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Amended claims in accordance with Rule 137(2) EPC.

(54) PUMP UNIT AND PUMP SYSTEM

(57) Pump unit (10) for installation in a pump system (100), in particular a booster pump system, comprising a pump casing (11) with at least two hydraulic connection ports (20, 30), wherein at least one of the hydraulic connection ports (20, 30) comprises a connecting pipe (21, 31) which is integrally connected to the pump casing (11) and which has a flange (22, 32), wherein a union nut (23, 33) is held on the connecting pipe (21, 31) between the flange (22, 32) and the pump casing (11) so that the union nut (23, 33) is held back by the flange (22, 32).

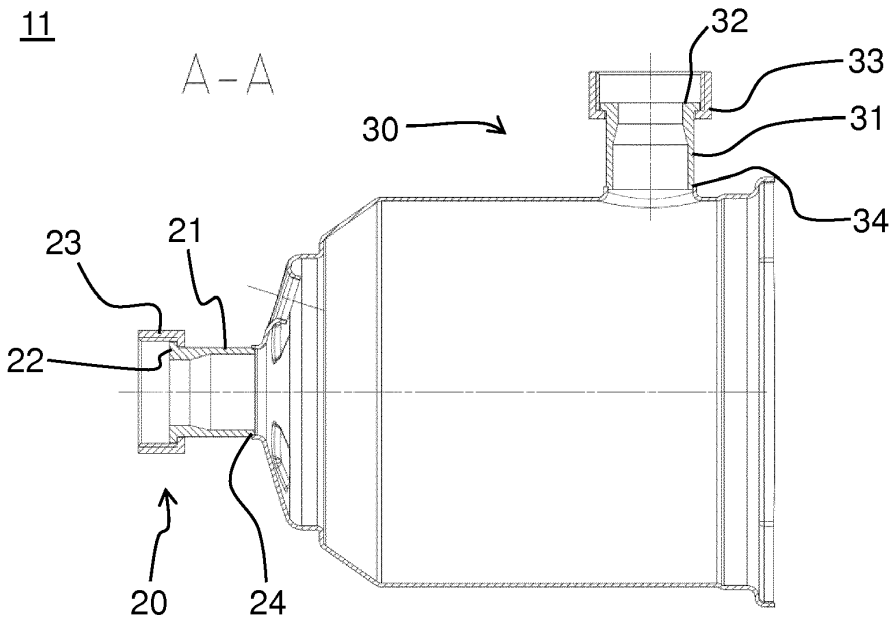

Fig. 2b

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Description

[0001] The invention relates to a pump unit for installation in a pump system, in particular a booster pump system, comprising a pump casing with at least two hydraulic connection ports. In addition the invention relates to a pump system, in particular a booster pump system.

[0002] Typically, several pump units are connected together to form a pump system that provides the required pressure. In particular for water supply, several pump units are combined to so-called booster pump systems in order to increase an existing water pressure and also to provide an adequate water pressure on higher floors.

[0003] The pump units in such pump systems have usually two hydraulic connection ports, whereby the fluid is sucked in at a suction port and discharged at a discharge port at a higher pressure. The hydraulic connection ports are typically formed by a threaded pipe. For the connection to an adjacent hydraulic component, the hydraulic component is screwed with its corresponding thread onto or into the thread of the threaded pipe of the hydraulic connection port.

[0004] For a watertight connection, adhesive is applied to the threads before screwing them together. This is particularly necessary with booster pump systems in order to achieve sufficient watertightness even at high pressures. The adhesive may contain substances that are potentially harmful to health and may be banned by technical standards in the future.

[0005] The objective of the underlying invention is to provide a pump unit that can be easily and quickly connected to other hydraulic components, whereby the connection has the required tightness, in particular even without adhesive. In addition, it is an objective of the invention to provide a pump system, in particular a booster pump system, which has a small number of hydraulic components, which can be assembled and maintained quickly and in a simple manner, whereby sufficient tightness is achieved even without the use of adhesive.

[0006] The underlying objective is solved by a pump unit having the features of claim 1, with advantageous embodiments listed in the dependent claims 2 to 6. A pumping system which solves the underlying problem has the features of claim 7, with advantageous embodiments being listed in the dependent claims 8 to 13.

[0007] The underlying pump unit is characterized in that at least one of the hydraulic connection ports comprises a connecting pipe which is integrally connected to the pump casing and which has a flange, wherein a union nut is held on the connecting pipe between the flange and the pump casing so that the union nut is held back by the flange. The pump casing, the connecting pipe and the flange form an integral element, wherein the flange is located at the end of the connecting pipe opposite the pump casing so that the union nut is undetachably held between the pump casing and the flange.

[0008] Advantageously, this ensures that the union nut cannot be lost during transport. Another advantage is that a hydraulic component that is to be connected to the connecting pipe does not have to be turned in order to achieve a hydraulic connection. Furthermore, it is advantageous that the integral connection has a high mechanical stability and can therefore withstand high pressures. With regard to installation in a pump system, it is advantageous that the number of components is reduced so that the assembly time is reduced.

[0009] According to an embodiment of the invention the connecting pipe is integrally connected to the pump casing by welding. In particular, the end of the connecting pipe opposite to the flange is welded to the pump casing. During welding, the union nut is held at a distance from the welding zone.

[0010] The advantage of the welded connection is that it has a high mechanical stability. In addition, a waterproof connection at high pressures is achievable even without the use of adhesive. Compared to the adhesive bond, the advantage in terms of production is that curing of the adhesive is not necessary so that shorter production times are achievable.

[0011] The connecting pipe is preferably welded to the pump casing by laser welding. This has the advantage that a watertight connection can be achieved with a relatively small welding zone.

[0012] According to an embodiment of the invention the pump casing comprises a suction port and a discharge port, wherein the suction port has a suction connecting pipe with a suction port flange and a suction port union nut and wherein the discharge port has a discharge connecting pipe with a discharge port flange and a discharge port union nut. Accordingly, both hydraulic connection ports of the pump unit have each a union nut that is retained by a respective flange.

[0013] Advantageously, the same or similar tools can be used for the integral connection between the pump casing and both connecting pipes, so that manufacturing costs can be reduced. In particular, the same welding tool can be used for both hydraulic connection ports.

