



(43) International Publication Date
3 January 2014 (03.01.2014)

(51) International Patent Classification:

F02B 39/00 (2006.01) *F02C 6/12* (2006.01)
F02B 37/00 (2006.01)

(21) International Application Number:

PCT/US2013/046741

(22) International Filing Date:

20 June 2013 (20.06.2013)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

102012012557.7 25 June 2012 (25.06.2012) DE

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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, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KN, KP, KR,

KZ, LA, LC, LK, LR, LS, LT, 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, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, 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, 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).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
- of inventorship (Rule 4.17(iv))

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(54) Title: EXHAUST-GAS TURBOCHARGER

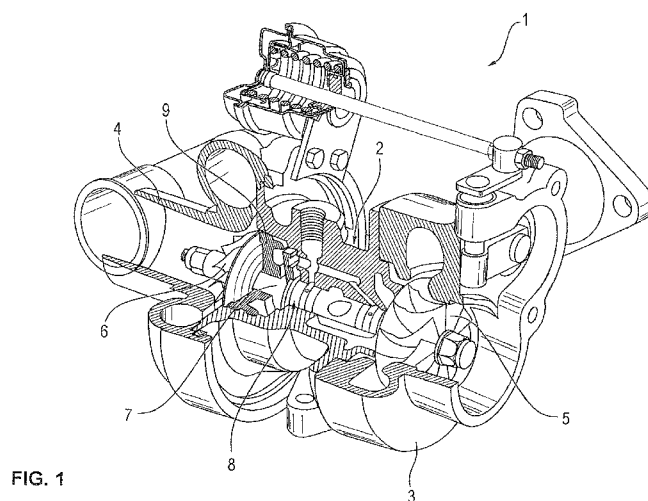


FIG. 1

(57) Abstract: The present invention relates to an exhaust-gas turbocharger (1) comprising a bearing housing (2), a bearing cartridge (8) inserted into the bearing housing (2), a shaft (7) which is mounted in the bearing cartridge (8) and which extends in an axial direction, a bearing housing cover (9) which is connected to the bearing housing (2), a turbine wheel (5) which is arranged on the shaft (7), and a compressor wheel (6) which is arranged on the shaft (7), wherein the bearing housing cover (9) is connected directly to the bearing cartridge (8) in order to secure the bearing cartridge (8) in the axial direction and against rotation.

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EXHAUST-GAS TURBOCHARGER

DESCRIPTION

5 The invention relates to an exhaust-gas turbocharger according to the preamble of claim 1 and to a method for the assembly of an exhaust-gas turbocharger.

Exhaust-gas turbochargers according to the prior art comprise a bearing housing. A shaft is rotatably mounted in the bearing housing. A turbine wheel is mounted on one end of the shaft. A compressor wheel is mounted on the other end of
10 the shaft. The mounting of the shaft in the bearing housing may be realized by means of a bearing cartridge. Rolling bearings and/or plain bearings for mounting the shaft are arranged in such a bearing cartridge. The bearing cartridge must be secured within the bearing housing both against an axial displacement and also against rotation. Separate fixing elements are normally used for securing the bearing cartridge.

15 It is an object of the present invention to specify an exhaust-gas turbocharger as per the preamble of claim 1 which, while being inexpensive to produce and assemble, can be operated reliably and with little maintenance. It is also an object of the present invention to specify a corresponding method for assembling the exhaust-gas turbocharger.

20 The object is achieved by the features of the independent claims. The dependent claims relate to advantageous refinements of the invention.

According to the invention, the bearing cartridge is secured both in the axial direction and also against rotation directly by means of the bearing housing cover. The "axial direction" is defined by the shaft. The "rotation" is a movement around the axial
25 direction. According to the invention, the bearing cartridge is secured in both axial directions and in both directions of rotation by means of the bearing housing cover. This is achieved in that the bearing housing cover is placed in direct connection with the bearing cartridge. Furthermore, the bearing housing cover is fixedly connected to the bearing housing, such that the bearing cartridge is fixedly positioned relative to the
30 bearing housing by means of the bearing housing cover.

According to the invention, the bearing housing cover directly absorbs the operating forces of the turbocharger. In this way, it is possible for a further component, which in previously known arrangements was used only for fixing the bearing

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cartridge, to be dispensed with. A reduction in tolerances is possible by fine machining of the contact surfaces with respect to the cartridge.

The axial securing action and the securing action against rotation are preferably realized by means of two positive fits between the bearing housing cover and the bearing cartridge. For the securing action in the axial direction, it is preferably provided that the bearing cartridge has a groove on the outer circumference. A radially inwardly directed lug of the bearing housing cover engages into said groove.

For the securing action against rotation, a pin is inserted, in particular in a radial direction, through the bearing housing cover and through the bearing cartridge. The pin is fixedly seated in the bearing housing cover. The pin has a small degree of play with respect to the bearing cartridge, such that the bearing cartridge can float on its damping film.

The invention also encompasses a method for the assembly of an exhaust-gas turbocharger. The advantageous refinements described within the context of the exhaust-gas turbocharger according to the invention, and the subclaims, are correspondingly preferably used with the method according to the invention. It is provided in the method according to the invention that, firstly, the bearing housing cover is pushed onto the bearing cartridge. Here, the lug of the bearing housing cover engages into the groove of the bearing cartridge. It is particularly preferable for a flattening to be provided on the groove. It is at precisely this flattening that the lug is pushed into the groove. The bearing housing cover is thereupon rotated relative to the bearing cartridge, such that the lug is no longer situated at the flattening. The two components are rotated relative to one another until two corresponding bores are aligned with one another. The pin is inserted into the bearing housing cover and into the bearing cartridge through said two bores.

The bearing housing cover and the bearing cartridge may be preassembled with one another and thus form an "assembled unit".

