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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
08 October 2020 (08.10.2020)

WIPO | PCT

(10) International Publication Number
WO 2020/201366 A1

(51) International Patent Classification:
F04B 17/03 (2006.01) *F04C 23/00* (2006.01)
F04B 23/02 (2006.01) *F04D 13/06* (2006.01)
F04B 35/00 (2006.01) *F04D 25/06* (2006.01)
F04C 11/00 (2006.01) *F04D 29/62* (2006.01)

(21) International Application Number:
PCT/EP2020/059276

(22) International Filing Date:
01 April 2020 (01.04.2020)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PA201970213 03 April 2019 (03.04.2019) DK

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

(54) Title: COMPRESSOR OR PUMP HOUSING ASSEMBLY AND METHOD OF ASSEMBLY OF A COMPRESSOR OR PUMP HOUSING

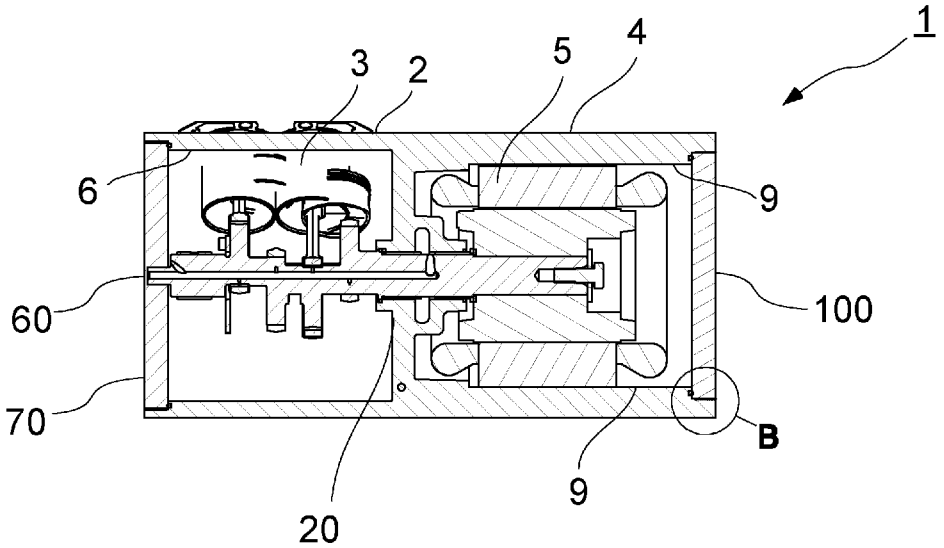

Fig. 3

(57) Abstract: The invention relates to a compressor or pump comprising a pump in a pump housing, a motor in a motor housing, which motor comprises a stator and a rotor and drives the pump by a common axle assembly, a pump end cover and a motor end cover, where end covers (7, 10) are assembled to pump- and/or motor housings (2, 4) or pump- and/or motor housings (2, 4) each having one closed end, which are assembled to each other by closure means consisting of a set of engagement means (13, 113, 213, 214), providing a sealed closure to the housing (2, 4). The invention further relates to a method of assembly of a compressor or pump housing.

WO 2020/201366 A1

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

COMPRESSOR OR PUMP HOUSING ASSEMBLY AND METHOD OF ASSEMBLY OF A COMPRESSOR OR PUMP HOUSING

The invention relates to a compressor or pump comprising a pump in a pump housing, a motor in a motor housing, which motor comprises a stator and a rotor and drives the pump by a common axle assembly, a pump end cover and a motor end cover.

The invention further relates to a method of assembly of end covers of a compressor or pump housing.

A compressor or pump, for example for use in relation to mobile transport reefer containers, normally is assembled by three or more parts, a main body containing piston and cylinder, crankshaft assembly and a motor body having a motor end cover.

At an opposite end of the motor body is a thin cover containing the oil pump assembly, A pump body, which at an end opposite the motor end, also can be provided with an end cover, here a pump end cover.

Normally these end covers are fastened to the motor and pump bodies or housings by means of a plurality of screws and/or bolts. Between the end covers and the motor or pump body is provided a gasket or seal to ensure that the joint does not leak.

The above parts are utilized to make one complete compressor including bolts, gaskets, washers, etc..

It is not unusual that 6 – 12 bolts have to be removed to be able to remove an end cover.

Further, when reassembling the pump or compressor, there is a need for even tightening of the bolts to achieve a leak tight connection.

Also, since machining lead to cost, it is desirable to provide a compressor or pump which can be assembled by using fewer items and in a more simple way.

The idea is to be able to carry out the joints between the above needed main parts, using less material and less machining cost, by use of different embodiments.

This is achieved by a compressor or pump where end covers are assembled to pump- and/or motor housings or pump- and/or motor housings each having one closed end, which are assembled to each other by closure means consisting of a set of engagement means, providing a sealed closure to the housing.

The set of engagement means may be a single set of engagement means.

In one embodiment, the first threading is positioned inside the housings at each end and the second threading is positioned at a rim or outer perimeter of a disc-shaped end closure. When the end closure is screwed into the pump or motor housing, the length of the threading is dimensioned according to the thickness of the end closure to achieve that when the end closure is screwed in place, the outer surface of the end closure is flush with the end of the housing.

Inside the housing, a stop or a ring having an inner diameter smaller than the inner diameter of the housing is provided. When mounting the end closure, the end closure abuts the stop which stop can be provided with sealing means, for example a flat ring-shaped gasket or by a groove formed at the end of the stop facing outwards, the groove being provided for accommodating an O-ring as a

sealing part. The O-ring placed in the groove will seal along an area close to the perimeter of the inner side of the end closure.

In an embodiment, the parts are assembled by a thread joint by having the thread on an outer side of a round going or circumferential flange extending from an inner side of the motor or pump end closure, and on an inner side of the pump and/or motor housing. The outer side of the round going or circumferential flange extending from the inner side of the motor or pump end closure, has an outer diameter corresponding to the inner side of the pump and/or motor housing in such a way that the threading can engage in a screw connection.

This is achieved by a compressor or pump housing assembly, where the set of engagement means, providing a sealed closure to the housing is mutual engaging threads, a first threading positioned inwards the housing and a second threading positioned at a circumference or an outer side of a round going or circumferential flange extending from an inner side of the motor or pump end closure.

In another embodiment the parts are assembled by a thread joint by having the thread on an inner side of protruding parts of a round going flange extending from an outer side of the motor or pump end closure or extending from a rim or circumference of the motor or pump end closure, and on an outer side of the pump and/or motor housing. The inner side of the protruding parts of the round going flange extending from the outer side of the motor or pump end closure or extending from the rim or circumference of the motor or pump end closure, has an inner diameter corresponding to the outer side of the pump and/or motor housing in such a way that the threading can engage in a screw flare connection.

This is achieved by a compressor or pump housing assembly, where the set of engagement means, providing a sealed closure to the housing is mutual engaging threads, a first threading positioned outwards the housing and a second threading positioned on an inner side of a protruding circumference or an inner side of a protruding part of a round going or circumferential flange extending from an outer side of the motor or pump end closure or extending from a rim or circumference of the motor or pump end closure.

In another embodiment, the end closures are mounted to the pump housing and/or motor housing by a press fit connection.

This is achieved by a compressor or pump housing assembly, where the set of engagement means, providing a sealed closure to the housing is a press fit between an inwardly facing area in the housing and an area positioned at a circumference or an outer side of a round going or circumferential flange extending from an inner side of the motor or pump end closure.

In another embodiment, a locked press fit is used to assemble a motor end closure to a motor housing and a pump end closure to a pump housing. As an additional securing feature, a groove can be provided in an inner side of the motor housing or in an inner side of the pump housing. A locking mechanism formed by a notch extending from an outer circumference of a round going or circumferential and extending flange of the motor- or pump closure, for engagement into the groove of the motor or pump housing, can further cause that the closure is held in place, and the pump or compressor unit is kept sealed. A sealing ring, for example an O-ring can be placed at an end of the pump- and/or motor housing, providing a sealed closing, securing that oil is kept in place within the housing.

All the above joint methods are shown as inside press fit or thread joints but could likewise be outside press fit or outside thread or flare joints as well as combinations of same.

This is achieved by a compressor or pump housing assembly, where the set of engagement means, providing a sealed closure to the housing is a snap fit between an inwardly facing groove in the housing and a protruding hook-member positioned at a circumference or an outer side of a round going or circumferential flange extending from an inner side of the motor or pump end closure.

