Innovation, Sciences et Développement économique Canada
Office de la Propriété Intellectuelle du Canada

Innovation, Science and Economic Development Canada
Canadian Intellectual Property Office

CA 3217334 A1 2022/11/03

(21) 3 217 334

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(86) **Date de dépôt PCT/PCT Filing Date:** 2022/04/26
(87) **Date publication PCT/PCT Publication Date:** 2022/11/03
(85) **Entrée phase nationale/National Entry:** 2023/10/19
(86) **N° demande PCT/PCT Application No.:** IB 2022/053841
(87) **N° publication PCT/PCT Publication No.:** 2022/229827
(30) **Priorité/Priority:** 2021/04/26 (IT102021000010442)

(51) **Cl.Int./Int.Cl.** ***B01J 3/00*** (2006.01),
B01J 19/00 (2006.01), ***B01J 3/02*** (2006.01),
B01J 3/03 (2006.01), ***F16L 23/036*** (2006.01),
F16L 41/08 (2006.01), *F16L 23/028* (2006.01),
F16L 23/032 (2006.01)

(71) **Demandeur/Applicant:**
RATTIINOX S.R.L., IT

(72) **Inventeur/Inventor:**
RATTI, WALTER, IT

(74) **Agent:** AIRD & MCBURNEY LP

(54) **Titre : BASE DE RESERVOIR POUR RECIPIENT SOUS PRESSION**
(54) **Title: A TANK BASE FOR A PRESSURE CONTAINER**

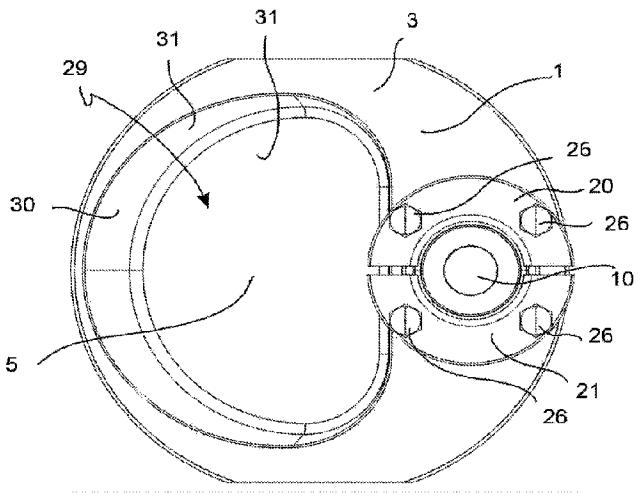

FIG. 9

(57) **Abrégé/Abstract:**
The present invention relates to a tank base (1) for a pressure container (2) comprising a tank base body (3) made in a single piece; wherein said tank base body (3) comprises an annular connection edge (4), for connecting said tank base (1) to said pressure container (2), and an inclined bottom wall (5), said annular connection edge (4) and inclined bottom wall (5) delimiting a tank bottom cavity (6) with edge surfaces (7) and bottom wall surfaces (8) converging towards a minimum portion (9); said minimum portion (9) comprising a drainage opening (10); and wherein said inclined bottom wall (5) is made devoid of any openings; said drainage opening (10) is surrounded by a valve flange (11) for connecting a clamp connection adapter unit (12), which converts a bolt compression connection into a clamp compression connection for interchangeably connecting a valve device (13) to said tank base (1).

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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
03 November 2022 (03.11.2022)

WIPO | PCT

(10) International Publication Number
WO 2022/229827 A1

(51) International Patent Classification:
B01J 3/00 (2006.01) *F16L 23/036* (2006.01)
B01J 3/02 (2006.01) *F16L 41/08* (2006.01)
B01J 3/03 (2006.01) *F16L 23/028* (2006.01)
B01J 19/00 (2006.01) *F16L 23/032* (2006.01)

(21) International Application Number:
PCT/IB2022/053841

(22) International Filing Date:
26 April 2022 (26.04.2022)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:
102021000010442 26 April 2021 (26.04.2021) IT

(71) Applicant: **RATTIINOX S.R.L.** [IT/IT]; VIA MESSINA, 111/A, I-20831 SEREGNO, MONZA E BRIANZA (IT).

(72) Inventor: **RATTI, Walter**; c/o RATTIINOX S.R.L., VIA MESSINA, 111/A, I-20831 SEREGNO, MONZA E BRIANZA (IT).

(74) Agent: **CRIPPA, Paolo Ernesto** et al.; c/o JACOBACCI & PARTNERS S.p.A., Via Senato, 8, I-20121 MILANO (IT).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU,

(54) Title: A TANK BASE FOR A PRESSURE CONTAINER

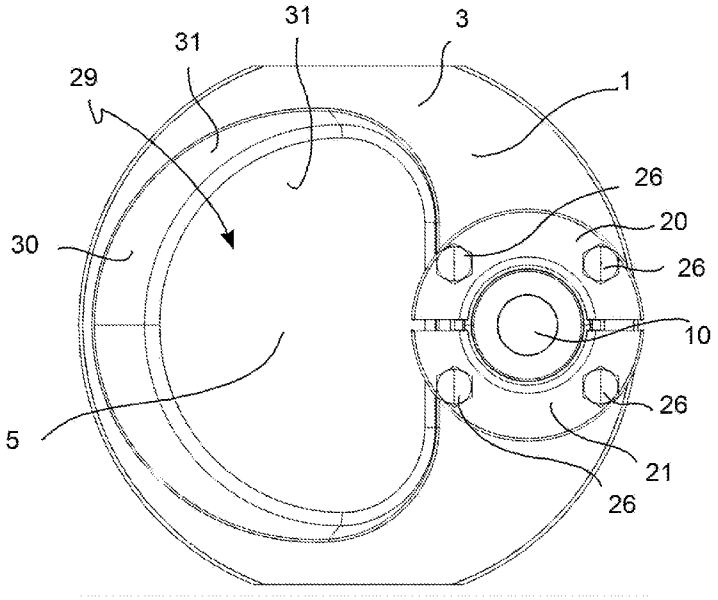

FIG. 9

(57) Abstract: The present invention relates to a tank base (1) for a pressure container (2) comprising a tank base body (3) made in a single piece; wherein said tank base body (3) comprises an annular connection edge (4), for connecting said tank base (1) to said pressure container (2), and an inclined bottom wall (5), said annular connection edge (4) and inclined bottom wall (5) delimiting a tank bottom cavity (6) with edge surfaces (7) and bottom wall surfaces (8) converging towards a minimum portion (9); said minimum portion (9) comprising a drainage opening (10); and wherein said inclined bottom wall (5) is made devoid of any openings; said drainage opening (10) is surrounded by a valve flange (11) for connecting a clamp connection adapter unit (12), which converts a bolt compression connection into a clamp compression connection for interchangeably connecting a valve device (13) to said tank base (1).

WO 2022/229827 A1

[Continued on next page]

WO 2022/229827 A1

RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

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

A TANK BASE FOR A PRESSURE CONTAINER

DESCRIPTION

[001] Technical Field of the Invention

[002] The present invention belongs, in general, to the field of tank bases for a pressure container.

[003] For example, the present invention relates to a tank base for a tank of a pressurized reactor having a tank bottom designed so as not to have process fluid accumulation zones. These tank bases have inclined surfaces, converging towards an outlet opening for the complete drainage of the process fluid.

[004] Furthermore, the present invention relates to an assembly comprising a tank base and a clamp connection adapter unit for connecting an interception device, for example, a valve.

[005] Background art

[006] A mixer is known from document US2004076076A1 for a liquid placed in a sterile container having a wall comprising a welding pin having a distal end inside the wall and having a proximal end outside the wall. The welding pin has a hole therein extending through the proximal end of the welding pin. A motor-operated magnet actuation unit is arranged in the hole in the welding pin. A hub bearing the rotors is rotatably mounted on the welding pin. A magnet operated complex is mounted in the hub and arranged in close proximity to the magnet operated complex but it is separated therefrom by a liquid seal gasket. The magnet actuation assembly includes a plurality of circumferentially spaced apart permanent actuated magnets, which are caged by bars to prevent the permanent actuated magnets from moving with respect to the hub. This solution comprises no drainage opening for the liquid placed in the container.

[007] A group of replaceable nozzles is known from document GB2097081A for an opening in the wall of a coated pressure container, said group comprises a flange arranged so as to extend externally from the wall of the container about the opening and to be connected to the jacket of the container, to define a passage through the jacket; a nozzle extending, in use, through the passage and having a first portion extending externally from the passage and a second portion, which is arranged inside the passage and has an outer surface complementary to an inner surface of the flange; a gasket arranged between the complementary flange and the surfaces of the nozzle to provide a fluid seal surface therebetween; and a clamp means cooperating with the jacket and the first nozzle portion to fix the nozzle within the passage and against the gasket. This known solution does not have a container bottom connected to the container and furthermore, it does not have the possibility to connect a mixer to the container in proximity, but separate from said opening. Furthermore, this solution has, in all embodiments thereof, the body of the element, which delimits the opening associated with the container, creating wide portions of pools of liquids, which cannot be drained, except by completely dismantling the container and separating this body from the walls

of the container.

[008] Document WO2009149511A1 shows a support for use in a pump unit, the pump unit including a plurality of component parts, which include a seal housing, a drive shaft having a rotation axis, an impeller and a pump housing, the pump housing including a main jacket. The pump housing support comprises: a base and an assembly element, which includes a part of the body onto which a part of the pump housing part can be assembled and a positioning flange extending therefrom, the positioning flange having a first and second positioning surface on the opposite sides thereof, in which the main coating is positioned on the first positioning surface and the seal housing is positioned on the second positioning surface.

[009] The use is known of welded bases made with inner surfaces converging towards an outlet valve in tanks for chemical systems, for example, in reactors.

[0010] The tank base is a component for manufacturing mixing containers, also with small and very small volumes, for example, on counters or on a pilot scale for critical biotechnological and pharmaceutical mixing applications. For example, the base can be used to construct relatively small tanks, to facilitate the mixing of volumes up to 0.8 L.

[0011] In order to satisfy processing needs, the tank base can be provided with openings for connecting mixers. These known bases are designed and produced from a single piece of full bar, which incorporates the bottom wall of the tank, the connection flange of the mixer and the body of the outlet valve.

[0012] The main problem of these small bases is the absolute uniqueness thereof for each type and size of mixer and for each type and size of valve.

[0013] In fact, for the reduced sizes of the tank, the requirement imposed by laws, for example, the pressure equipment directive, commonly called PED (from the English, Pressure Equipment Directive), a directive of the European Union 2014/68/UE, impose to pressure containers manufactured with welding of the different components, such as the mixer flanges and the flanges of the valves, to maintain a distance not closer than 25 mm. If it is necessary to make weldings closer than 25 mm, complex and costly analyses must be carried out on each piece produced in order to check the integrity and perfect seal of the component.

[0014] This limitation results in these tank bases being made in a single piece by mechanical machining from full, wherein the connection flange of the mixer is obtained via machining by swarf removal and a part of the valve body of the process fluid interception device.

[0015] The choice of the type of stirrer, make, model and configuration of the impeller requires lengthy validation times due to the study of the effect of mixing the product. If the bottom of the tank is realized from full, custom-made, it must only be realized after such study is complete, and, consequently, the tank realization times are considerably longer.

[0016] Furthermore, it is often necessary to provide a further connection to a conduit for a cleaning fluid inlet valve, a conduit, which usually converges into the valve body made in a single piece in the tank base, as shown in figures 1, 2 and 3 illustrating a solution of the state-of-the-art.

[0017] Therefore, the need is strongly felt to have, in the same tank bottom, flexibility for providing the connection flange of the mixer and the connection flange of the valve, avoiding having to comprise weldings close to one another.

[0018] Object and Summary of the Invention

[0019] Therefore, it is the object of the present invention to overcome the drawbacks of the state-of-the-art and allow achieving the aforesaid needs, by suggesting a tank base of a pressure container capable of ensuring adequate flexibility on changing the type and/or size of the mixer and/or the process fluid interception valve.

[0020] This and other objects are achieved by an assembly as claimed in claim **1**.

[0021] Some advantageous embodiments are the subject of the dependent claims.

[0022] Furthermore, this and other objects are achieved by an assembly according to claim 19, an assembly set according to claim 20 and 21, a method for manufacturing a tank base according to claim 24 and a method for manufacturing a tank base assembly according to claim 25.

[0023] By virtue of the general embodiment and the variants described above and further described below, it is possible to obtain the following advantages.

[0024] The suggested tank base allows use for different types of mixers and also for different types of fluid interception valves.

[0025] In particular, the suggested solutions allow avoiding having weldings close to one another, i.e. less than 25 mm apart from one another, while allowing mixer connection flanges to be used, which are much larger than those allowed in the tank bases of the state-of-the-art. In other words, the mixer opening, which creates the housing for the mixer flange can also be made very large, capable of coming come close to the valve coupling seat

[0026] The suggested tank base body has zones with a greater thickness, or stems, where it is possible to connect load cells directly to the base.

[0027] Furthermore, it is possible to keep the drainage angle of the inclined bottom wall optimum and equal for all solutions and types of mixers and valves, which are desired to be associated with the tank base.

[0028] By virtue of the suggested solutions, the manufacturing costs are significantly reduced with respect to those of the solutions of the state-of-the-art, which comprise making, in a single piece with the inclined bottom wall, both the connection flange of the mixer and the valve body. In particular, much less raw material is used, there is less material to be removed and much simpler machinings are carried out.

[0029] By virtue of the suggested solutions, the supply times are much shorter (in fact, it is possible to keep a smaller number of tank bases in stock, in terms of size), the tank or apparatus, which uses the tank, can be supplied more quickly (the delivery times for the solutions where all the parts are made from full are, on average, 8 - 10 weeks, causing problems for the tank manufacturers). Alternatively, tank manufacturers can keep these tank bases made according to the invention in stock, because they can be selected in order to obtain any tank configuration.