Further details, advantages and features of the present invention become apparent from the following description of exemplary embodiments with reference to the drawing. In the drawing:

figure 1 shows an exhaust-gas turbocharger according to the invention as per an exemplary embodiment,

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figure 2 shows an assembled unit of the exhaust-gas turbocharger according to the invention as per the exemplary embodiment,

figure 3 shows a bearing housing cover of the exhaust-gas turbocharger according to the invention as per the exemplary embodiment,

5 figure 4 shows a bearing cartridge of the exhaust-gas turbocharger according to the invention as per the exemplary embodiment,

figure 5 shows a first assembly step for the exhaust-gas turbocharger according to the invention as per the exemplary embodiment,

10 figure 6 shows a second assembly step for the exhaust-gas turbocharger according to the invention as per the exemplary embodiment,

figure 7 shows a bearing cartridge with two-part bearing housing cover of an exhaust-gas turbocharger according to the invention as per a further exemplary embodiment, and

figure 8 shows a sectional illustration of figure 7.

15 Figure 1 shows, in a partially sectional view, a schematically simplified illustration of the exhaust-gas turbocharger 1 according to the exemplary embodiment.

The exhaust-gas turbocharger 1 comprises a bearing housing 2, a turbine housing 3 and a compressor housing 4. A turbine wheel 5 is arranged in the turbine housing 3. A compressor wheel 6 is situated in the compressor housing 4. A shaft 7 is rotatably mounted in the bearing housing 2. The mounting of the shaft 7 is realized by means of a bearing cartridge 8. In the example shown, the bearing housing 2 is closed off at the compressor side by means of a bearing housing cover 9. Likewise, the bearing housing 2 may alternatively or additionally also be closed off at the turbine side by means of a bearing housing cover 9. The shaft 7 runs through the bearing housing cover 9.

25 During operation of the exhaust-gas turbocharger 1, exhaust gas flows to the turbine wheel 5 via the turbine housing 3. In this way, the turbine wheel 5, the shaft 7 and the compressor wheel 6 are set in rotation. Charge air for an internal combustion engine is compressed by means of the compressor wheel 6. Oil is supplied to the bearing cartridge 8 via the bearing housing 2. Accordingly, the shaft 7 must be sealed off with respect to the bearing housing cover 9. Furthermore, the bearing housing cover 9 is also sealingly connected to the bearing housing 2 in order to prevent an escape of oil.

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Figure 2 shows a plurality of components of the exhaust-gas turbocharger 1 as an assembled unit 10. Said assembled unit 10 comprises the bearing cartridge 8, the bearing housing cover 9 mounted on the bearing cartridge 8, and a seal bush 13 inserted into the bearing housing cover 9. To simplify the illustration, the shaft 7 is
5 illustrated merely as an axis.

Figure 2 shows two rolling bearings 11 of the bearing cartridge 8 for the shaft 7. The bearing housing cover 9 is screwed directly to the bearing housing 2 by means of a screw connection 12 in the form of a threaded bolt.

Figure 2 shows the fully assembled state of the assembled unit 10. Figure 3
10 shows the bearing housing cover 9 in a complete view and in a cut-away view. Figure 4 shows the bearing cartridge 8 in detail. From said figures, it can be seen that the bearing housing cover 9 has a lug 14. Said lug 14 extends radially inward. An encircling groove 16 is formed on the outer circumference of the bearing cartridge 8. The groove 16 has a flattening 20 at one location. In the assembled state of the
15 assembly unit 10, the lug 14 is in positive engagement with the groove 16. In this way, an axial displacement of the bearing cartridge 8 is no longer possible in either direction.

Furthermore, a first bore 17 is formed in the bearing housing cover 9. In the assembled state, said first bore 17 is aligned with a second bore 18 in the bearing
20 cartridge 8. In the example shown, the first bore 17 is situated in the lug 14. Correspondingly, the second bore 18 is situated in the groove 16. A pin 15 is inserted through the first bore 17 and through the second bore 18. The pin 15 prevents a rotation of the bearing cartridge 8 relative to the bearing housing cover 9.

The process of assembling the assembled unit 10 will be explained on the basis
25 of figures 5 and 6. As per figure 5, the lug 14 is firstly positioned at the flattening 20. The bearing cartridge 8 and the bearing housing cover 9 are thereupon pushed one inside the other. In a subsequent step, the bearing housing cover 9 is rotated relative to the bearing cartridge 8, such that, as illustrated in figure 6, the lug 14 is no longer situated at the flattening 20. Said bearing housing cover is rotated until the first bore 17
30 is aligned with the second bore 18. The pin 15 is thereupon inserted. Said complete assembled unit 10 is connected to the bearing housing 2. Here, the screw connection 12 is formed through bolt holes 19.

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According to the invention, the bearing housing cover 9 is placed in direct positive connection with the bearing cartridge 8. Here, the bearing cartridge 8 is secured both against an axial displacement and also against rotation. According to the invention, no further components are required for securing the bearing cartridge 8,
5 such that both assembly and production are simplified.

Figures 7 and 8 show in each case the fixing of the bearing cartridge 8 by means of a two-part bearing housing cover 9. Here, the bearing housing cover 9 comprises a symmetrical first part 21 and an asymmetrical second part 22. The two parts 21 and 22 are connected to the bearing housing 2 by means of the screw
10 connection 12.

Figures 2, 5 and 8 show piston rings 24 (also: seal rings). Alternatively to the illustration, an inner ring 23 of the bearing cartridge 8 may be of elongated design, such that the piston rings 24 can be arranged directly on the inner ring 23.

In addition to the above written description of the invention, reference is hereby
15 explicitly made to the diagrammatic illustration of the invention in figures 1 to 8 for additional disclosure thereof.