In another series of embodiments, the assembly of end covers to the pump and/or motor housing can be carried out in a middle part of the pump or compressor.

Here, for example the pump housing is formed as a cylindrical part with an open end pointing towards the motor housing and a closed end pointing away from the motor housing. The motor housing is also formed with as a cylindrical part with an open end pointing towards the pump housing and a closed end pointing away from the pump housing.

An outer diameter of the cylindrical motor housing corresponds to an inner diameter of the cylindrical pump housing.

A console carrying the axle is placed within the pump housing, the console having an outer diameter corresponding to the inner diameter of the pump housing.

At the end of the console pointing towards the open end of the pump housing, a groove is provided for accommodating an O-ring as a sealing part.

To provide an assembly of the pump housing and the motor housing, the open ends are pointed towards each other and the pump housing is on the inner side of the open end provided with threading and the motor housing is on its outer side of the open end provided with a mutual formed threading, thereby making a thread joint.

This is achieved by a compressor or pump housing assembly, where the pump housing and the motor housing each having one closed end and an open end where the set of engagement means, providing a sealed closure to the housing, is mutual engaging threads, a first threading positioned inwards the open end of the pump housing and a second threading positioned at a perimeter or an outer side at the open end of the motor housing.

In an embodiment the motor housing and pump housing is not provided with threading and the assembly is performed by pressing the motor housing into the pump housing by a press fit.

This is achieved by a compressor or pump housing assembly, where the pump housing and the motor housing each having one closed end and an open end where the set of engagement means, providing a sealed closure to the housing is a press fit between an inwardly facing area in the pump housing and an area positioned at a circumference at the open end of the motor housing.

In an embodiment the press fit is further provided with a locking mechanism formed by a notch extending from an outer circumference of the open end of the motor housing, for engagement into a groove on the inner side of the open end of the pump housing. The notch and groove can further cause that the parts are held in place, and the pump or compressor unit is kept sealed.

This is achieved by a compressor or pump housing assembly, where the pump housing and the motor housing each having one closed end and an open end

where the set of engagement means, providing a sealed closure to the housing is a snap fit between an inwardly facing groove in the pump housing and a protruding hook-member positioned at a circumference at the open end of the motor housing.

The last embodiments are directed to a solution where the respective pump housing and motor housing can be joined and thereby at the same time form the end covers, which due to their construction can be assembled using fewer parts than usual.

In the above, the embodiments are described where the motor housing is inserted into the pump housing and the dimensions are adjusted accordingly. It is clear that a solution where the pump housing is inserted into the motor housing is an alternative why the invention should also cover this embodiment.

Hereby also a method of assembling of a compressor or pump comprising a pump in a pump housing, a motor in a motor housing, which motor comprises a stator and a rotor and drives the pump by a common axle assembly, a pump end cover and a motor end cover is provided, where end covers are assembled to pump- and/or motor housings or pump- and/or motor housings each having one closed end, which are assembled to each other by closure means consisting of a set of engagement means providing a sealed closure to the housing.

The set of engagement means may be a single set of engagement means.

Additionally, one or more joints or main body part should contain a part or device designed in such a way that this joint, part, area, location or disk will be the primary burst part, should the pressure in the system and compressor reach a level higher than the safety pressure, i.e. 100°C, which is substantially

above the maximum test pressure (equivalent to 40 bar(g) of R134a, 17% higher than maximum test pressure and 63% lower than burst pressure).

This burst area could be in the form of a disk, round/oval or otherwise circular area, decreased wall thickness and/or porous material or similar method that will cause this exact part to burst prior to other parts of the compressor, such as cylinder heads, bolts, brazing or copper pipes.

The above and other features and advantages of the present invention will become readily apparent to those skilled in the art by the following detailed description of exemplary embodiments thereof with reference to the attached drawings, in which:

Figure 1 shows a cross sectional view along a middle axis of a vacuum pump;

Figure 2 shows an enlarged view of section A, marked with a circle in figure 1;

Figure 3 shows a cross sectional view along a middle axis of an embodiment of a vacuum pump;

Figure 4 shows an enlarged view of section B, marked with a circle in figure 3;

Figure 5 shows a cross sectional view along a middle axis of an embodiment of a vacuum pump;

Figure 6 shows an enlarged view of section C, marked with a circle in figure 5;

Figure 7 shows a cross sectional view along a middle axis of an embodiment of a vacuum pump;

Figure 8 shows an enlarged view of section D, marked with a circle in figure 7;

Figure 9 shows a cross sectional view along a middle axis of an embodiment of a vacuum pump;

Figure 10 shows an enlarged view of section E, marked with a circle in figure 9;

Figure 11 shows a cross sectional view along a middle axis of an embodiment of a vacuum pump;

Figure 12 shows an enlarged view of section F, marked with a circle in figure 11;

Figure 13 shows a cross sectional view along a middle axis of an embodiment of a vacuum pump; and

Figure 14 shows an enlarged view of section G, marked with a circle in figure 13.

Various embodiments are described hereinafter with reference to the figures. Like reference numerals refer to like elements throughout. Like elements will, thus, not be described in detail with respect to the description of each figure.

It should also be noted that the figures are only intended to facilitate the description of the embodiments.

They are not intended as an exhaustive description of the claimed invention or as a limitation on the scope of the claimed invention. In addition, an illustrated embodiment needs not have all the aspects or advantages shown.

An aspect or an advantage described in conjunction with a particular embodiment is not necessarily limited to that embodiment and can be practiced in any other embodiments even if not so illustrated, or if not so explicitly described.

Throughout, the same reference numerals are used for identical or corresponding parts.

A compressor or pump 1 comprising a pump 3 in a pump housing 2, a motor 5 in a motor housing 4, which motor 5 comprises a stator and a rotor and drives the pump 3 by a common axle assembly 20. An embodiment is shown in Figure 1, where the pump housing 2 and the motor housing 4 is formed as a cylindrical part with open ends. At each end, the housing is provided with a respective cover 7, 10, the pump housing 2 with a pump end cover 7 and the motor housing 4 with a motor end cover 10.

The end covers 7, 10 can be mounted to the housings 2, 4 by a thread joint 13 by having the thread 13 on an outer side of a round going or circumferential flange 8, 11 extending in longitudinal direction of the pump or motor housing 2, 4 from an inner side of the pump or motor end closure 7, 10, and on an inner side 6, 9 of the pump and/or motor housing. The outer side of the round going or circumferential flange 8, 11 extending from the inner side of the pump or motor end closure 7, 10, has an outer diameter corresponding to the inner side 6, 9 of the pump and/or motor housing 2, 4 in such a way that the threading 13 can engage in a screw connection.

A sealing ring 12, for example an O-ring can be placed in a groove 14 at an end of the pump- and/or motor housing 2, 4, providing a sealed closing, securing that oil is kept in place within the housing 2, 4.

The end covers 7, 10 can be mounted to the housings 2, 4 by a thread joint 13 by having the thread 13 on an inner side of a protruding part of a round going flange 8, 11 extending in longitudinal direction of the pump or motor housing 2, 4 from an outer side of the pump or motor end closure 7, 10, or extending from a rim or circumference of the motor or pump end closure 7, 10 and on an outer side of the pump and/or motor housing 2, 4. The inner side of the protruding part of the round going or circumferential flange 8, 11 extending from the outer side of the pump or motor end closure 7, 10 or extending from the rim or circumference of the motor or pump end closure 7, 10, has an inner diameter corresponding to the outer side of the pump and/or motor housing 2, 4 in such a way that the threading 13 can engage in a screw flare connection.

In an embodiment, the first threading 13 is positioned inside the housings 2, 4 at each end and the second threading 23 is positioned at a rim or outer perimeter of a disc-shaped end closure. When the end closure is screwed into the pump or motor housing, the length of the threading is dimensioned according to the thickness of the end closure to achieve that when the end closure is screwed in place, the outer surface of the end closure is flush with the end of the housing.

Inside the housing, a stop or a ring having a diameter smaller than the diameter of the housing is provided. When mounting the end closure, the end closure abuts the stop which stop can be provided with sealing means, for example a flat ring-shaped gasket or by a groove formed at the end of the stop facing outwards, the groove being provided for accommodating an O-ring as a sealing part. The O-ring placed in the groove will seal along an area close to the perimeter of the inner side of the end closure.