[0030] By virtue of the suggested solutions, the construction of the tank is much simpler. Furthermore, the process fluid interception valve is not present during the realization of the tank, allowing simpler machinings and reducing the probability of faults with the valve body.

[0031] The pressure tests to be carried out on the tanks are also easier, since the valve can be replaced with a cap to perform the pressure tests.

[0032] As a function of the process to be carried out, the pharmaceutical companies generally "validate" some specifications concerning the mixing or mixer to be used, or the features thereof (such as minimum speed, minimum mixable volume, etc.), indeed they often validate a brand and a specific model. By virtue of these tank base solutions, tank manufacturers do not have to purchase a specific base for the single application (costly and time-consuming), but they can always choose the tank base of the size suited for the tank and weld the correct mixer flange (mixer manufacturer standard) according to the specifications set by the customer and choose the interception valve again in keeping with the customer's specifications.

[0033] Having the possibility to use a standardized tank base, onto which it is possible to weld a standardized support of any stirrer, or mixer, as it is a construction based on standard components, the manufacturing of the tank will be much quicker, satisfying the same technical requirements as the solution with a tank base made from full. This ensures greater versatility, since different types of stirrers and discharge valves can be combined. Furthermore, in the event of reusing the tank for another purpose, if the mixer is compatible with the new application, it will be possible to replace the discharge valve to complete the new application.

[0034] Brief Description of the Drawings

[0035] Further features and advantages of the invention will become apparent from the description provided below of preferred embodiments thereof, given by way of non-limiting example, with reference to the accompanying drawings, in which:

[0036] – figure 1 shows an axonometric view of a tank base according to the state-of-the-art, drawn with a continuous line, applied to a tank, with a dashed line;

[0037] – figures 2 and 3 illustrate an axonometric and cross-sectional view of the tank base in figure 1;

[0038] – figure 4 shows an axonometric view of a tank base according to the present invention, from

the side of the tank bottom cavity;

[0039] – figure 4 shows an axonometric view of a tank base assembly from the side of the welding pocket and clamp connection adapter unit;

[0040] – figures 5, 6, 7 and 8 show the front, side, upper or tank side, lower or outer tank side views of the tank base assembly in figure 4;

[0041] – figure 9 shows a cross-section of the tank base assembly in figure 4;

[0042] – figures 10 and 11 show a tank side axonometric and cross-sectional view of the tank base assembly, in which a mixer opening has been made;

[0043] – figure 12 shows a detail of a tank base with an associated clamp connection adapter unit, which sandwiches a connection flange of a valve device;

[0044] – figures 13, 14 and 15 illustrate a tank side axonometric view, an outer side axonometric view and a cross-sectional view of a tank base assembly with the clamp connection adapter unit and, welded mixer flange, according to a first variant;

[0045] – figures 16, 17, 18, 19 and 20 show a cross-sectional view of a tank base assembly with the clamp connection adapter unit and, welded mixer flange, according to a second, third, fourth and fifth variant;

[0046] – figures 21, 22 and 23 show an axonometric view from three different view points of a tank base assembly with which a mixer is associated, a valve device for intercepting the process fluid and a secondary valve for a cleaning fluid;

[0047] – figure 24 shows a side view with separate parts of a tank base assembly with which a mixer is associated, a valve device for intercepting the process fluid according to a further embodiment;

[0048] – figure 25 illustrates a side view of an assembly comprising a pressure container with which a tank base is associated to which a valve device is connected and a mixer, through a mixer flange, as well as a temperature probe and sampling valve to said tank base;

[0049] – figure 26 shows a side view orthogonal to the view in figure 25 of the assembly in figure 24;

[0050] – figure 27 illustrates an axonometric view of the assembly in figure 25 in which the pressure container has been removed from the tank base;

[0051] – figure 28 illustrates an axonometric view with separate parts of the assembly in figure 27.

[0052] Detailed Description of some Preferred Embodiments of the Invention

[0053] The present invention will now be described in detail with reference to the accompanying drawings to enable a person skilled in the art to realize and use it. Various changes to the embodiments described will be readily apparent to those skilled in the art and the general principles described may be applied to other embodiments and applications without departing from the scope of protection of the present invention, as defined in the appended claims. Therefore, the present

invention should not be considered as limited to the embodiments described and shown, but should be granted the broadest scope of protection in compliance with the features described and claimed.

[0054] Unless otherwise defined, all the technical and scientific terms used herein have the same meaning commonly used by those of ordinary skill in the field of the present invention. In case of a conflict, the present description, including the definitions provided, will be binding. Furthermore, the examples are merely provided for illustrative purposes, and as such should not be considered as limiting.

[0055] In order to facilitate the understanding of the embodiments described herein, reference will be made to some specific embodiments and a specific language will be used to describe them. The terminology used in this document has the purpose of describing only particular embodiments, and is not intended to limit the scope of the present invention.

[0056] According to an embodiment, there is provided an assembly of a pressure container 2 and a valve device 13. Said assembly comprises a tank base 1 for said pressure container 2 comprising a tank base body 3. Said tank base body 3 is made in a single piece.

[0057] Said tank base body 3 comprises an annular connection edge 4, for connecting said tank base 1 to said pressure container 2, and an inclined bottom wall 5, to allow a fluid to flow, by gravity, towards a minimum portion 9 thereof, said annular connection edge 4 and inclined bottom wall 5 delimiting a tank bottom cavity 6 with edge surfaces 7 and bottom wall surfaces 8 converging towards said minimum portion 9.

[0058] Said minimum portion 9 comprises a drainage opening 10 for the complete drainage, by gravity, of a fluid contained in said pressure container 2.

[0059] Said inclined bottom wall 5 is made devoid of any further drainage openings.

[0060] Said drainage opening 10 is surrounded by a valve flange 11 for connecting a clamp connection adapter unit 12, which converts a bolt compression connection into a clamp compression connection for interchangeably connecting a valve device 13 to said tank base 1.

[0061] According to an embodiment, said valve flange 11 delimits, in the portion opposite to said tank bottom cavity 6 thereof, a valve coupling seat 15 delimited close to said drainage opening 10 by at least one direct valve support plane 16 opposite to said tank bottom cavity 6.

[0062] Said valve support plane 16 is externally delimited by a valve seat edge 17 in the thickness of which there are provided threaded blind holes 18 able to accommodate threaded stems 19 protruding from said valve seat edge 17.

[0063] According to an embodiment, said tank base 1 comprises a clamp connection adapter unit 12.

[0064] According to an embodiment, said clamp connection adapter unit 12 is a Zero Dead Leg connection flange, or ZDL connection, comprising at least two clamps 20, 21 extending about said

drainage opening 10, each for an arc equal to, or less than 180DEG.

[0065] Each clamp 20, 21 comprises an arched connection portion 22 and a folded tightening portion 23.

[0066] Said folded tightening portion 23 enters said valve coupling seat 15 and faces said valve support plane 16 creating a support and tightening counter-surface 24.

[0067] Said valve seat edge 17 with the threaded blind holes 18 thereof accommodates threaded stems 19 protruding from said valve seat edge 17.

[0068] Said arched connection portion 20 faces said valve seat edge 17 and the connection seats 25 thereof accommodate the portions of said threaded stems 19.

[0069] Tightening bolts 26 are screwed to the free ends of the threaded stems 19 and tighten said clamps 20, 21 so as to sandwich a valve flange 27 of a valve device 13 between the support and tightening counter-surfaces 24 thereof and said valve support plane 16.

[0070] According to an embodiment, a mixer opening 28 is made in said inclined bottom wall 5, which is not adapted to drain fluid, wherein alternatively:

[0071] said mixer opening 28 is a through opening, which puts a welding pocket 29 in communication with said tank bottom cavity 6;

[0072] or

[0073] said mixer opening 28 is a circular through opening, which puts a welding pocket 29 in communication with said tank bottom cavity 6.

[0074] A mixer flange 32 is firmly connected to said mixer opening 28 for the seal connection of a mixer 34.

[0075] Said mixer flange 32 and said mixer 34 occlude said mixer opening 28.

[0076] According to an embodiment, said assembly comprises said mixer flange 32; and said mixer flange 32 is inserted and welded to the edges of said mixer opening 28.

[0077] According to an embodiment, said welding pocket 29 has a “D”-plan shape.

[0078] According to an embodiment, said welding pocket 29 is delimited by said inclined bottom wall 5 and welding pocket edges 30 forming inner welding pocket surfaces 31.

[0079] The inner welding pocket surfaces 31 are divergent moving away from said inclined bottom wall 5.

[0080] According to an embodiment, said mixer flange 32 comprises a mixer flange body 33 for supporting a mixer 34.

[0081] According to an embodiment, said mixer flange 32 comprises a mixer flange body 33 for accommodating a mixer shaft 34 and rotatably freely supporting a mixer head 35 at least partially inside said tank bottom cavity 6.

[0082] According to an embodiment, said mixer flange 32 comprises a mixer flange body 33.

[0083] Said mixer flange body 33 comprises a first mixer flange body portion 37 extending into said tank bottom cavity 6.

[0084] Said mixer flange body 33 comprises a second mixer flange body portion 38 extending away from said inclined bottom wall 5.

[0085] According to an embodiment, said second mixer flange body portion 38 is at least partially accommodated in said welding pocket 29.

[0086] According to an embodiment, said mixer flange 32 comprises at least one lateral mixer welding extension 39.

[0087] Said at least one lateral mixer welding extension 39 comprises welding edges 40 adapted to be welded to edges of said mixer opening 28.

[0088] According to an embodiment, said assembly 14 comprises a mixer 34.

[0089] Said mixer 34 comprises a mixer head 36 supported on the side of the inclined bottom wall 5 delimiting said tank bottom cavity 6.

[0090] Said mixer 34 comprises a gear motor unit 41 adapted to move said mixer head 36; said gear motor unit 41 is secured by said mixer flange 32 welded to said inclined bottom wall 5.

[0091] According to an embodiment, said assembly comprises said tank base 1, a mixer 34 and a valve device 13 for intercepting a process fluid.

[0092] According to an embodiment, said assembly comprises said tank base 1, a mixer 34 and a valve device 13 for intercepting a process fluid and a secondary valve 42 for intercepting a cleaning fluid, wherein said secondary valve 42 is fluidically joined to said valve device 13.

[0093] According to an embodiment, said annular connection edge 4 comprises a temperature probe port 43 for fluidically sealably connecting a temperature probe 44, thus without allowing a fluid to drain, and detecting the temperature of a fluid contained in said tank bottom cavity 6.

[0094] According to an embodiment, said annular connection edge 4 comprises a sampling valve port 45 for fluidically sealably connecting a sampling valve 46 and without allowing the complete drainage of a fluid, and collecting a sample, also in very small residual volumes of fluid.

[0095] According to an embodiment, there is provided a valve device assembly 13 and a tank base 1.

[0096] Said tank base 1 is adapted to be connected to a pressure container 2.

[0097] Said tank base 1 comprising a tank base body 3. Said tank base body 3 is made in a single piece.

[0098] Said tank base body 3 comprises an annular connection edge 4, for connecting said tank base 1 to said pressure container 2, and an inclined bottom wall 5, to allow a fluid to flow, by gravity, towards a minimum portion 9 thereof, said annular connection edge 4 and inclined bottom wall 5 delimiting a tank bottom cavity 6 with edge surfaces 7 and bottom wall surfaces 8 converging

towards said minimum portion 9.

[0099] Said minimum portion 9 comprises a drainage opening 10 for the complete drainage, by gravity, of a fluid contained in said pressure container 2.

[00100] Said inclined bottom wall 5 is made devoid of any further drainage openings.

[00101] Said drainage opening 10 is surrounded by a valve flange 11 for connecting a clamp connection adapter unit 12, which converts a bolt compression connection into a clamp compression connection for interchangeably connecting a valve device 13 to said tank base 1.

[00102] A mixer opening 28 is made in said inclined bottom wall 5, which is not adapted to drain fluid.

[00103] Said mixer opening 28 is a through opening, which puts a welding pocket 29 in communication with said tank bottom cavity 6.

[00104] A mixer flange 32 is firmly connected to said mixer opening 28 for the seal connection of a mixer 34.

[00105] Said mixer flange 32 and said mixer 34 occlude said mixer opening 28.

[00106] According to an embodiment, an assembly set is provided according to any one of the embodiments described above. Said assembly set comprises a plurality of tank base assemblies 14, wherein said tank bases 14 each comprise a mixer opening 28. The mixer openings 28 of the different tank bases 14 have different extension sizes from one another.

[00107] A respective mixer flange 32 is firmly connected to each mixer opening 28 for the seal connection of a mixer 34.

[00108] According to an embodiment, an assembly set is provided according to any one of the embodiments described above. Said assembly set comprises at least one tank base 14. Said tank base 14 comprises a mixer opening 28.

[00109] A mixer flange 32 selected from a set of mixer flanges of different sizes is firmly connectable to said mixer opening 28 for the seal connection of a mixer 34.

[00110] According to an embodiment, a set of assemblies according to one of the embodiments described above, provides that all the mixer flanges 32 comprise a lateral mixer welding extension 39 having welding edges 40 of identical sizes.

[00111] Each mixer flange 32 comprises a mixer flange body 33; said mixer flange body 33 comprises a first mixer flange body portion 37 adapted to extend into a tank bottom cavity 6; said mixer flange body 33 comprises a second mixer flange body portion 38 adapted to extend away from an inclined tank base 1 bottom wall 5; and wherein said second mixer flange body portion 38 is adapted to be at least partially accommodated in a tank base 1 welding pocket 29.

[00112] Each mixer flange 32 has a size and/or shape of said first mixer flange body portion 37, which is different from the other mixer flanges 32 of the same set of mixer flanges.