[0014] According to an embodiment of the invention the discharge connecting pipe have the same inner diameter. The connecting pipes have the save inner diameter preferably when the pump unit is intended to be operated at flow rates of up to 5 m^3/h. This has the advantage that the same tool, in particular welding tool, can be used for both connecting pipes so that time and costs can be saved during production for the changeover of the tool. In addition, this feature improves the efficiency of the pump unit at these flows by reducing the flow resistance.

[0015] According to an alternative embodiment of the invention the suction connecting pipe has a larger inner diameter than the discharge connecting pipe. The suction connecting pipe has a larger diameter than the discharge connecting preferably when the pump unit is intended to be operated at flow rates of 5 m^3/h or more. Advantageously, this feature improves the efficiency of the pump at higher flow rates by reducing flow resistance, in par-

ticular at the suction port.

[0016] According to an embodiment of the invention the union nut is made of brass. The advantage of brass is that it has preferred mechanical properties for the screwed joint, particularly in terms of stiffness, and that it is cost effective in terms of manufacturing costs. It is advantageous that the union nut has no contact with the water passing through the connecting pipe so that the pump unit according to this invention can also be used if brass is restricted or prohibited in drinking water supply systems by future regulations.

[0017] The underlying pump system is characterized in that the pump system comprises at least one pump unit that has the previously described technical features and at least one hydraulic component having a first thread, wherein a union nut of the pump unit is screwed to the first thread. Accordingly, the union nut is screwed directly onto the first thread of the valve member. The hydraulic component is preferably a valve member. A sealing ring is preferably inserted between the valve member and the connecting pipe so that no further components are required for the connection between the valve member and the pump unit.

[0018] An advantage is that the hydraulic component that is to be connected to the connecting pipe does not have to be turned in order to achieve a hydraulic connection, which leads to an easier installation. In addition, the installation time can be improved in particular, as the number of construction parts is reduced.

[0019] According to an embodiment of the invention the pump system comprises at least one manifold with a manifold tube having at least one manifold connecting pipe, wherein the manifold connecting pipe is integrally connected to the manifold tube and has a manifold, wherein a manifold union nut is held on the manifold connecting pipe between the manifold flange and the manifold tube so that the manifold union nut is held back by the flange. The manifold tube, the manifold connecting pipe and the manifold flange form an integral element, wherein the flange is located at the end of the connecting pipe opposite the manifold tube so that the manifold union nut is undetachably held between the manifold tube and the manifold flange. Preferably, the manifold connecting pipe is integrally connected to the manifold tube by welding, in particular by laser welding.

[0020] An advantage is that the union nut cannot be lost during transport. Another advantage is that a hydraulic component, in particular the valve member, does not have to be turned in order to achieve a hydraulic connection between the hydraulic component and the manifold connecting pipe. Furthermore, it is advantageous that the integral connection has a high mechanical stability and can therefore withstand high pressures. With regard to installation in a pump system, the assembly time is advantageously reduced due to the low number of components. In particular, the manifold can be easily removed from the rest of the system so that it is easy to replace or turn around.

[0021] According to an embodiment of the invention the manifold connecting pipe is integrally connected to the radial wall of the manifold tube, wherein a dome closes one axial front side of the manifold tube. A connection of the manifold is arranged on the opposite axial front side of the manifold tube.

[0022] With regard to installation, it is advantageous for the installer not to have to manually close one axial side of the manifold tube so that time can be saved during installation. In addition, the tightness is improved as the manifold tube has only one threaded connection. In particular, it is easy to select the side of the connection of the manifold by rotating the manifold around an axis parallel to the connecting pipes. For example, to change the side of the discharge manifold, it is only necessary to close the connected valve members, loosen the union nuts, rotate the manifold around an axis parallel to the connecting pipes and retighten the union nuts. Advantageously, the use of a rounded dome prevents areas of no or reduced flow.

[0023] According to an embodiment of the invention the pump system comprises a suction manifold and a suction valve member, wherein a suction manifold tube of the suction manifold has at least one suction manifold connecting pipe with a suction manifold flange and a suction manifold union nut, wherein the suction manifold union nut is screwed to a second thread of the suction valve member and wherein the suction union nut is screwed to a first thread of the suction valve member. For sealing a sealing ring is inserted between the suction manifold and the suction valve member and between the suction valve member and the suction connection pipe of the pump unit. With the exception of the sealing rings, the installation of the suction valve member is realized in this way without additional components. Furthermore, the connections between the components are realized solely by union nuts.

[0024] Advantageously, the assembly time is reduced, because as few components as possible are used and all connections are realized by union nuts. In addition, the tightness is improved since the number of hydraulic connections is reduced. In addition, the sole use of union nuts allows the hydraulic components to be removed without the need to remove any other hydraulic components, which improves ease of maintenance.

[0025] According to an embodiment of the invention, the pump system comprises a discharge manifold, a check valve member and a discharge valve member, wherein a discharge manifold tube of the discharge manifold has at least one suction manifold connecting pipe with a discharge manifold flange and a discharge manifold union nut, wherein the discharge manifold union nut is screwed to a thread of the discharge valve member, wherein the discharge union nut is screwed to a first thread of the check valve member, and the check valve member is directly hydraulically connected to the discharge valve member. Sealing rings are inserted between the discharge manifold, the discharge valve mem-

ber, the check valve member and the discharge connecting pipe of the pump unit in order to achieve a sealing of the components. With the exception of the sealing rings, the installation of the check valve member and the discharge valve member is realized in this way without additional components.

[0026] Advantageously, the assembly time is reduced, because as few components as possible are used. In addition, the tightness is improved since the number of hydraulic connections is reduced.

[0027] According to an embodiment of the invention, the discharge valve has a union nut on the opposite side to the thread and the check valve member has a second thread on the opposite side to the first thread, wherein the union nut of the discharge valve is screwed to the second thread of the check valve member.

[0028] The advantage of this configuration is that all hydraulic connections are realized by union nuts so that a simpler and faster assembly of the pump system is possible. In particular, the same tool may be used to assemble all hydraulic connections. In addition, the sole use of union nuts allows the hydraulic components to be removed without the need to remove any other hydraulic components, which improves ease of maintenance.

[0029] According to another embodiment of the invention each manifold comprise two or three manifold connecting pipes, wherein each manifold connecting pipe is hydraulically connected one pump unit. Therefore, the pump system according to the invention has two or three pump units.

