relative motion of the tray 25 with respect to the footing 19, due to the sliding

of the bars 31a, 31b, of the tray 25 in the openings 35 of the engagement elements 22a', 22a", 22b', 22b".

**[0055]** These shaped portions 36 are adapted also to guide and facilitate the assembly of the electric pump 10.

**[0056]** In fact, in order to be able to associate the pump body 11 with the footing 19, one must simply rest the pump body 11 on the footing 19 so that the bars 31a, 31b of the tray 25 rest on the respective shaped portions 36 of the engagement elements 22a', 22a", 22b', 22b", in the disengagement configuration, shown in Figure 10.

**[0057]** The means for detachable association between the pump body 11 and the footing 19 are constituted by:

- first rotatable bar 28a of the footing 19,
- second rotatable bar 28b of the footing 19,
- first engagement elements 22a' and 22a" on the first rotatable bar 28a,
- second engagement elements 22b' and 22b" on the second rotatable bar 28b,
- bars 31a, 31b of the tray 25 of the pump body 11.

**[0058]** The electric pump 10 comprises a lever 37 for the actuation of the means for detachable association.

**[0059]** The lever 37 has an end 38 for interaction with the first rotatable bar 28a of the footing 19, which is shaped complementarily or is complementary to the portion 39 that protrudes from the body 24 of said first rotatable bar 28a.

**[0060]** The lever 37 is used only during the step for association or separation of the pump body 11 and of the footing 19.

**[0061]** The lever 37 connects to and interacts with the protruding portion 39 of the first rotatable bar 28a, at the point 23 of the electric pump 10, shown above.

**[0062]** Once the electric pump 10 has been assembled and during its normal operation, the lever 37 is removed and separated from said pump.

**[0063]** When necessary, the lever 37 connects to and interacts with the protruding portion of the second rotatable bar 28b, after removing the cap 70.

**[0064]** If it is necessary to move both rotatable bars 28a and 28b at the same time, the installation technician/user actuates the first rotatable bar 28a by means of the lever 37 and the second rotatable bar 28b by means of a per se known socket wrench, or vice versa.

**[0065]** The association between the pump body 11 and the footing 19 occurs in the following manner.

**[0066]** The footing 19 has the engagement elements 22a', 22a", 22b', 22b" in the disengagement configuration, shown in Figures 3, 4, 4a, 10.

**[0067]** The pump body 11 is arranged on the footing 19, so that the bars 31a, 31b of the tray 25 of the pump body 11 rest on the shaped portions 36 of the engagement elements 22a', 22a", 22b', 22b", with each one of the bars 31a, 31b of the tray 25 parallel to a corresponding rotatable bar 28a, 28b.

**[0068]** The lever 37 is associated with the protruding portion 39 of the first rotatable bar 28a, interlocking the

protruding portion 39 of the first rotatable bar 28a in the end 38 of the lever 37, in the direction designated by the arrow 40 in Figure 3, at the point 23 of the electric pump 10.

**[0069]** Then the lever 37 is rotated in the direction of the arrow 41 of Figure 4, from the position shown in Figure 4 to the position shown in Figure 5.

**[0070]** Due to the shape mating between the protruding portion 39 of the first rotatable bar 28a and the end 38 of the lever 37, the rotation of the lever 37 causes the rotation of the first rotatable bar 28a, which in turn causes the rotation of the first engagement elements 22a' and 22a".

**[0071]** Due to the mechanical connection of each first engagement element 22a', 22a" with a corresponding second engagement element 22b', 22b", by means of a linkage element 30, the rotation of the first engagement elements 22a', 22a" entails the synchronized and coordinated rotation of the second engagement elements 22b', 22b".

**[0072]** The rotary motion of the engagement elements 22a', 22a", 22b', 22b", allows the bars 31a, 31b, of the tray 25 to move from the shaped portions 36, entering the corresponding openings 35 and sliding therein, running along the entire rounded edge 33 of the corresponding plates 32, as shown in Figure 11.

**[0073]** In the configuration of the engagement elements 22a', 22a", 22b', 22b" shown in Figure 11, due to the coupling between the bars 31a, 31b of the tray 25 and the engagement elements 22a', 22a", 22b', 22b", the association between the pump body 11 and the footing 19 and their mutual fixing are provided, as shown also in Figures 5 and 5a.

**[0074]** During the rotation of the engagement elements 22a', 22a", 22b', 22b", the intake port 13 and the delivery port 42 of the pump body 11 are connected fluidically to the respective manifolds 21 and 20 of the footing 19, each manifold having an inlet 43 conveniently arranged for connection to a corresponding intake port 13 or delivery port 42.

**[0075]** At this point it is possible to remove the lever 37 from the point 23 of the electric pump 10, since the assembly thereof has ended and therefore it can be put into service.

**[0076]** In the opposite manner, therefore by performing in reverse the steps described above, it is possible to disengage the pump body 11 from the footing 19.

**[0077]** It should be noted that the operations for assembly and disassembly of the electric pump 10 are easier and quicker with respect to other electric pumps of a known type.

**[0078]** It should also be noted that with such an electric pump it is possible to associate or disengage the footing 19 and the pump body 11 by actuating all the engagement elements 22a', 22a", 22b', 22b" from a single point 23.

**[0079]** Figures 6 to 9 and 12 show an electric pump 110, according to the invention, in a second embodiment.

**[0080]** The electric pump 110 is similar to the previous

one and its components that correspond to components of the electric pump in its first embodiment bear the same numerals increased by 100.

**[0081]** The electric pump 110 comprises, additionally with respect to the electric pump in its first embodiment described above, two secondary removable fixing elements 150 between the pump body 111 and the footing 119.

**[0082]** The secondary removable fixing elements 150 are constituted by threaded knobs, which comprise a handle 151 and a stem 155 which extends from the handle 151 and is at least partially threaded.

**[0083]** The stem 155 is provided with a wider and threaded end 157 which:

- passes through a corresponding first through hole 152 of the tray 125,
- and is screwed into a second hole 153, on a side wall of the substantially tray-like body 124 of the footing 119, said second hole 153 corresponding to and being coaxial with the first hole 152.

**[0084]** The first hole 152 has a first portion 160 with reduced cross-section, which is tapped upon the passage of the end 157 of the stem 155, and a second portion 161 that has a cross-section that is wider and larger than the cross-section of the end 157 of the stem 155.

**[0085]** The second portion 161 is proximate to the second hole 153.

**[0086]** The wider end 157 of the stem 155 can slide within the second portion 161 of the first hole 152, but the first portion 160, with reduced cross-section, prevents its sliding and any exit from the first hole 152.

**[0087]** In particular, a spring 154 is present between the handle 151 of each knob 150 and the inlet of the first hole 152, surrounds the stem 155 and is suitable for the elastic return of the stem 155, in order to retract the end 157 of the knob 150 and retain it in the second portion 161 of the first hole 152, once the knob 150 has been unscrewed from the second hole 153.

**[0088]** In a preferred embodiment of the electric pump 110, the end 157 of the stem 155 of the knob 150 taps at least the first portion 160 of the hole 152, upon its passage, reaching the second portion 161, and screws into a threaded insert 162 that is present inside the second hole 153.

**[0089]** The shapes of the end 157 of the stem 155 and of the first portion of the first hole 152 allow the knob 150 to be always integral with the tray 125, both with the pump body 111 engaged with the footing 119 and with the pump body 111 disengaged from the footing 119.

**[0090]** After engaging the tray 125 with the footing 119, in a manner similar to what occurs for the electric pump in its first embodiment, said tray is further secured to the footing 119 by means of the secondary fixing elements 150.

**[0091]** In order to be able to then disengage the pump body 111 from the footing 119, it is necessary, first of all,

to unscrew the fixing elements 150 in order to remove them from the footing 119, then the footing 119 is disengaged from the tray 125 similarly to what is done for the electric pump in its first embodiment.

[0092] Another particularity of the electric pump 110 resides in that the tray 125 has a plurality of feet 156, which extend starting from the surface of the tray that is directed toward the footing 119, in the configuration for use of the electric pump 110.

[0093] These feet 156 are adapted to allow a stable vertical resting of the pump body 111 when it is not associated with the footing 119.

[0094] Another particularity of the invention resides in that the electric pump 10, 110 comprises a sensor, not shown in the figures, which allows to detect, for example, by means of a signal displayed on the display of the electric pump, not designated in the figures, the correct fixing of the pump body 11, 111, to the footing 19, 119, before putting the electric pump 10, 110 into operation.

[0095] In practice it has been found that the invention achieves the intended aim and objects, providing an electric pump that allows easier and quicker association/separation of pump body and footing.