In an embodiment, the end closures 7, 10 are mounted to the pump housing 2 and/or motor housing 4 by a press fit connection 113. Here the inner sides 6, 9 of the pump- and motor housing 2, 4 at their open ends are not provided with

threading, but manufactured with a tolerance in relation to the outer diameter of the round going or circumferential flanges 8, 11 extending in longitudinal direction of the pump or motor housing 2, 4 from an inner side of the pump or motor end closure 7, 10 giving a press fit when pressed together.

In another embodiment, a locked press fit is used to assemble a motor end closure to a motor housing and a pump end closure to a pump housing. As an additional securing feature, a groove can be provided in an inner side of the motor housing or in an inner side of the pump housing. A locking mechanism formed by a notch extending from an outer circumference of a round going or circumferential and extending flange of the motor- or pump closure, for engagement into the groove of the motor or pump housing, can further cause that the closure is held in place, and the pump or compressor unit is kept sealed. A sealing ring, for example an O-ring can be placed in a groove at an end of the pump- and/or motor housing, providing a sealed closing, securing that oil is kept in place within the housing.

All the above joint methods are shown as inside press fit or thread joints but could likewise be outside press fit or thread or flare joints as well as combinations of same.

Outside press fit or thread or flare joints should be understood as solutions where an outside part of the pump housing 2 and/or motor housing 4 are used for the assembly together with an inside part of a protruding flange 8, 11 extending from a rim or circumference of the of the motor or pump end closure 7, 10.

In another series of embodiments as shown in Figures 3, 4, 7, 8, 11 and 12, the assembly of end covers to the pump and/or motor housing can be carried out in a middle part of the pump or compressor 1.

Here, for example the pump housing 2 is formed as a cylindrical part with an open end pointing towards the motor housing 4 and a closed end 21 pointing away from the motor housing. The motor housing 4is also formed as a cylindrical part with an open end pointing towards the pump housing 2 and a closed end 22 pointing away from the pump housing 2.

An outer diameter of the cylindrical motor housing 4 corresponds to an inner diameter of the cylindrical pump housing 2.

A console 24 carrying the axle 20 is placed within the pump housing 2, the console 24 having an outer diameter corresponding to the inner diameter of the pump housing 2.

At the end of the console 24 pointing towards the open end of the pump housing 2, a groove 14 is provided for accommodating an O-ring as a sealing part 12.

Figure 3 shows an embodiment of an assembly of the pump housing 2 and the motor housing 4, where the open ends are pointed towards each other and the pump housing 2 is on the inner side 6 of the open end provided with threading and the motor housing 4 is on its outer side of the open end provided with a mutual formed threading, thereby making a thread joint.

In an embodiment, shown in Figure 7, the motor housing 4 and pump housing 2 is not provided with threading and the assembly is performed by pressing the motor housing 4 into the pump housing 2 by a press fit.

In an embodiment, shown in Figure 11, the press fit is further provided with a locking mechanism formed by a notch 214 extending from an outer circumference of the open end of the motor housing 4, for engagement into a groove 213 on the inner side of the open end of the pump housing 2. The notch

214 and groove 213 can further cause that the parts are held in place, and the pump or compressor unit 1 is kept sealed. This assembly is called a snap fit, since the parts simply snap together forming an assembly easy to put together, but still having a sufficient locking effect to keep the parts together in a sealed manner.

The last embodiments are directed to a solution where the respective pump housing and motor housing can be joined and thereby at the same time form the end covers, which due to their construction can be assembled using fewer parts than usual.

In the above, the embodiments are described where the motor housing 4 is inserted into the pump housing 2 and the dimensions are adjusted accordingly. It is clear that a solution where the pump housing 2 is inserted into the motor housing 4 is an alternative, why the invention should also cover this embodiment.

Additionally, one or more joints or main body part should contain a part or device designed in such a way that this joint, part, area, location or disk will be the primary burst part, should the pressure in the system and compressor reach a level higher than the safety pressure, i.e. 100°C, which is substantially above the maximum test pressure (equivalent to 40 bar(g) of R134a, 17% higher than maximum test pressure and 63% lower than burst pressure).

This burst area (not shown) could be in the form of a disk, round/oval or otherwise circular area, decreased wall thickness and/or porous material or similar method that will cause this exact part to burst prior to other parts of the compressor, such as cylinder heads, bolts, brazing or copper pipes.

CLAIMS

1. A compressor or pump comprising a pump in a pump housing, a motor in a motor housing, which motor comprises a stator and a rotor and drives the pump by a common axle assembly, a pump end cover and a motor end cover, **characterized in that** end covers (7, 10, 70, 100) are assembled to pump- and/or motor housings (2, 4), or pump- and/or motor housings (2, 4) each having one closed end, which are assembled to each other by closure means consisting of a set of engagement means (13, 23, 113, 213, 214), providing a sealed closure to the housing (2, 4).

2. A compressor or pump housing assembly according to claim 1, where the set of engagement means, providing a sealed closure to the housing (2, 4) is mutual engaging threads (13, 23), a first threading (13) positioned inwards the housing (2, 4) and a second threading (23) positioned at a rim or outer perimeter of a disc-shaped end closure.

3. A compressor or pump housing assembly according to claim 1, where the set of engagement means, providing a sealed closure to the housing (2, 4) is mutual engaging threads (13, 23), a first threading (13) positioned inwards the housing (2, 4) and a second threading (23) positioned at a circumference or an outer side of a round going or circumferential flange (8, 11) extending from an inner side of the motor or pump end closure (7, 10).

4. A compressor or pump housing assembly according to claim 1, where the set of engagement means, providing a sealed closure to the housing (2, 4) is mutual engaging threads (13, 23), a first threading (13) positioned inwards the housing (2, 4) and a second threading (23) positioned at a circumference or an outer side of a round going or circumferential flange (8, 11) extending from an inner side of the motor or pump end closure (7, 10).

5. A compressor or pump housing assembly according to claim 1, where the set of engagement means, providing a sealed closure to the housing (2, 4) is mutual engaging threads (13), a first threading positioned outwards the housing (2, 4) and a second threading positioned on an inner side of a protruding circumference or an inner side of a protruding part of a round going or circumferential flange (8, 11) extending from an outer side of the motor or pump end closure (7, 10) or extending from a rim or circumference of the motor or pump end closure (7, 10).

6. A compressor or pump housing assembly according to claim 1, where the set of engagement means, providing a sealed closure to the housing is a press fit (113) between an inwardly facing area in the housing (2, 4) and an area positioned at a circumference or an outer side of a round going or circumferential flange (8, 11) extending from an inner side of the motor or pump end closure (7, 10).

7. A compressor or pump housing assembly according to claim 1, where the set of engagement means, providing a sealed closure to the housing (2, 4) is a snap fit between an inwardly facing groove (213) in the housing (2, 4) and a protruding hook-member (214) positioned at a circumference or an outer side of a round going or circumferential flange (8, 11) extending from an inner side of the motor or pump end closure (7, 10).

8. A compressor or pump housing assembly according to claim 1, wherein the pump housing (2) and the motor housing (4) each having one closed end (21, 22) and an open end where the set of engagement means, providing a sealed closure to the housing, is mutual engaging threads (13), a first threading positioned inwards the open end of the pump housing (2) and a second threading positioned at a perimeter or an outer side at the open end of the motor housing (4).

9. A compressor or pump housing assembly according to claim 1, wherein the pump housing (2) and the motor housing (4) each having one closed end (21, 22) and an open end where the set of engagement means, providing a sealed closure to the housing (2, 4) is a press fit between an inwardly facing area in the pump housing (2) and an area positioned at a circumference at the open end of the motor housing (4).

10. A compressor or pump housing assembly according to claim 1, wherein the pump housing (2) and the motor housing (4) each having one closed end (21, 22) and an open end where the set of engagement means, providing a sealed closure to the housing (2, 4) is a snap fit between an inwardly facing groove in the pump housing (2) and a protruding hook-member positioned at a circumference at the open end of the motor housing (4).

11. Method of assembling of a compressor or pump comprising a pump in a pump housing, a motor in a motor housing, which motor comprises a stator and a rotor and drives the pump by a common axle assembly, a pump end cover and a motor end cover, where end covers (7, 10, 70, 100) are assembled to pump- and/or motor housings (2, 4), or pump- and/or motor housings (2, 4) each having one closed end, which are assembled to each other by closure means consisting of a set of engagement means (13, 23, 113, 213, 214), providing a sealed closure to the housing (2, 4).

12. Method according to claim 11, wherein the closure means consisting of a set of engagement means (13, 23, 113, 213, 214), providing a sealed closure to the housing (2, 4) is provided by a first threading (13) positioned inside the housing (2, 4) and a second threading (23) positioned on an end cover (7, 10, 70, 100).