[0030] Advantageously, a higher flow rate can be achieved in this way. Redundancy is also achieved with regard to the downtime of individual pump units. By providing the valves, in particular the suction valve member and the discharge valve member, and the connection with the union nuts, individual pumps can be removed without the need to remove any other components of the system, thus improving ease of maintenance.

[0031] To illustrate the invention, the following figures show examples of the invention. They show:

Fig. 1 a perspective view of a pump unit according to the invention,

Fig. 2a a top view of a pump casing of the pump unit according to the invention,

Fig. 2b a side cross-section of the casing of the pump unit according to the invention,

Fig. 3 a perspective view of a pump system according to the invention,

Fig. 4 a side view of the pump system in cross-section as an exploded view,

Fig. 5a a front view of a discharge manifold according to the invention and

Fig. 5b a cross-section of the discharge manifold of Fig. 5a along the Line A-A.

[0032] Fig. 1 shows a perspective view of a pump unit 10 according to the invention. The pump unit 10 comprises a pump casing 11, in which an impeller is arranged, and a drive unit 12, which is intended to drive the impeller. A fixing element 13 is provided for fixing the pump unit 10. Preferably, the pump unit 10 is a horizontal multistage pump, as it is often used in booster pump systems.

[0033] The pump casing 11 has two hydraulic connection ports, a suction port 20 and a discharge port 30. The suction port 20 is located on an axial face of the pump casing 11 and comprises a suction connecting pipe 21 with a suction port flange 22 and a suction port union nut 23. The discharge port 30 is located on a radial wall of the pump casing 11 and comprises a discharge connecting pipe 31 with a discharge port flange 32 and a discharge port union nut 33.

[0034] The pump casing 11 is shown in Fig. 2a in a top view. A cross-section of the pump casing 11 of Fig. 2a along line A-A is shown in Fig. 2b. As shown in Fig. 2b, the suction connecting pipe 21 comprises the suction port flange 22 on the side opposite to the pump casing 11. The suction port union nut 23 is located between the suction port flange 22 and the pump casing 11 so that the suction port union nut 23 is held back by the suction port flange 22. In an analogous way, the discharge connecting pipe 31 comprises the discharge port flange 32 on the side opposite to the pump casing 11, wherein the discharge port union nut 33 is located between the discharge port flange 32 and the pump casing 11. The discharge port union nut 33 is held back by the discharge port flange 32.

[0035] An integral connection between the suction connecting pipe 21 and the discharge connecting pipe 31 with the pump casing 11 is preferably achieved by welding. For the manufacturing of the hydraulic connection ports 20, 30 the following steps are preferably carried out. First, the connecting pipe 21, 31 with the flange 22, 32 is manufactured, wherein the connecting pipe 21, 31 with the flange 22, 32 is formed by milling from a single body, the flange 22, 32 is formed by pressure forming with a pressing tool or the flange 22, 32 is welded to the connecting pipe 21, 31. Then the union nut 23, 33 is inserted onto the connecting pipe 21, 31. Then the connecting pipe 21, 31 is welded on the pump casing 11, keeping the union nut 23, 33 at a distance from a welding zone 24, 34 by means of a tool. As an option, at least the welding zone 24, 34 is finally sandblasted. The welding is preferably carried out automatically, using in particular a laser welding system.

[0036] As shown in Fig. 2b, the suction connecting pipe 21 and the discharge connecting pipe 31 have the same inner diameter for pump units 10 intended to be operated at flow rates of up to 5 m^3/h. For example, both the suction connecting pipe 21 and the discharge connecting pipe 31 have an inner diameter of 25 mm at a flow rate up to

5 m^3/h.

[0037] For pump units 10 intended to be operated at flow rates of 5 m^3/h or more, the suction connecting pipe 21 has preferably a larger inner diameter than the discharge connecting pipe 31. For example: for a flow rate of 6 m^3/h the suction connecting pipe 21 has an inner diameter of 32 mm while the discharge connecting pipe 31 has an inner diameter of 25 mm; for a flow rate of 10 m^3/h the suction connecting pipe 21 has an inner diameter of 40 mm while the discharge connecting pipe 31 has an inner diameter of 32 mm; and for a flow rate of 16 m^3/h the suction connecting pipe 21 has an inner diameter of 45 mm while the discharge connecting pipe 31 has an inner diameter of 40 mm.

[0038] An embodiment of the pump system 100 according to the invention is shown in Fig. 3 in perspective view. The pump system 100 comprises two pump units 10, two suction valve member 40, two check valve member 50, a suction manifold 60, a discharge manifold 70 and two discharge valve member 80.

[0039] On the suction side, the pumping system 100 has the suction manifold 60 with a suction manifold tube 61 having two suction manifold connecting pipes 62, wherein the suction manifold connecting pipes 62 are integrally connected to the radial wall of the manifold tube 61 and have each a suction manifold flange 63 (see Fig. 4). The suction manifold union nut 64 is located between the suction manifold flange 63 and the manifold tube 61 so that the suction manifold union nut 64 is held back by the flange 63. There is one suction valve member 40 located between each suction manifold pipe 62 and each pump unit 10, which has a first thread 41 and a second thread 42, wherein the first thread 41 corresponds to the suction port union nut 23 and the second thread 42 corresponds to the suction manifold union nut 64. For establishing a hydraulic connection, the suction manifold union nut 64 is screwed to the second thread 42 of the suction valve member 40 and the suction union nut 23 is screwed to the first thread 41 of the suction valve member 40, wherein a sealing ring 92 is inserted between each component.

[0040] On the discharge side, the pumping system 100 has the discharge manifold 70 with a discharge manifold tube 71 having two discharge manifold connecting pipes 72, wherein the discharge manifold connecting pipes 72 are integrally connected to the radial wall of the discharge manifold tube 71 and have each a discharge manifold flange 73 (see Fig. 4, Fig 5a and Fig. 5b). The discharge manifold union nut 74 is located between the discharge manifold flange 73 and the discharge manifold tube 71 so that the discharge manifold union nut 74 is held back by the discharge manifold flange 73. There is one check valve member 50 and one discharge valve member 80 located between each discharge manifold pipe 72 and each pump unit 10. The check valve member 40 has a first thread 41 and a second thread 42, wherein the first thread 41 corresponds to the discharge union nut 33. The discharge valve member 80 has a thread 81 that corresponds to the discharge manifold union nut 74 and a union nut 82 that corresponds to a second thread 52 of the check valve member 50. For establishing a hydraulic connection, the discharge manifold union nut 74 is screwed to the thread 81 of the discharge valve member 80, the union nut 82 of the discharge valve member 80 is screwed to the second thread 52 of the check valve member 50 and the discharge union nut 33 is screwed to the first thread 51 of the check valve member 50, wherein a sealing ring 92 is inserted between each component (see Fig. 4).