[0096] The invention provides an electric pump which allows a quicker and easier assembly/disassembly thereof than similar electric pumps of a known type, with consequent improvements in terms of speed and ease of maintenance.

[0097] Furthermore, the invention provides an electric pump in which it is not necessary, during assembly/maintenance, to apply/remove individually the means for mechanical fixing between the pump body and the footing.

[0098] Finally, the invention provides an electric pump that does not require the use of a plurality of tools in order to fix the pump body to the footing or to remove it therefrom.

[0099] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may furthermore be replaced with other technically equivalent elements.

[0100] In practice, the materials used, so long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to the requirements and the state of the art.

[0101] The disclosures in Italian Patent Application No. 102020000004909 from which this application claims priority are incorporated herein by reference.

[0102] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

## Claims

1. An electric pump (10, 110) comprising:

- a pump body (11, 111) inside which there are:
- a mechanical section (12), which comprises an intake port (13) and a delivery port (42, 142), and contains one or more impellers (14), interleaved by diffusers (15) and keyed on a driving shaft (16),
- an electromechanical section (17), comprising an electric motor (18) for the movement of said driving shaft (16),
- a footing (19, 119), inside which there are two manifolds (20, 21, 120, 121), a first delivery manifold (20, 120) connected to said delivery port (42, 142) and a second intake manifold (21, 121) connected to said intake port (13),

said electric pump (10, 110) being **characterized in that** it comprises one or more means for detachable association between said pump body (11, 111) and said footing (19, 119) which can be actuated from a single point (23, 123) of said electric pump (10, 110).

2. The electric pump (10, 110) according to claim 1, **characterized in that** it is of the vertical type.

3. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that**:

- said footing (19, 119) has a substantially tray-like body (24, 124), with said manifolds (20, 21, 120, 121) that cross it, parallel to its base (26), passing through two opposite first side walls (27a, 27b, 127a).
- said pump body (11, 111) is provided with a tray (25, 125) at the lower end of said mechanical section (12), which encloses said substantially tray-like body (24, 124) of said footing (19, 119).

4. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that** above said manifolds (20, 21, 120, 121) said footing (19, 119) comprises two rotatable bars:

- a first rotatable bar (28a, 128a),
- a second rotatable bar (28b, 128b),

said rotatable bars (28a, 28b, 128a, 128b) having a polygonal and/or oval cross-section, said rotatable bars (28a, 28b, 128a, 128b) extending between two second side walls (29a, 29b) which are perpendicular to said first side walls (27a, 27b, 127a) of said substantially tray-like body (24, 124) of said footing (19, 119).

5. The electric pump (10, 110) according to one or more

of the preceding claims, **characterized in that** at least said first rotatable bar (28a, 128a) has a portion (39, 139) that protrudes from said body (24, 124) of said footing (19, 119) and can be accessed, for its rotation, from said single point (23, 123).

6. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that** elements for engagement with said tray (25, 125) are keyed on each one of said rotatable bars (28a, 28b, 128a, 128b), respectively:

- two first engagement elements (22a', 22a", 122a', 122a") on said first rotatable bar (28a, 128a),
- two second engagement elements (22b', 22b", 122b', 122b") on said second rotatable bar (28b, 128b).

7. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that** each one of said first engagement elements (22a', 22a", 22b', 22b", 122a', 122a", 122b', 122b") is engaged with a corresponding bar (31a, 31b, 131a, 131b) of said tray (25, 125) in the configuration for use of said electric pump (10, 110), respectively:

- said first engagement elements (22a', 22a", 122a', 122a") are engaged with a first bar (31a, 131a) of said tray (25, 125),
- said second engagement elements (22b', 22b", 122b', 122b") are engaged with a second bar (31b, 131b) of said tray (25, 125).

8. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that**:

- each one of said first engagement elements (22a', 22a", 122a', 122a") is coplanar with a corresponding one of said second engagement elements (22b', 22b", 122b', 122b"),
- each one of said first engagement elements (22a', 22a", 122a', 122a") is connected mechanically to a corresponding one of said second engagement elements (22b', 22b", 122b', 122b") by means of a linkage element (30, 130).

9. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that** each one of said engagement elements (22a', 22a", 22b', 22b", 122a', 122a", 122b', 122b") comprises a plate (32) that is keyed on a corresponding one of said rotatable bars (28a, 28b, 128a, 128b) at right angles thereto, said plate (32) having a rounded edge (33), an arc-like tab (34) extending from said plate (32), with an extension that is substantially parallel to the extension of said rounded edge (33).

10. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that** said tab (34) extends substantially starting from one end of said rounded edge (33), an opening (35) being present between said rounded edge (33) and said tab (34) of said plate (32) for the sliding of said corresponding bar (31a, 31b, 131a, 131b) of said tray (25, 125).

11. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that** at the end of said rounded edge (33) of said plate (32) that lies opposite the end from which said tab (34) extends there is a shaped portion (36) which duplicates at least partially the profile of said corresponding bar (31a, 31b, 131a, 131b) of said tray (25, 125).

12. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that** said means for detachable association between said pump body (11, 111) and said footing (19, 119) are constituted by:

- said first rotatable bar (28a, 128a) of said footing (19, 119),
- said second rotatable bar (28b, 128b) of said footing (19, 119),
- said first engagement elements (22a', 22a", 122a', 122a"),
- said second engagement elements (22b', 22b", 122b', 122b"),
- each said corresponding bar (31a, 31b, 131a, 131b) of said tray (25, 125) of said pump body (11, 111).

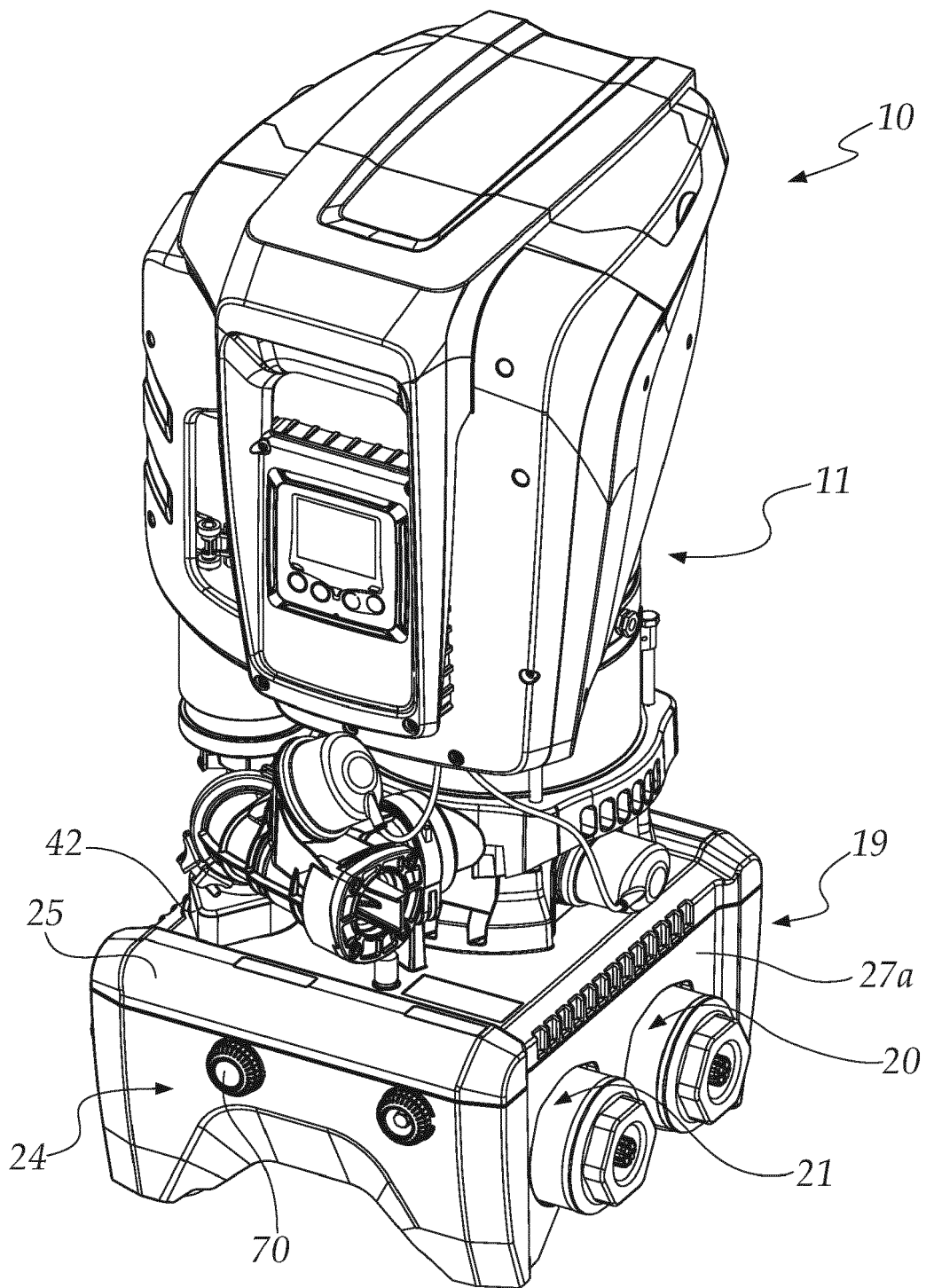
13. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that** it comprises a lever (37, 137) for the actuation of said detachable association means, said lever (37, 137) having an end (38, 138) for interaction with said first rotatable bar (28a, 128a) of said footing (19, 119), which is shaped complementarily or is complementary to said portion (39, 139) of said first rotatable bar (28a, 128a) that protrudes from said body (24, 124) of said footing (19, 119).