LIST OF REFERENCE SIGNS

	1	Exhaust-gas turbocharger
	2	Bearing housing
5	3	Turbine housing
	4	Compressor housing
	5	Turbine wheel
	6	Compressor wheel
	7	Shaft
10	8	Bearing cartridge
	9	Bearing housing cover
	10	Assembled unit
	11	Rolling bearing
	12	Screw connection
15	13	Seal bush
	14	Lug
	15	Pin
	16	Groove
	17	First bore
20	18	Second bore
	19	Bolt holes
	20	Flattening
	21	First bearing housing cover part
	22	Second bearing housing cover part
25	23	Inner ring
	24	Piston rings

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CLAIMS

1. An exhaust-gas turbocharger (1) comprising:
 - a bearing housing (2),
 - 5 - a bearing cartridge (8) inserted into the bearing housing (2),
 - a shaft (7) which is mounted in the bearing cartridge (8) and which extends in an axial direction,
 - a bearing housing cover (9) which is connected to the bearing housing (2),
 - 10 - a turbine wheel (5) which is arranged on the shaft (7), and
 - a compressor wheel (6) which is arranged on the shaft (7),wherein
 - the bearing housing cover (9) is connected directly to the bearing cartridge (8) in order to secure the bearing cartridge (8) in the axial direction and
 - 15 against rotation.
2. The exhaust-gas turbocharger as claimed in claim 1, wherein the bearing housing cover (9) engages into the bearing cartridge (8) with a positive fit.
3. The exhaust-gas turbocharger as claimed in one of the preceding claims, wherein, to provide an axial securing action, at least one radially inwardly directed lug (14) of the bearing housing cover (9) projects into a groove (16) of the bearing cartridge (8).
- 20 4. The exhaust-gas turbocharger as claimed in claim 3, wherein, for the insertion of the lug (14), the groove (16) is flattened at at least one location.
5. The exhaust-gas turbocharger as claimed in either of claims 3 and 4,
- 25 wherein the bearing housing cover (9) is manufactured in one piece, in particular as a cast part, together with the lug (14).
6. The exhaust-gas turbocharger as claimed in one of claims 1 to 4, wherein the bearing housing cover (9) is formed in multiple parts.
7. The exhaust-gas turbocharger as claimed in one of the preceding claims,
- 30 wherein, to provide a securing action against rotation, at least one continuous pin (15) is inserted into the bearing housing cover (9) and into the bearing cartridge (8).
8. The exhaust-gas turbocharger as claimed in claim 6, wherein the fit of the pin (15) in a first bore (17) in the bearing housing cover (9) is in the form of a

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transition or interference fit, and wherein the fit of the pin (15) in a second bore (18) in the bearing cartridge (8) is in the form of a clearance fit.

9. The exhaust-gas turbocharger as claimed in one of the preceding claims, wherein a seal bush (13) is inserted in the bearing housing cover (9), wherein the shaft
5 (7) runs through the seal bush (13).

10. The exhaust-gas turbocharger as claimed in one of the preceding claims, wherein the bearing housing cover (9) fixes the bearing cartridge (8) together with an elongated inner ring, wherein on the elongated inner ring (23) there is arranged at least one piston ring (24) for providing sealing with respect to the bearing housing cover (9).

10 11. The exhaust-gas turbocharger as claimed in one of the preceding claims, wherein the bearing housing cover (9) is connected to the bearing housing (2) by means of a bayonet connection or a screw connection (12).

12. A method for the assembly of an exhaust-gas turbocharger (1), comprising the following steps:

- 15 – providing a bearing cartridge (8) having a groove (16) on the circumference,
- mounting a bearing housing cover (9) with at least one radially inwardly directed lug (14) onto the bearing cartridge (8), wherein the lug (14) engages into the groove (16),
- 20 – rotating the bearing housing cover (9) relative to the bearing cartridge (8), and
- inserting a pin (15) into the bearing housing cover (9) and into the bearing cartridge (8).