[0041] The discharge manifold 70 is shown in detail in Figures 5a and 5b, with the discharge manifold flange 73 and the arrangement of the discharge manifold union nut 74 being in particularly shown in the cross-section of Fig. 5b. The discharge manifold 70 has a port 77 for a pressure tank 90 that is used for pressure compensation and port 78 for pressure measurement device 91 that is used for pressure monitoring.

[0042] On the suction side, the pumping system 100 is connected to the rest of a hydraulic system via a suction connection 66, which is located at an axial front side of the suction manifold tube 61 (see Fig. 3). The opposite axial front side of the suction manifold tube 61 is closed by a suction manifold rounded dome 65 that is welded to the suction manifold tube 61. Analogous to this, on the discharge side the pumping system 100 is connected to the rest of the hydraulic system via a discharge connection 76, which is located at an axial front side of the discharge manifold tube 71 (see Fig. 3). The opposite axial front side of the discharge manifold tube 71 is closed by a suction manifold rounded dome 75 that is preferably welded to the discharge manifold tube 71 (see Fig. 5a). In the embodiment shown in Fig. 3, the suction connection 66 and discharge connection 76 are located on the same side of the pump system 100. Depending on the application, it can be required that the side of the suction connection 66 and/or discharge connection 76 must be changed in order to adapt the pump system to external conditions. The side of the suction connection 66 can be modified by releasing the suction manifold union nuts 64, rotating the suction manifold 60 about an axis parallel to the suction manifold connecting pipes 62 and tightening the suction manifold union nuts 64 again. Analogously, the side of the discharge connection 76 can be changed. In this way, the pump system 100 can be quickly and easily adapted to external conditions.

References

[0043]

10 pump unit
11 pump casing
12 drive unit
13 fixing device

20 connection port, suction port

21 connecting pipe, suction connecting pipe
22 flange, suction port flange
23 union nut, suction port union nut
24 welding zone

30 connection port, discharge port
31 connecting pipe, discharge connecting pipe
32 flange, discharge port flange
33 union nut, discharge port union nut
34 welding zone

40 valve member, suction valve member
41 first thread
42 second thread

50 valve member, check valve member
51 first thread
52 second thread

60 manifold, suction manifold
61 manifold tube, suction manifold tube
62 manifold connecting pipe, suction manifold connecting pipe
63 manifold flange, suction manifold flange
64 manifold union nut, suction, manifold union nut
65 dome
66 suction connection
70 manifold, discharge manifold
71 manifold tube, discharge manifold tube
72 manifold connecting pipe, discharge connecting pipe
73 manifold flange, discharge manifold flange
74 manifold union nut, discharge manifold union nut
75 dome
76 discharge connection
77 port for the pressure tank
78 port for the pressure measurement device

80 valve member, discharge valve member
81 thread
82 union nut

90 pressure tank
91 pressure measurement device
92 sealing ring

100 pump system

Claims

1. Pump unit (10) for installation in a pump system (100), in particular a booster pump system, comprising a pump casing (11) with at least two hydraulic connection ports (20, 30), **characterized in that**, at least one of the hydraulic connection ports (20, 30) comprises a connecting pipe (21, 31) which is integrally connected to the pump casing (11) and which has a flange (22, 32), wherein a union nut (23, 33) is held on the connecting pipe (21, 31) between the flange (22, 32) and the pump casing (11) so that the union nut (23, 33) is held back by the flange (22, 32).

2. Pump unit (10) according to claim 1, **characterized in that**, the connecting pipe (21, 31) is integrally connected to the pump casing (11) by welding, in particular laser welding.

3. Pump unit (10) according to claim 1 or 2, **characterized in that**, the pump casing (11) comprises a suction port (20) and a discharge port (30),

   - wherein the suction port (20) has a suction connecting pipe (21) with a suction port flange (22) and a suction port union nut (23) and
   - wherein the discharge port (30) has a discharge connecting pipe (31) with a discharge port flange (32) and a discharge port union nut (33).

4. Pump unit (10) according to claim 3 **characterized in that**, the suction connecting pipe (21) and the discharge connecting pipe (31) have the same inner diameter, in particular for pump units (10) intended to be operated at flow rates of up to 5 m^3/h.

5. Pump unit (10) according to claim 3, **characterized in that**, the suction connecting pipe (21) has a larger inner diameter than the discharge connecting pipe (31), in particular for pump units (10) intended to be operated at flow rates of 5 m^3/h or more.

6. Pump unit (10) according to one of the proceeding claims, **characterized in that**, the union nut (23, 33) is made of brass.

7. Pump system (100), in particular a booster pump system, comprising

   - at least one pump unit (10) according to one of the previous claims, and
   - at least one hydraulic component, in particular a valve member (40, 50), having a first thread (41, 51), wherein the union nut (23, 33) of the pump unit (10) is screwed to the first thread (41, 51).

8. Pump system (100) according to claim 7, **characterized in that**, the pump system (100) comprises at least one manifold (60, 70) with a manifold tube (61, 71) having at least one manifold connecting pipe (62, 72), wherein the manifold connecting pipe (62, 72) is integrally connected to the manifold tube (61, 71) and which has a manifold flange (63, 73), wherein a manifold union nut (64, 74) is held on the manifold connecting pipe (62, 72) between the manifold flange

(63, 73) and the manifold tube (61, 71) so that the manifold union nut (64, 74) is held back by the flange (63, 73).

9. Pump system (100) according to claim 8, **characterized in that**, the manifold connecting pipe (61, 71) is integrally connected to the radial wall of the manifold tube (61, 71), wherein one axial front side of the manifold tube (61, 71) is closed by a dome (65, 75).