[00113] According to an embodiment, each mixer flange 32 comprises a mixer flange body 33; said mixer flange body 33 comprises a first mixer flange body portion 37 adapted to extend into a tank bottom cavity 6; said mixer flange body 33 comprises a second mixer flange body portion 38 adapted to extend away from an inclined tank base 1 bottom wall 5; and wherein said second mixer flange body portion 38 is adapted to be at least partially accommodated in a tank base 1 welding pocket 29.

[00114] Each mixer flange 32 has a size and/or shape of said second mixer flange body portion 38, which is different from the other mixer flanges 32 of the same set of mixer flanges.

[00115] The present invention further relates to a method for manufacturing a tank base 1, wherein there is provided, alternatively,

[00116] the step of

[00117] melting and machining, by swarf removal, a tank base having the features in claim 1;

[00118] or

[00119] machining, by swarf removal from a full piece, a tank base having the features in claim 1.

[00120] The present invention further relates to a method for manufacturing a tank base assembly 14, wherein there are provided the steps of:

[00121] providing an assembly 14 according to any one of claims 1 to 23;

[00122] connecting to said valve flange 11 a clamp connection adapter unit 12, which converts a bolt compression connection into a clamp compression connection for interchangeably connecting a valve device 13 to said tank base 1.

[00123] The present invention also relates to a method further comprising the step of:

[00124] making a mixer opening 28 in said inclined bottom wall 5;

[00125] welding a mixer flange 32 to the edges of said mixer opening 28.

[00126] The present invention also relates to a method further comprising the step of:

[00127] connecting a mixer 34 to said mixer flange 32;

[00128] connecting a valve device 13 to said clamp connection adapter unit 12.

[00129] According to a general embodiment, a tank base 1 for a pressure container 2 comprises a tank base body 3 made in a single piece.

[00130] Said tank base body 3 comprises an annular connection edge 4, for connecting said tank base 1 to said pressure container 2, and an inclined bottom wall 5.

[00131] Said annular connection edge 4 and inclined bottom wall 5 delimit a tank bottom cavity 6 with edge surfaces 7 and bottom wall surfaces 8 converging towards a minimum portion 9.

[00132] Said minimum portion 9 comprising a drainage opening 10.

[00133] Said inclined bottom wall 5 is made devoid of any openings.

[00134] Said drainage opening 10 is surrounded by a valve flange 11 for connecting a clamp connection adapter unit 12, which converts a bolt compression connection into a clamp compression connection for interchangeably connecting, and sandwiching, a valve device 13 to said tank base 1.

[00135] According to an embodiment, said valve flange 11 delimits, in the portion thereof opposite to said tank bottom cavity 6, a valve coupling seat 15.

[00136] Said valve coupling seat 15 is delimited, close to said drainage opening 10, by at least one direct valve support plane 16 opposite to said tank bottom cavity 6.

[00137] Said valve support plane 16 is externally delimited by a valve seat edge 17 in the thickness of which there are provided threaded blind holes 18 able to accommodate threaded stems 19 protruding from said valve seat edge 17.

[00138] According to a general embodiment, a tank base assembly 14 comprises a tank base 1 according to any of the embodiments described above. Said tank base 1 comprises a clamp connection adapter unit 12.

[00139] According to an embodiment, said clamp connection adapter unit 12 is a Zero Dead Leg connection flange, or ZDL connection, comprising at least two clamps 20, 21 extending about said drainage opening 10, each for an arc equal to, or less than 180DEG.

[00140] Each clamp 20, 21 comprises an arched connection portion 22 and a folded tightening portion 23.

[00141] Said folded tightening portion 23 enters said valve coupling seat 15 and faces said valve support plane 16 creating a support and tightening counter-surface 24.

[00142] Said valve seat edge 17 with the threaded blind holes 18 thereof accommodates threaded stems 19 protruding from said valve seat edge 17.

[00143] Said arched connection portion 20 faces said valve seat edge 17 and the connection seats 25 thereof accommodate the portions of said threaded stems 19.

[00144] Tightening bolts 26 are screwed to the free ends of the threaded stems 19 and tighten said clamps 20, 21 so as to sandwich a valve flange 27 of a valve device 13 between the support and tightening counter-surfaces 24 thereof and said valve support plane 16.

[00145] According to an embodiment, a mixer opening 28 is made in said inclined bottom wall 5.

[00146] According to an embodiment, said mixer opening 28 is a through opening, which puts a welding pocket 29 in communication with said tank bottom cavity 6.

[00147] According to an embodiment, said mixer opening 28 is a circular through opening, which puts a welding pocket 29 in communication with said tank bottom cavity 6.

[00148] According to an embodiment, said welding pocket 29 has a “D”-plan shape.

[00149] According to an embodiment, said welding pocket 29 is delimited by said inclined bottom wall 5 and welding pocket edges 30 forming inner welding pocket surfaces 31.

[00150] The inner welding pocket surfaces 31 are divergent moving away from said inclined bottom wall 5.

[00151] According to an embodiment, said assembly comprises a mixer flange 32.

[00152] Said mixer flange 32 is inserted and welded to the edges of said mixer opening 28.

[00153] According to an embodiment, said mixer flange 32 comprises a mixer flange body 33 for supporting a mixer 34.

[00154] According to an embodiment, said mixer flange 32 comprises a mixer flange body 33 for accommodating a mixer shaft 34 and rotatably freely supporting a mixer head 35 at least partially inside said tank bottom cavity 6.

[00155] According to an embodiment, said mixer flange 32 comprises a mixer flange body 33.

[00156] According to an embodiment, said mixer flange body 33 comprises a first mixer flange body portion 37 extending into said tank bottom cavity 6.

[00157] According to an embodiment, said mixer flange body 33 comprises a second mixer flange body portion 38 extending away from said inclined bottom wall 5.

[00158] According to an embodiment, said second mixer flange body portion 38 is at least partially accommodated in said welding pocket 29.

[00159] According to an embodiment, said mixer flange 32 comprises at least one lateral mixer welding extension 39.

[00160] According to an embodiment, said at least one lateral mixer welding extension 39 comprises welding edges 40 adapted to be welded to edges of said mixer opening 28.

[00161] According to an embodiment, said assembly 14 comprises a mixer 34.

[00162] According to an embodiment, said mixer 34 comprises a mixer head 36 supported on the side of the inclined bottom wall 5 delimiting said tank bottom cavity 6.

[00163] According to an embodiment, said mixer 34 comprises a gear motor unit 41 adapted to move said mixer head 36; said gear motor unit 41 is secured by a mixer flange 32 welded to said inclined bottom wall 5.

[00164] According to an embodiment, said assembly comprises said tank base 1, a mixer 34 and a valve device 13 for intercepting a process fluid.

[00165] According to an embodiment, said assembly comprises a tank base 1, a mixer 34 and a valve device 13 for intercepting a process fluid and a secondary valve 42 for intercepting a cleaning fluid, wherein said secondary valve 42 is fluidically joined to said valve device 13.

[00166] The present invention further relates to a set of assemblies 14 comprising a plurality

of assemblies according to any one of the embodiments described above, wherein the tank bases 1 each have mixer openings 28 having different extension sizes from one another.

[00167] The present invention further relates to a set of mixer flanges 32.

[00168] In this set, all the mixer flanges 32 comprise a lateral mixer welding extension 39 with welding edges 40 of identical sizes.

[00169] Each mixer flange 32 comprises a mixer flange body 33; said mixer flange body 33 comprises a first mixer flange body portion 37 adapted to extend into a tank bottom cavity 6; said mixer flange body 33 comprises a second mixer flange body portion 38 adapted to extend away from an inclined tank base 1 bottom wall 5; and wherein said second mixer flange body portion 38 is adapted to be at least partially accommodated in a tank base 1 welding pocket 29.

[00170] Each mixer flange 32 has a size and/or shape of said first mixer flange body portion 37, which is different from the other mixer flanges 32 of the same set of mixer flanges.

[00171] According to an embodiment, each mixer flange 32 has a size and/or shape of said second mixer flange body portion 38, which is different from the other mixer flanges 32 of the same set of mixer flanges.

[00172] The present invention further relates to a method for manufacturing a tank base 1, wherein there is provided, alternatively, the step of

[00173] melting and machining, by swarf removal, a tank base having the features in claim 1;

[00174] or

[00175] machining, by swarf removal from a full piece, a tank base having the features in claim 1.

[00176] According to a further alternative and optional procedure of implementing the method, there are provided the steps of:

[00177] comprising an assembly 14 according to any one of claims 3 to 10;

[00178] connecting to said valve flange 11 a clamp connection adapter unit 12, which converts a bolt compression connection into a clamp compression connection for interchangeably connecting a valve device 13 to said tank base 1.

[00179] According to a further alternative and optional way of executing the method, there are further provided the steps of:

[00180] making a mixer opening 28 in said inclined bottom wall 5;

[00181] welding a mixer flange 32 to the edges of said mixer opening 28.

[00182] According to a further alternative and optional way of executing the method, there are further provided the steps of:

[00183] connecting a mixer 34 to said mixer flange 32;

[00184] connecting a valve device 13 to said clamp connection adapter unit 12.

[00185] In order to meet specific, contingent needs, a person skilled in the art may make several changes and adaptations to the above-described embodiments and may replace elements with other functionally equivalent ones, without thereby departing from the scope of the following claims.

REFERENCE SIGNS

1	tank base
2	pressure container or tank
3	tank base body
4	annular connection edge
5	inclined bottom wall
6	tank bottom cavity
7	edge surfaces
8	bottom wall surfaces
9	minimum portion
10	drainage opening
11	valve flange
12	clamp connection adapter unit
13	valve device
14	tank base assembly
15	valve coupling seat
16	valve support plane
17	valve seat edge
18	threaded blind holes
19	threaded stems
20	clamp
21	clamp
22	arched connection portion
23	folded tightening portion
24	support and tightening counter-surface
25	connection seats thereof
26	tightening bolts
27	valve flange
28	mixer opening
29	welding pocket
30	welding pocket edges
31	Inner welding pocket surfaces
32	mixer flange
33	mixer flange body
34	mixer

35 mixer shaft
36 mixer head
37 first mixer flange body portion
38 second mixer flange body portion
39 lateral mixer welding extension
40 welding edges
41 gear motor unit
42 secondary valve
43 temperature probe port
44 temperature probe
45 sampling valve port
46 sampling valve

CLAIMS

1. An assembly of a pressure container (2) and valve device (13), wherein

said assembly comprises a tank base (1) for said pressure container (2) comprising a tank base body (3); said tank base body (3) being made in a single piece; wherein

said tank base body (3) comprises an annular connection edge (4), for connecting said tank base (1) to said pressure container (2), and an inclined bottom wall (5), for allowing a fluid to flow, by gravity, towards a minimum portion (9) thereof, said annular connection edge (4) and inclined bottom wall (5) delimiting a tank bottom cavity (6) with edge surfaces (7) and bottom wall surfaces (8) converging towards said minimum portion (9); and wherein

said minimum portion (9) comprises a drainage opening (10) for the complete drainage, by gravity, of a fluid contained in said pressure container (2);

characterized in that

said inclined bottom wall (5) is made devoid of any further drainage openings;

said drainage opening (10) is surrounded by a valve flange (11) for connecting a clamp connection adapter unit (12), which converts a bolt compression connection into a clamp compression connection for interchangeably connecting a valve device (13) to said tank base (1).

2. An assembly according to claim 1, wherein

said valve flange (11) delimits, in the portion thereof opposite to said tank bottom cavity (6), a valve coupling seat (15) delimited close to said drainage opening (10) by at least one direct valve support plane (16) opposite to said tank bottom cavity (6); and wherein

said valve support plane (16) is externally delimited by a valve seat edge (17) in the thickness of which there are provided threaded blind holes (18) adapted to accommodate threaded stems (19) protruding from said valve seat edge (17).

3. An assembly according to claim 1 or 2, wherein

said tank base (1) comprises a clamp connection adapter unit (12).

4. An assembly according to claim 3 when dependent on said claim 2, wherein

said clamp connection adapter unit (12) is a Zero Dead Leg connection flange, or ZDL connection, comprising at least two clamps (20, 21) extending about said drainage opening (10), each for an arc equal to, or less than 180DEG; and wherein

each clamp (20, 21) comprises an arched connection portion (22) and a folded tightening portion (23); wherein

said folded tightening portion (23) enters said valve coupling seat (15) and faces said valve support plane (16) creating a support and tightening counter-surface (24);

said valve seat edge (17) with the threaded blind holes (18) thereof accommodates threaded stems (19) protruding from said valve seat edge (17);

said arched connection portion (20) faces said valve seat edge (17) and the connection seats (25) thereof accommodate the portions of said threaded stems (19);

tightening bolts (26) are screwed to the free ends of the threaded stems (19) and tighten said clamps (20, 21) so as to sandwich a valve flange (27) of a valve device (13) between the support and tightening counter-surfaces (24) thereof and said valve support plane (16).

5. An assembly according to any one of the preceding claims, wherein

a mixer opening (28) is made in said inclined bottom wall (5), which is not adapted to drain fluid, wherein alternatively:

> said mixer opening (28) is a through opening, which puts a welding pocket (29) in communication with said tank bottom cavity (6);
>
> or
>
> said mixer opening (28) is a circular through opening, which puts a welding pocket (29) in communication with said tank bottom cavity (6);

and wherein a mixer flange (32) is firmly connected to said mixer opening (28) for the seal connection of a mixer (34); and wherein

said mixer flange (32) and said mixer (34) occlude said mixer opening (28).

6. An assembly according to claim 5, wherein

said assembly comprises said mixer flange (32); and said mixer flange (32) is inserted and welded to the edges of said mixer opening (28).