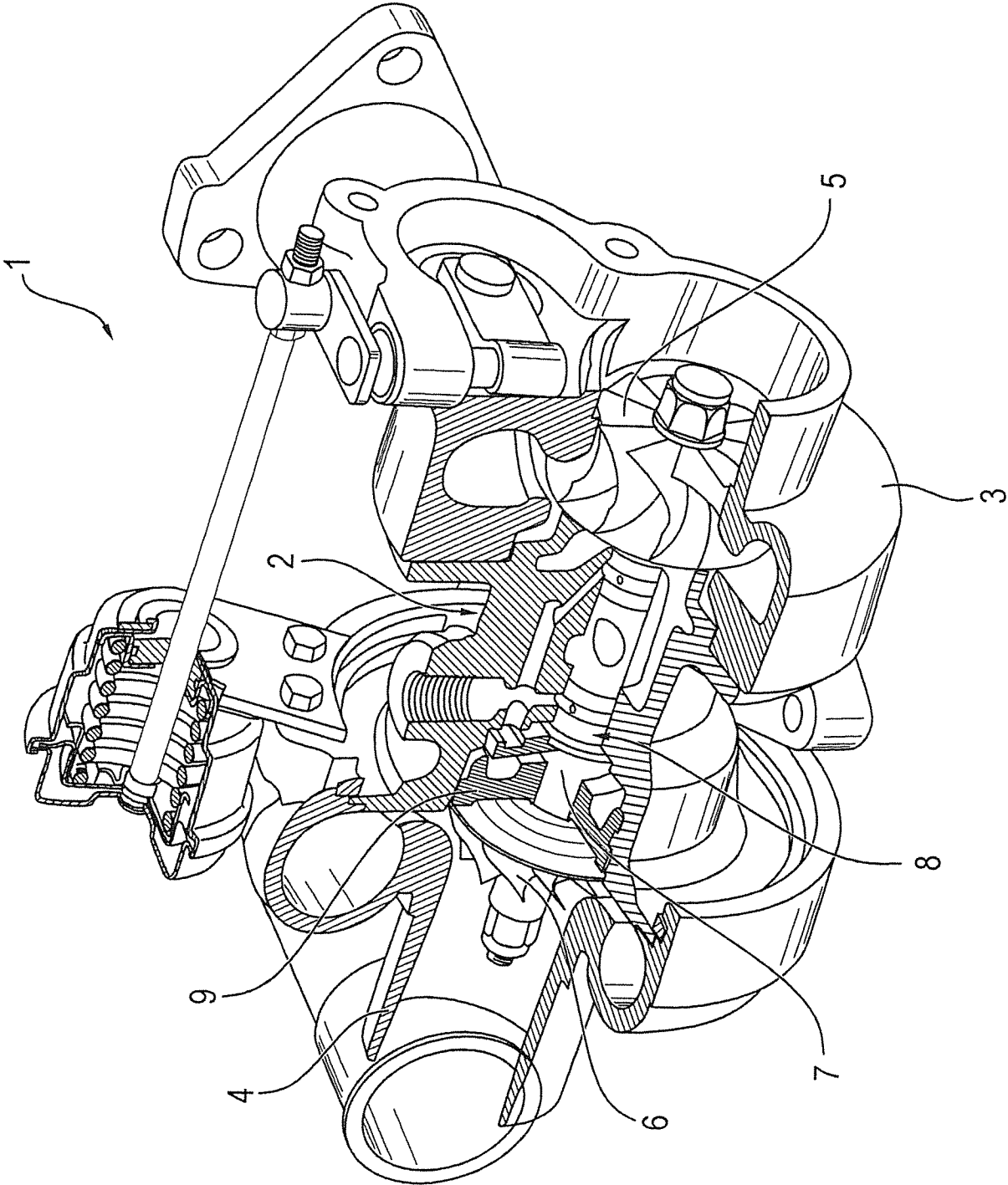


FIG. 1

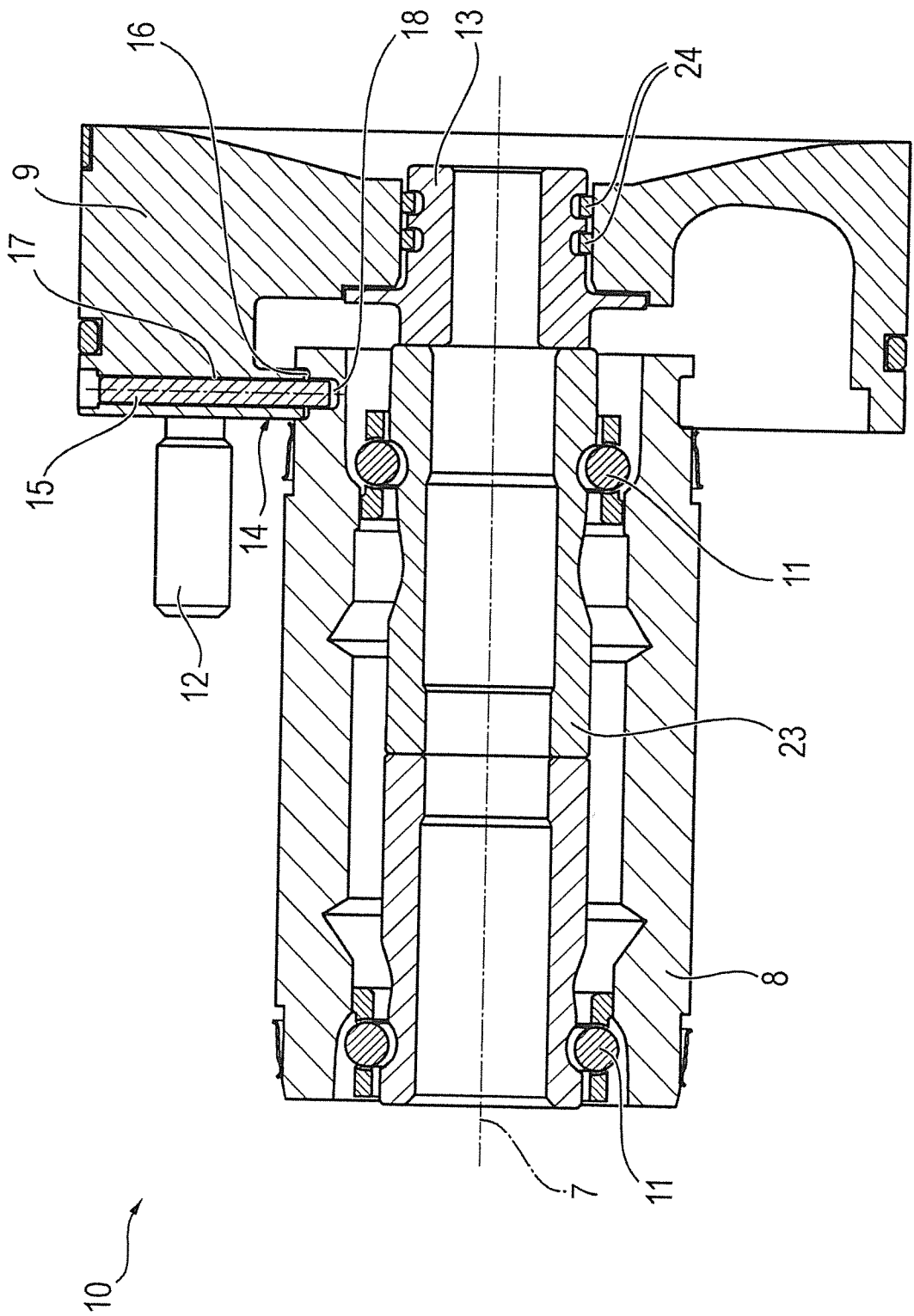


FIG. 2