14. The electric pump (110) according to one or more of the preceding claims, **characterized in that** it comprises at least one secondary removable fixing element (150) between said pump body (111) and said footing (119).

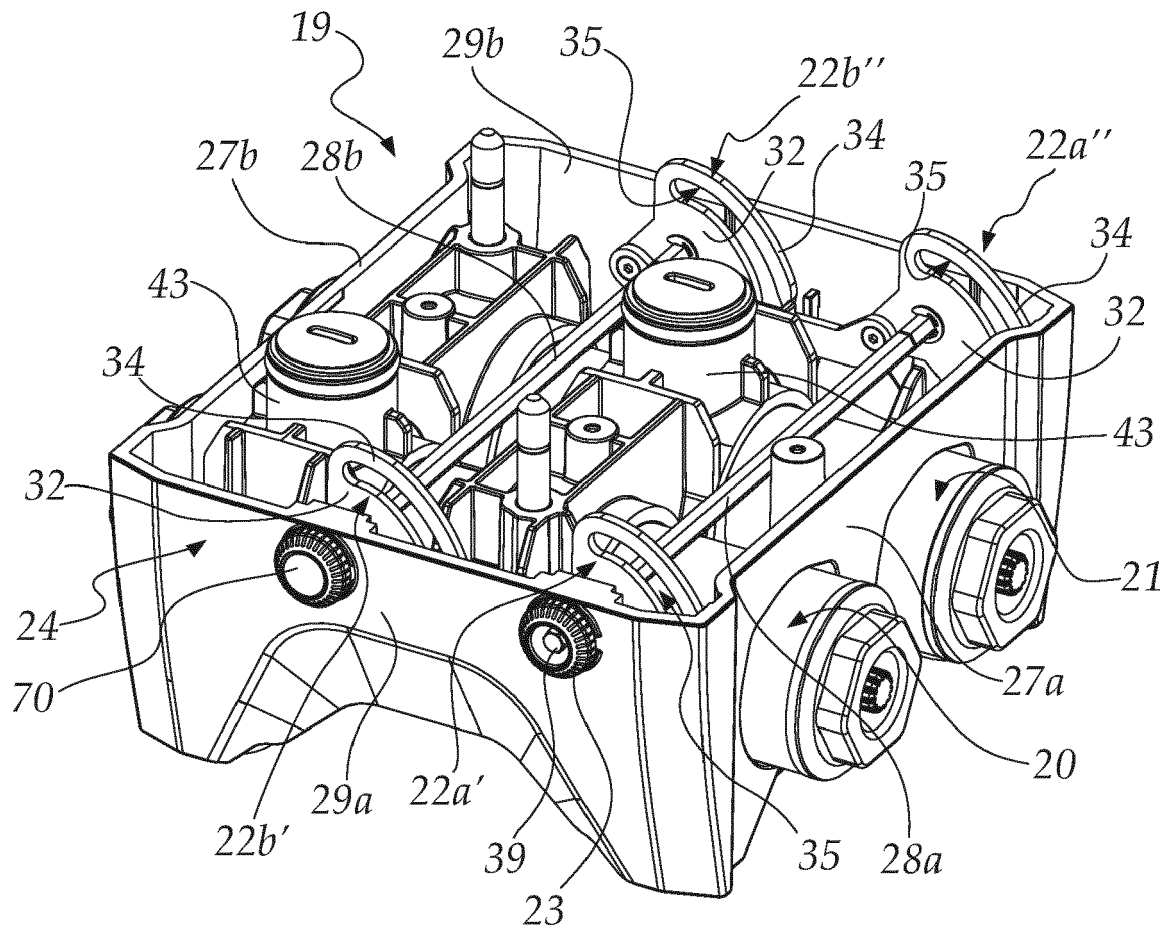
15. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that** said secondary removable fixing element (150) is constituted by a threaded knob, which comprises a handle (151) and a stem (155) which extends from said handle (151) and is at least partially threaded.

16. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that** said stem (155) is provided with a wider and threaded end (157) which:
- passes through a corresponding first through hole (152) of said tray (125),
  - is screwed into a second hole (153), on a side wall of said substantially tray-like body (124) of said footing (119), said second hole (153) corresponding to and being coaxial with said first hole (152).
17. The electric pump (110) according to one or more of the preceding claims, **characterized in that** said first hole (152) has:
- a first portion (160) with reduced cross-section, which is tapped upon the passage of said end (157) of said stem (155),
  - a second portion (161) that has a wider cross-section that is larger than the cross-section of said end (157) of said stem (155), said second portion (161) being proximate to said second hole (153), said end (157) of said stem (155) being able to slide within said second portion (161).
18. The electric pump (110) according to one or more of the preceding claims, **characterized in that** a spring (154) is present between said handle (151) of said knob and the inlet of said first hole (152) and surrounds said stem (155).
19. The electric pump (110) according to one or more of the preceding claims, **characterized in that** said tray (125) is provided with a plurality of feet (156), which extend starting from the surface of said tray (125) that is directed toward said footing (119), in the configuration for use of said electric pump (110).
20. The electric pump (10, 110) according to one or more of the preceding claims, **characterized in that** it comprises a sensor for detecting the correct fixing of said pump body (11, 111) to said footing (19, 119).
21. A lever (37, 137) for the actuation of means for detachable association between said pump body (11, 111) and said footing (19, 119) of an electric pump (10, 110) according to one or more of the preceding claims, **characterized in that** it has an end (38, 138) for interaction with said first rotatable bar (28a, 128a) of said footing (19, 119), which is shaped complementarily or is complementary to said portion (39, 139) of said first rotatable bar (28a, 128a) that protrudes from said body (24, 124) of said footing (19, 119).