7. An assembly according to claim 5 or 6, wherein

said welding pocket (29) has a “D”-plan shape.

8. An assembly according to claim 5, 6 or 7, wherein

said welding pocket (29) is delimited by said inclined bottom wall (5) and welding pocket edges (30) forming inner welding pocket surfaces (31); and wherein

the inner welding pocket surfaces (31) are divergent moving away from said inclined bottom wall (5).

9. An assembly according to claim 5 or 6, wherein

said mixer flange (32) comprises a mixer flange body (33) for supporting a mixer (34).

10. An assembly according to claim 5 or 6 or 9, wherein

said mixer flange (32) comprises a mixer flange body (33) for accommodating a mixer shaft (34) and rotatably freely supporting a mixer head (35) at least partially inside said tank bottom cavity (6).

11. An assembly according to claim 5 or 6 or 9 or 10, wherein

said mixer flange (32) comprises a mixer flange body (33); and

said mixer flange body (33) comprises a first mixer flange body portion (37) extending into said tank bottom cavity (6); and

said mixer flange body (33) comprises a second mixer flange body portion (38) extending away from said inclined bottom wall (5).

12. An assembly according to claim 5 to 6 or any one of claims 9 to 11, wherein

said second mixer flange body portion (38) is at least partially accommodated in said welding pocket (29).

13. An assembly according to claim 5 to 6 or any one of claims 9 to 12, wherein

said mixer flange (32) comprises at least one lateral mixer welding extension (39);

said at least one lateral mixer welding extension (39) comprises welding edges (40) adapted to be welded to edges of said mixer opening (28).

14. An assembly according to any one of claims 1 to 13; wherein

said assembly (14) comprises a mixer (34); wherein

said mixer (34) comprises a mixer head (36) supported on the side of the inclined bottom wall (5) delimiting said tank bottom cavity (6); and

said mixer (34) comprises a gear motor unit (41) adapted to move said mixer head (36); said gear motor unit (41) is secured by said mixer flange (32) welded to said inclined bottom wall (5).

15. An assembly according to any one of claims 1 to 14; wherein

said assembly comprises said tank base (1), a mixer (34) and a valve device (13) for intercepting a process fluid.

16. An assembly according to any one of claims 1 to 14; wherein

said assembly comprises said tank base (1), a mixer (34) and a valve device (13) for intercepting a process fluid and a secondary valve (42) for intercepting a cleaning fluid, wherein said secondary valve (42) is fluidically joined to said valve device (13).

17. An assembly according to any one of claims 1 to 16; wherein

said annular connection edge (4) comprises a temperature probe port (43) for fluidically sealably connecting a temperature probe (44), thus without allowing a fluid to drain, and detecting the temperature of a fluid contained in said tank bottom cavity (6).

18. An assembly according to any one of claims 1 to 16; wherein

said annular connection edge (4) comprises a sampling valve port (45) for fluidically sealably connecting a sampling valve (46), and without allowing the complete drainage of a fluid, and collecting a sample of fluid, also in very small residual volumes of fluid, contained in said tank bottom cavity (6).

19. A valve device assembly (13) and a tank base (1), wherein

said tank base (1) is adapted to be connected to a pressure container (2); and wherein

said tank base (1) comprising a tank base body (3); said tank base body (3) being made in a single piece; wherein

said tank base body (3) comprises an annular connection edge (4), for connecting said tank base (1) to said pressure container (2), and an inclined bottom wall (5), for allowing a fluid to flow, by gravity, towards a minimum portion (9) thereof, said annular connection edge (4) and inclined bottom wall (5) delimiting a tank bottom cavity (6) with edge surfaces (7) and bottom wall surfaces (8) converging towards said minimum portion (9); and wherein

said minimum portion (9) comprises a drainage opening (10) for the complete drainage, by gravity, of a fluid contained in said pressure container (2); and wherein

said inclined bottom wall (5) is made devoid of any further drainage openings;

said drainage opening (10) is surrounded by a valve flange (11) for connecting a clamp connection adapter unit (12), which converts a bolt compression connection into a clamp compression connection for interchangeably connecting a valve device (13) to said tank base (1); and wherein

a mixer opening (28) is made in said inclined bottom wall (5), which is not adapted to drain fluid; wherein

said mixer opening (28) is a through opening, which puts a welding pocket (29) in communication with said tank bottom cavity (6);

and wherein a mixer flange (32) is firmly connected to said mixer opening (28) for the seal connection of a mixer (34); and wherein

said mixer flange (32) and said mixer (34) occlude said mixer opening (28).

20. An assembly set according to claim 1 or 19, wherein said assembly set comprises a plurality of tank base assemblies (14), wherein said tank bases (14) each comprise a mixer opening (28) and wherein

the mixer openings (28) of the different tank bases (14) have different extension sizes from one another, and wherein

a respective mixer flange (32) is firmly connected to each mixer opening (28) for the seal connection of a mixer (34).

21. An assembly set according to claim 1 or 19, wherein said assembly set comprises at least a tank base (14), wherein said tank base (14) comprises a mixer opening (28) and wherein

a mixer flange (32) selected from a set of mixer flanges of different sizes is firmly connectable to said mixer opening (28) for the seal connection of a mixer (34).

22. A set of assemblies according to claim 20 or 21, wherein

all the mixer flanges (32) comprise a lateral mixer welding extension (39) having welding edges (40) of identical size; and wherein

each mixer flange (32) comprises a mixer flange body (33); said mixer flange body (33) comprises a first mixer flange body portion (37) adapted to extend into a tank bottom cavity (6); said mixer flange body (33) comprises a second mixer flange body portion (38) adapted to extend away from an inclined tank base (1) bottom wall (5); and wherein said second mixer flange body portion (38) is adapted to be at least partially accommodated in a tank base (1) welding pocket (29); and wherein

each mixer flange (32) has a size and/or shape of said first mixer flange body portion (37), which is different from the other mixer flanges (32) of the same set of mixer flanges.

23. A set of assemblies according to claim 20 or 21 or 22, wherein

each mixer flange (32) comprises a mixer flange body (33); said mixer flange body (33) comprises a first mixer flange body portion (37) adapted to extend into a tank bottom cavity (6); said mixer flange body (33) comprises a second mixer flange body portion (38) adapted to extend away from an inclined tank base (1) bottom wall (5); and wherein said second mixer flange body portion (38) is adapted to be at least partially accommodated in a tank base (1) welding pocket (29); and wherein

each mixer flange (32) has a size and/or shape of said second mixer flange body portion (38), which is different from the other mixer flanges (32) of the same set of mixer flanges.

24. A method for manufacturing a tank base (1), wherein, alternatively,

the step of

melting and machining, by swarf removal, a tank base having the features in claim 1;

or

machining, by swarf removal from a full piece, a tank base having the features in claim 1.

25. A method for manufacturing a tank base assembly (14), wherein there are provided the steps of:

comprising an assembly (14) according to any one of claims 1 to 23;

connecting to said valve flange (11) a clamp connection adapter unit (12), which converts a bolt compression connection into a clamp compression connection for interchangeably connecting a valve device (13) to said tank base (1).

26. A method according to claim 25, further comprising the step of:

making a mixer opening (28) in said inclined bottom wall (5);

welding a mixer flange (32) to the edges of said mixer opening (28).

27. A method according to claim 26, further comprising the step of:

connecting a mixer (34) to said mixer flange (32);

connecting a valve device (13) to said clamp connection adapter unit (12).

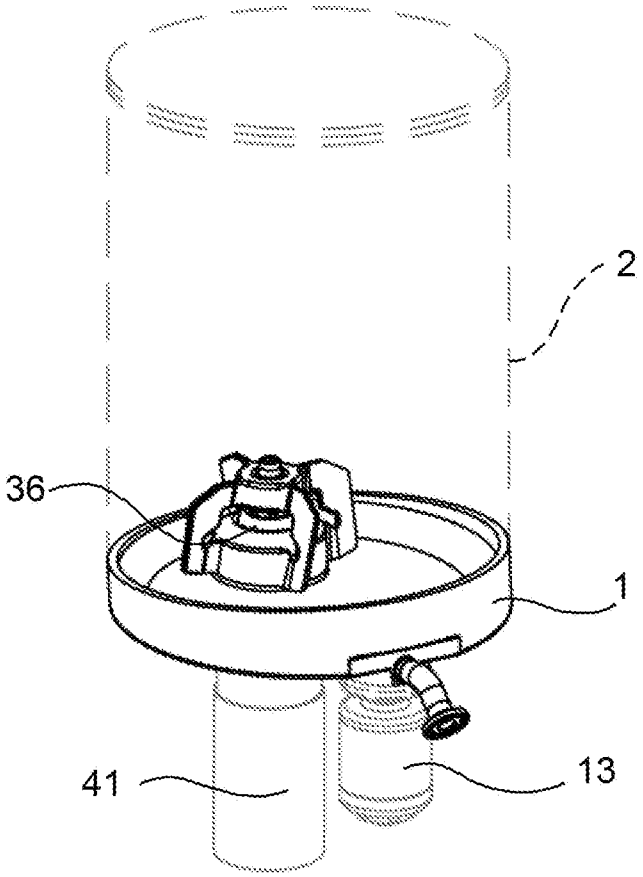

FIG. 1
(State of the art)

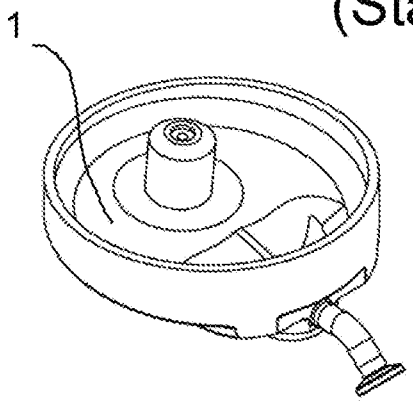

FIG. 2

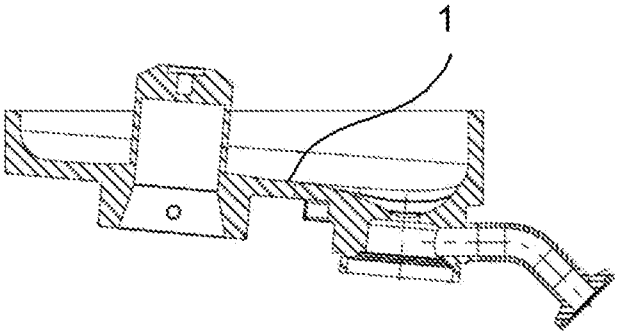

FIG. 3
(State of the art)