10. Pump system (100) according to claim 8 or 9 **characterized in that**, the pump system (100) comprises a suction manifold (60) and a suction valve member (40),

- wherein a suction manifold tube (61) of the suction manifold (60) has at least one suction manifold connecting pipe (62) with a suction manifold flange (63) and a suction manifold union nut (64),
- wherein the suction manifold union nut (64) is screwed to a second thread (42) of the suction valve member (40), and
- wherein the suction union nut (23) is screwed to the first thread (41) of the suction valve member (40).

11. Pump system (100) according to one of the claims 8 to 10, **characterized in that**, the pump system (100) comprises a discharge manifold (70), a check valve member (50) and a discharge valve member (80),

- wherein a discharge manifold tube (71) of the discharge manifold (70) has at least one suction manifold connecting pipe (72) with a discharge manifold flange (73) and a discharge manifold union nut (74),
- wherein the discharge manifold union nut (74) is screwed to a thread (81) of the discharge valve member (80),
- wherein the discharge union nut (33) is screwed to the first thread (51) of the check valve member (50), and
- the check valve member (50) is directly hydraulically connected to the discharge valve member (80).

12. Pump system (100) according to claim 11, **characterized in that**, the discharge valve (80) has a union nut (82) on the opposite side to the thread (81) and the check valve member (50) has a second thread (52) on the opposite side to the first thread (51), wherein the union nut (82) of the discharge valve (80) is screwed to the second thread (52) of the check valve member (50).

13. Pump system (100) according to one of the claims 7 to 12, **characterized in that**, each manifold (50, 60) comprise two or three manifold connecting pipes (62, 72), wherein one pump unit (10) is hydraulically connected at each manifold connecting pipe (62, 72).

Amended claims in accordance with Rule 137(2) EPC.

1. Pump system (100), in particular a booster pump system, comprising

- at least one pump unit (10),
- at least one valve member (40, 50), having a first thread (41, 51), and
- at least one manifold (60, 70) with a manifold tube (61, 71) having at least one manifold connecting pipe (62, 72), wherein
- the pump unit (10) comprising a pump casing (11) with at least two hydraulic connection ports (20, 30), at least one of the hydraulic connection ports (20, 30) comprises a connecting pipe (21, 31) which is integrally connected to the pump casing (11) and which has a flange (22, 32),
- a union nut (23, 33) is held on the connecting pipe (21, 31) between the flange (22, 32) and the pump casing (11) so that the union nut (23, 33) is held back by the flange (22, 32), the union nut (23, 33) of the pump unit (10) is screwed to the first thread (41, 51),
- the manifold connecting pipe (62, 72) is integrally connected to the manifold tube (61, 71) and which has a manifold flange (63, 73), wherein a manifold union nut (64, 74) is held on the manifold connecting pipe (62, 72) between the manifold flange (63, 73) and the manifold tube (61, 71) so that the manifold union nut (64, 74) is held back by the flange (63, 73),

characterized in that,

- the manifold (60, 70) is a discharge manifold (70) with a discharge manifold tube (71) having at least one discharge manifold connecting pipe (72) with a discharge manifold flange (73) and a discharge manifold union nut (74),
- the valve member (40, 50) is a check valve member (50), and
- the pump system (100) further comprises a discharge valve member (80),
- the discharge manifold union nut (74) is screwed to a thread (81) of the discharge valve member (80),
- the discharge union nut (33) is screwed to the first thread (51) of the check valve member (50), and
- the check valve member (50) is directly hydrau-

lically connected to the discharge valve member (80).

2. Pump system (100) according to claim 1, **characterized in that,** the connecting pipe (21, 31) is integrally connected to the pump casing (11) by welding, in particular laser welding.

3. Pump system (100) according to claim 1 or 2, **characterized in that,** the pump casing (11) comprises a suction port (20) and a discharge port (30),

- wherein the suction port (20) has a suction connecting pipe (21) with a suction port flange (22) and a suction port union nut (23) and
- wherein the discharge port (30) has a discharge connecting pipe (31) with a discharge port flange (32) and a discharge port union nut (33).

4. Pump system(100) according to claim 3 **characterized in that,** the suction connecting pipe (21) and the discharge connecting pipe (31) have the same inner diameter, in particular for pump units (10) intended to be operated at flow rates of up to 5 m^3/h.

5. Pump system(100) according to claim 3, **characterized in that,** the suction connecting pipe (21) has a larger inner diameter than the discharge connecting pipe (31), in particular for pump units (10) intended to be operated at flow rates of 5 m^3/h or more.

6. Pump system (100) according to one of the proceeding claims, **characterized in that,** the union nuts (23, 33) is made of brass.

7. Pump system (100) according to one of the preceding claims, **characterized in that,** the manifold connecting pipe (61, 71) is integrally connected to the radial wall of the manifold tube (61, 71), wherein one axial front side of the manifold tube (61, 71) is closed by a dome (65, 75).

8. Pump system (100) according to one of the preceding claims **characterized in that,** the pump system (100) comprises a suction manifold (60) and a suction valve member (40),

- wherein a suction manifold tube (61) of the suction manifold (60) has at least one suction manifold connecting pipe (62) with a suction manifold flange (63) and a suction manifold union nut (64),
- wherein the suction manifold union nut (64) is screwed to a second thread (42) of the suction valve member (40), and
- wherein the suction union nut (23) is screwed to the first thread (41) of the suction valve member (40).

9. Pump system (100) according to one of the preceding claims, **characterized in that,** the discharge valve member (80) has a union nut (82) on the opposite side to the thread (81) and the check valve member (50) has a second thread (52) on the opposite side to the first thread (51), wherein the union nut (82) of the discharge valve member (80) is screwed to the second thread (52) of the check valve member (50).

10. Pump system (100) according to one of the preceding claims, **characterized in that,** each manifold (50, 60) comprise two or three manifold connecting pipes (62, 72), wherein one pump unit (10) is hydraulically connected at each manifold connecting pipe (62, 72).