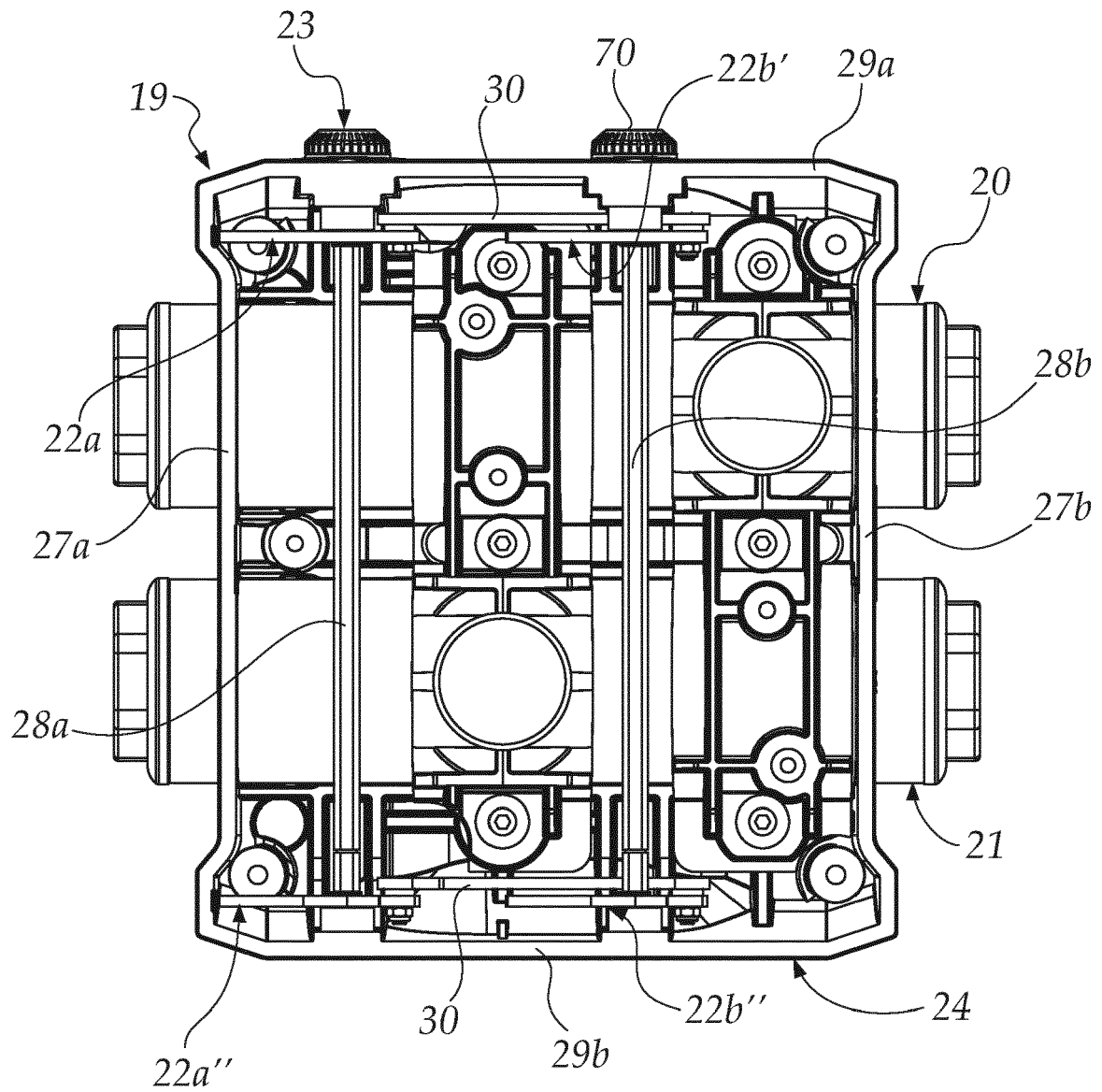




*Fig.1*



*Fig.2a*



*Fig.2b*

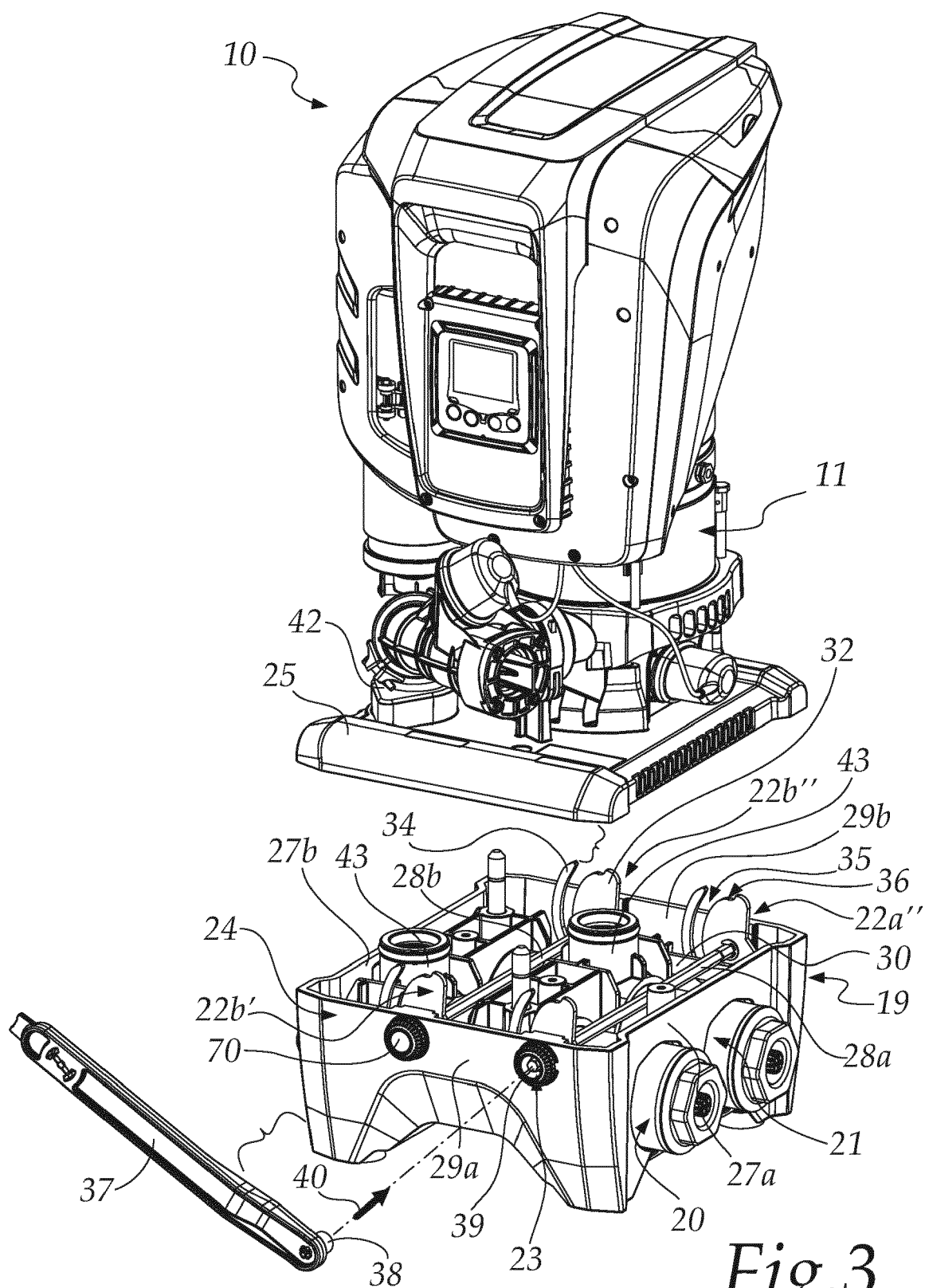


Fig.3