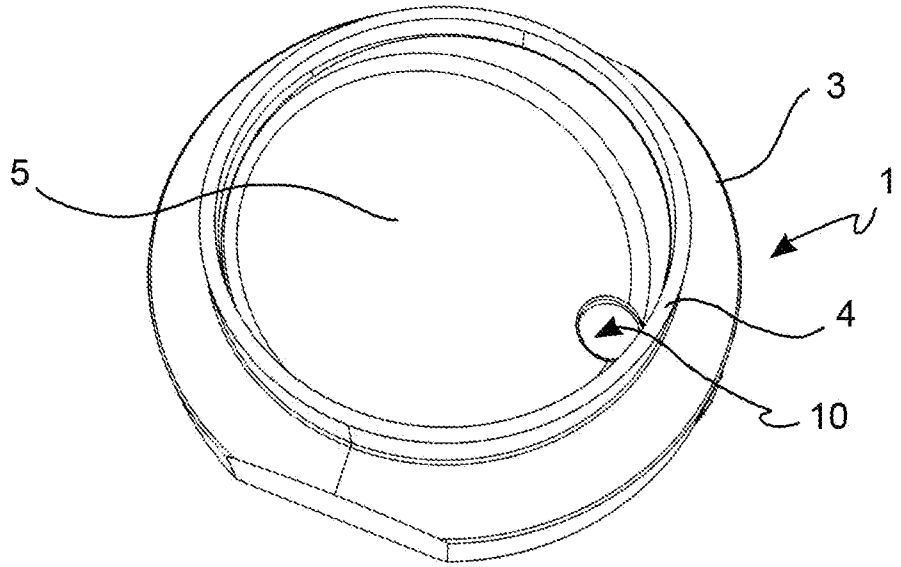

FIG. 4

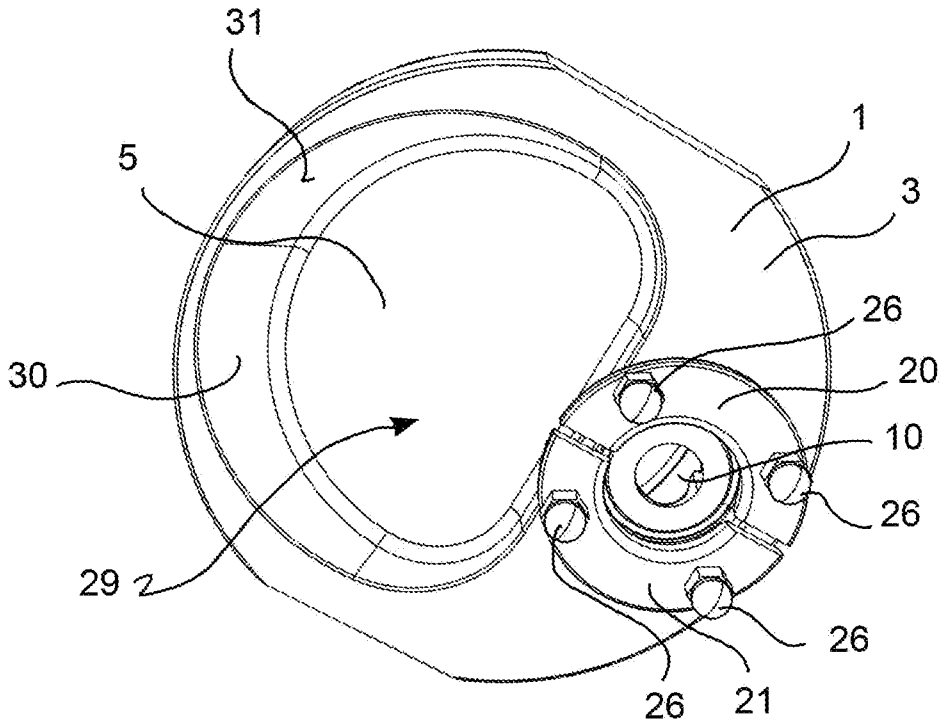

FIG. 5

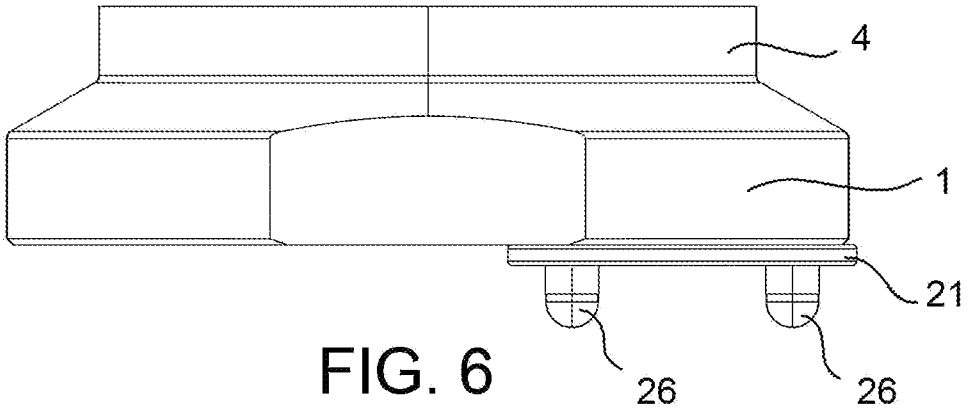

FIG. 6

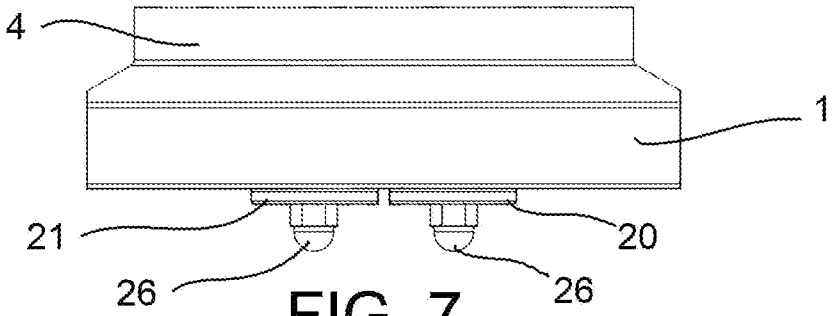

FIG. 7

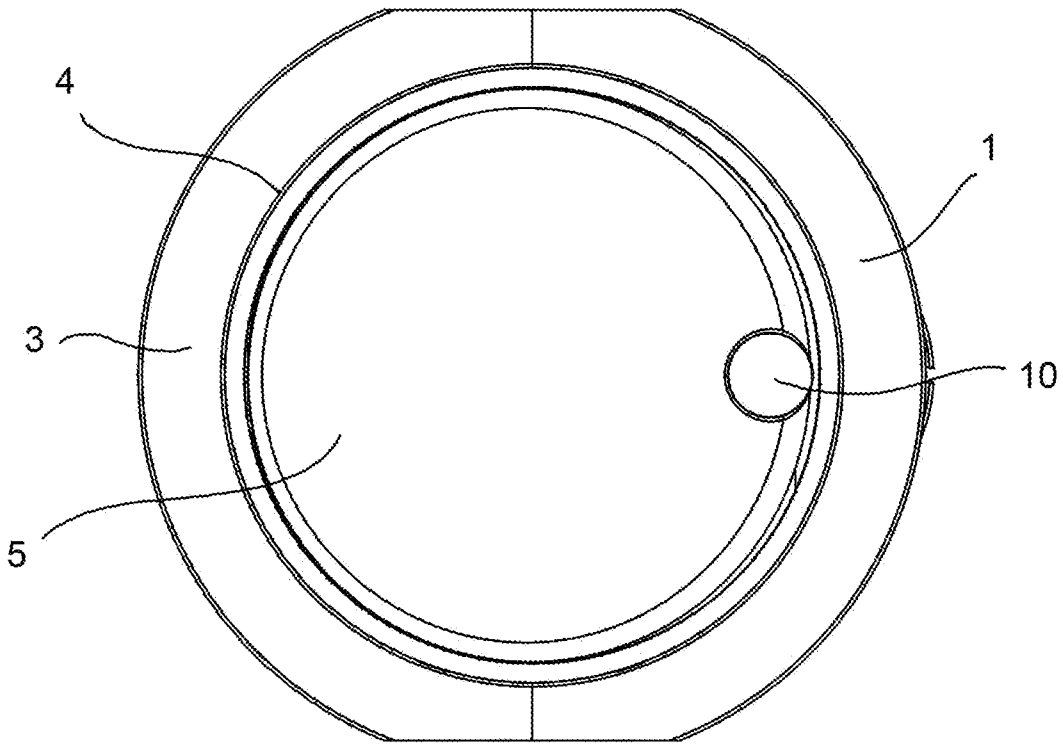

FIG. 8

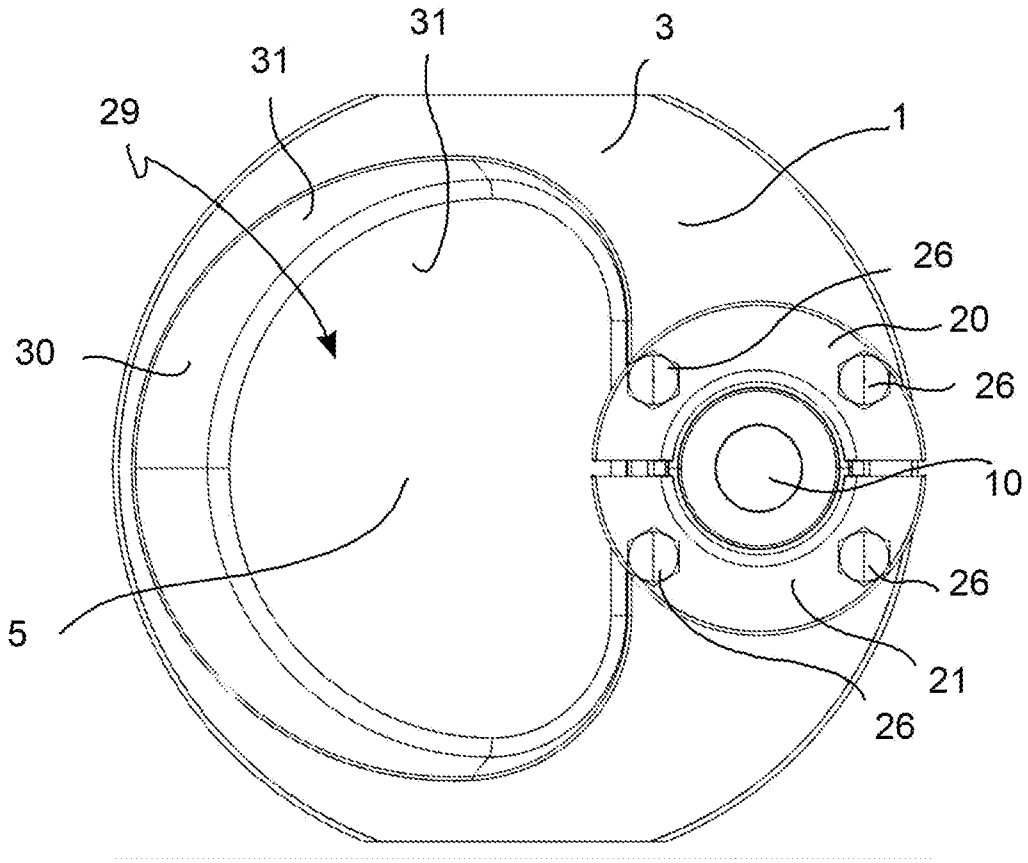
31
3
31
29
1
26
20
30
26
10
26
5
21
26

FIG. 9

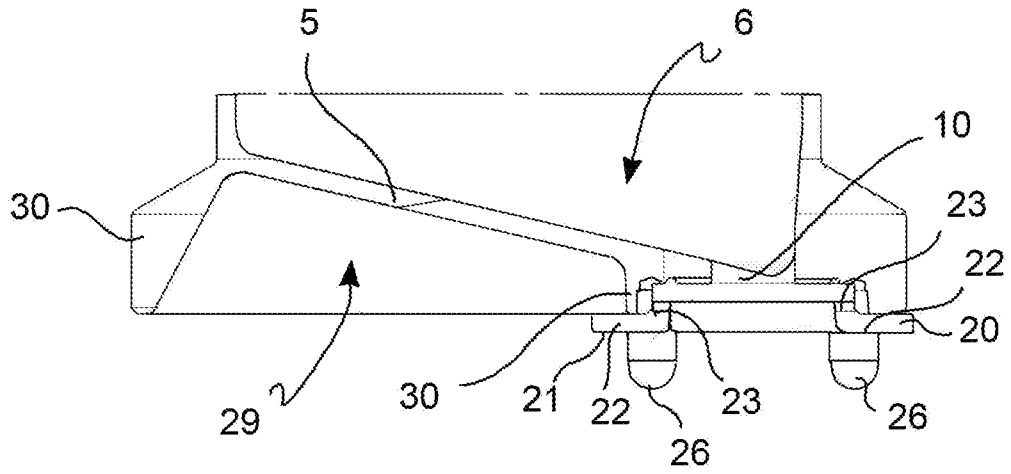
5
6
10
30
23
22
20
29
30
21
22
23
26
26

FIG. 10

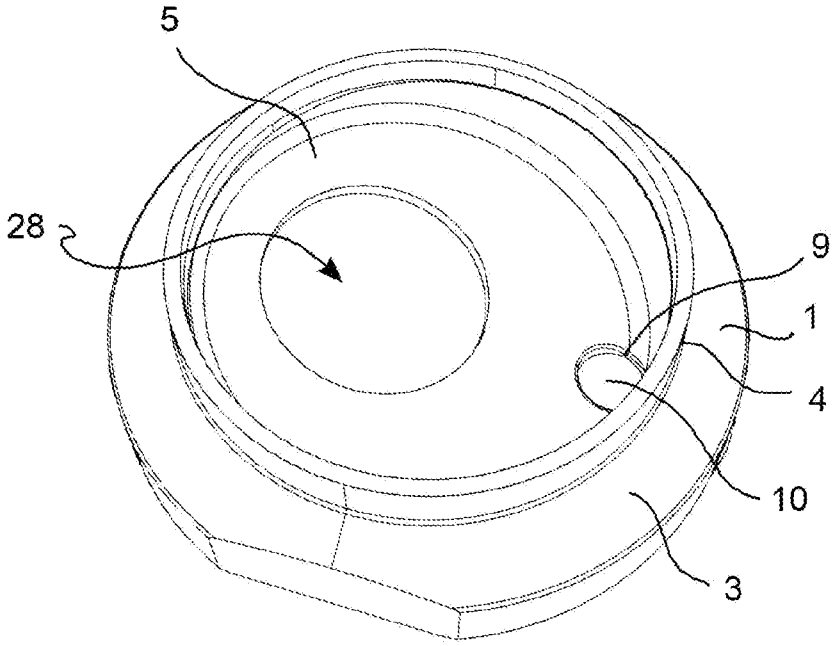

FIG. 11

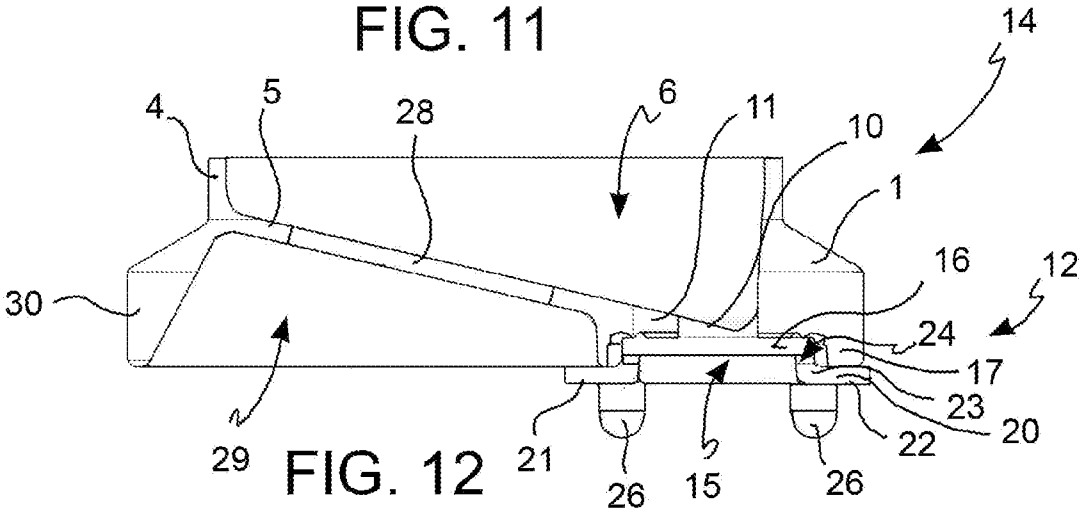

FIG. 12

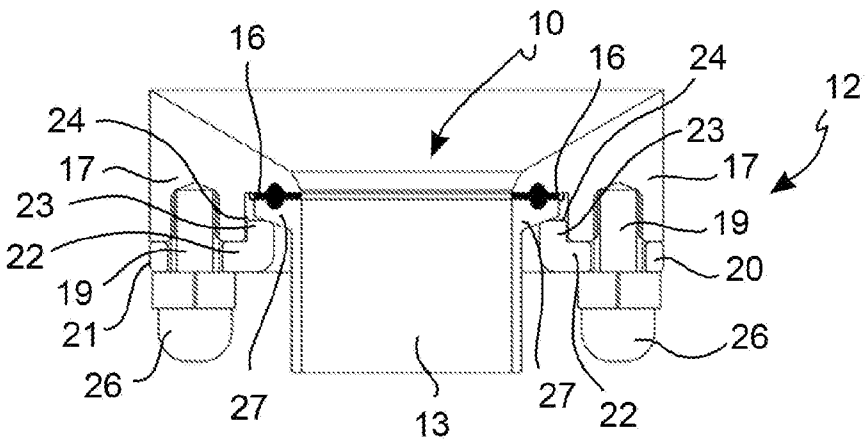

FIG. 13

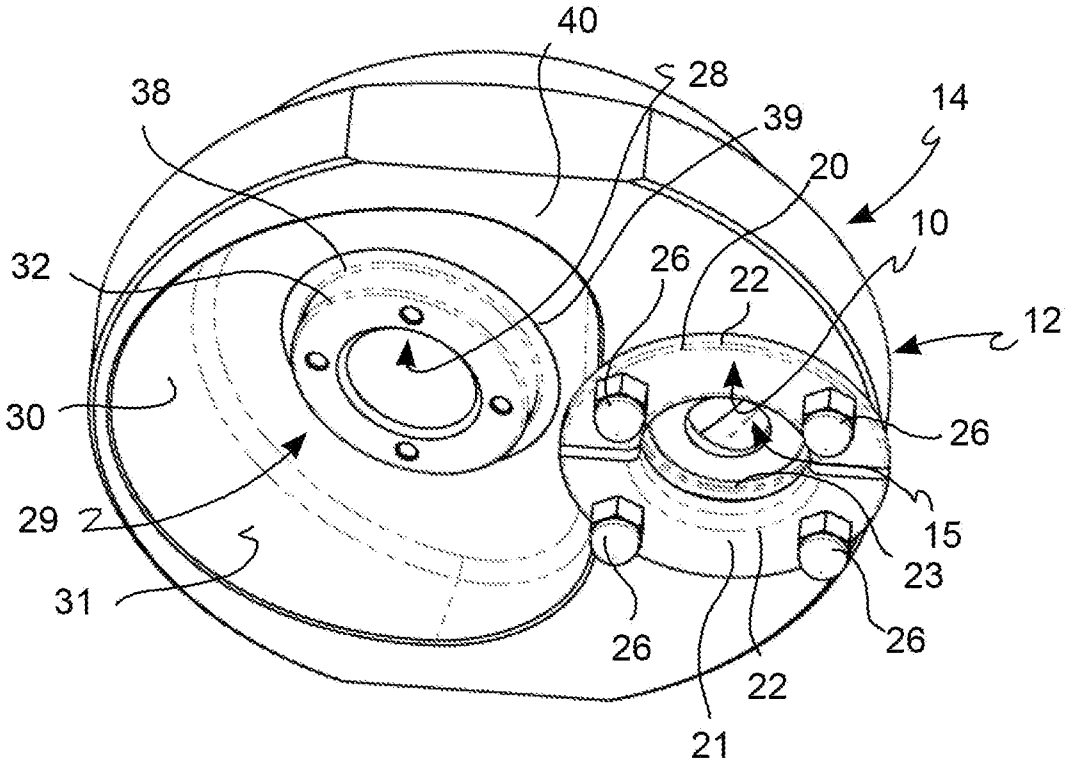
40
28
38
39
14
20
10
32
26
22
12
30
26
29
15
23
31
26
26
22
21