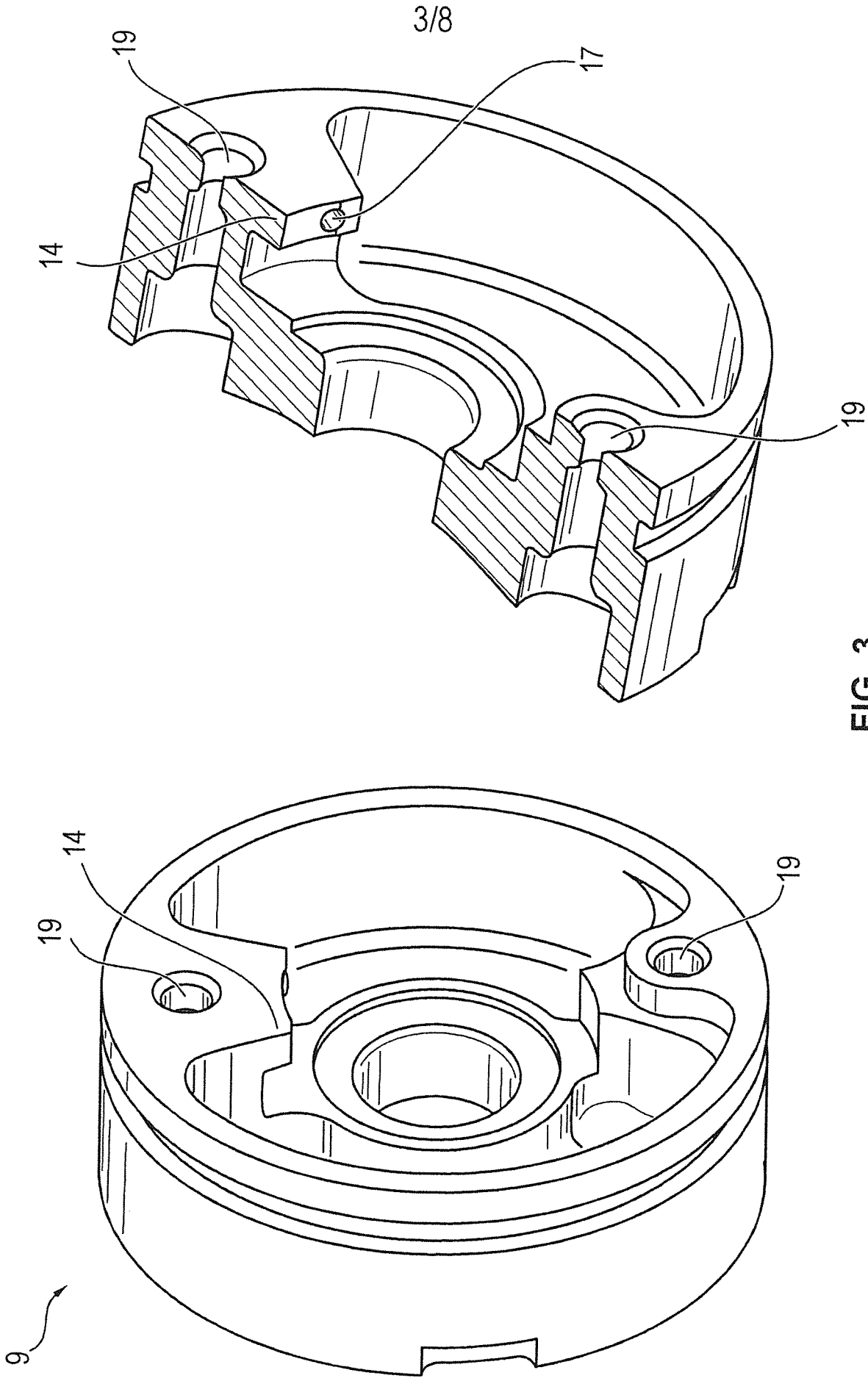


FIG. 3

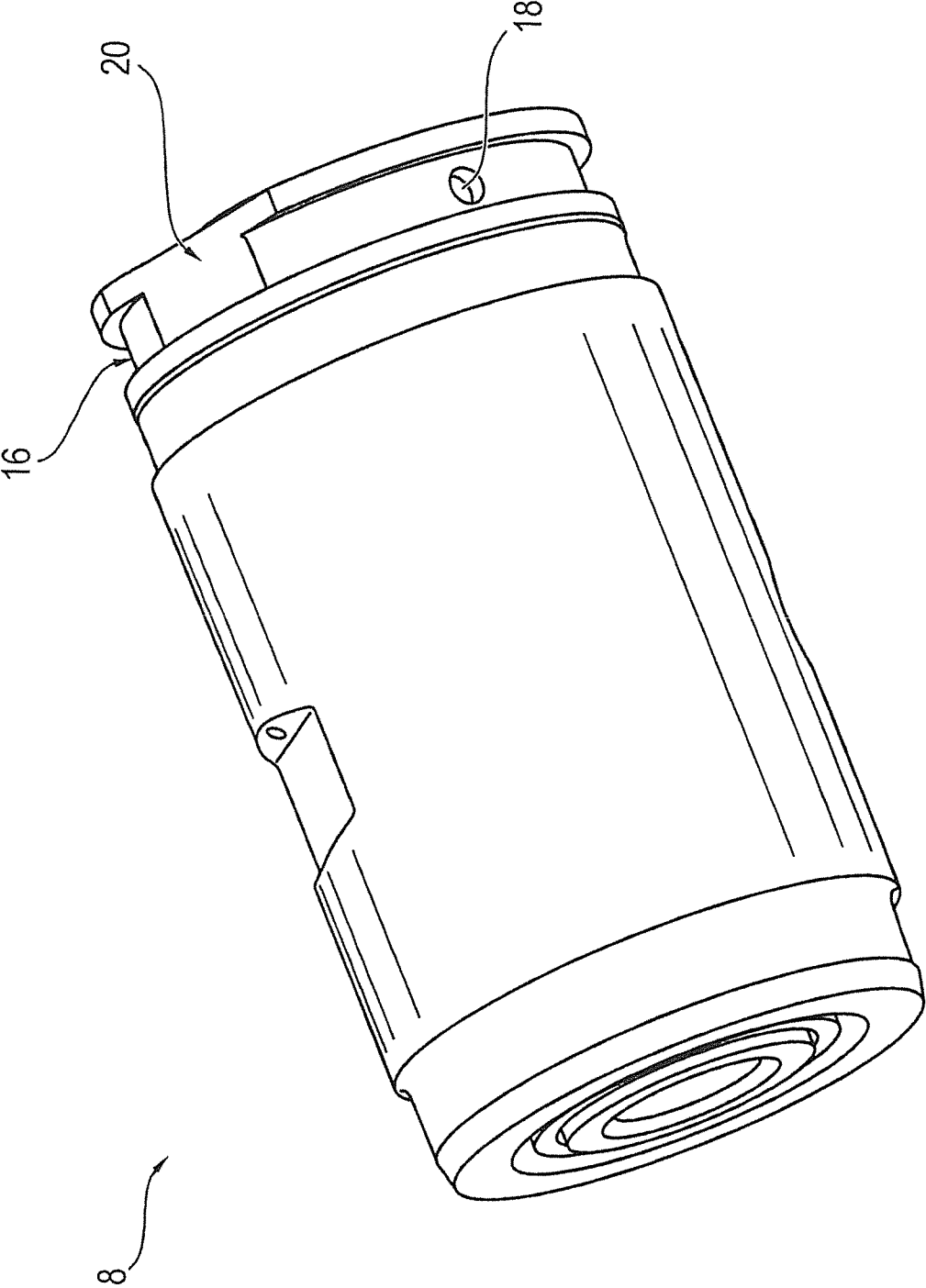


FIG. 4