13. Method according to claim 11, wherein the closure means consisting of a set of engagement means (13, 23, 113, 213, 214), providing a sealed closure to the housing (2, 4) is provided by a press fit.

14. Method according to claim 11, wherein the closure means consisting of a set of engagement means (13, 23, 113, 213, 214), providing a sealed closure to the housing (2, 4) is provided by a snap fit.

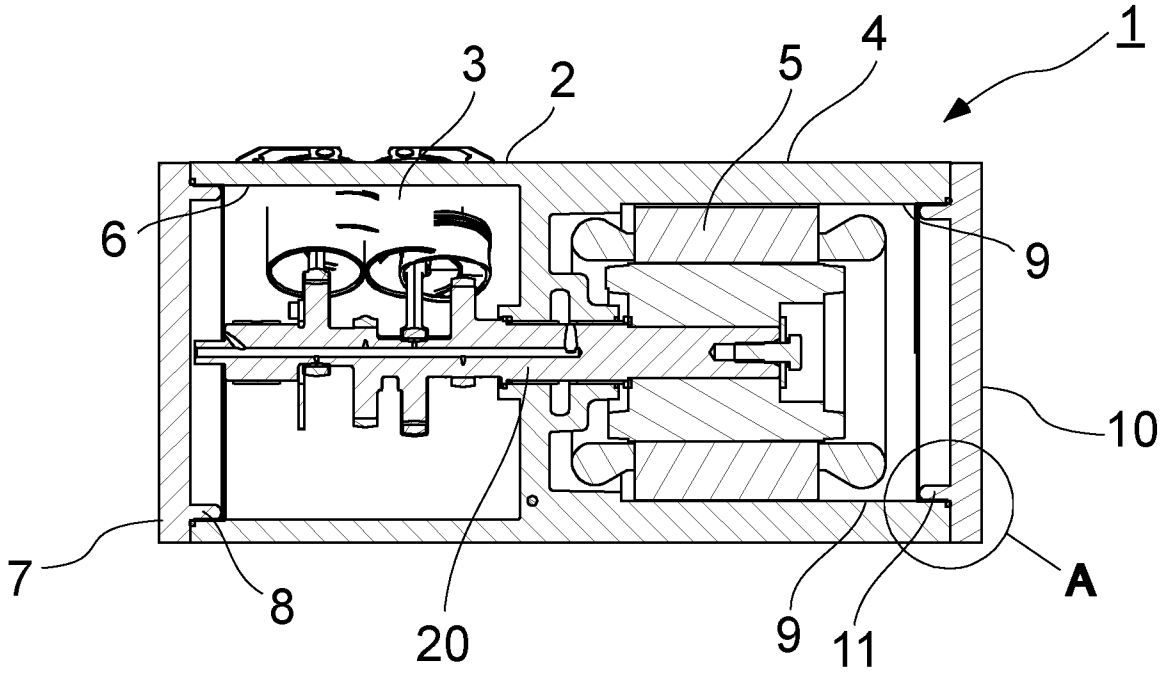


Fig. 1

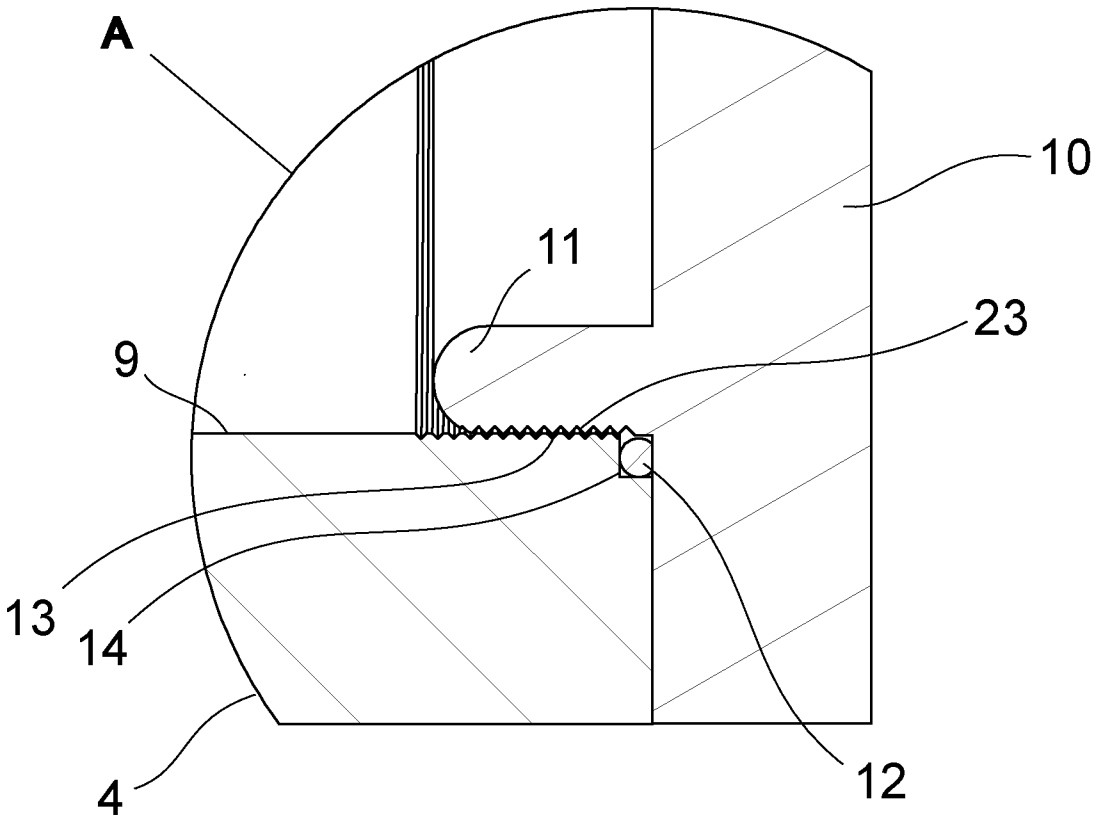


Fig. 2

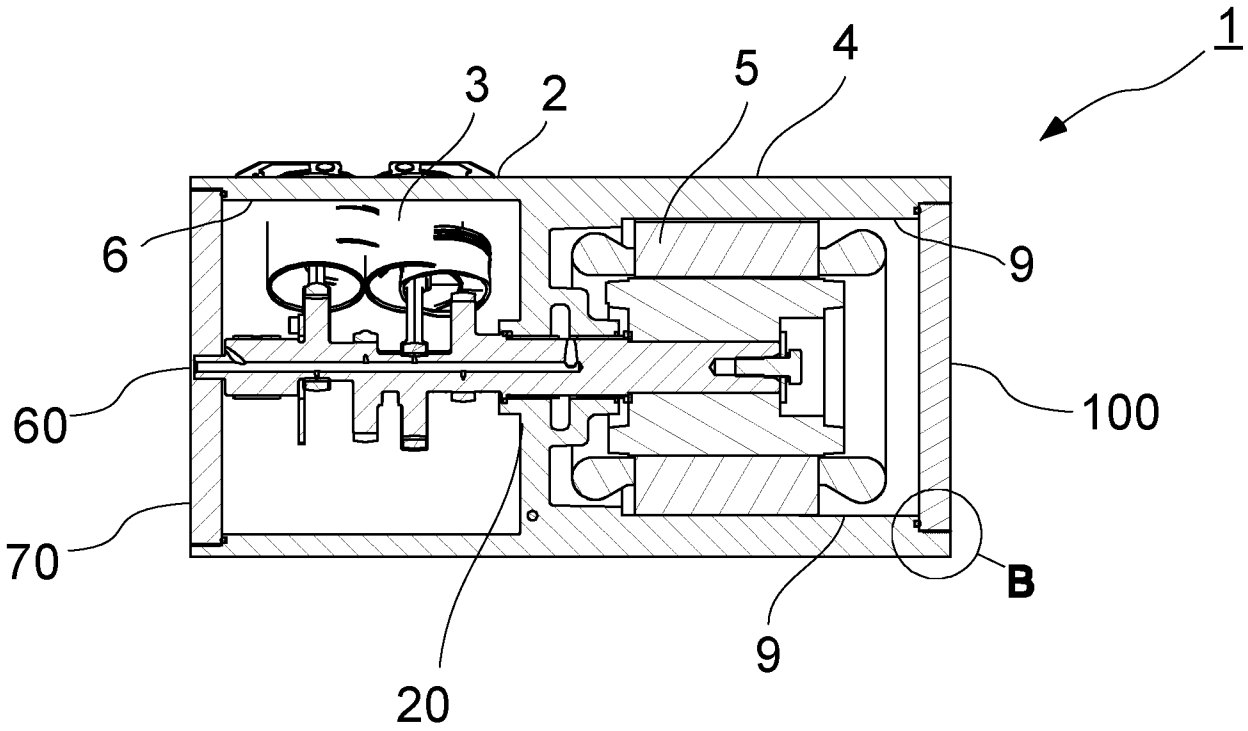


Fig. 3