FIG. 14

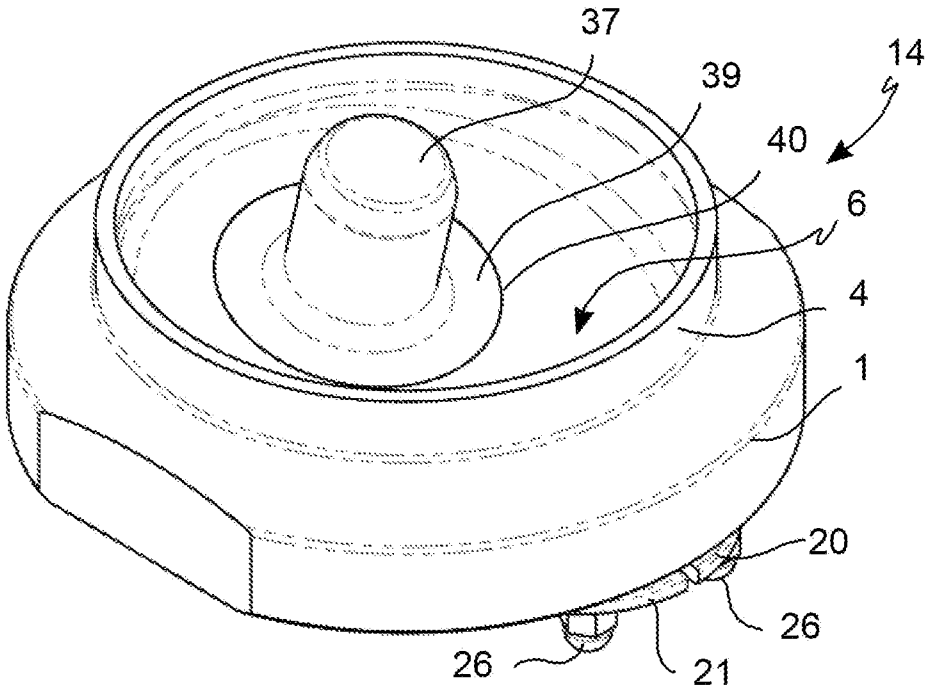
37
14
39
40
6
4
1
20
26
26
21

FIG. 15

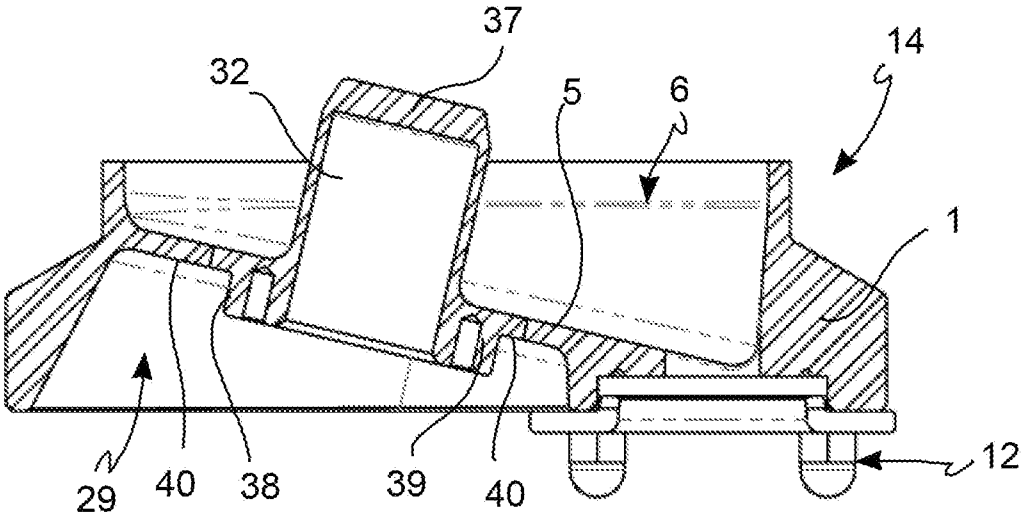

FIG. 16

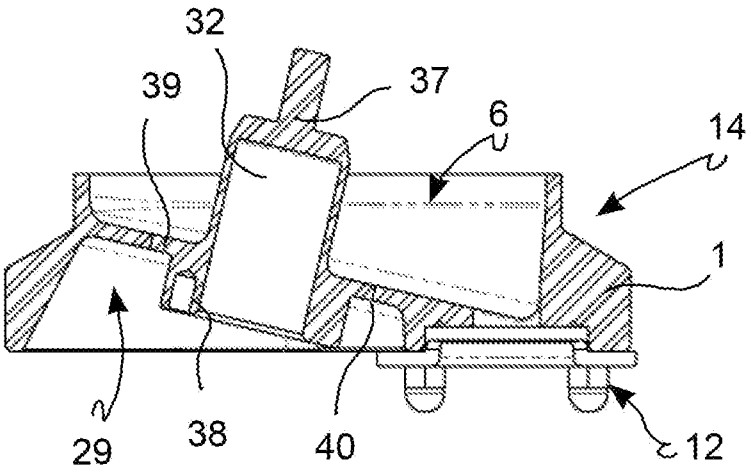

FIG. 17

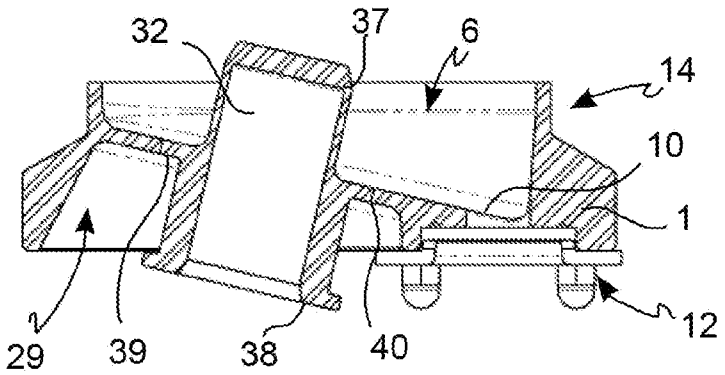

FIG. 18

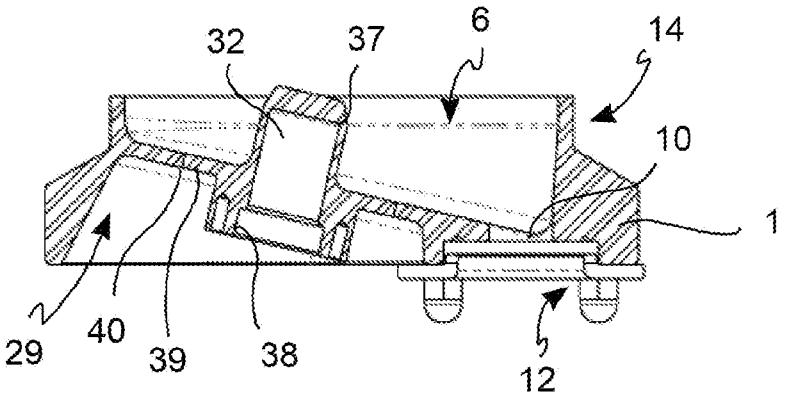