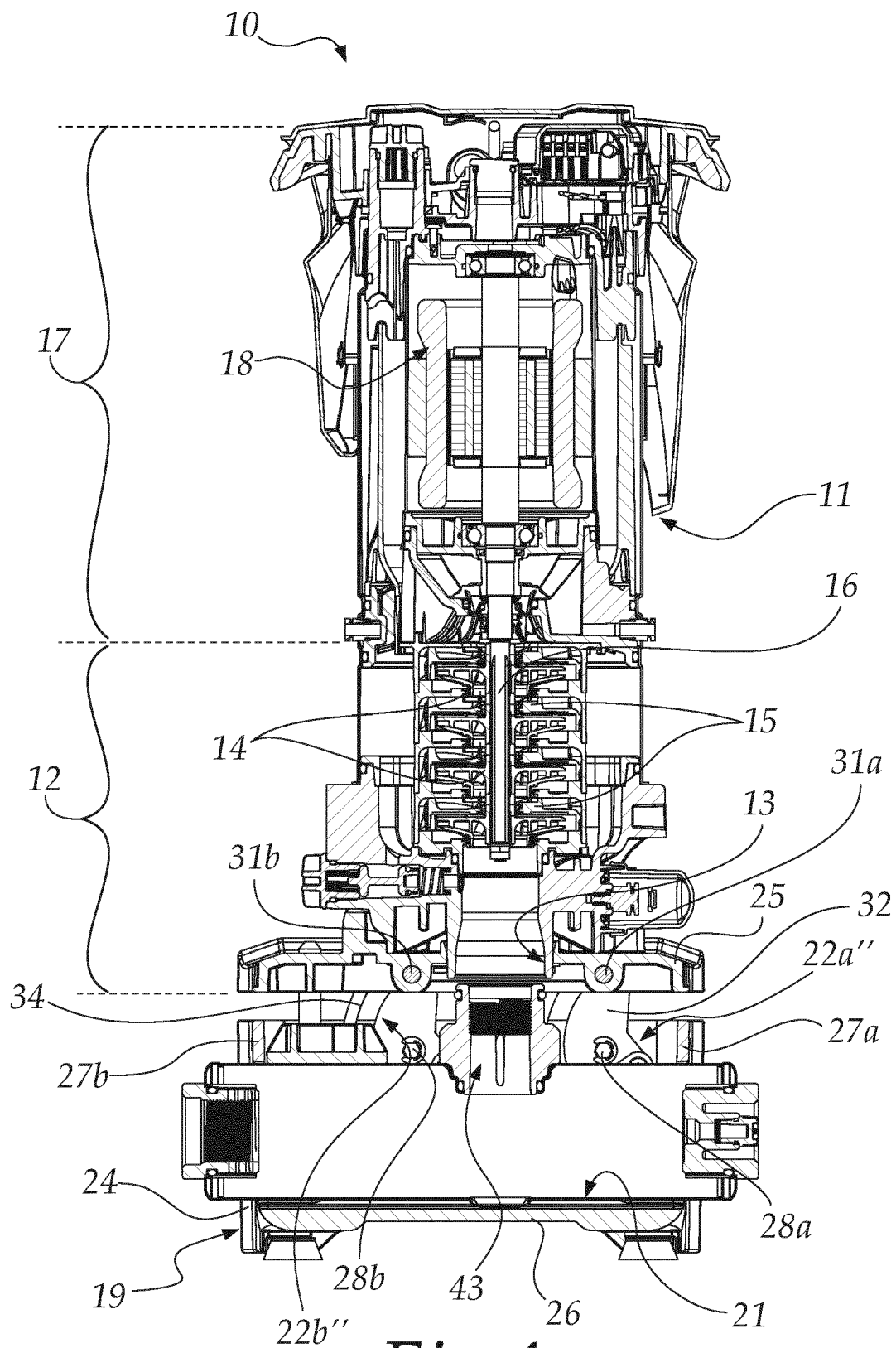
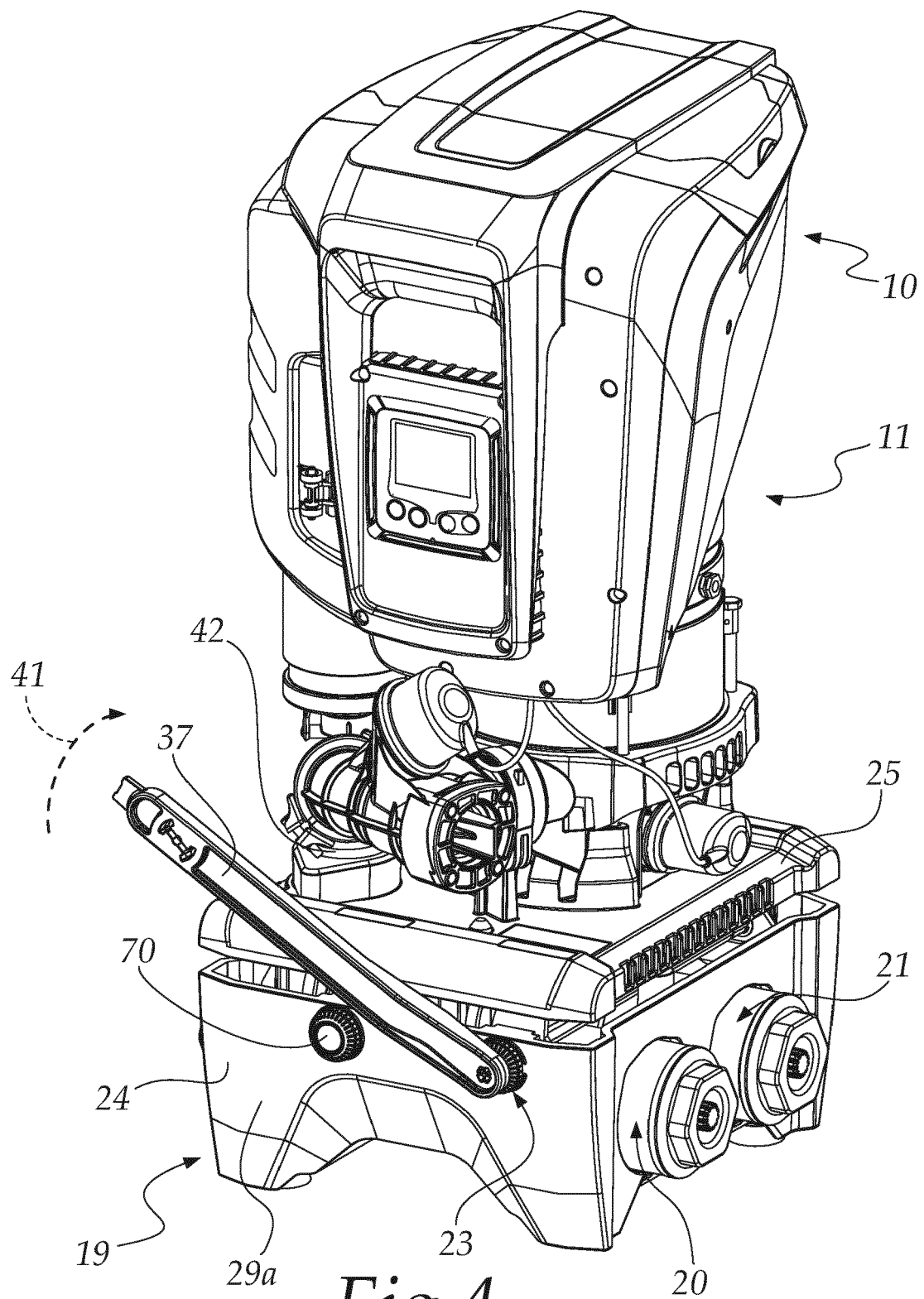
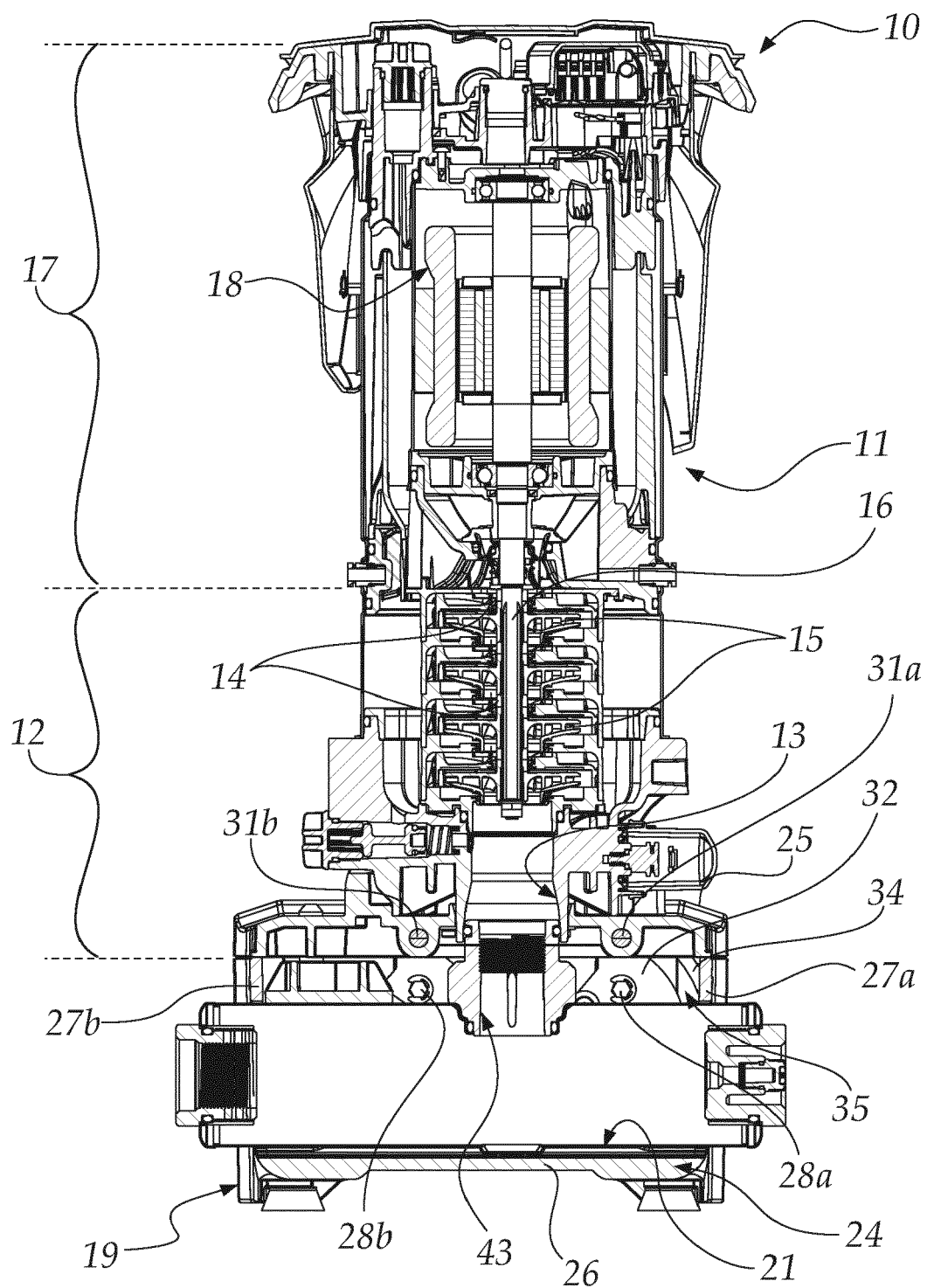