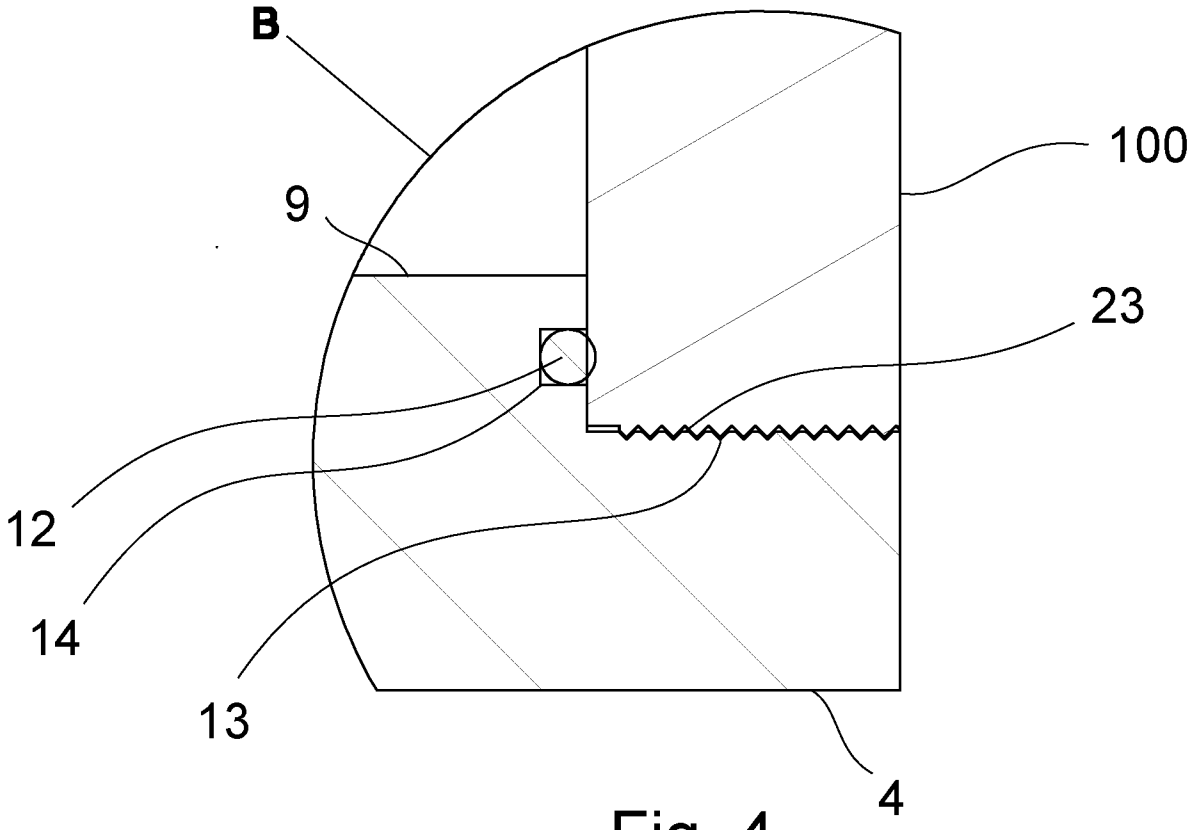


Fig. 4

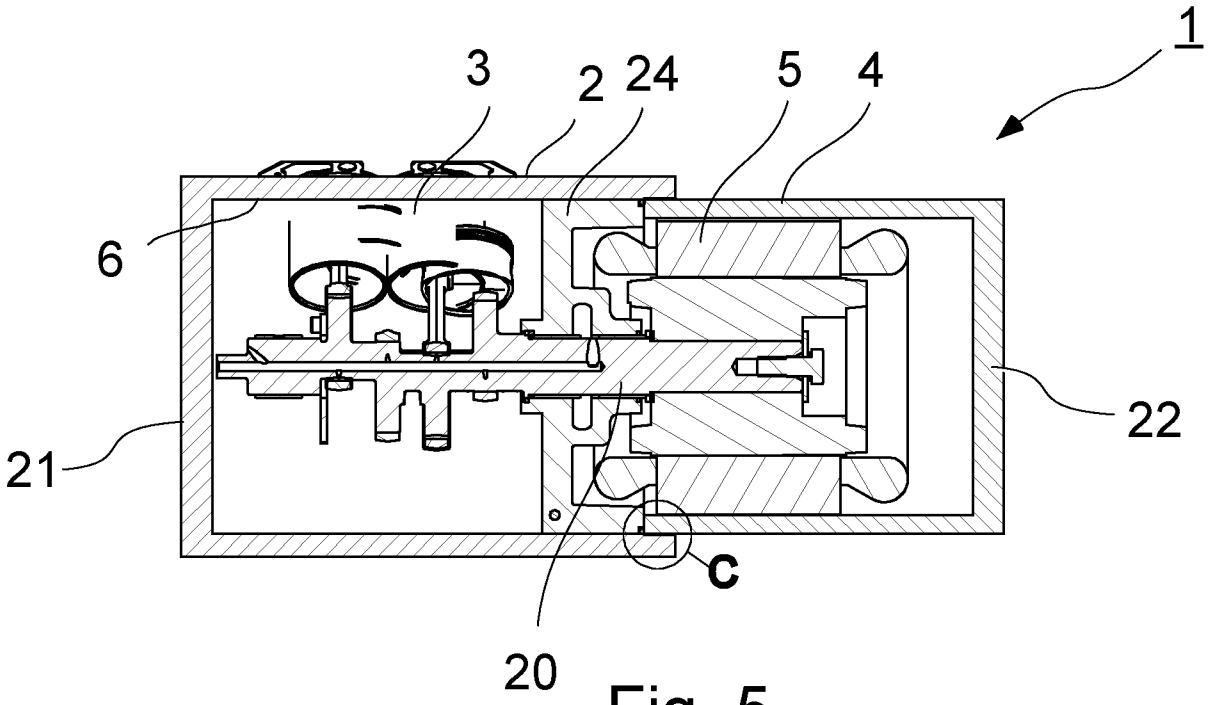


Fig. 5

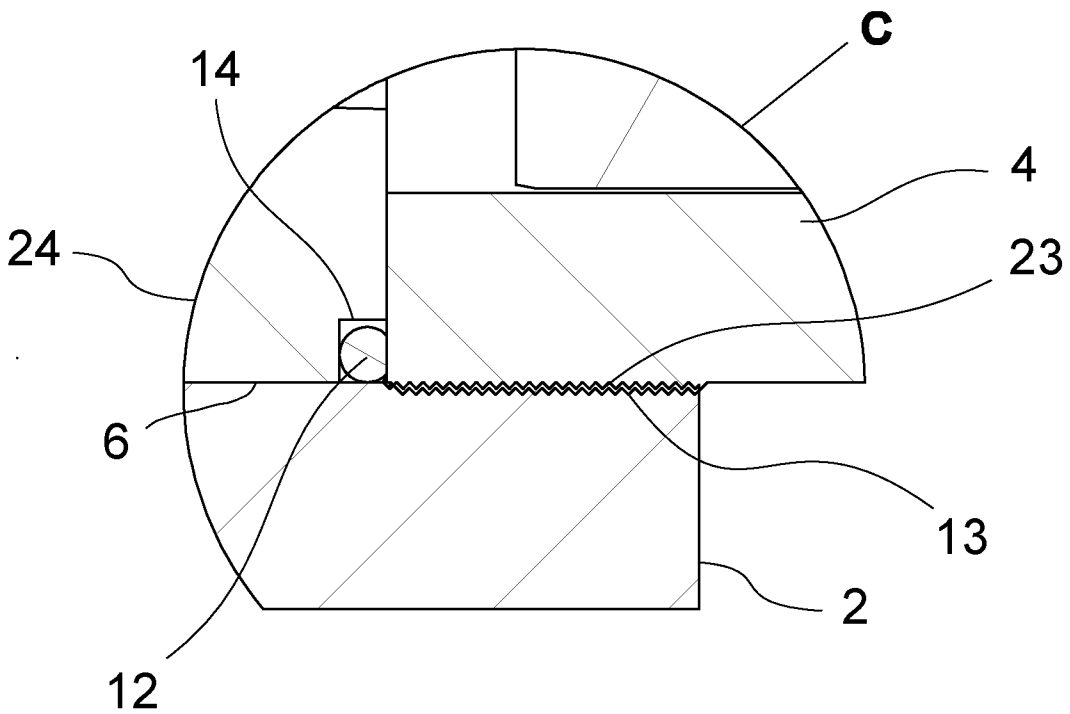
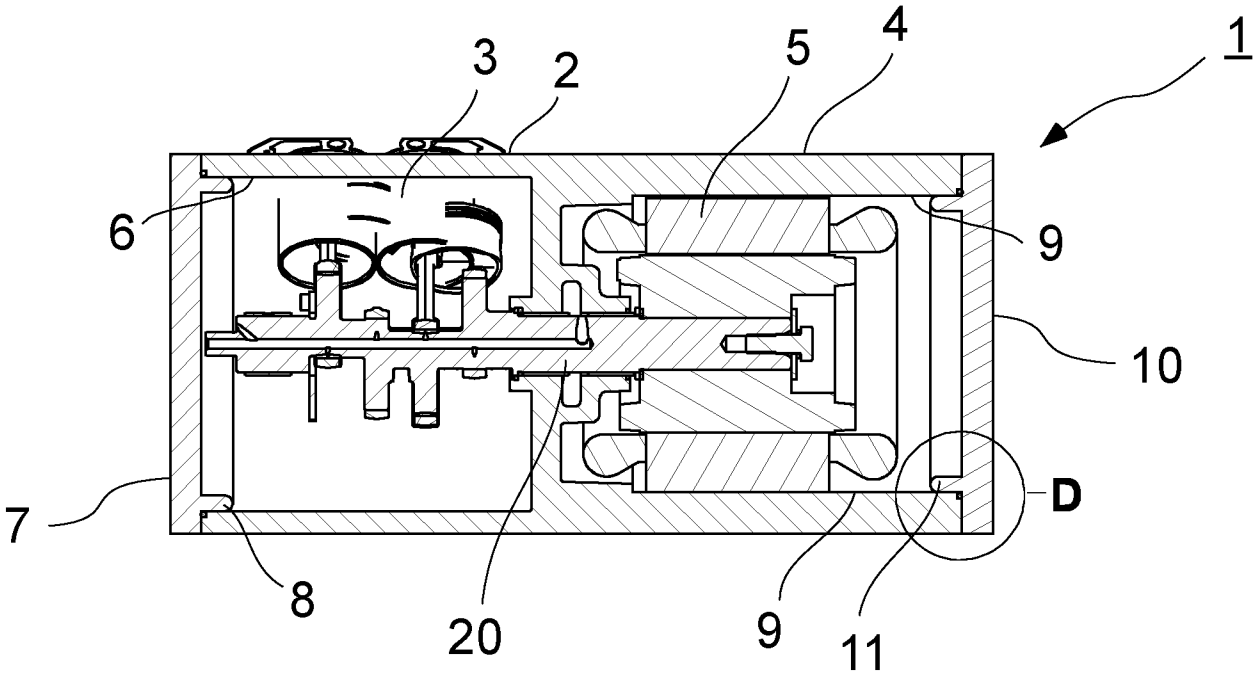


Fig. 6



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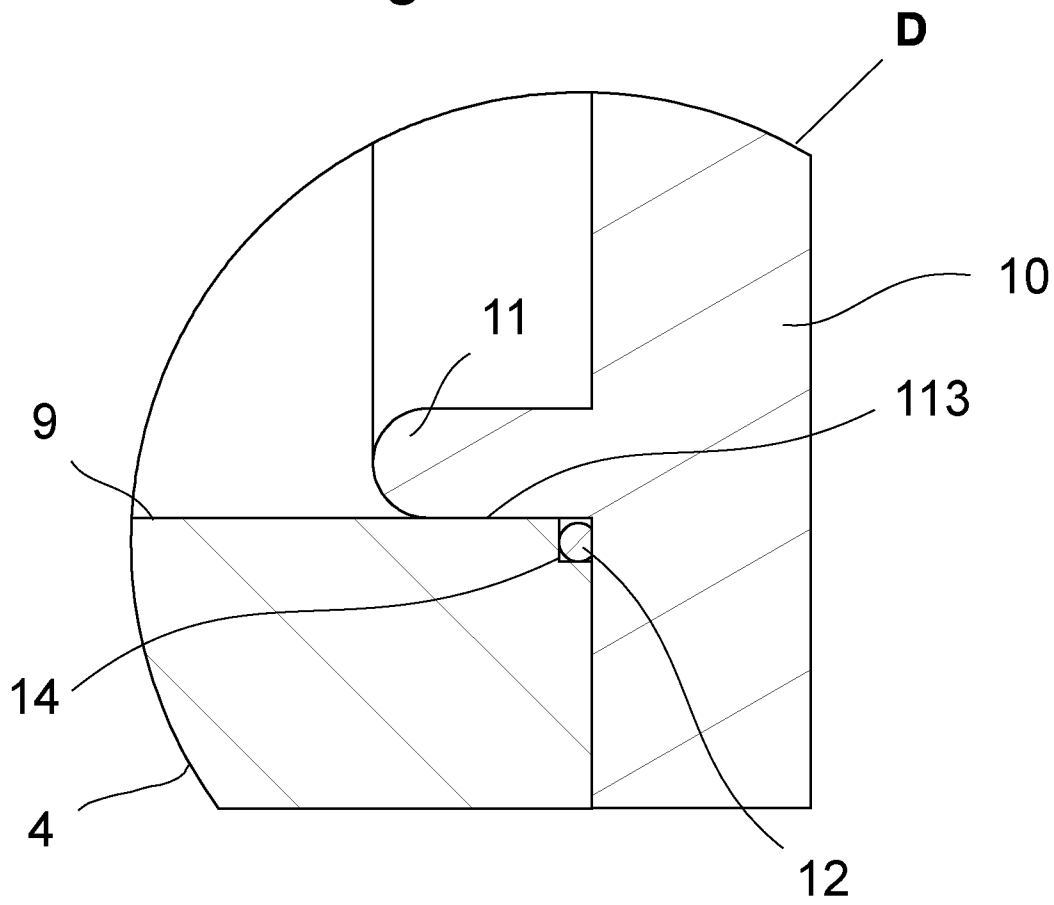

