



(51) International Patent Classification:

F16C 35/06 (2006.01) *F16J 15/32* (2006.01)
F16C 41/00 (2006.01) *G01P 3/44* (2006.01)

(21) International Application Number:

PCT/IB2010/001273

(22) International Filing Date:

2 April 2010 (02.04.2010)

(25) Filing Language:

English

(26) Publication Language:

English

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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, 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, KM, 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, PE, PG, PH, PL, PT, RO, RS, RU, 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, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (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, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

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

(54) Title: PROCESS FOR MOUNTING A ROLLING BEARING ASSEMBLY ONTO A SUPPORT MEMBER

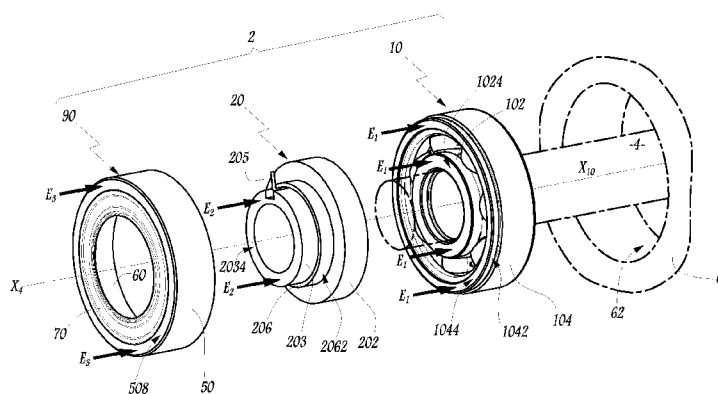


Fig. 4

(57) Abstract: This process is for mounting a rolling bearing assembly (2) onto a support member (6), the rolling bearing assembly comprising a rolling bearing (10) having an inner ring (102) and an outer ring (104), a target (60) adapted to rotate with the outer ring around a rotation axis (X_{10}) of the rolling bearing, a sensor unit (20) including at least one sensing element adapted to read the target, and a sealing gasket (70) extending between a fixed part (206) and a rotating part (50) of the rolling bearing assembly. This process comprises the steps of: a) mounting the target (60) and the sealing gasket (70) on a radial inner face of a cylindrical cover member (50), b) pushing the rolling bearing (10) into a first housing (62) of the support member (6), with a first axial effort (E_1), and blocking the outer ring (104) in rotation within this first housing, c) fastening the sensor unit (20) to the inner ring (102), with a second axial effort (E_2), and d) fastening the cover member (50), equipped with the target (60) and the seal gasket (70), to the outer ring (104), with a third axial effort (E_3).

PROCESS FOR MOUNTING A ROLLING BEARING ASSEMBLY ONTO A SUPPORT MEMBER

TECHNICAL FIELD OF THE INVENTION

5 This invention relates to a process for mounting a rolling bearing assembly onto a support member, such as the hub of a wheel of a two-wheeled vehicle.

BACKGROUND OF THE INVENTION

10 A rolling bearing assembly comprises an inner ring, an outer ring and several rolling bodies installed between these two rings. These rolling bodies can be balls, rollers or needles. In the sense of the present invention, a rolling bearing can be, for instance, a ball bearing, a roller bearing or a needle bearing.

15 It is known to use a tachometer in order to determine the rotation speed of a member supported by a rolling bearing. As considered in EP-A-1 251 354, one can use a sensor assembly including an active part, such as a magnetic multipolar ring, forming a target whose rotation is detected by a sensor. This active part is mounted on a synthetic support member fast in rotation with the outer ring of a ball bearing. Such a device is globally satisfactory. However, it is somehow cumbersome to mount onto a support member insofar as the sensor sub-assembly which includes the sensing unit and the
20 active part is attached to the ball bearing prior to the mounting operation of the ball bearing on a support member.

SUMMARY OF THE INVENTION

25 This invention aims at solving the above-mentioned problem with a new process which facilitates the mounting of a rolling bearing assembly onto the support member.

To this end, the invention concerns a process for mounting a rolling bearing assembly onto a support member, said rolling bearing assembly comprising a rolling bearing having an inner ring and an outer ring, a target adapted to rotate with the outer ring around a rotation axis of the rolling bearing, a sensor unit including at least one
30 sensing element adapted to read the target and a sealing gasket extending between a fixed part and a rotating part of said rolling bearing assembly. According to the invention, this process comprises the steps of:

- a) mounting the target and the sealing gasket on a radial inner face of a cylindrical cover member

- b) pushing the rolling bearing into a first housing of the support member, with a first axial effort, and blocking the outer ring of the rolling bearing in rotation within this first housing,
- c) fastening the sensor unit to the inner ring, with a second axial effort and
- 5 d) fastening the cover member, equipped with the target and the sealing gasket, to the outer ring, with a third axial effort.

Thanks to the invention, the rolling bearing assembly can be installed on a support member such as a hub with three successively applied axial efforts, which are easy and intuitive for an operator. Moreover, this mounting process increases the serviceability of the rolling bearing assembly insofar as access to the target and to sensing element

10 remains easy after mounting of the rolling bearing assembly on its support member.

In the present description, the words "axial", "radial", "axially", "radially", "centrifugal", "centripetal" and similar words relate to the axis of rotation of the outer ring of the bearing with respect to its inner ring. A direction is "axial" when it is parallel to this axis and "radial" when it is perpendicular and secant with this axis. A surface is "axial" when it is

15 perpendicular to this axis and "radial" when it surrounds this axis. For instance, an axial effort is parallel to the axis of rotation.

According to further aspects of the invention which are advantageous but not compulsory, the process might incorporate one or several of the following features:

- 20 - Step b) occurs before step c) or step c) occurs before step b).

In step d) the cover member is directly mounted onto the outer ring. The cover member can be immobilized onto the outer ring by press-fitting, gluing, clipping or screwing. In particular, in step d), an annular skirt of the cover member can be introduced within a groove of the outer ring, thanks to the third axial effort.

25 - Alternatively, the cover member is pushed into a second housing of the support member, with said third axial effort, and this cover member is blocked in rotation within this second housing. In such a case, the cover member can be blocked within the second housing by press-fitting or gluing.

30 - Prior to step a), the cover member and the target are selected in such a way that the inner diameter of the target is larger than the outer diameter of the outer ring.