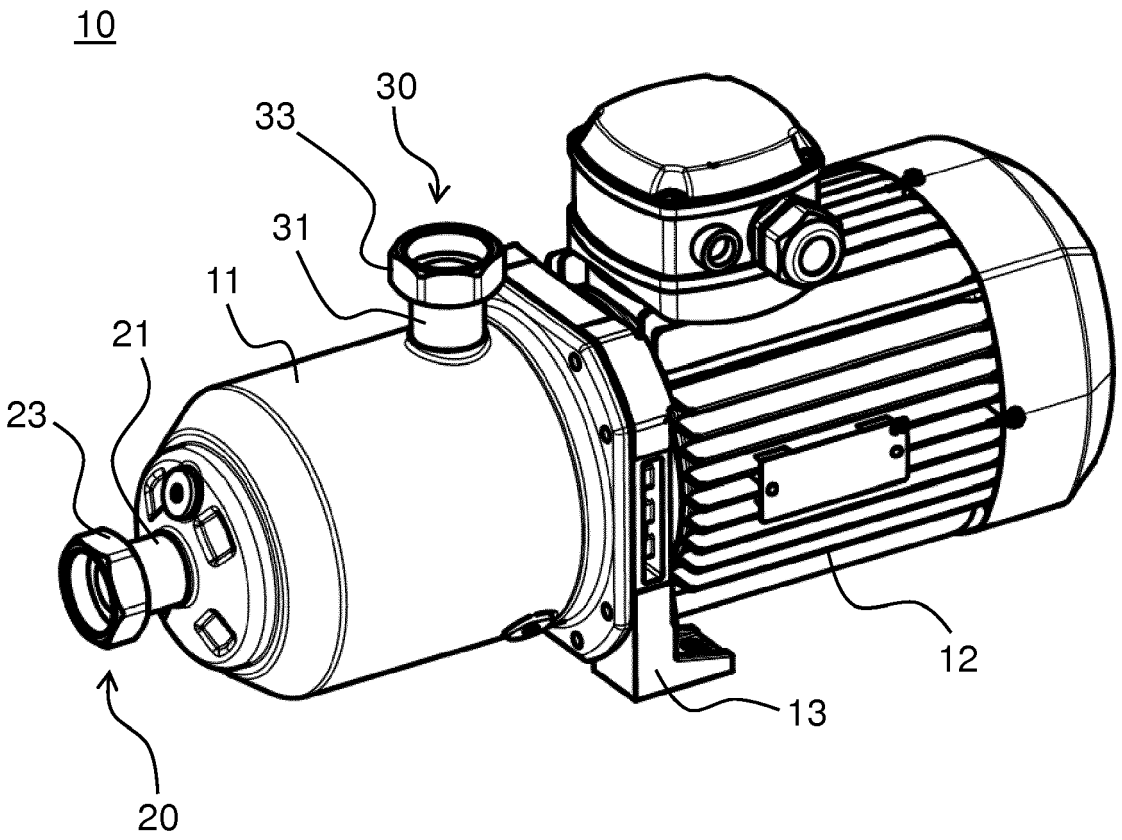

Fig. 1

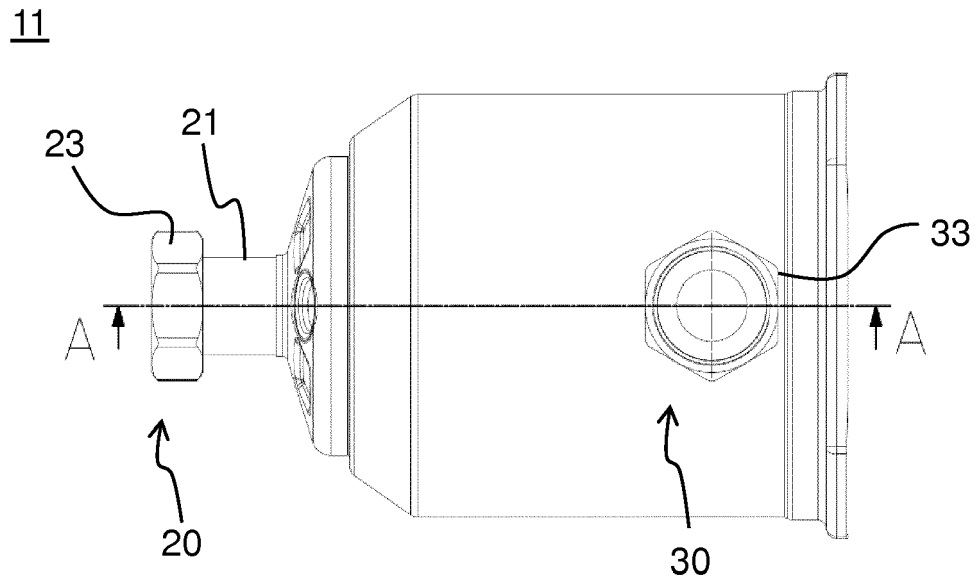

Fig. 2a

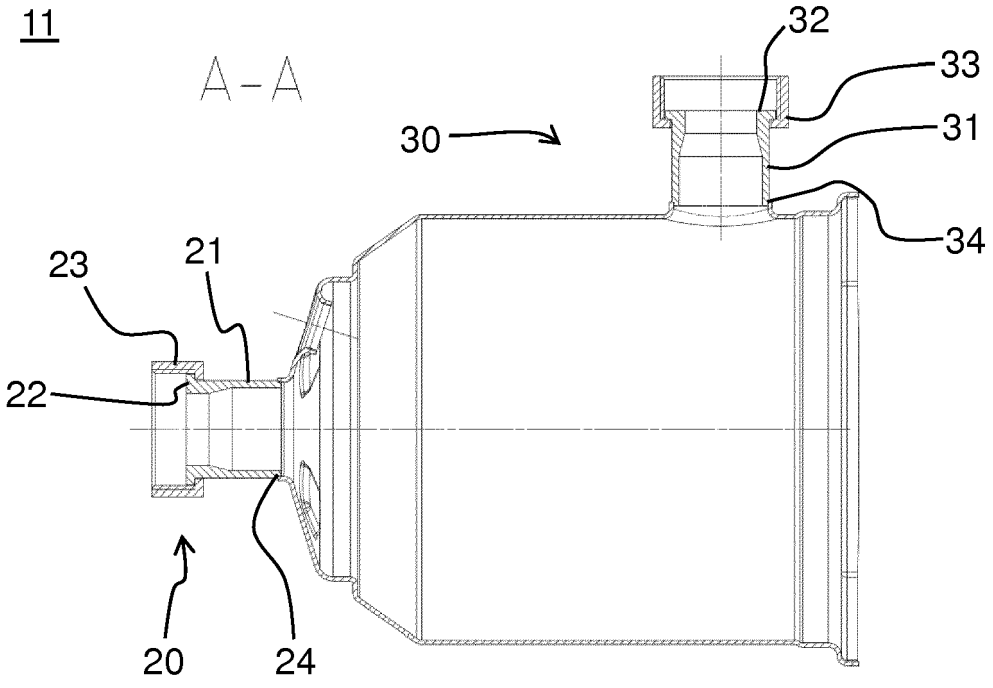

Fig. 2b

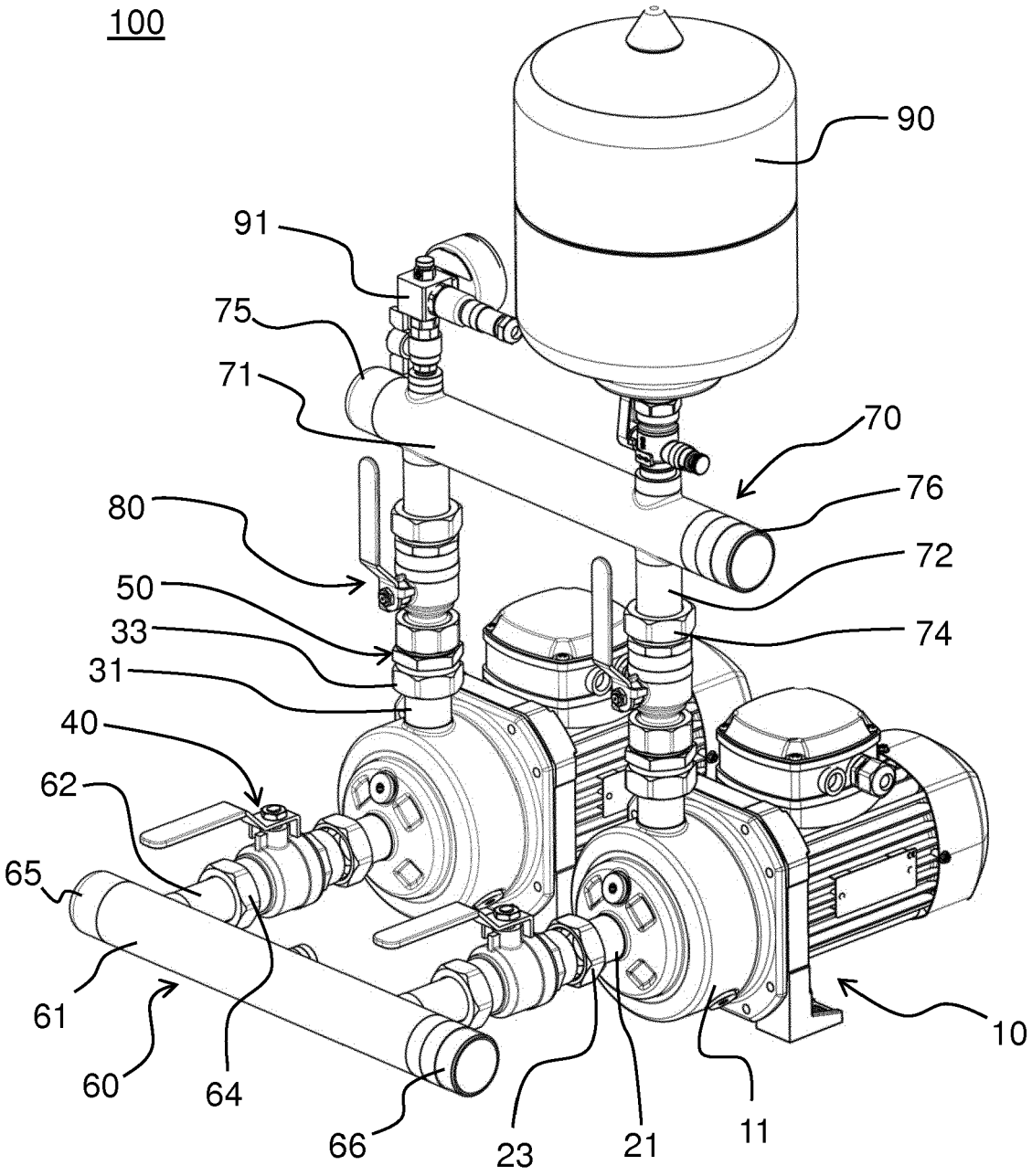

Fig. 3

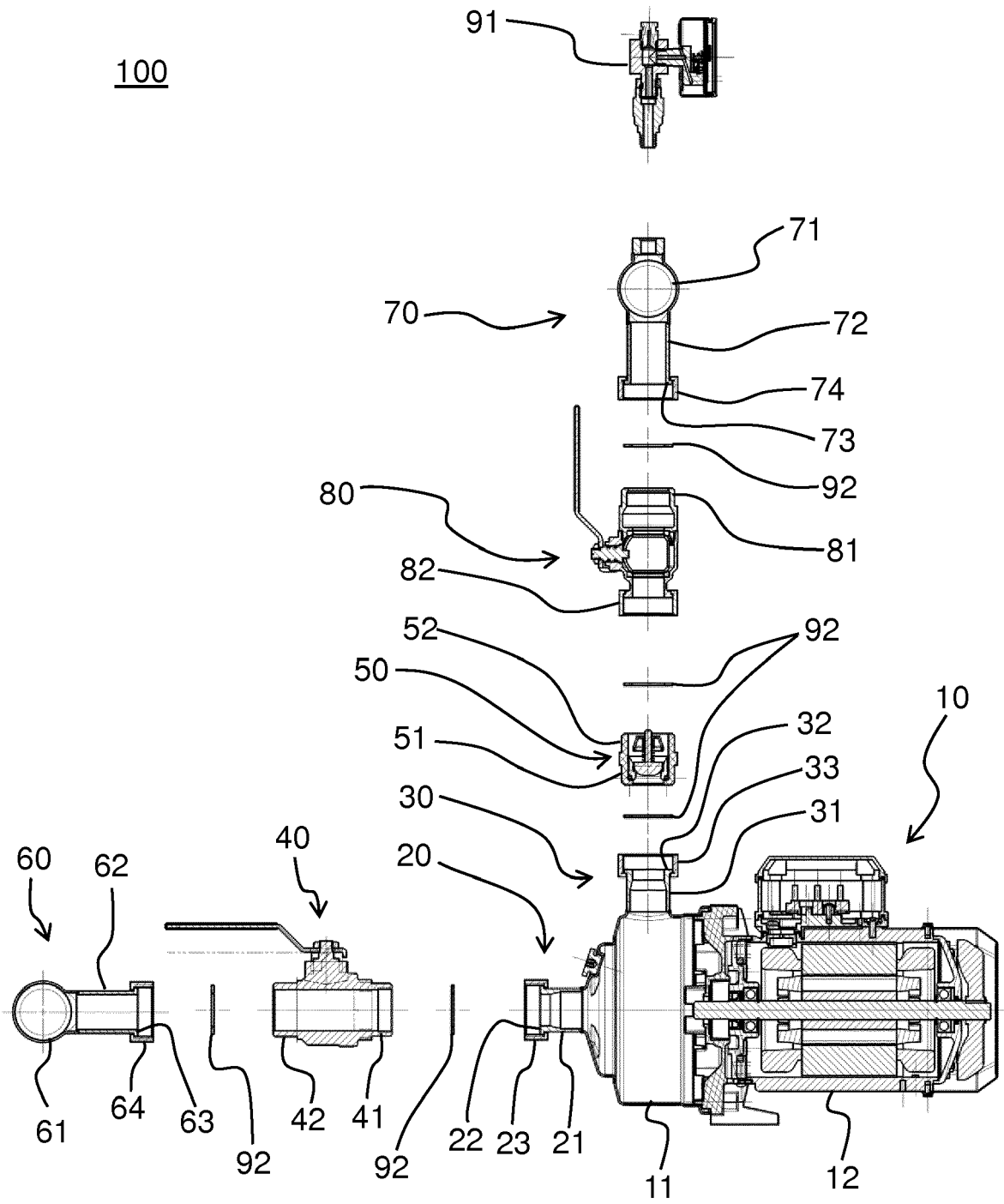
