(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 081 815 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
19.10.2016 Bulletin 2016/42

(51) Int Cl.:
F04C 18/02 *(2006.01)*

(21) Application number: **16155379.7**

(22) Date of filing: **12.02.2016**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **19.02.2015 JP 2015030708**

(71) Applicant: **Mitsubishi Heavy Industries, Ltd.**
Tokyo 108-8215 (JP)

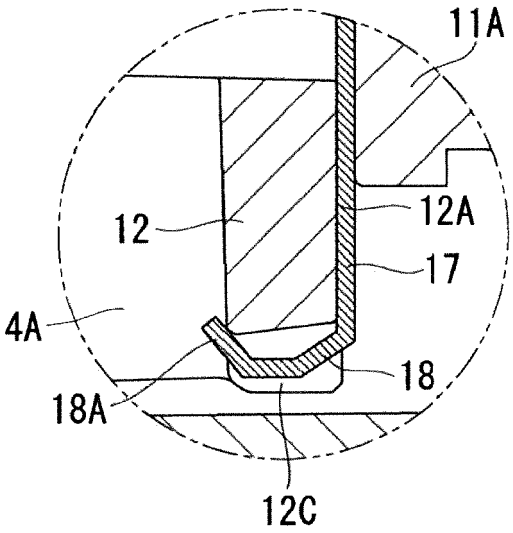
(72) Inventors:
- **Mizuno, Hisao**
  Tokyo, 108-8215 (JP)
- **Noguchi, Akihiro**
  Aichi, 453-0862 (JP)
- **Goto, Takashi**
  Aichi, 453-0862 (JP)
- **Shikanai, Toshiyuki**
  Aichi, 453-0862 (JP)

(74) Representative: **Henkel, Breuer & Partner**
Patentanwälte
Maximiliansplatz 21
80333 München (DE)

(54) SCROLL COMPRESSOR

(57) A scroll compressor includes a fixed scroll including an end plate (11A) fixed to a fixed member, an orbiting scroll engaging with the fixed scroll to form a compression chamber, having an end plate (11A) back surface supported by a thrust bearing (12), and driven to orbit about the fixed scroll, and a thin plate-shaped thrust plate (17) provided on a thrust bearing surface (12A) of the thrust bearing (12) and formed of an abrasion-resistant material, the orbiting scroll sliding on the thrust plate (17) at the end plate (11A) back surface. The thrust plate (17) includes a plurality of elastically-deformable hook-shaped locking claws (18) provided respectively at plural points of the outer periphery of the thrust plate (17), and is fixed in such a manner that hook portions (18A) of the locking claws (18) are locked on a thrust bearing (12) side.

FIG. 2



EP 3 081 815 A1

Description

[Technical Field]

[0001] The present invention relates to a scroll compressor provided with a thrust plate formed of an abrasion-resistant material on a thrust bearing supporting an orbiting scroll.

[Background Art]

[0002] A scroll compressor includes a compression mechanism having a pair of fixed and orbiting scrolls each provided with a spiral wrap standing on one side of an end plate. The end plate of the fixed scroll is fixed to a fixed member, and the orbiting scroll engages with the fixed scroll to form a compression chamber. Such an end plate is, at a back surface thereof, supported by a thrust bearing. Thus, the orbiting scroll can be driven to orbit about the fixed scroll. Moreover, a thin plate-shaped thrust plate formed of an abrasion-resistant material, such as a steel plate, to prevent seizure is provided on a thrust bearing surface of the thrust bearing on which the orbiting scroll slides when it is driven to orbit.

[0003] As described in Patent Literature 1, the thrust plate has a relatively-large thickness. For example, in the case of a plate material having a thickness of about 5 mm, the thrust plate is directly fixed to the thrust bearing via countersunk screws or the like. In the case of a plate material having a thickness of about 0.5 to 2 mm, the thrust plate cannot be directly screwed onto the thrust bearing. For this reason, bending pieces are, as described in Patent Literature 2, provided respectively at plural points of the outer periphery of the thrust plate, and are locked at cutouts of the thrust bearing to hold the thrust plate on the thrust bearing surface.