- In step d), a sealing lip of the sealing gasket is brought into sliding contact with an outer annular radial surface of a part fast in rotation with the inner ring.

- In step a), the target is immobilized onto the cover member by press-fitting, gluing or clipping.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood on the basis of the following description which is given in correspondence with the annexed figures and as an illustrative example, without restricting the object of the invention. In the annexed figures:

- 5 - figure 1 is a perspective view of a hub and a fork of a two-wheeled vehicle, the hub including a rolling bearing assembly mounted onto this hub during the process of the invention;
- figure 2 is a partial cross-section, at a larger scale and along plane II on figure 1, showing a rolling bearing assembly used in the device of figure 1;
- 10 - figure 3 is an enlarged view of detail III on figure 2;
- figure 4 is an exploded perspective of the rolling bearing assembly represented on figures 2 and 3, showing how this assembly is mounted with respect to the shaft and hub shown on figures 1 to 3 which are partially represented in chain dotted lines;
- 15 - figure 5 is a detailed view similar to figure 3 in case the process of the invention is used with a second embodiment of a rolling bearing assembly;
- figure 6 is a perspective exploded view similar to figure 4 for the embodiment of figure 5;
- figure 7 is a detailed view similar to figure 3 in case the process of the invention is used with a rolling bearing assembly according to a third embodiment of the invention; and
- 20 - figure 8 is a perspective view similar to figure 4 for the embodiment of figure 7.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

25 Figure 1 depicts the use of a rolling bearing assembly 2 in conjunction with a shaft 4 and a hub 6. The hub belongs to a non-represented wheel which is held by two fork members 8 supporting shaft 4. The rolling bearing assembly 2 of the invention is used in conjunction with another rolling bearing assembly 3 in order to support, with a possibility of rotation, hub 6 around shaft 4 which is stationary when fork members 8 are stationary.

30 Rolling bearing assembly 2 includes a ball bearing 10 comprising an inner ring 102 and an outer ring 104 defining between them a rolling chamber where balls 106 are held in position by a cage 108. Ring 102 is fast with shaft 4 and ring 104 is rotatable around a central axis X_{10} of rolling bearing 10 which is superimposed with the central longitudinal axis X_4 of shaft 4 when rolling bearing 10 is mounted on shaft 4.

35 Rolling bearing assembly 2 also includes means to determine a rotation parameter of the outer ring 104, with respect to the inner ring 102. A rotation parameter is

representative of the pivoting movement of one part with respect to another. Such a parameter can be an angle measuring the angular position of one part with respect to the other, around the central axis X_{10} of ball bearing 10. Such a parameter can also be a speed, a displacement, an acceleration or a vibration.

These detection means include a sensor unit 20 having a body 202 supporting a Hall effect cell 204 forming a sensing element. An electric cable 205 connects cell 204 to an appropriate electronic control unit which is remote from rolling bearing assembly 2. Alternatively, some electronic components can be embedded in body 202 in order to treat the output signal of cell 204.

Body 202 is mounted on an annular shoe or spacer 203 which also belongs to sensor unit 20. Shoe 203 is fitted around shaft 4 and wedged onto inner ring 102 thanks to a skirt 2032 blocked in an inner peripheral groove or recess 1022 of inner ring 102. Thus, body 202 is fast in rotation with inner ring 102. A terminal nut 40 is mounted on shaft 4 and adapted to exert on shoe 203 an axial effort E_{40} , that is an effort parallel to axis X_{10} . This axial effort is transmitted, as an effort E_{30} , by shoe 203 to inner ring 102 which is in abutment against a spacer 42 extending between rolling bearing assemblies 2 and 3.

A metallic flange 50 is wedged on outer ring 104. Flange 50 acts as a cover for an encoder washer 60 which constitutes a target for Hall effect cell 204. Encoder washer 60 is magnetically active and includes several magnetic North and South poles regularly distributed around axis X_{10} in working configuration of rolling assembly 2. Encoder washer 60 is mounted on the radial inner face 502 of flange 50.

Sensing element 204 is arranged to detect encoder washer 60 in a radial direction.

Flange 50 is wedged onto outer ring 104. More precisely, an annular skirt 504 of flange 50 is introduced within an outer groove or recess 1042 of outer ring 104, so that items 50 and 104 are fast in rotation with each other.

Other possibilities to fasten flange 50 onto outer ring 104 include gluing, force fitting and screwing.

Flange 50 works as a radial cover which shields encoder washer 60 against shocks and/or pollution. In other words, encoder washer 60 is protected by flange 50 since encoder washer 60 is located radially inside flange 50. A sealing gasket 70 is mounted on flange 50 and extends radially inwardly from flange 50 so that a sealing lip 72 of sealing gasket 70 comes in sliding contact with the outer radial surface 2062 of a ring 206 which is engaged around shoe 203 in order to hold body 202 in position with respect to this shoe.

When it is necessary to mount rolling bearing assembly 2 onto hub 6 which forms a support member, one builds a sub-assembly 90 formed of items 50, 60 and 70. More

precisely, encoder washer 60 is mounted onto radial inner face 502 of flange 50 and sealing gasket 70 is inserted within a radial inner groove 506 of flange 50.

Encoder washer 60 is held fast with respect to flange or cover 50 thanks to an elastic deformation of flange 50 which occurs when washer 60 is introduced within this flange. Alternatively, encoder washer 60 can be immobilized onto flange 50 by gluing or clipping.

Then, ball bearing 10 is introduced within a cylindrical housing 62 of hub 6 centered on axis X_4 , thanks to a first axial effort E_1 exerted on the lateral surfaces 1024 and 1044 of rings 102 and 104 which are supposed to be oriented towards sensor unit 20 upon completion of the mounting operations. This introduction of ball bearing 10 within housing 62 is easy since surfaces 1024 and 1044 are accessible.

Then, sensor unit 20 is fastened to inner ring 102 by pushing this unit with a second axial effort E_2 exerted on an axial face 2034 of shoe 203 which faces away from rolling bearing 10. This effort E_2 is applied in such a way that skirt 2032 penetrates within groove 1022. This operation is also easy insofar as surface 2034 is easily accessible.