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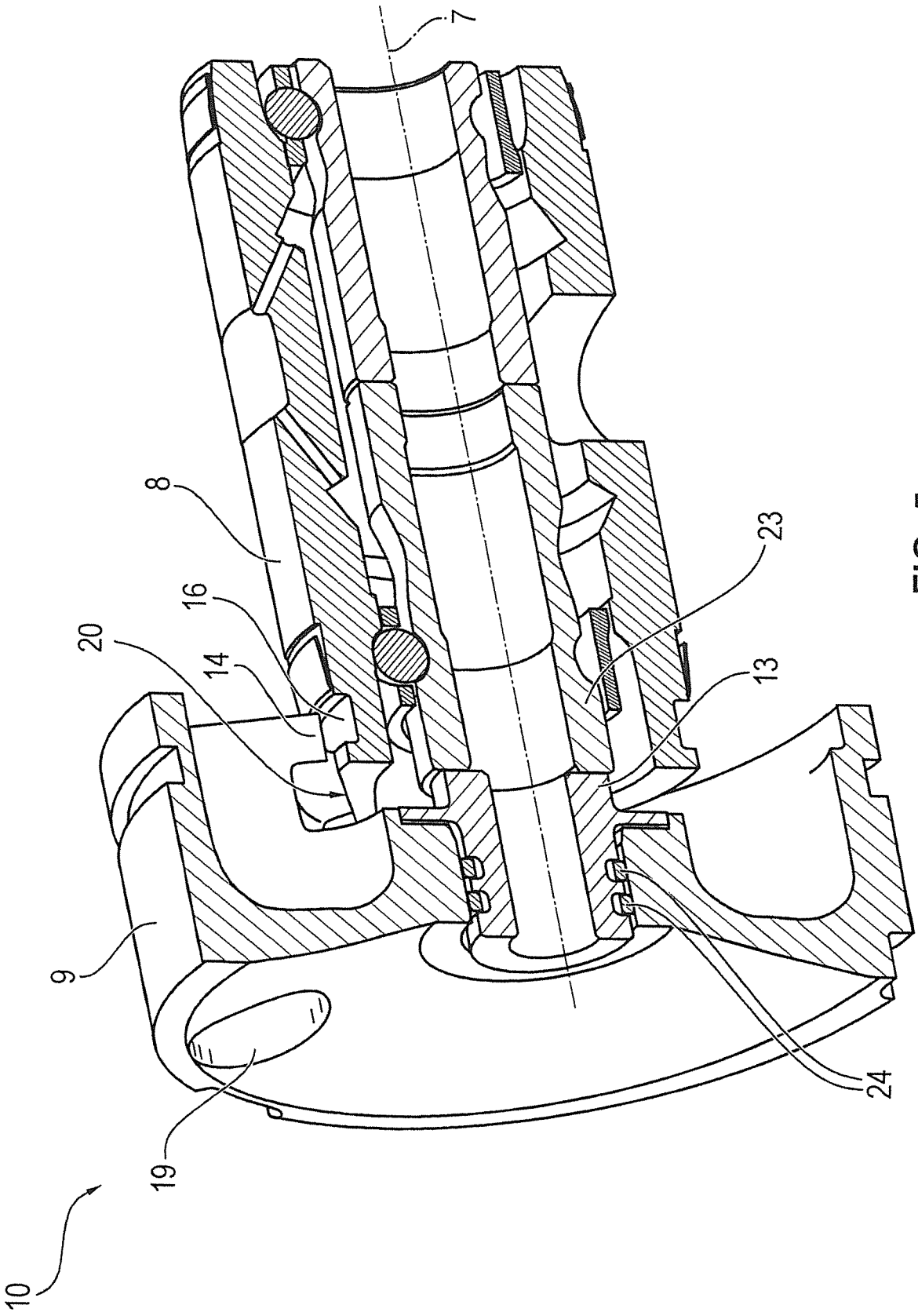
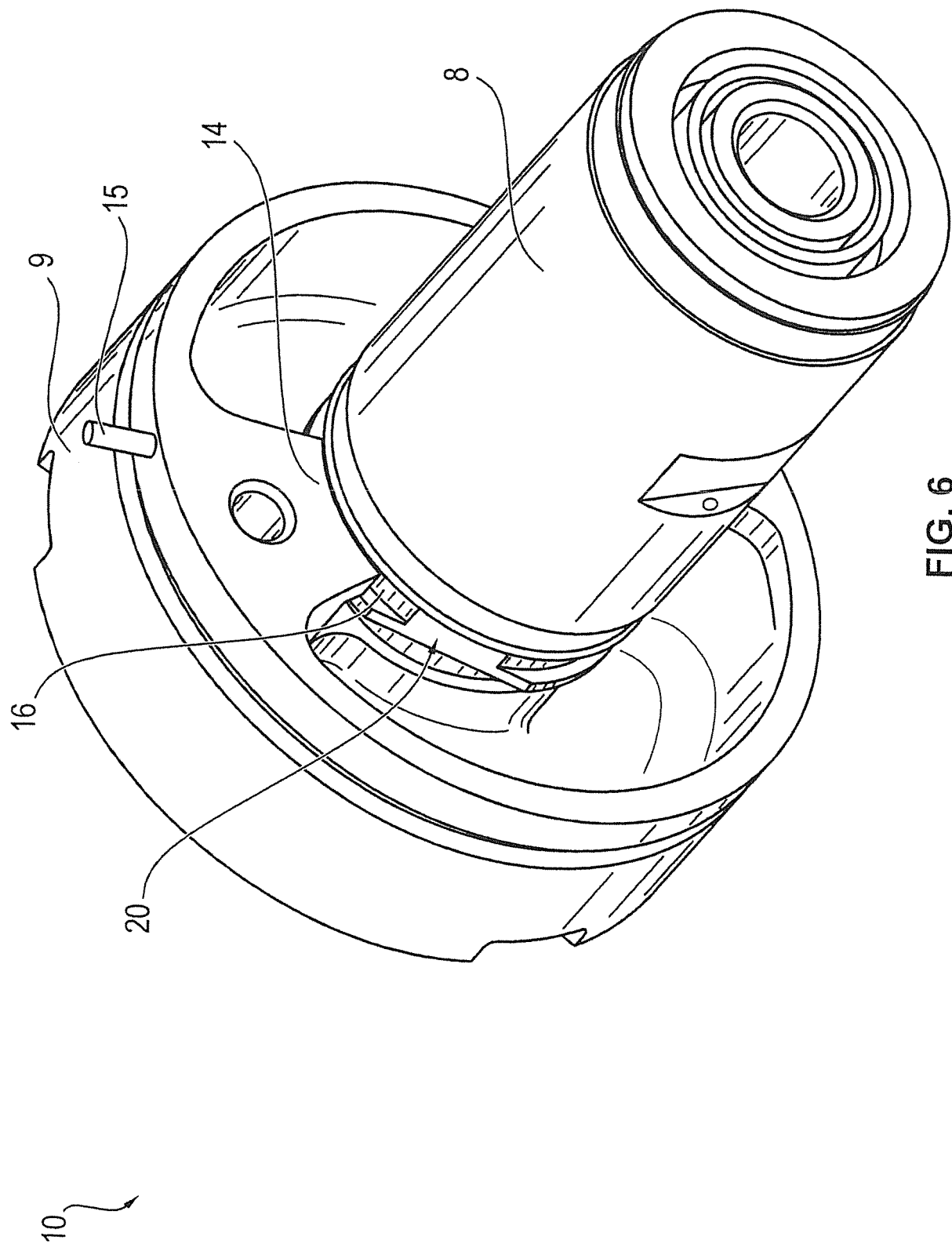