Fig. 4a



*Fig.4*



*Fig.5a*

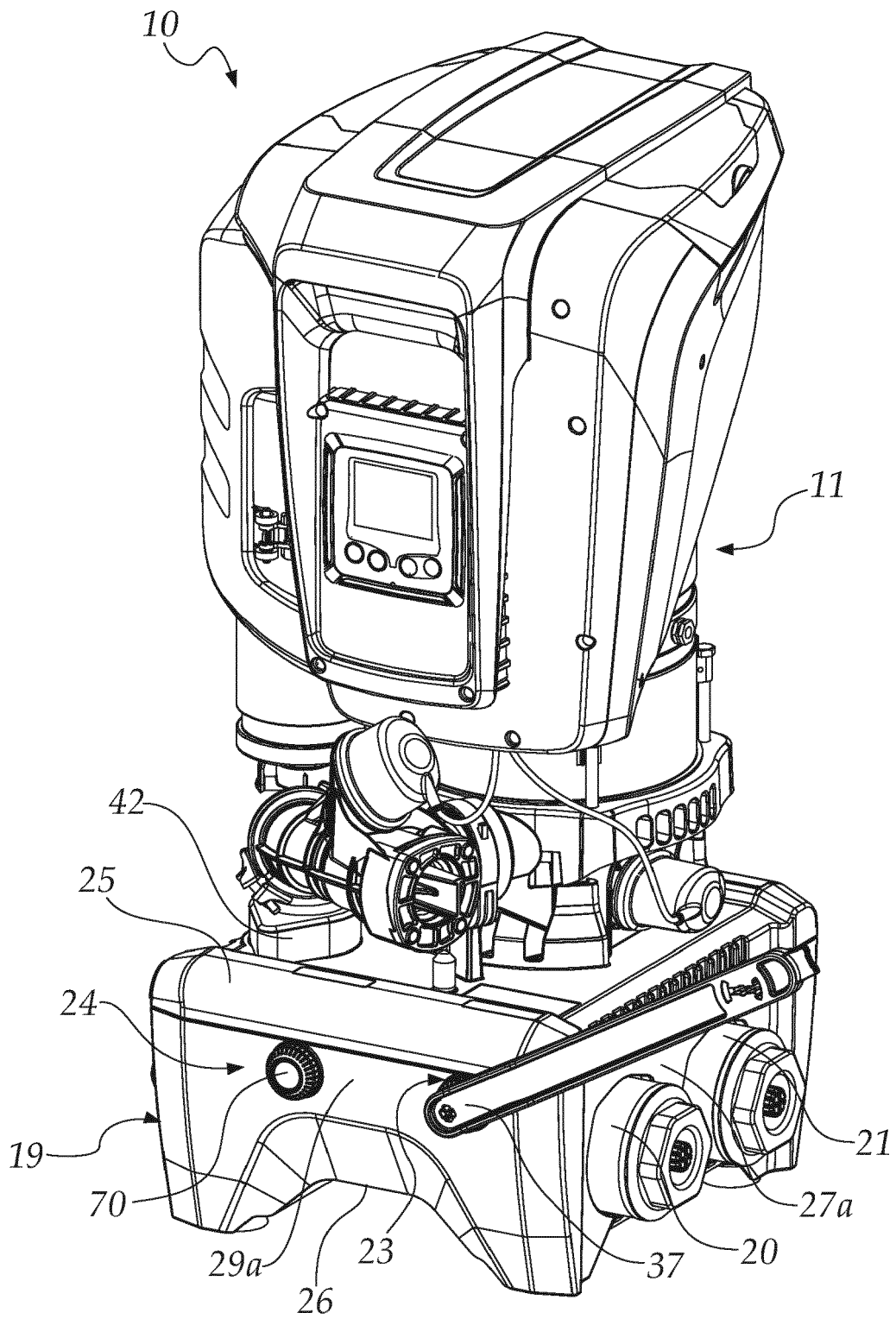
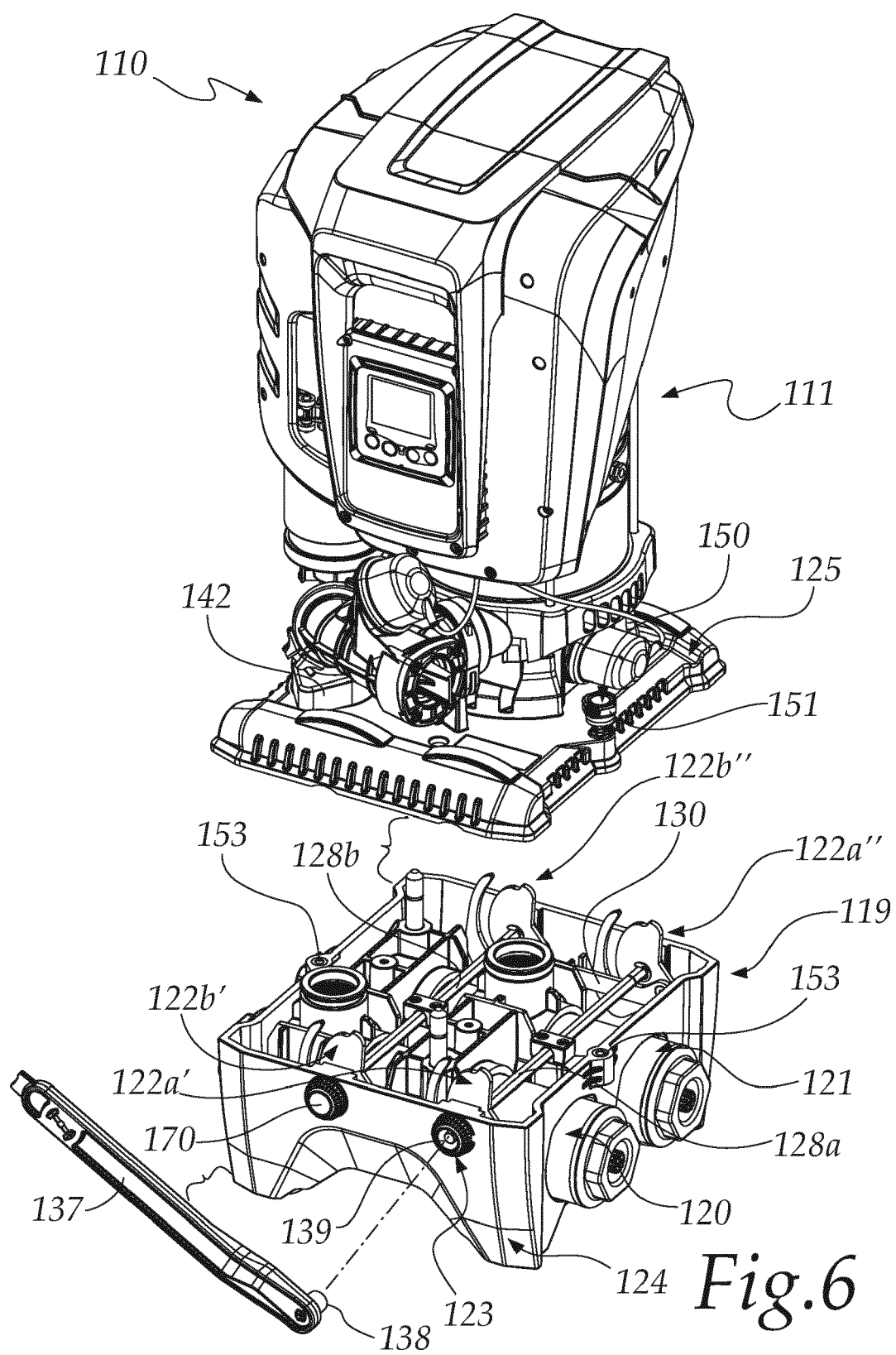