Then, sub-assembly 90 is mounted around sensor unit 20 thanks to a third axial effort E_3 exerted on a lateral face 508 of flange 50 which faces away from rolling bearing 10.

Thanks to effort E_3 , flange 50 is introduced within housing 62 and fastened onto outer ring 104 by introduction of skirt 504 within groove 1042 up to when alignment of items 60 and 204, along axis X_{10} , is obtained. Moreover, effort E_3 allows to bring sealing lip 72 into sliding contact with surface 2062.

Thus, mounting of rolling bearing assembly 2 with respect to hub 6 is easy and can be performed by an operator at the premises of a two-wheeled vehicle manufacturing company or in a repair shop.

With this respect, the mounting process of rolling bearing assembly 2 is compatible with an easy dismounting of this assembly, insofar as the components of this assembly can be removed from housing 62 in an easy way.

According to an alternative process of the invention, it is possible to fasten sensor unit 20 to inner ring 102, by introducing skirt 2032 within groove 1022, prior to pushing ball bearing 10 within housing 62. Then, units 10 and 20 are introduced in one operation within housing 62, with a combined axial effort $E_1 + E_2$.

In the second and third embodiments of the invention represented on figures 5 to 8, the elements similar to the ones of the first embodiment have the same references. The second and third embodiments work generally in the same way as the first embodiment

and one describes here-after mainly the differences between these embodiments and the first embodiment.

In the second embodiment of figures 5 and 6, a flange 50 has an outer diameter D_{50} which is larger than the outer diameter D_{104} of the outer ring 104 of a ball bearing 10. Under such circumstances, hub 6 is provided with two respective housings 62 and 64 which are circular and concentric and whose respective internal diameters are equal to or slightly larger than diameters D_{104} and D_{50} .

As in the first embodiment, flange 50 holds, surrounds and covers an encoder washer 60 and a sealing gasket 70 and constitutes with them a sub-assembly 90. Item 60 is mounted on the radial inner face 502 of flange 50, as in the first embodiment.

Mounting of rolling bearing assembly 2 with respect to hub 6 occurs by the introduction of ball bearing 10 within housing 62, thanks to an axial effort E_1 . Then, sensor unit 20 is introduced within housing 64, thanks to a second axial effort E_2 . After that, sub-assembly 90, previously built with items 50, 60 and 70, is introduced also within housing 64, thanks to a third axial effort E_3 . This brings encoder washer 60 in alignment, along axis X_{10} , with cell 204 and sealing lip 72 in sliding contact with the outer radial surface 2062 of a ring 206 fast in rotation around the body 202 of sensor unit 20.

Flange 50 can be blocked in rotation within housing 64 by different techniques, e.g. by press-fitting or gluing.

In the third embodiment of the invention represented on figures 7 and 8, a flange 50 includes a first cylindrical portion 501 having a circular cross-section and defining a radial inner face 502 on which encoder washer 60 is immobilized. Flange 50 also includes a second cylindrical portion or skirt 504 with a circular cross-section. The two portions 501 and 504 joined together by an annular portion 505 which is perpendicular to the central axis X_{10} of the ball bearing 10. Thanks to annular portion 505, cylindrical portions 501 and 504 can have different diameters.

Portion 504 is wedged onto outer ring 104 of ball bearing 10. More precisely, portion 504 is introduced within an outer groove 1042 of outer ring 104, so that items 50 and 104 are fast in rotation with each other.

Thanks to the configuration of flange 50, the radial inner diameter d_{60} of encoder washer 60 is larger than the outer diameter D_{104} of outer ring 104. This enables encoder washer 60 to be large enough to include a number of magnetic poles sufficient for a precise detection of its rotation by Hall effect 204, whereas rolling bearing 10 can be compact.

Rolling bearing assembly 2 is mounted within hub 6 by introducing ball bearing 10 within a housing 62 of hub 6 thanks to a first axial effort E_1 , as in the first embodiment.

Then, sensor unit 20 is fasten to ball bearing 10 thanks to a second axial effort E_2 , resulting in the introduction of an annular skirt 2022 of a shoe 202, fast in rotation with the body 202 of unit 20, within an annular groove 1022 of the rolling inner ring 102, as in the first embodiment.

5 Finally, a sub-assembly 90, previously built with flange 50, encoder washer 60 and a sealing gasket 70 mounted onto the radial inner face 502, is locked onto outer ring 104 by the introduction of cylindrical portion 504 within the space defined by groove 1042 around inner ring 104 inside housing 62. This is obtained thanks to an axial effort E_3 exerted on the edge of flange 50.

10 This mounting operation of flange 50 on outer ring 104 brings encoder washer in alignment, along axis X_{10} , with cell 204 and a sealing lip 72 of gasket 70 in sliding contact with an outer peripheral surface 2022 of sensor unit body 202 and an outer peripheral surface 2032 of a shoe 203 fast in rotation with the inner ring 102 of ball bearing 10. Surfaces 2022 and 2032 form together an annular surface. Alternatively, a ring similar to
15 ring 206 of the first and second embodiments can be used.

 In the third embodiment, flange 50 can be immobilized onto outer ring 104 by different techniques, e.g. press-fitting, gluing, clipping or screwing.

 In the second and third embodiments, fastening of sensor unit 20 to inner ring 102 can occur prior to the introduction of ball bearing 10 within hub 6.

20 In all embodiments, the respective sizes of ball bearing 10 and housing 62 are such that, once it is introduced within housing 62, by effort E_1 , ball bearing 10 is blocked in rotation with respect to hub 6.

 In non-represented alternative embodiments of the invention, sensor unit 20 may include more than one Hall effect cell 204.

25 The features of the embodiments mentioned here-above can be combined.

 As mentioned here-above, the invention is particularly adapted for realizing a tachometer of a two-wheeled vehicle. However, other applications can be considered.