FIG. 19

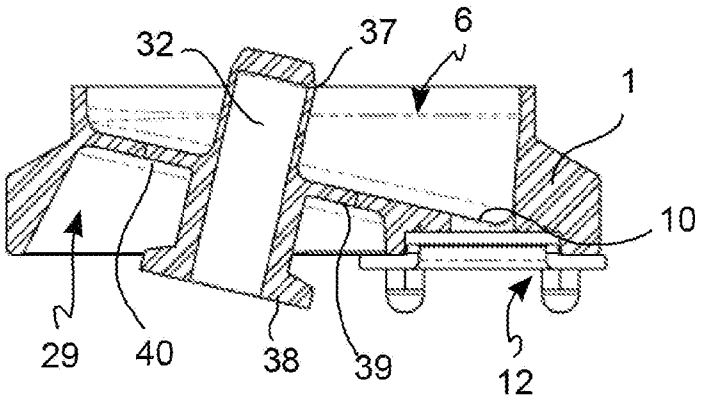

FIG. 20

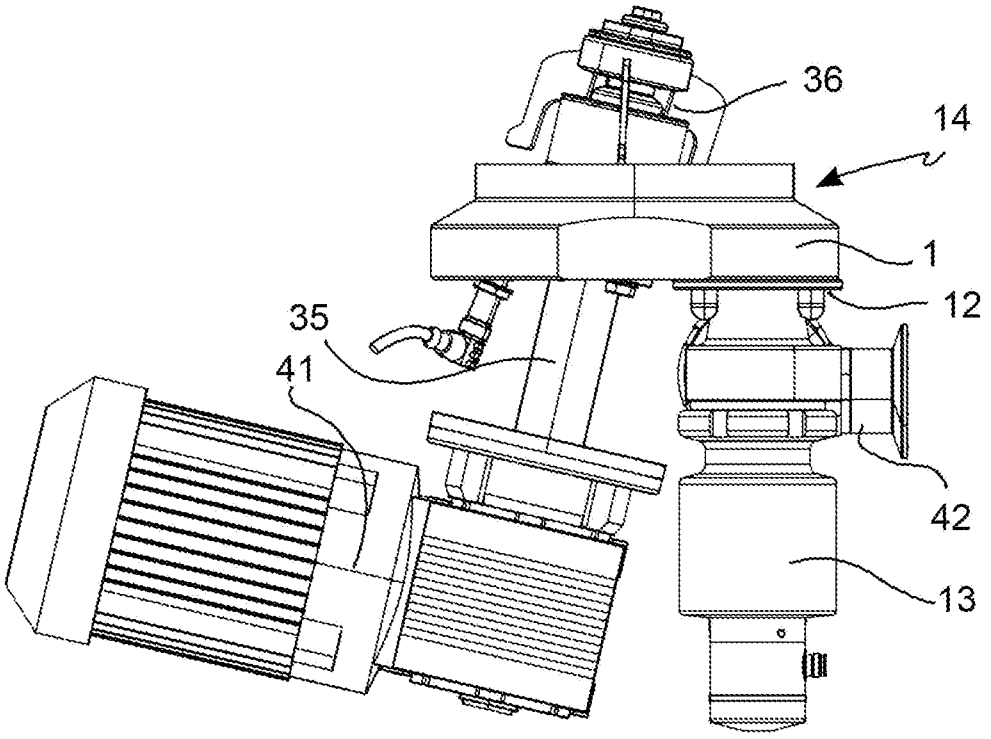

FIG. 21

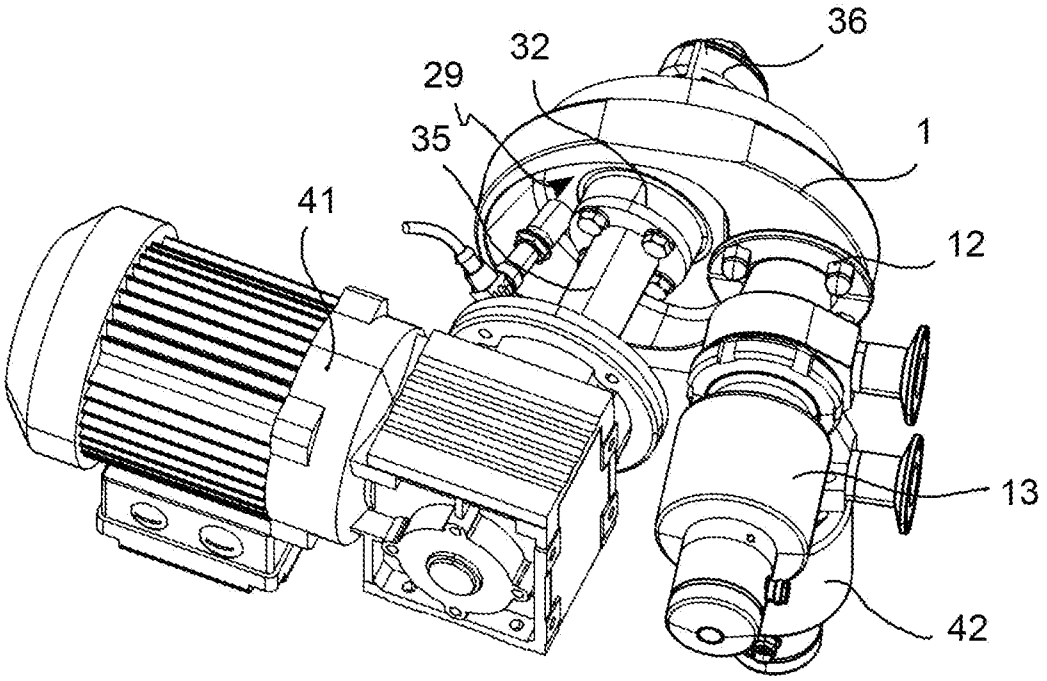

FIG. 22

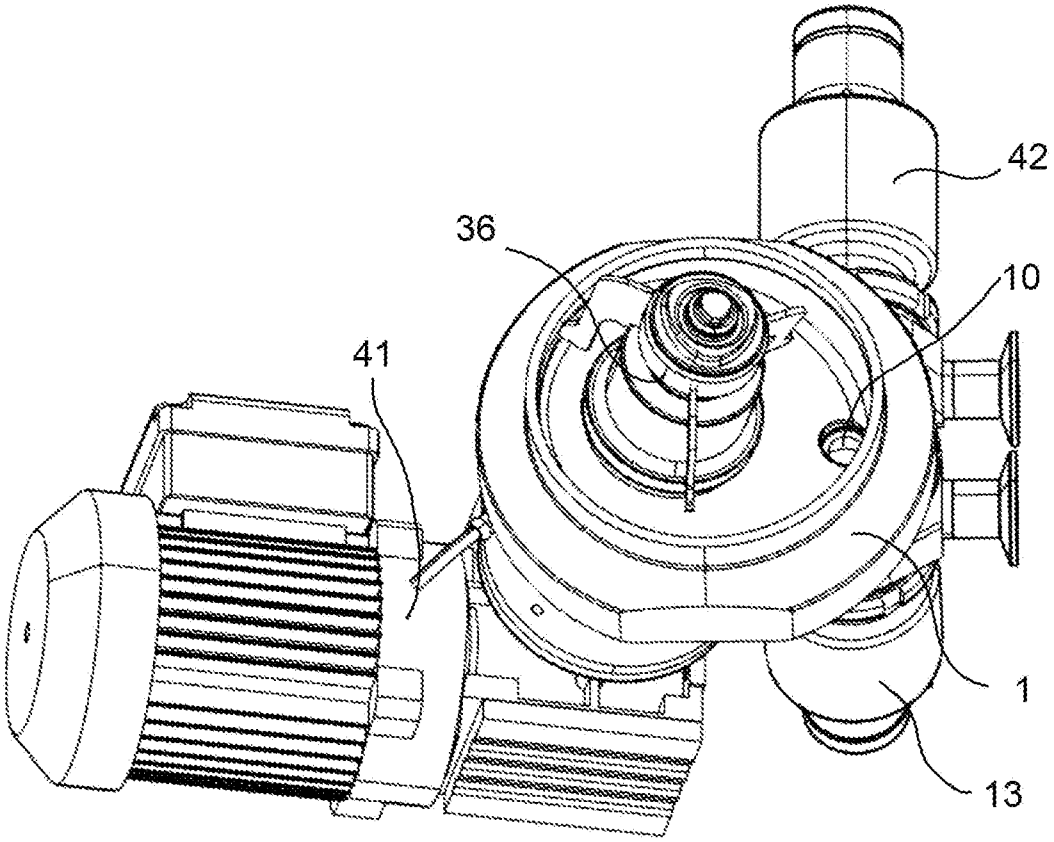

FIG. 23

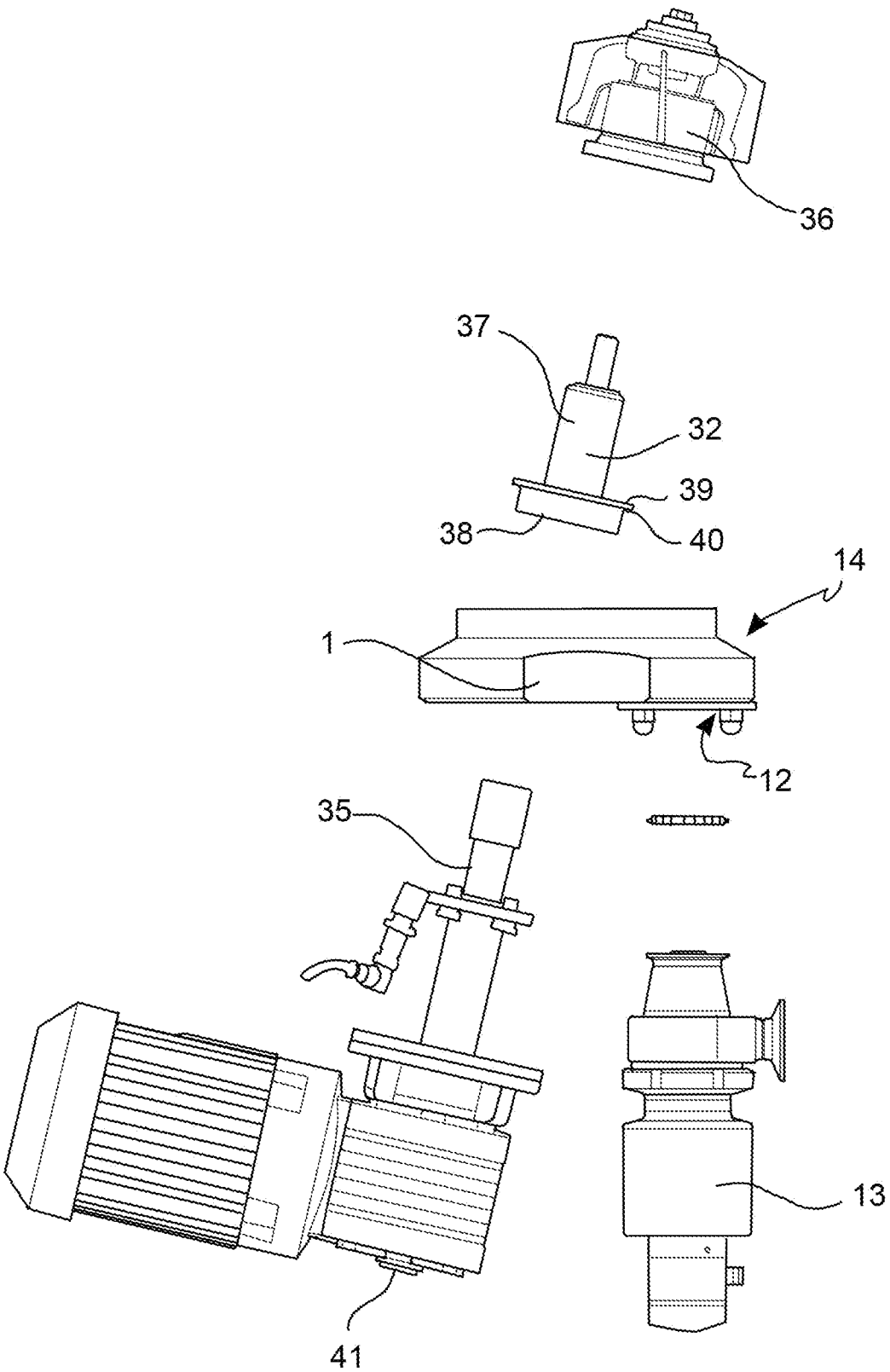