FIG. 5



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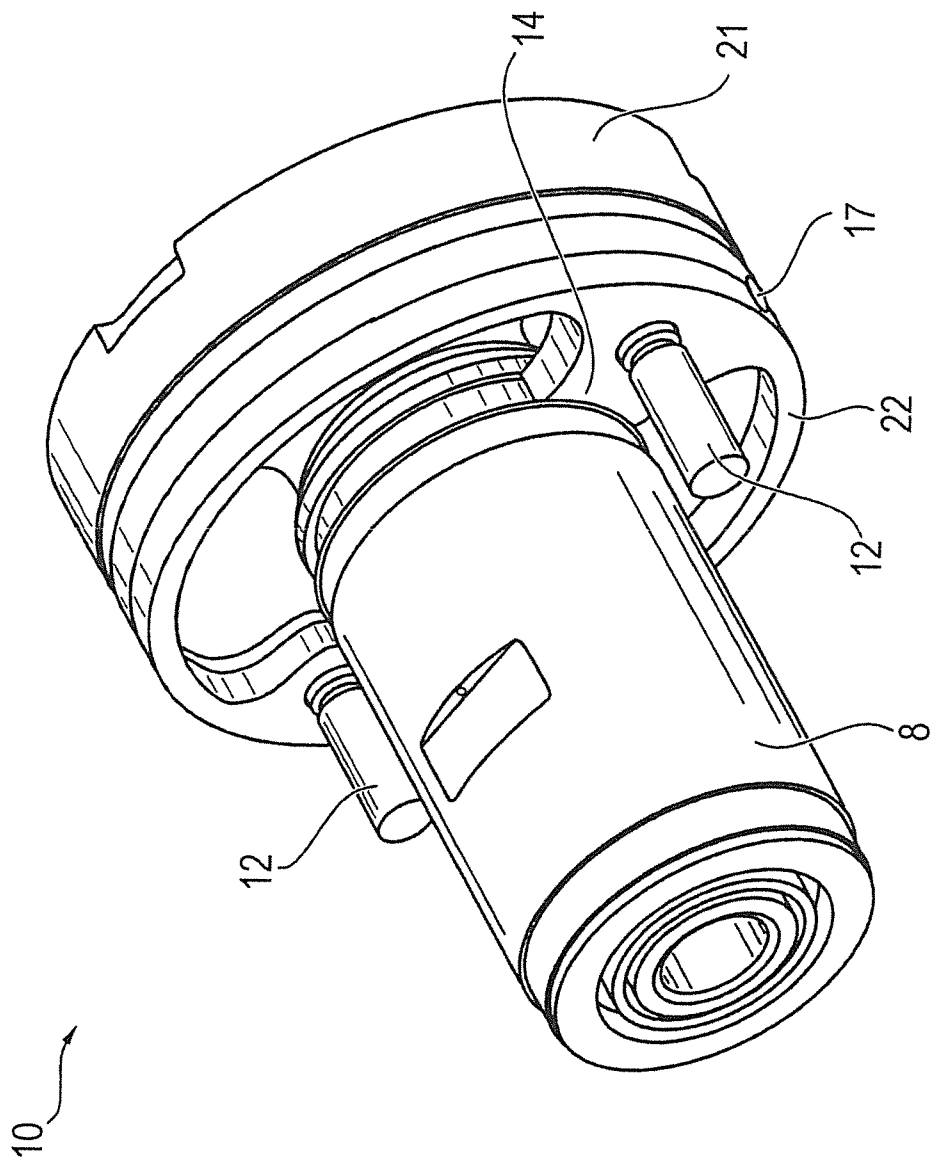