CLAIMS

1. A process for mounting a rolling bearing assembly (2) onto a support member (6), said rolling bearing assembly comprising:

- a rolling bearing (10) having an inner ring (102) and an outer ring (104);
- a target (60) adapted to rotate with the outer ring (104) around a rotation axis (X_{10}) of the rolling bearing;
- a sensor unit (20) including at least one sensing element (204) adapted to read the target, and
- a sealing gasket (70) extending between a fixed part (206; 202, 203) and a rotating part (50) of said rolling bearing assembly,

wherein said process comprises the steps of:

- a) mounting said target (60) and said sealing gasket (70) on a radial inner face (502) of a cylindrical cover member (50),
- b) pushing said rolling bearing (10) into a first housing (62) of said support member (6), with a first axial effort (E_1), and blocking said outer ring (104) in rotation within this first housing,
- c) fastening said sensor unit (20) to said inner ring (102), with a second axial effort (E_2), and
- d) fastening said cover member (50), equipped with said target (60) and said sealing gasket (70), to said outer ring (104), with a third axial effort (E_3).

2. Process according to claim 1, wherein step b) occurs before step c).

3. Process according to claim 1, wherein step c) occurs before step b).

4. Process according to one of the previous claims, wherein, in step d), said cover member (50) is directly mounted (E_3) onto said outer ring (104).

5. Process according to claim 4, wherein, in step d), said cover member (50) is immobilized onto said outer ring (104) by press-fitting, gluing, clipping or screwing.

6. Process according to claim 5, wherein, in step d), an annular skirt (504) of said cover member (50) is introduced within a groove (1042) of said outer ring (104), thanks to said third axial effort (E_3).

7. Process according to any one of claims 1 to 3, wherein said cover member (50) is pushed into a second housing (64) of said support member (6), with said third axial effort (E_3), and blocked in rotation within this second housing.

5 8. Process according to claim 7, wherein said cover member (50) is blocked within said second housing (64) by press-fitting or gluing.

10 9. Process according to any one of the previous claims, wherein, prior to step a), said cover member (50) and said target (60) are selected in such a way that the inner diameter (d_{60}) of the target is larger than the outer diameter (D_{104}) of said outer ring (104).

15 10. Process according to any one of the previous claims, wherein, in step d), a sealing lip (72) of said sealing gasket (70) is brought into sliding contact with an outer annular radial surface (2062; 2022, 2032) of a part fast (206; 202, 203) in rotation with said inner ring (102).

20 11. Process according to any one of the previous claims, wherein in step a), said target (60) is immobilized onto said cover member (50) by press-fitting, gluing or clipping.