FIG. 24

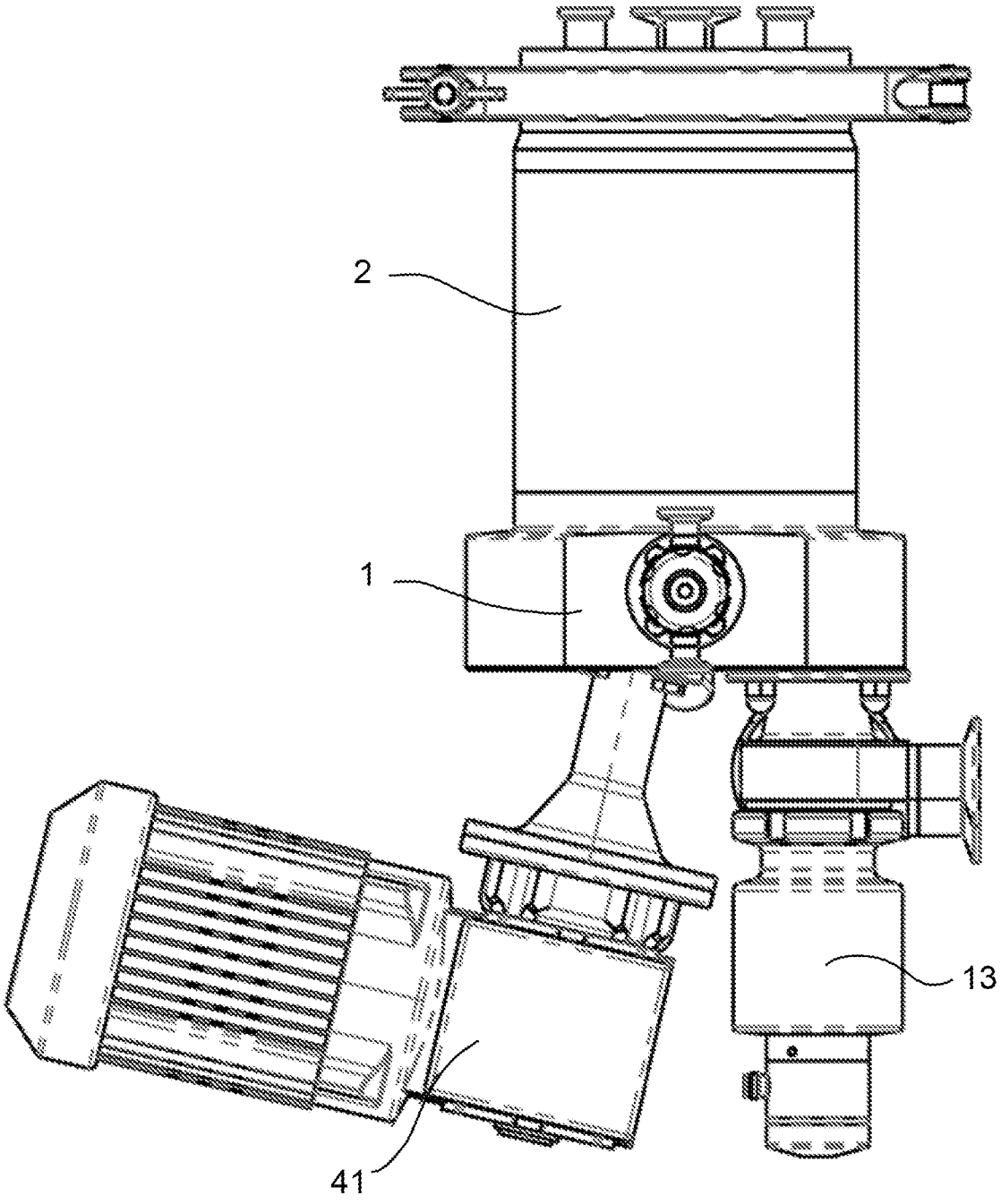

FIG. 25

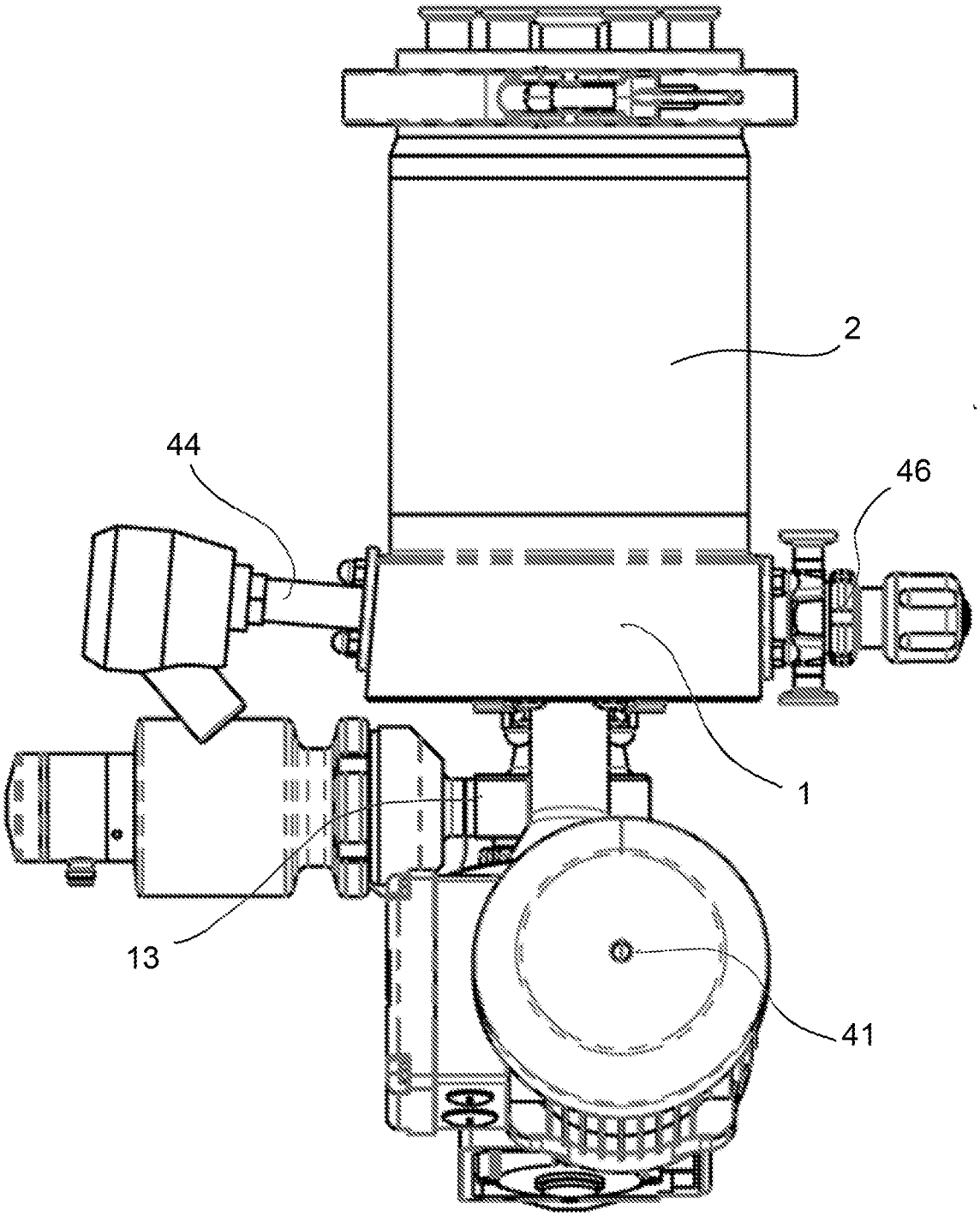

FIG. 26

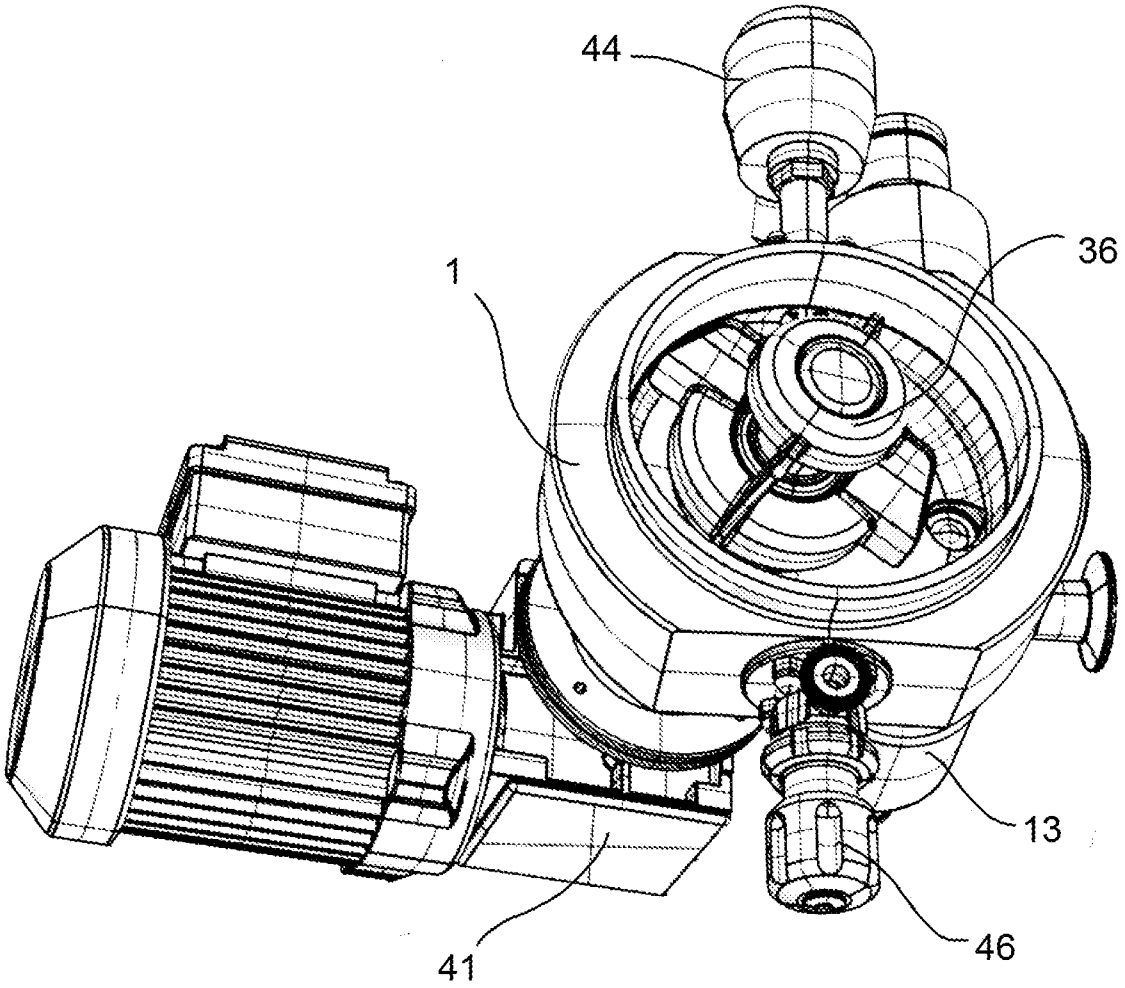

FIG. 27

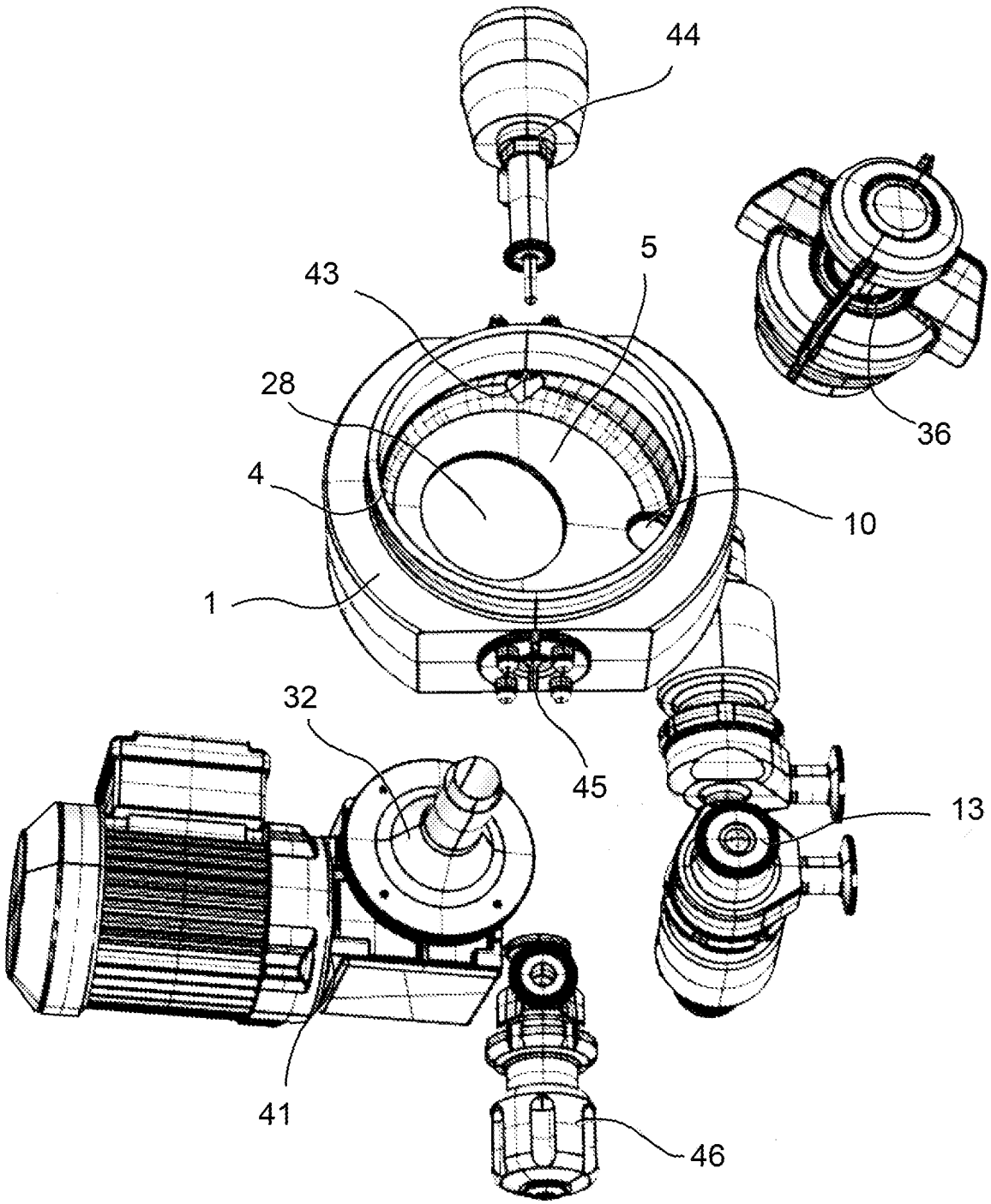

FIG. 28

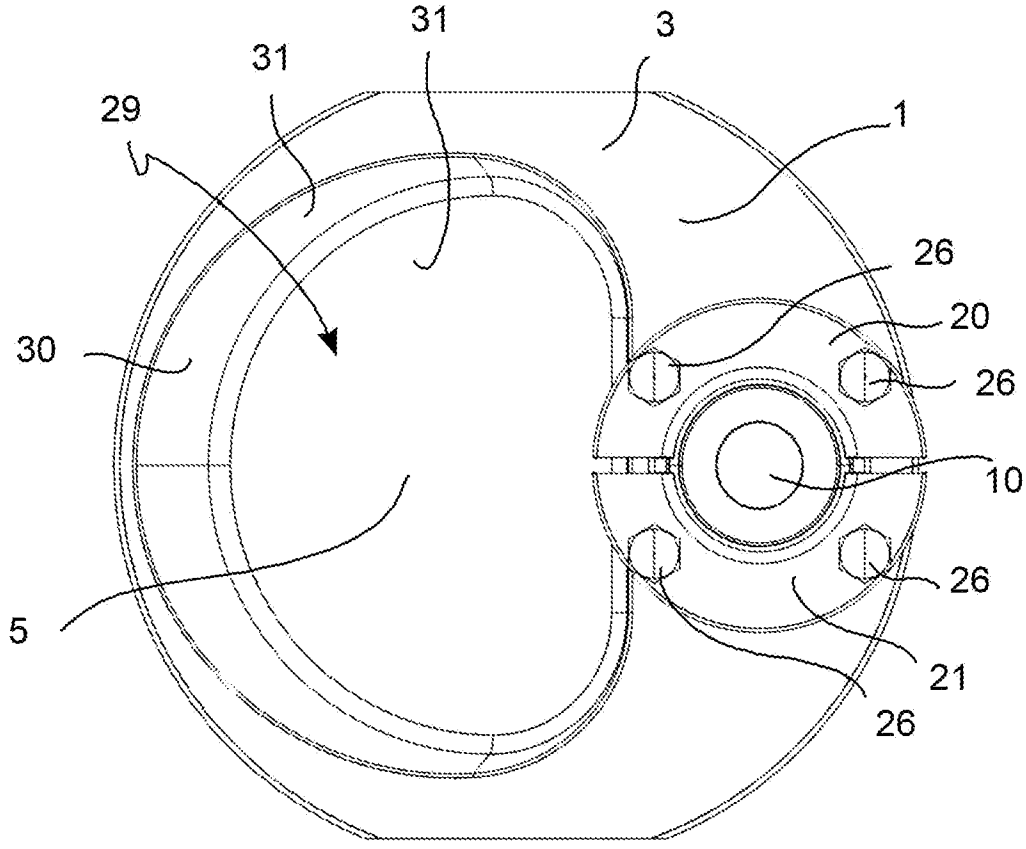

FIG. 9