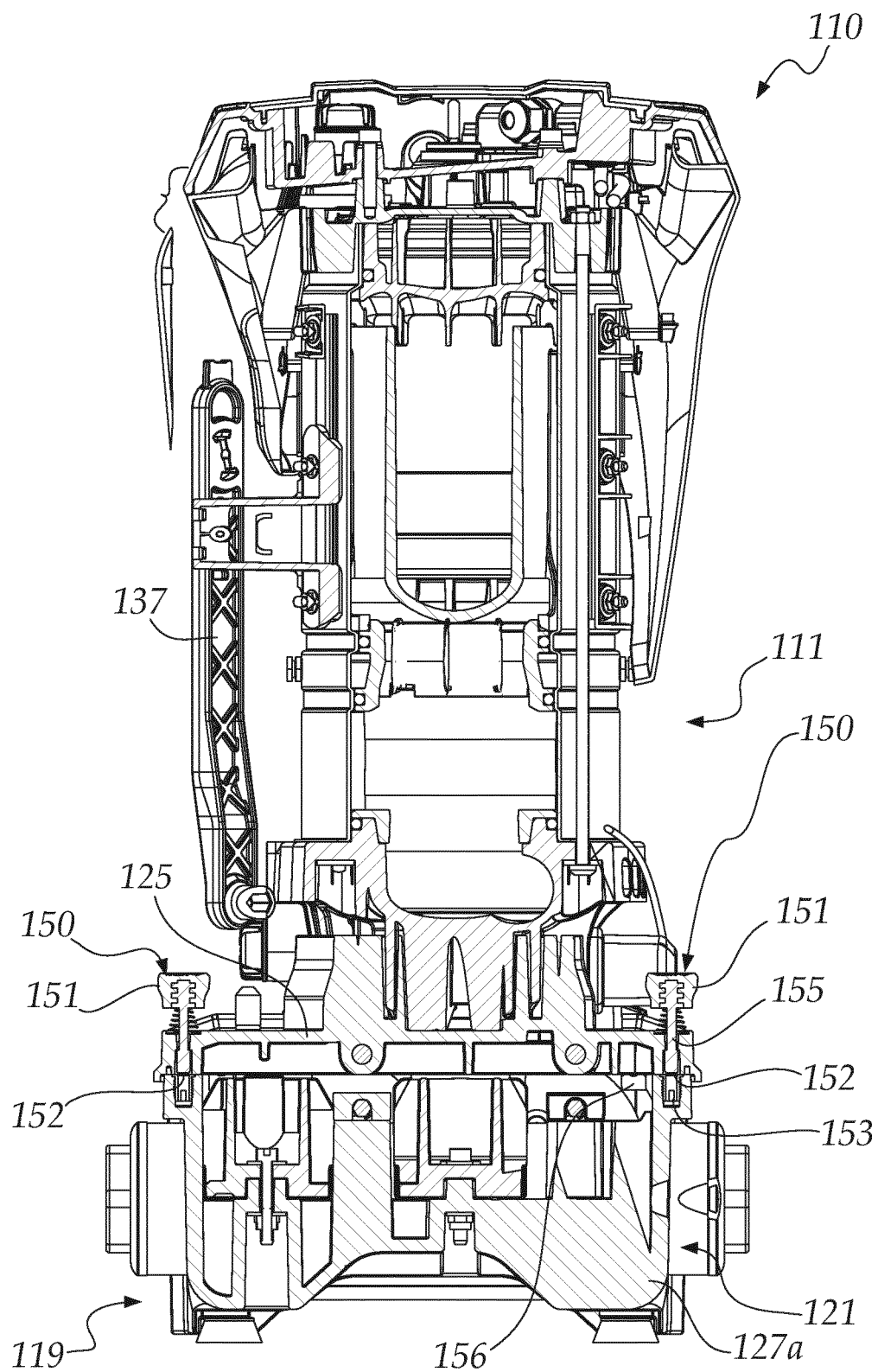
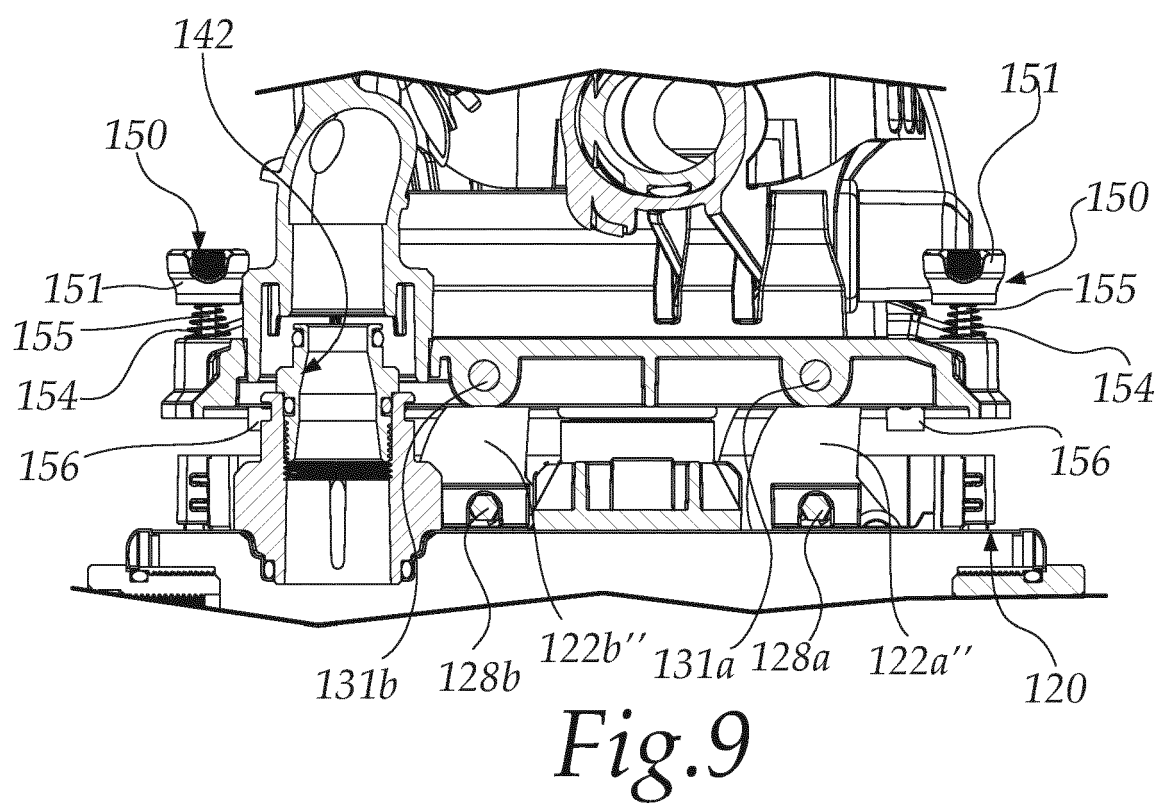
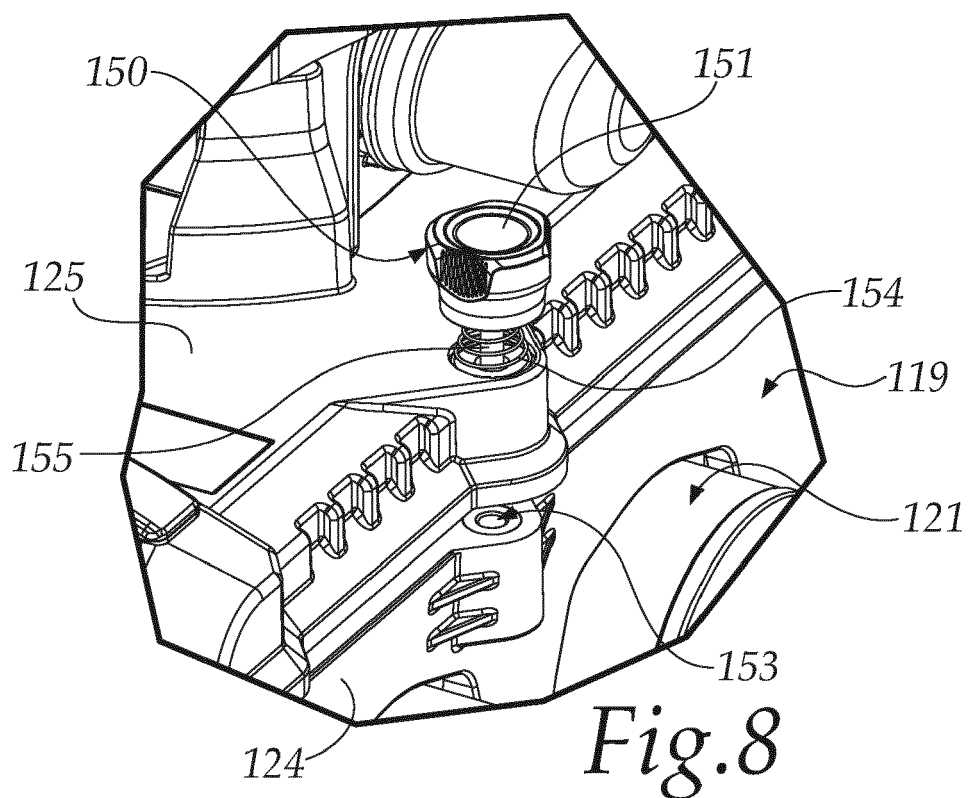