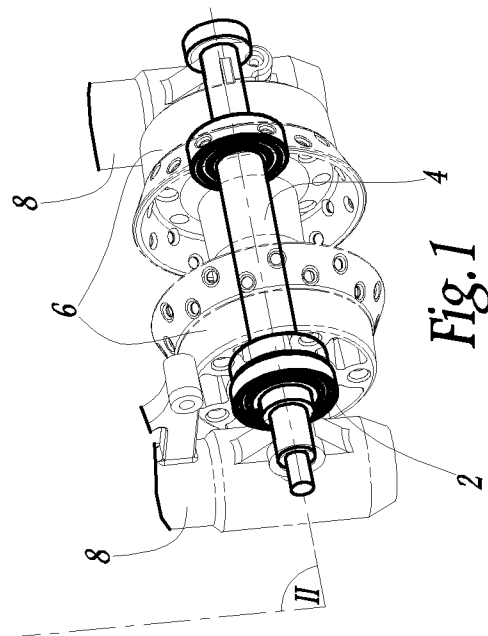


Fig. 1

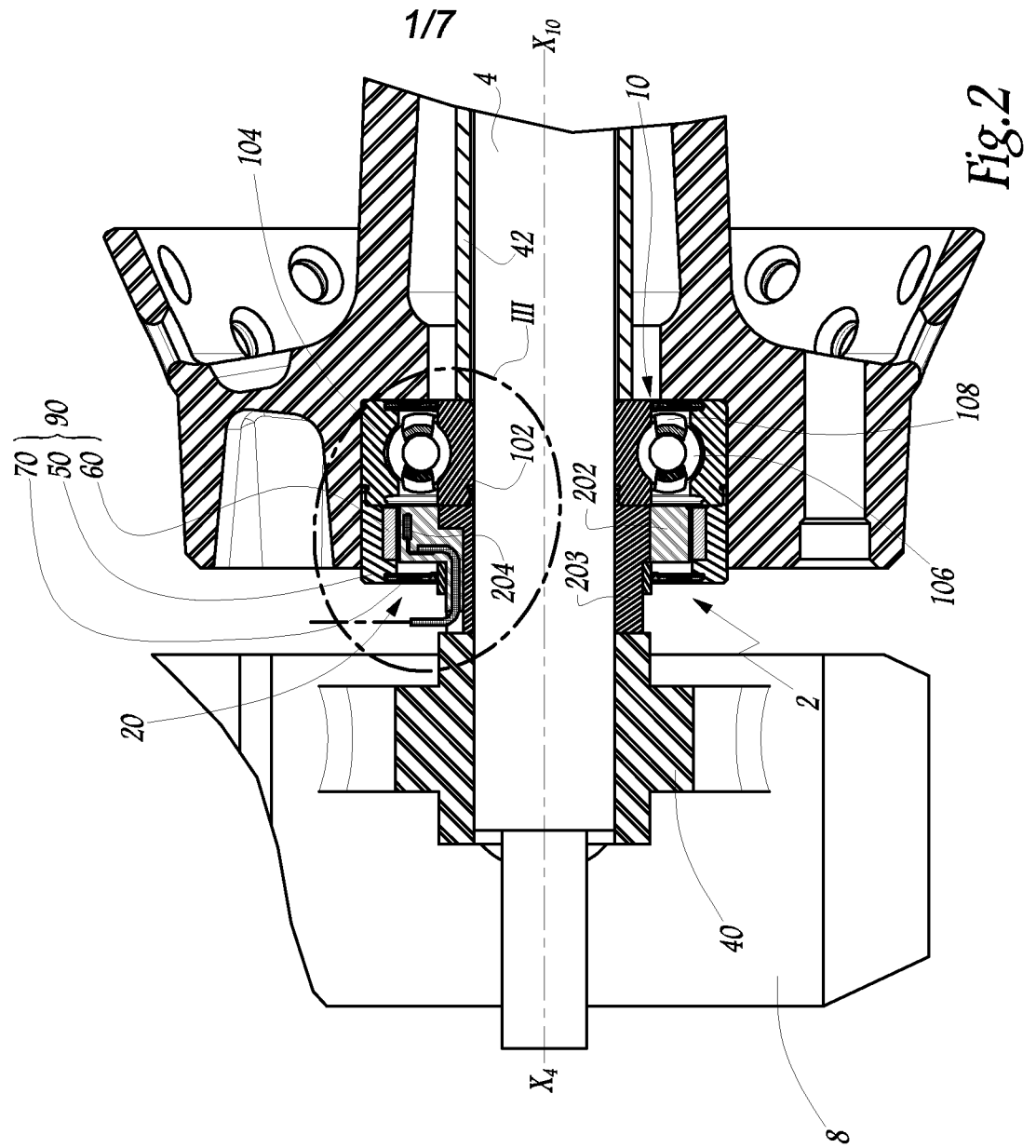


Fig. 2

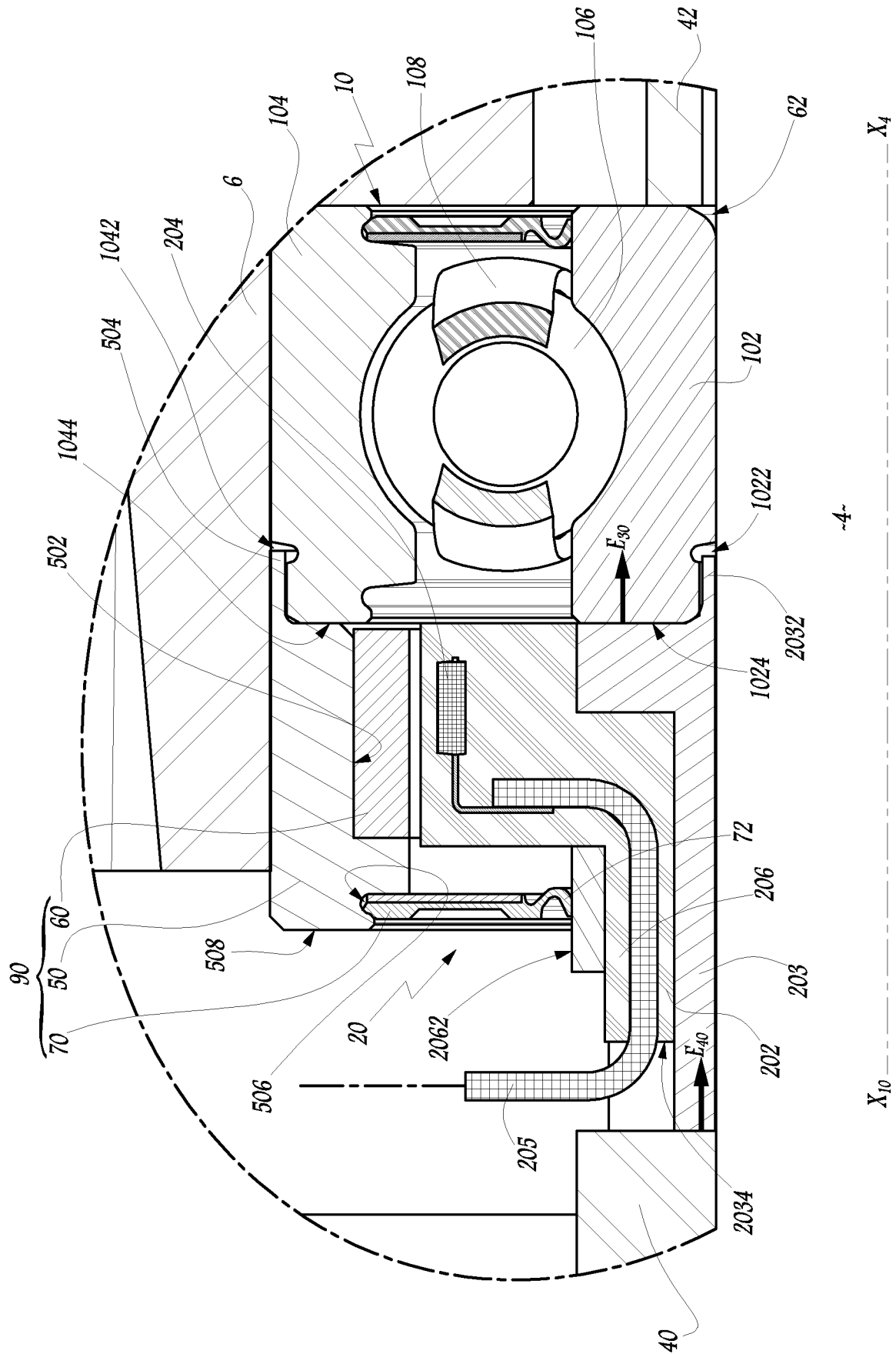


Fig. 3

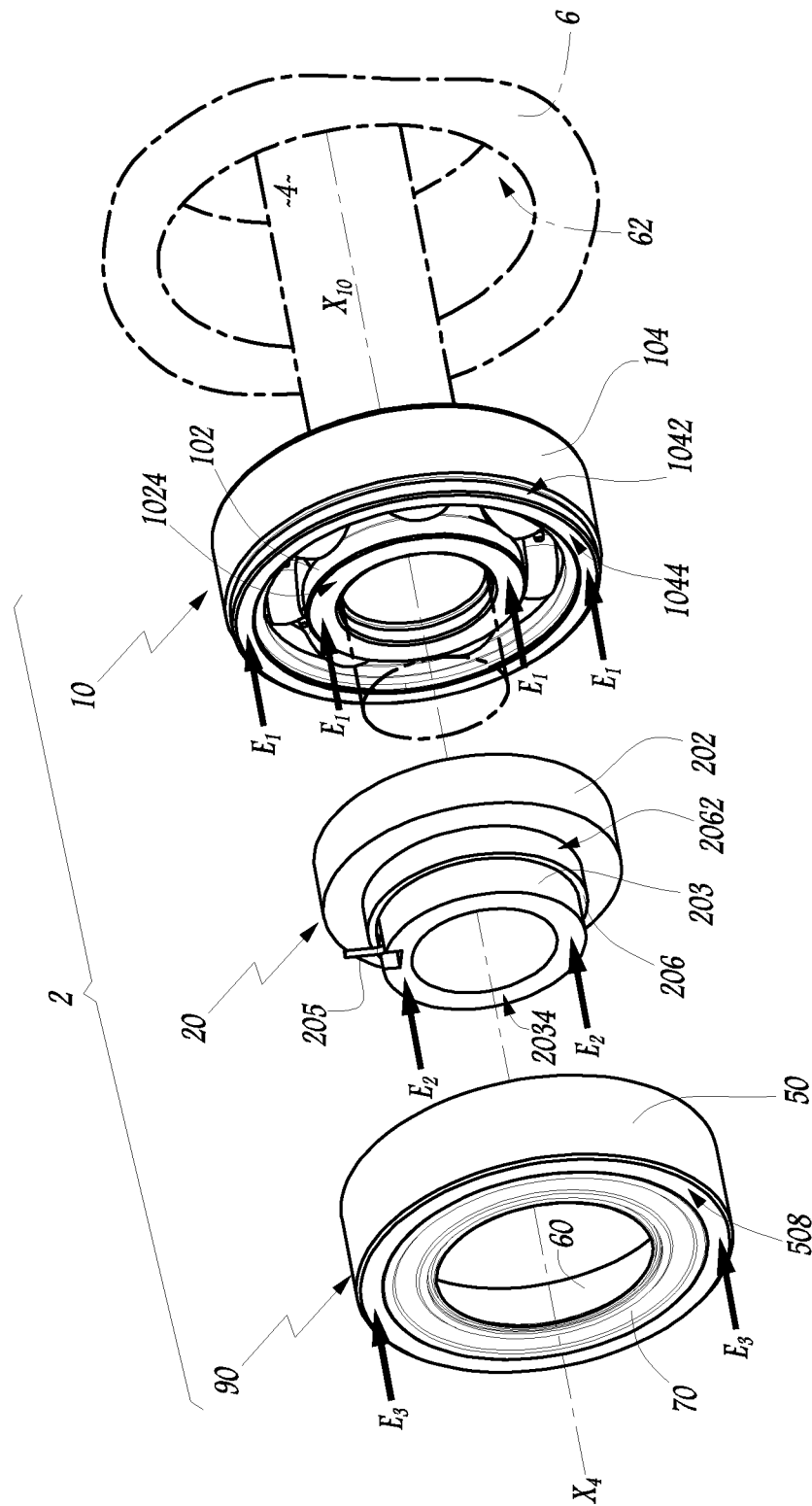


Fig. 4

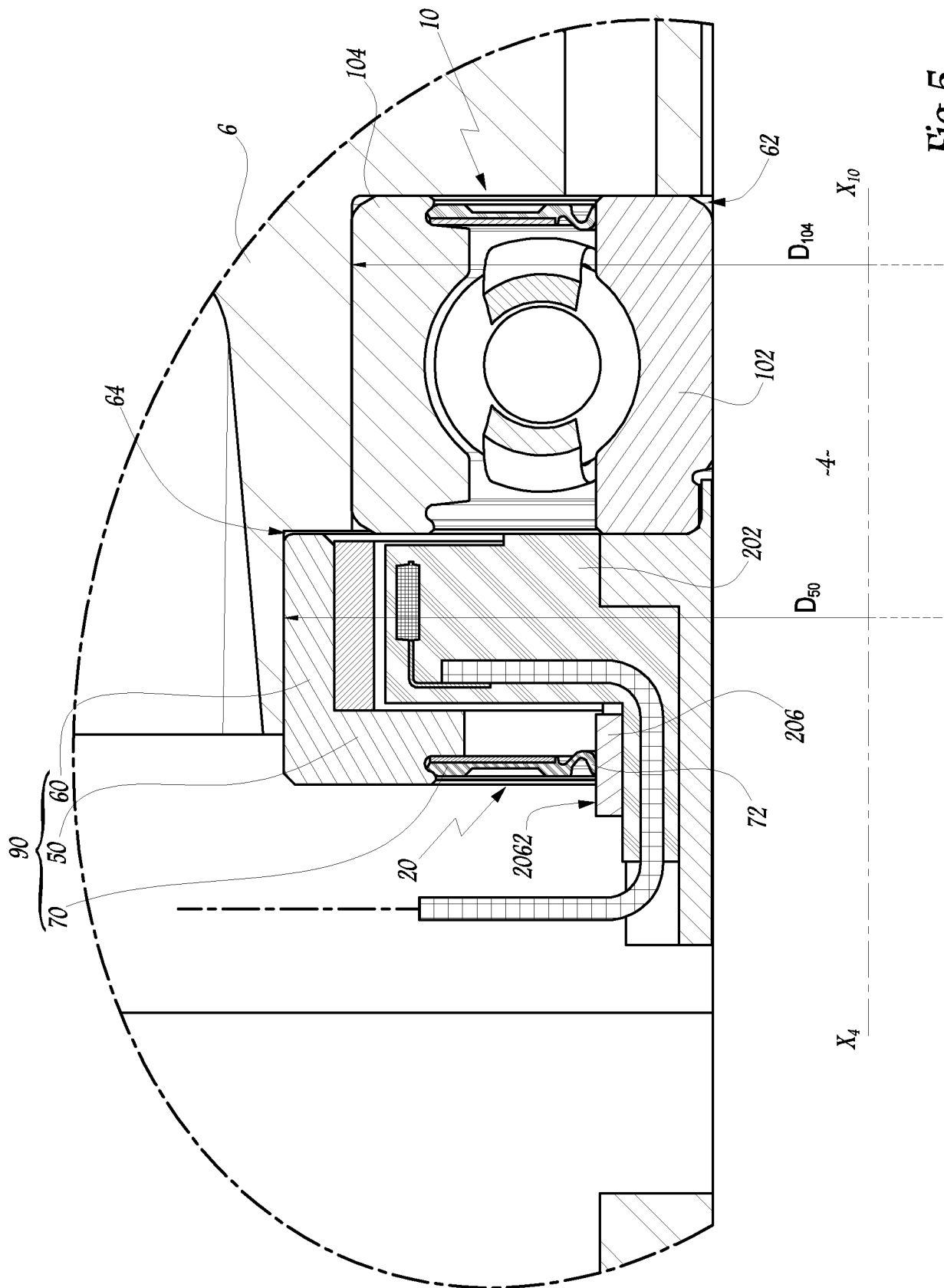


Fig. 5

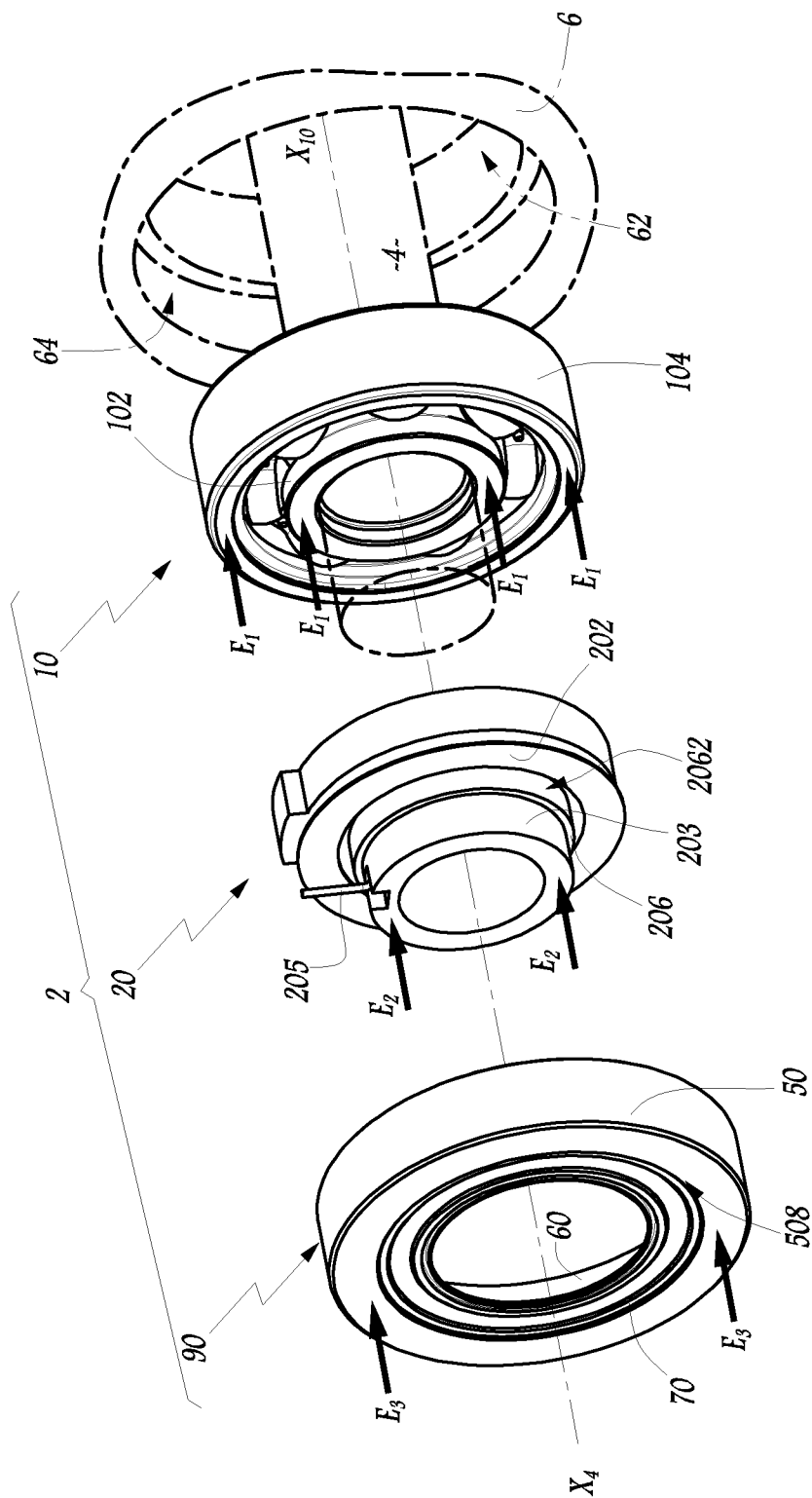


Fig.6