FIG. 7

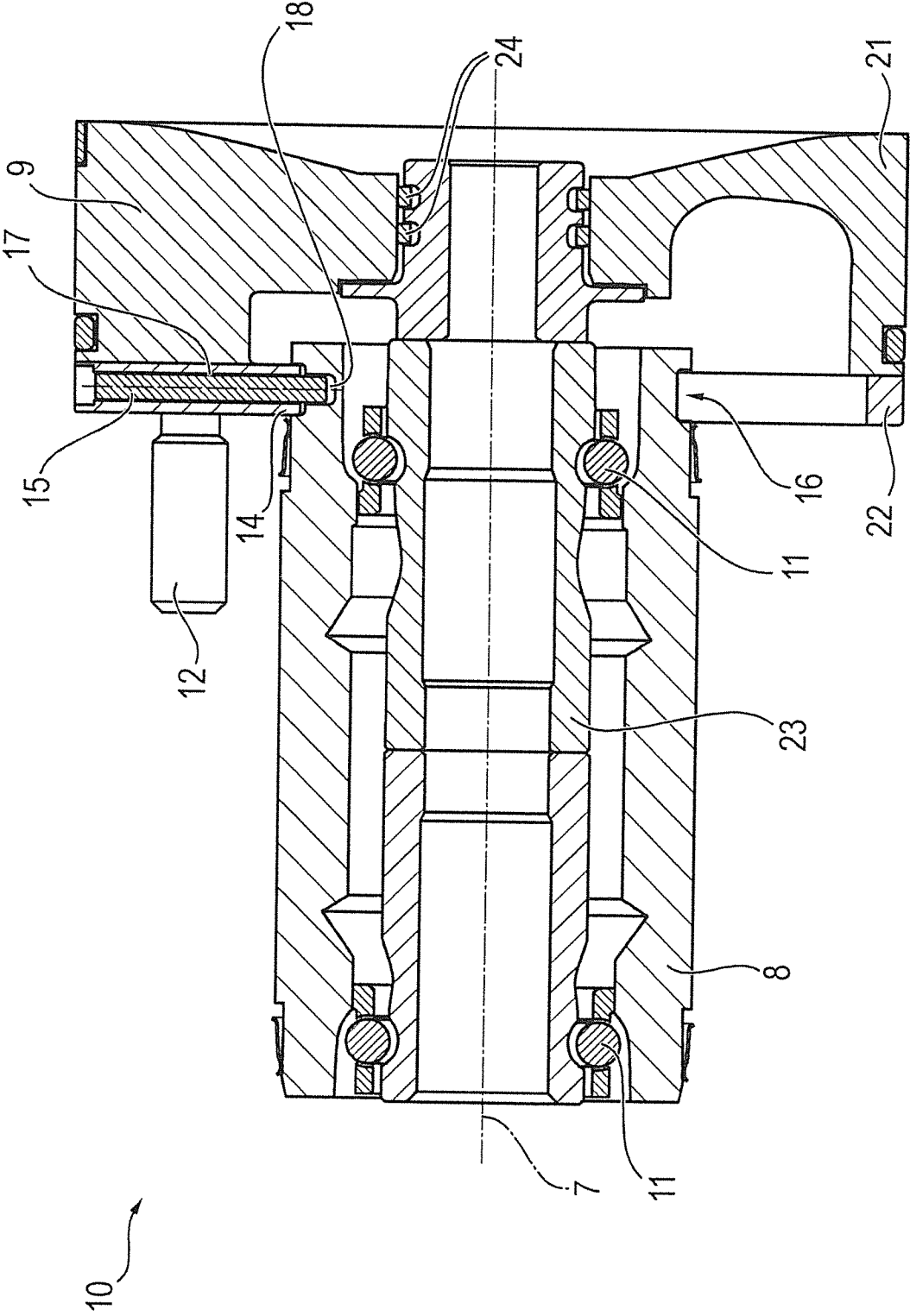


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/046741**A. CLASSIFICATION OF SUBJECT MATTER****F02B 39/00(2006.01)i, F02B 37/00(2006.01)i, F02C 6/12(2006.01)i**

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)

F02B 39/00; F16C 27/04; F02C 6/12; F16C 19/18; F16C 33/62; F02B 33/44; F04D 29/046; F16C 19/50; F02B 37/00

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: turbocharger, bearing, housing, cartridge, and cover

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2012-0057975 A1 (LISCHER, THOMAS) 08 March 2012 See abstract; paragraph [0012]; claim 1 and figures 1,2.	1-12
A	US 2010-0215491 A1 (MOCKRIDGE et al.) 26 August 2010 See abstract; paragraphs [0006],[0014]; figure 1.	1-12
A	KR 10-2007-0031388 A (HONEYWELL INTERNATIONAL INC.) 19 March 2007 See abstract; claims 1-7 and figure 2.	1-12
A	US 5,028,150 A (KRONENBERGER et al.) 02 July 1991 See abstract; claim 1 and figures 1,2.	1-12
A	US 2006-0123783 A1 (PHILIPPE, NOELLE) 15 June 2006 See abstract and claim 1.	1-12



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

13 November 2013 (13.11.2013)

Date of mailing of the international search report

21 November 2013 (21.11.2013)

Name and mailing address of the ISA/KR

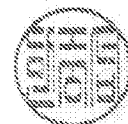
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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