[Citation List]

[Patent Literature]

[0004]

[PTL 1] Japanese Unexamined Patent Application, Publication No. 2002-242859
[PTL 2] Japanese Unexamined Patent Application, Publication No. 2004-60469

[Summary of Invention]

[Technical Problem]

[0005] As described in Patent Literature 1, when the thrust plate has a large thickness, the axial dimensions of the scroll compressor increase by such a thickness, leading to an increase in compressor size, weight, and cost. Thus, in order to reduce the size, the weight, and the cost, a thin plate having a thickness of about 0.5 to 2 mm is used. In the case of providing such a thin plate-shaped thrust plate, a mound having a height less than that of the thrust plate is provided at the outer periphery of the thrust bearing surface. Rotation of the thrust plate is restricted in such a manner that the thrust plate is placed in a recess formed inside the mound and that the bent pieces are locked respectively at the cutouts of the thrust bearing.

[0006] However, the thrust plate described above is held in the state in which the back surface of the end plate of the orbiting scroll and the thrust bearing sandwich the thrust plate, and is not directly fixed. For this reason, the thrust plate is released and moves due to an excessive thrust load caused by, e.g., liquid compression, damage of the bent piece(s), or abrasion of the mound. This leads to a problem that failure, damage, etc. of the compressor are caused by contact between the thrust plate and an anti-rotation mechanism or a housing, the anti-rotation mechanism and the housing being provided between the back surface of the end plate of the orbiting scroll and the thrust bearing.

[0007] The present invention is intended to provide a scroll compressor configured such that a thin plate-shaped thrust plate having a thickness of even 2 mm or less can be firmly fixed to a thrust bearing to prevent troubles caused by contact between the thrust plate and another component due to movement of the thrust plate.

[Solution to Problem]

[0008] A scroll compressor of a first aspect of the present invention includes a fixed scroll including an end plate fixed to a fixed member, an orbiting scroll engaging with the fixed scroll to form a compression chamber, having an end plate back surface supported by a thrust bearing, and driven to orbit about the fixed scroll, and a thin plate-shaped thrust plate provided on a thrust bearing surface of the thrust bearing and formed of an abrasion-resistant material, the orbiting scroll sliding on the thrust plate at the end plate back surface. The thrust plate includes a plurality of elastically-deformable hook-shaped locking claws provided respectively at plural points of the outer periphery of the thrust plate, and is fixed in such a manner that hook portions of the locking claws are locked on a thrust bearing side.

[0009] According to the present aspect, the thin plate-shaped thrust plate placed on the thrust bearing surface of the thrust bearing can be locked on the thrust bearing side via the hook portions of the elastically-deformable hook-shaped locking claws provided respectively at the plural points of the outer periphery of the thrust plate.

[0010] Thus, a thin plate-shaped thrust plate having a thickness of even 2 mm or less can be directly fixed onto the thrust bearing surface of the thrust bearing. This restricts movement of the thin plate-shaped thrust plate due to, e.g., an excessive thrust load or abrasion of a mound, and therefore, reduces or prevents troubles that failure, damage, etc. of the compressor are caused by

contact between the thrust plate and another component, such as an anti-rotation mechanism or a housing, due to movement of the thrust plate.

[0011] In the above-described scroll compressor, the hook-shaped locking claws may be provided respectively at at least two points at a predetermined interval at the outer periphery of the thrust plate.

[0012] According to the above-described scroll compressor, since the hook portions of the hook-shaped locking claws are locked on the thrust bearing side at the plural points, i.e., two or more points, of the thrust plate, the thrust plate can be directly fixed onto the thrust bearing surface of the thrust bearing. It can be further ensured that the thin plate-shaped thrust plate is hooked by the locking claws to restrict the movement, and therefore, reduces or prevents the troubles caused by contact between the thrust plate and another component, such as the anti-rotation mechanism or the housing, due to movement of the thrust plate.