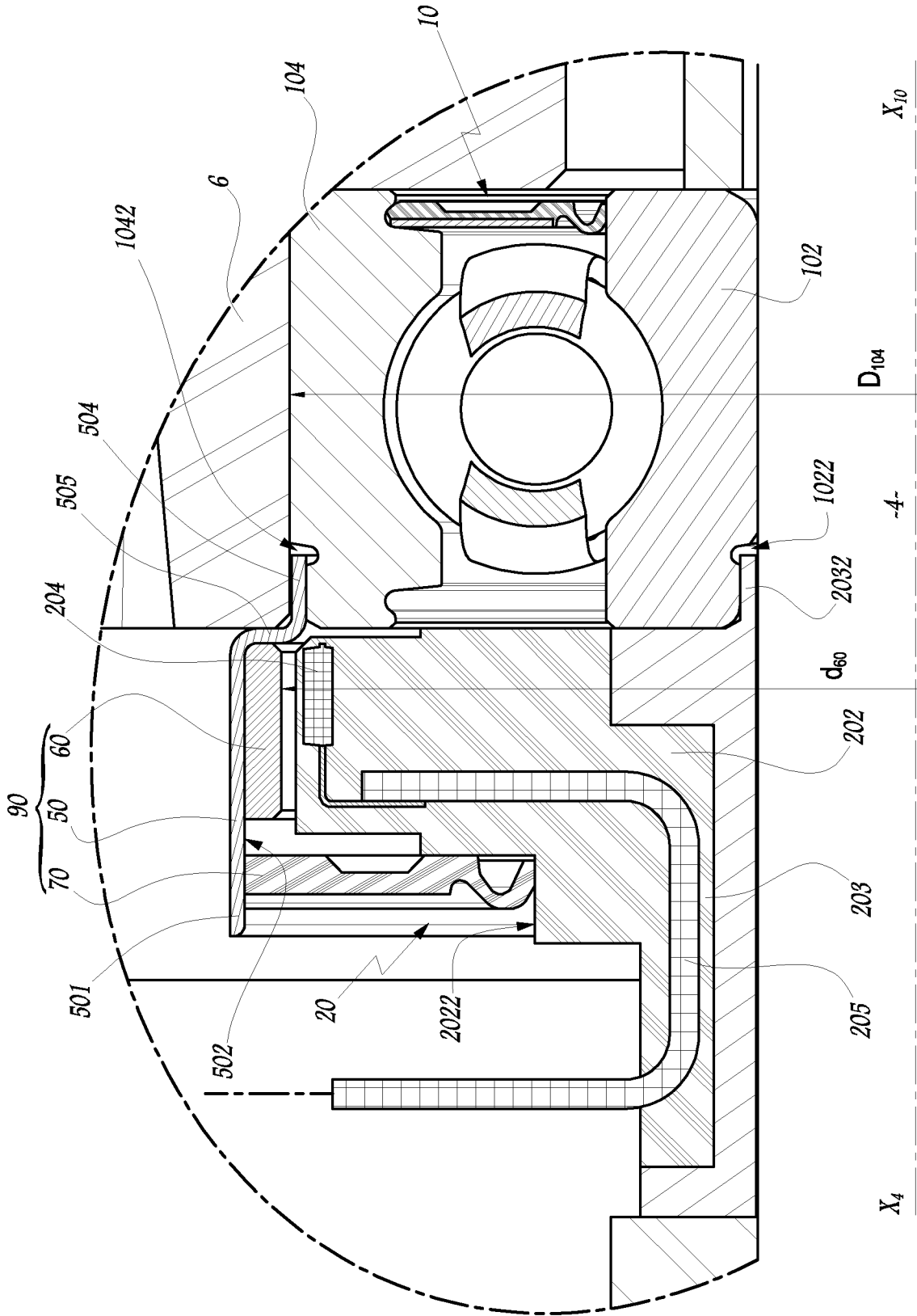


Fig. 7

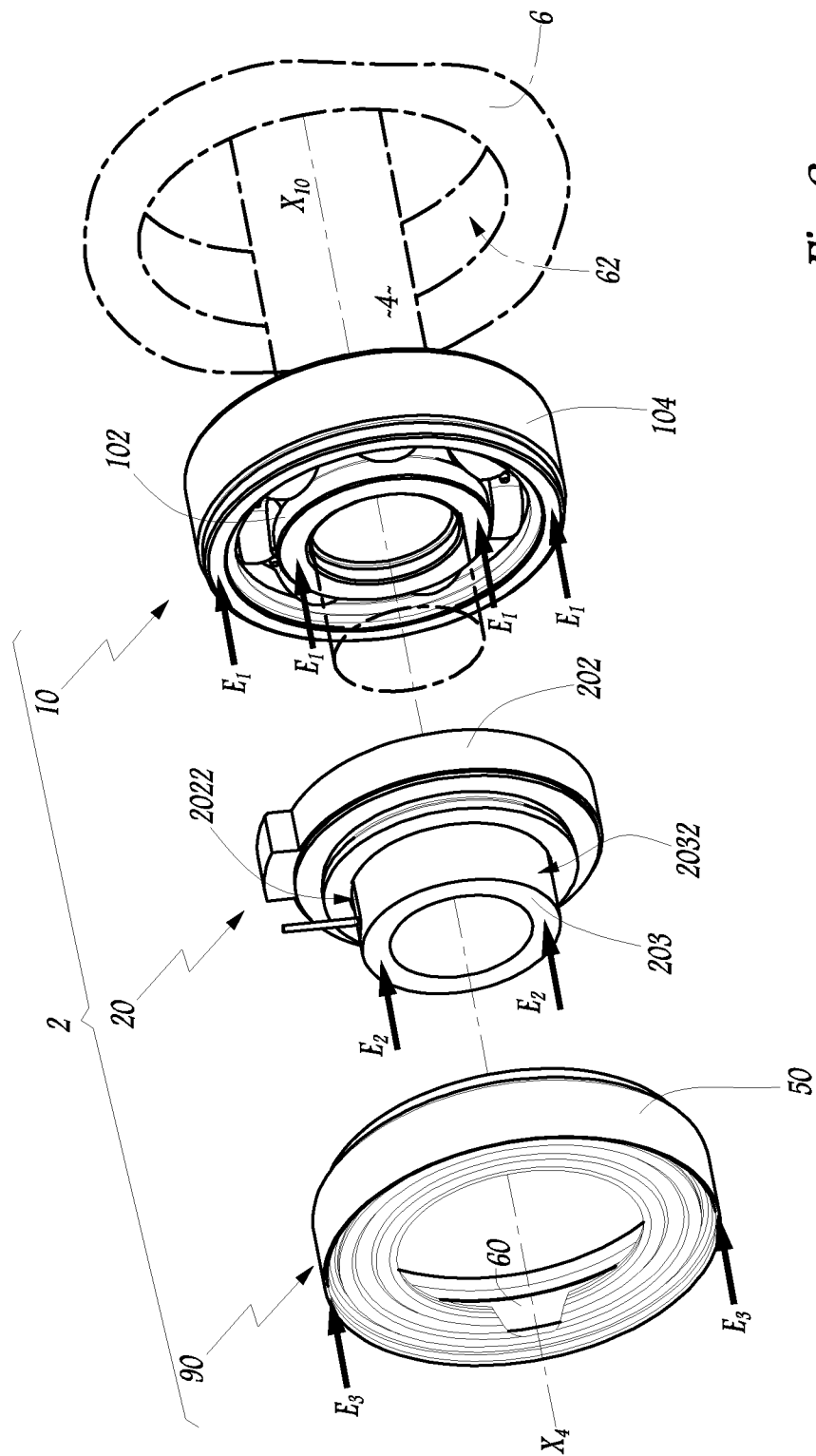


Fig.8

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2010/001273

A. CLASSIFICATION OF SUBJECT MATTER

INV. F16C35/06 F16C41/00 F16J15/32 G01P3/44
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)

F16C G01P F16J

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 practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 822 413 A2 (TIMKEN CO [US]) 4 February 1998 (1998-02-04)	1,3-6, 10,11
Y	column 6, line 46 - column 10, line 45 figures 1-5	7-9
X	JP 2000 356646 A (NSK LTD) 26 December 2000 (2000-12-26)	1-6,10, 11
Y	* abstract figure 9	7-9
Y	EP 1 696 217 A1 (SKF AB [SE]) 30 August 2006 (2006-08-30) figure 1	7-9



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search

25 January 2011

Date of mailing of the international search report

09/02/2011

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2010/001273

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