Fig. 8

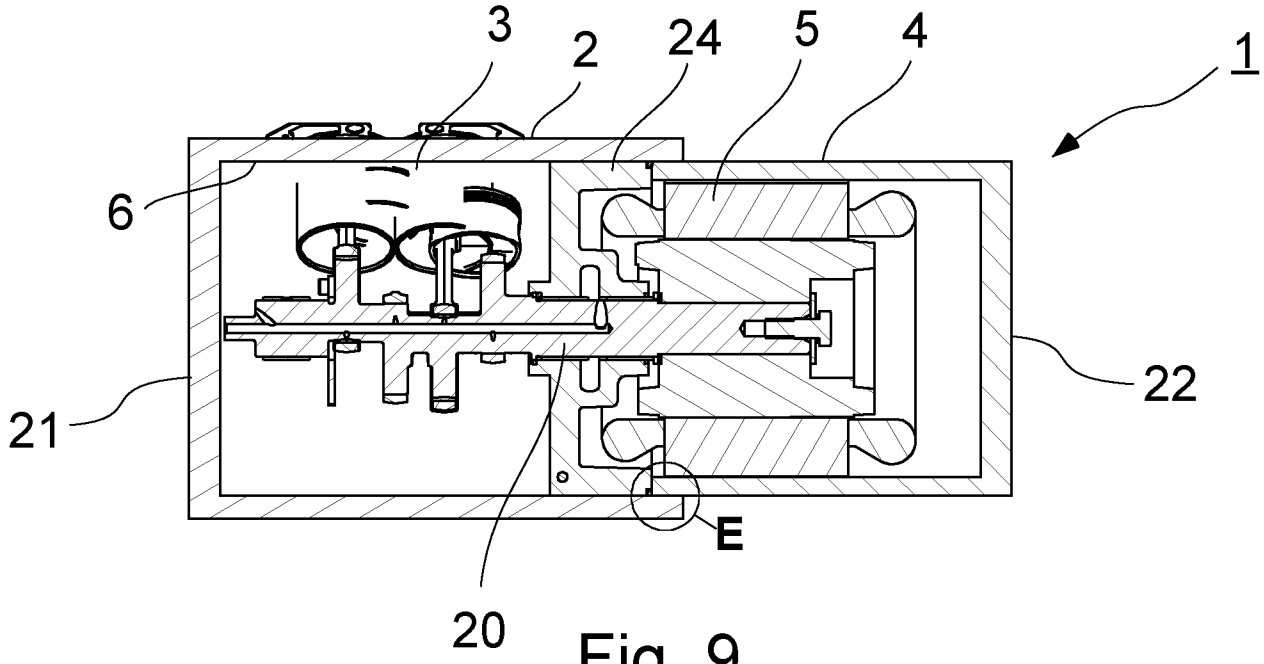

Fig. 9

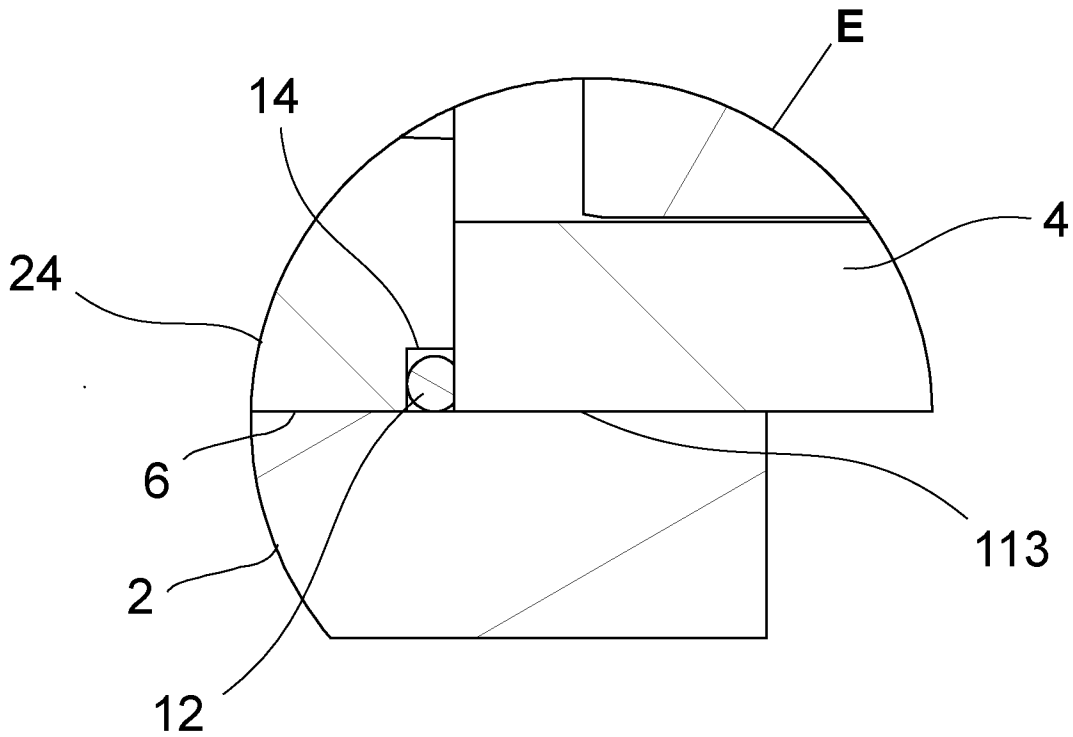

Fig. 10

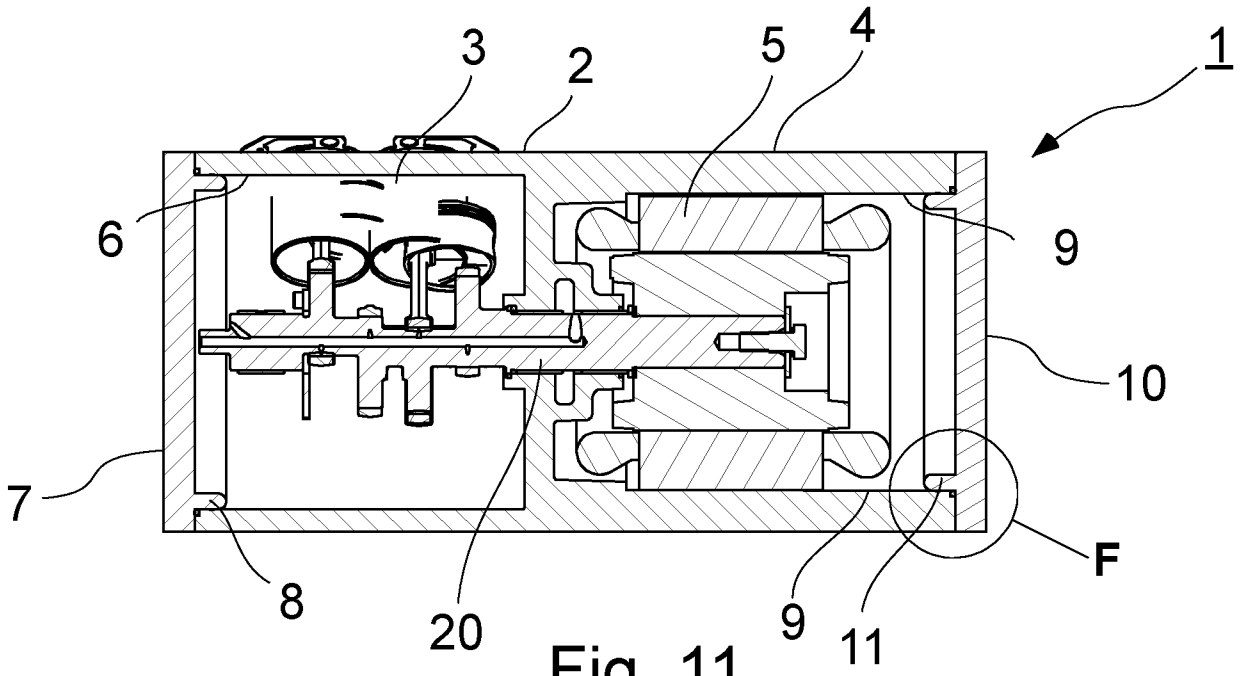

Fig. 11

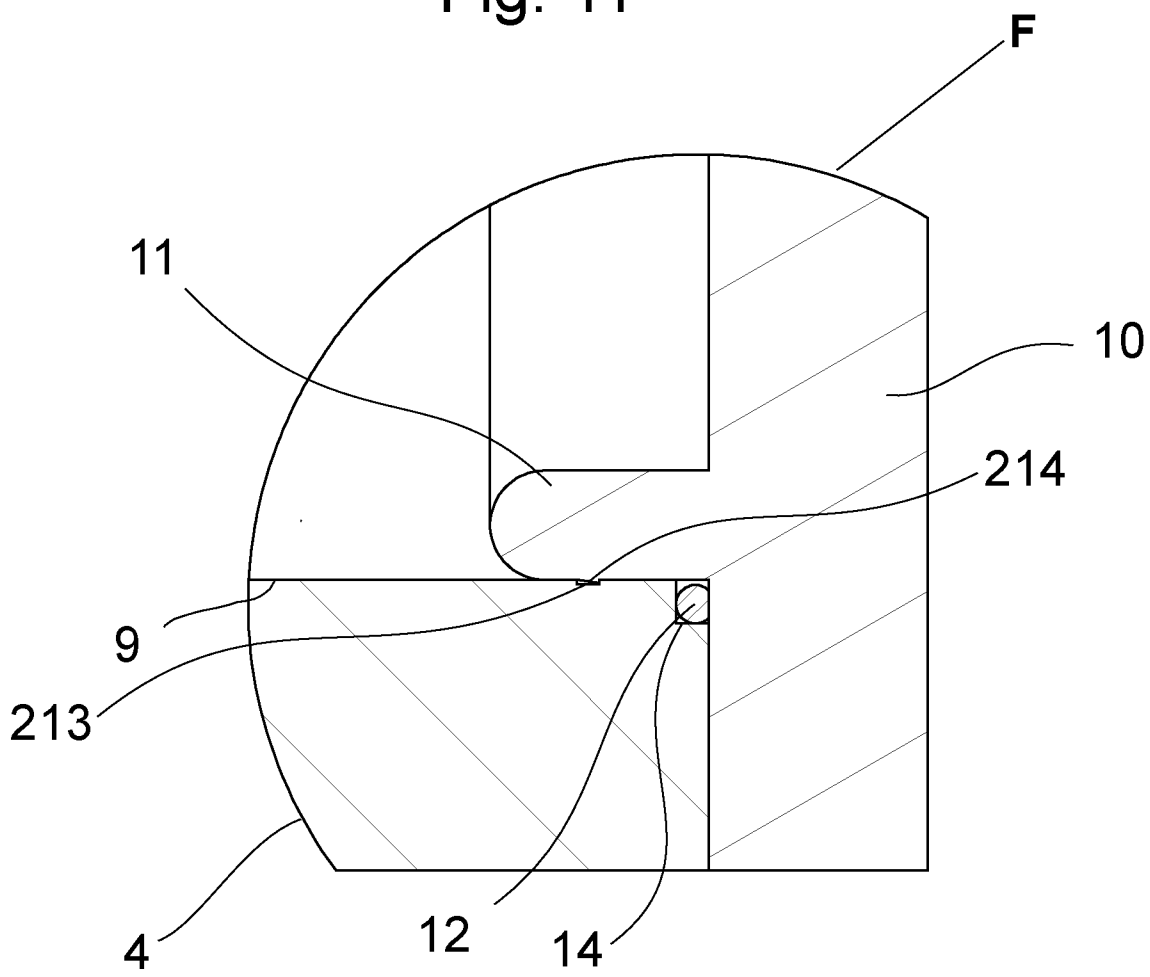

Fig. 12

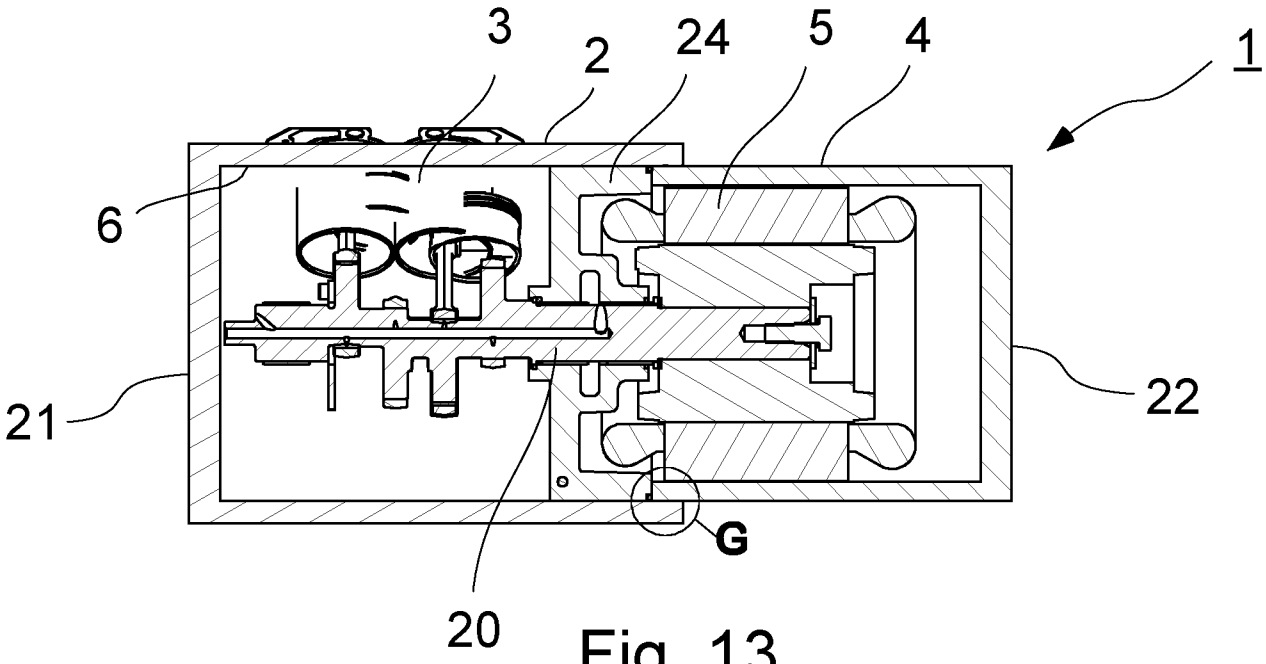

Fig. 13

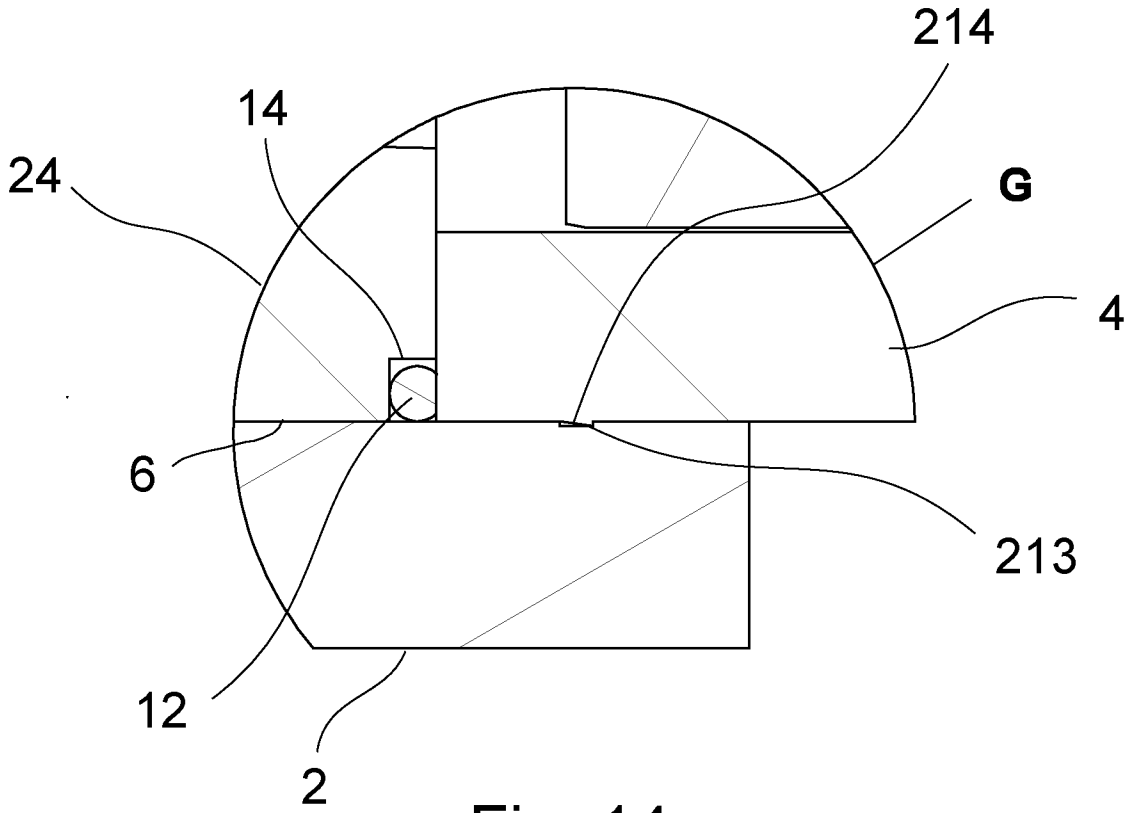

Fig. 14

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2020/059276

A. CLASSIFICATION OF SUBJECT MATTER
INV. F04B17/03 F04B23/02 F04B35/00 F04C11/00 F04C23/00
F04D13/06 F04D25/06 F04D29/62
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F04B F04C F04D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
3 June 2020	15/06/2020

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

1

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2020/059276

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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X	DE 198 21 229 A1 (TOYOTA MOTOR CO LTD [JP]) 3 December 1998 (1998-12-03) figure 1 column 8, lines 13-25	1,7,11, 14
X	US 2018/306180 A1 (CHAN CHING-CHUNG [TW] ET AL) 25 October 2018 (2018-10-25) figure 5 paragraphs [0021] - [0028]; figures 1-7	1,8-10
X	DE 199 59 022 C1 (BOSCH GMBH ROBERT [DE]) 21 June 2001 (2001-06-21) figure 1 column 2, line 39 - column 3, line 44	1,9,11, 13
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1

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