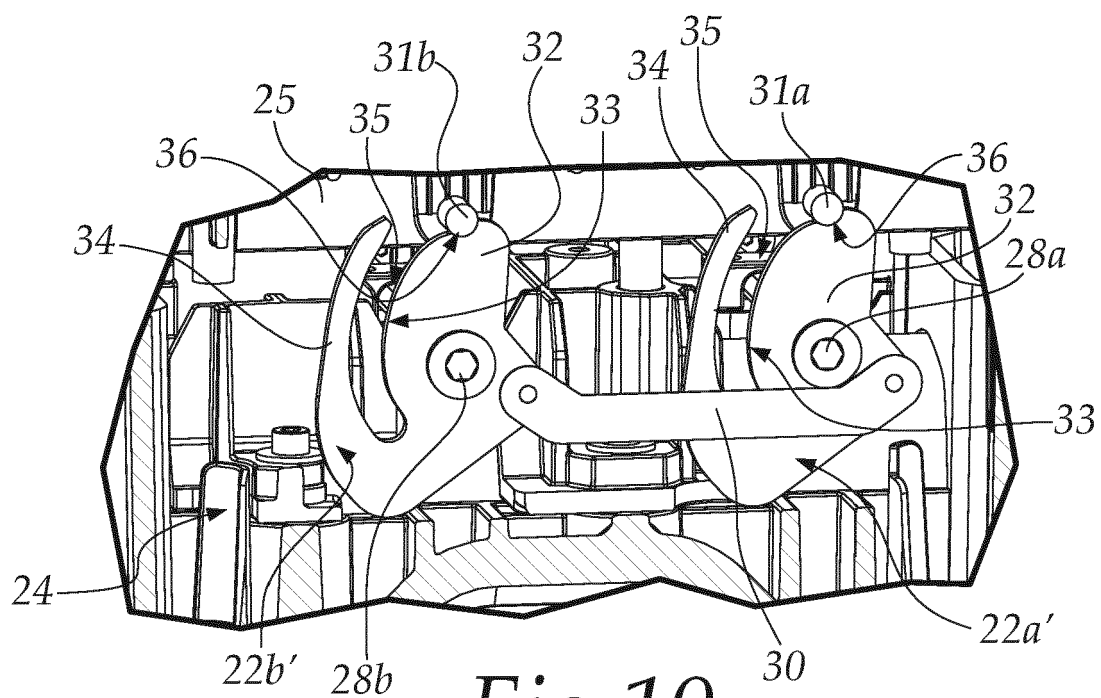
Fig.5



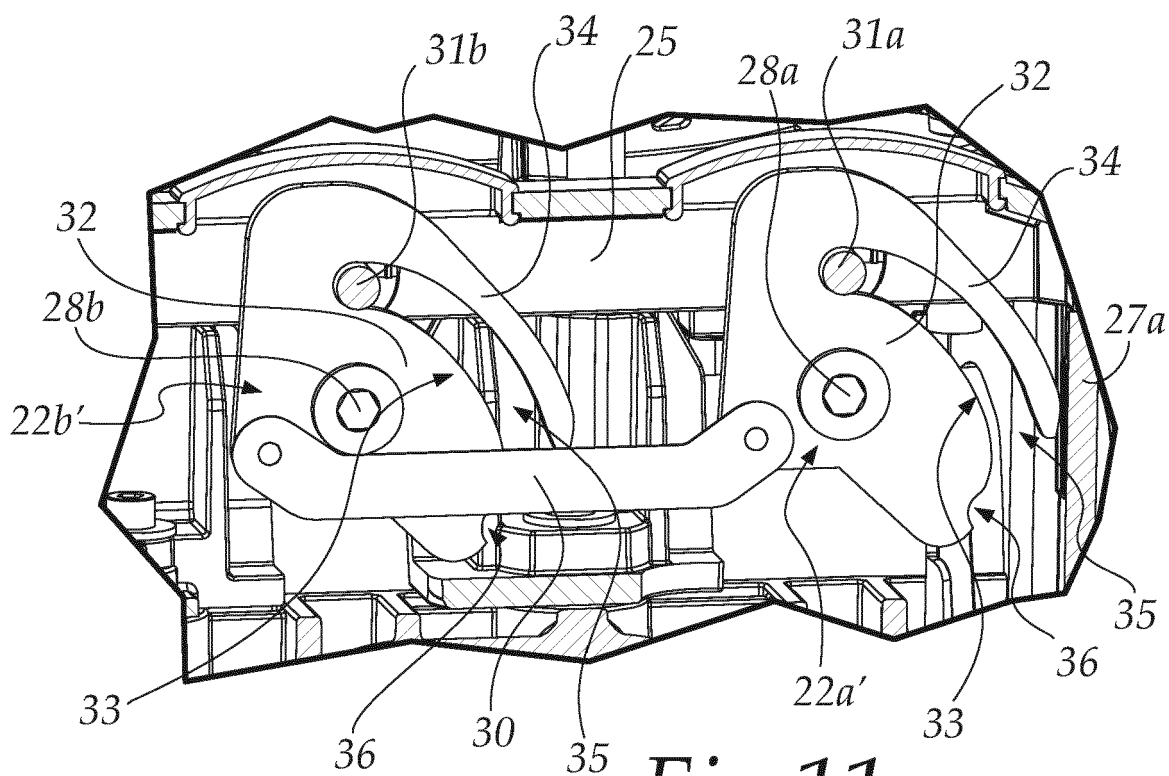




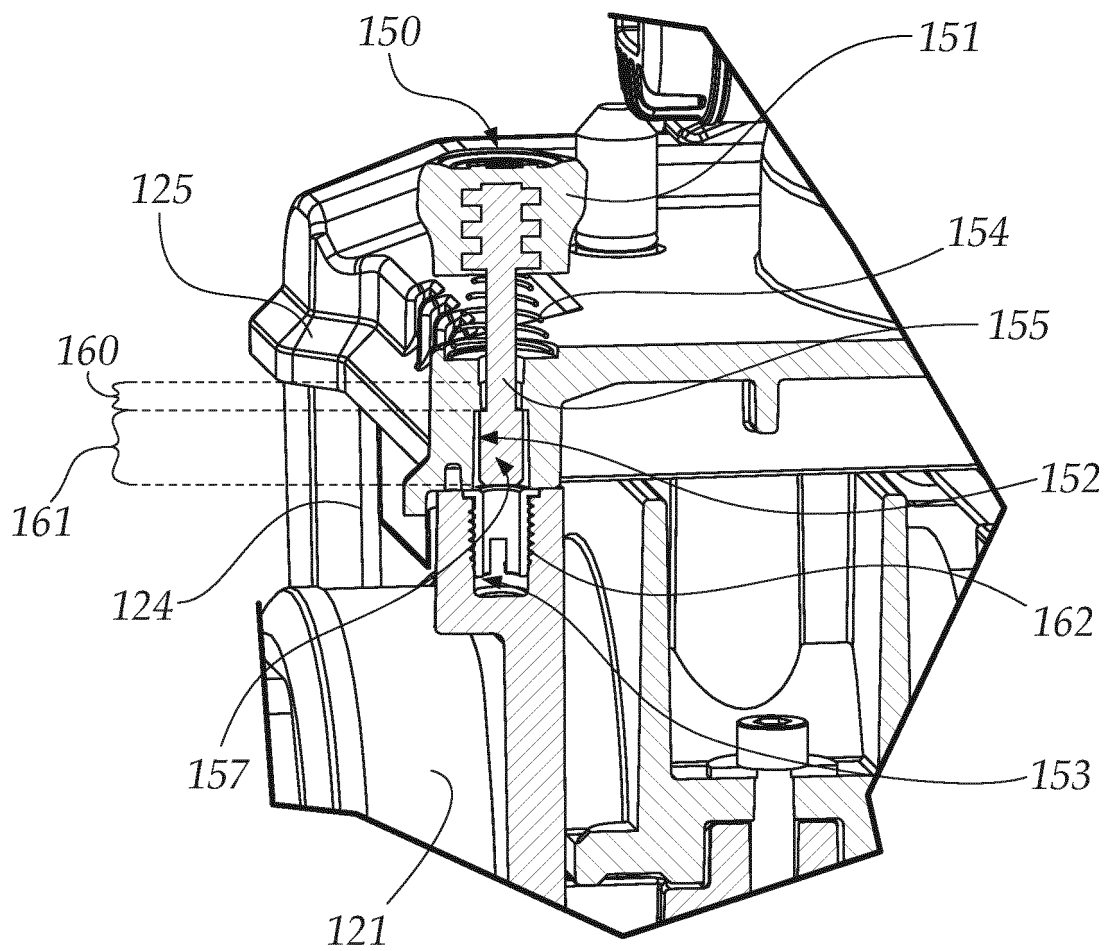




*Fig.10*



*Fig.11*



*Fig.12*



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Application Number  
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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 28 June 2021	Examiner Nobre Correia, S
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