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Fig. 4

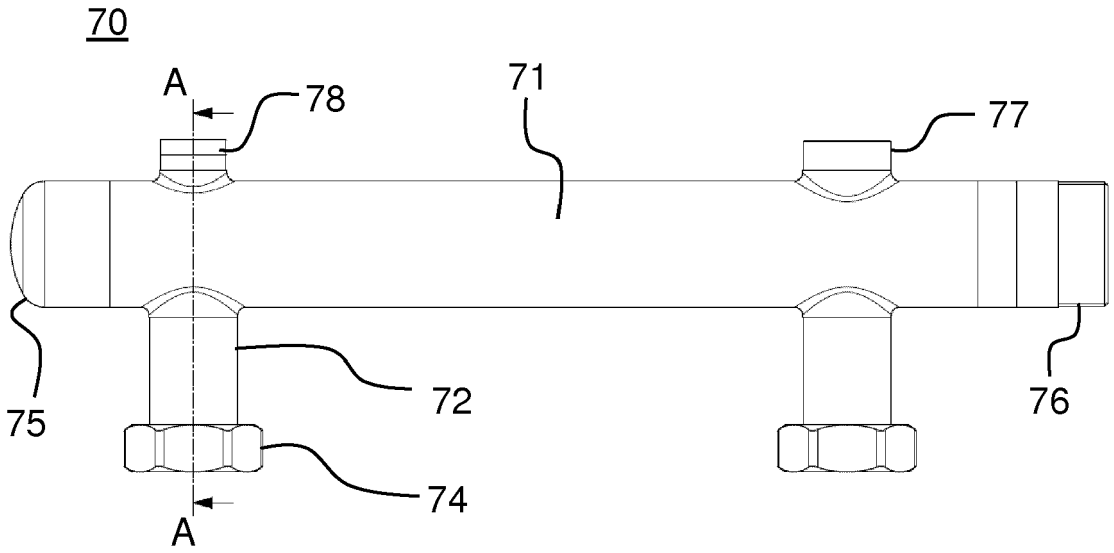

Fig. 5a

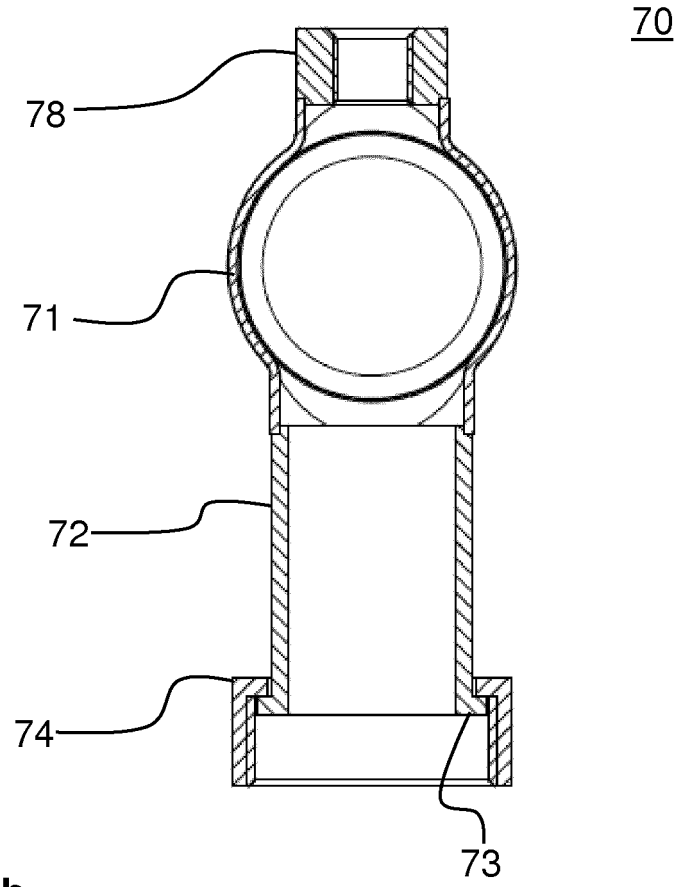

Fig. 5b

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EUROPEAN SEARCH REPORT

Application Number
EP 18 02 0642

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F04D
F16L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 June 2019	de Martino, Marcello

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