[0013] A scroll compressor of a second aspect of the present invention includes a fixed scroll including an end plate fixed to a fixed member, an orbiting scroll engaging with the fixed scroll to form a compression chamber, having an end plate back surface supported by a thrust bearing, and driven to orbit about the fixed scroll, and a thin plate-shaped thrust plate provided on a thrust bearing surface of the thrust bearing and formed of an abrasion-resistant material, the orbiting scroll sliding on the thrust plate at the end plate back surface. The thrust plate includes a plurality of weld nuts provided respectively at plural points of the outer periphery on a back side of the thrust plate, and is fixed via bolts screwed respectively into the weld nuts from an opposite bearing surface side of the thrust bearing.

[0014] According to the scroll compressor, the thin plate-shaped thrust plate placed on the thrust bearing surface of the thrust bearing can be fixed in such a manner that the bolts are screwed respectively into the weld nuts from the opposite bearing surface side of the thrust bearing at the plural points of the outer periphery of the thrust plate.

[0015] Thus, a thin plate-shaped thrust plate having a thickness of even 2 mm or less can be, by direct bolting, fixed onto the thrust bearing surface of the thrust bearing. This restricts movement of the thin plate-shaped thrust plate due to, e.g., an excessive thrust load or abrasion of a mound, and therefore, reduces or prevents troubles that failure, damage, etc. of the compressor are caused by contact between the thrust plate and another component, such as an anti-rotation mechanism or a housing, due to movement of the thrust plate.

[0016] In the above-described scroll compressor, each bolt may be provided with a hexagonal hole at a head portion thereof.

[0017] According to the above-described scroll compressor, even if a sufficient space cannot be ensured on the opposite bearing surface side of the thrust bearing, the thrust plate can be, using SCH bolts having head portions with hexagonal holes, directly bolted and fixed onto the thrust bearing surface of the thrust bearing. Thus, it can be further ensured that movement of the thin plate-shaped thrust plate is restricted by bolting. This reduces or prevents the troubles caused by contact between the thrust plate and another component, such as the anti-rotation mechanism or the housing, due to movement of the thrust plate.

[0018] A scroll compressor of a third aspect of the present invention includes an orbiting scroll engaging with a fixed scroll to form a compression chamber, having an end plate back surface supported by a thrust bearing, and driven to orbit about the fixed scroll, and a thin plate-shaped thrust plate provided on a thrust bearing surface of the thrust bearing and formed of an abrasion-resistant material, the orbiting scroll sliding on the thrust plate at the end plate back surface. A plurality of countersunk screw holes are formed respectively at plural points of the circumference of the thrust bearing, countersunk holes formed respectively with bent portions to be fitted respectively into the countersunk screw holes are formed at the peripheral edge of the thrust plate, and the thrust plate is fixed onto the thrust bearing via countersunk screws fitted respectively into the countersunk holes.

[0019] According to the scroll compressor, the thin plate-shaped thrust plate placed on the thrust bearing surface of the thrust bearing can be fixed in such a manner that the countersunk holes formed with the bent portions and formed at the peripheral edge of the thrust plate are fitted respectively into the countersunk screw holes of the thrust bearing and that the countersunk screws are fastened respectively into the countersunk screw holes of the thrust bearing via the countersunk holes.

[0020] Thus, a thin plate-shaped thrust plate having a thickness of even 2 mm or less can be, by direct screwing, fixed onto the thrust bearing surface of the thrust bearing. This restricts movement of the thin plate-shaped thrust plate due to, e.g., an excessive thrust load or abrasion of a mound, and therefore, reduces or prevents troubles that failure, damage, etc. of the compressor are caused by contact between the thrust plate and another component, such as an anti-rotation mechanism or a housing, due to movement of the thrust plate.

[0021] In the above-described scroll compressor, a surface of a head portion of each countersunk screw may be embedded in a corresponding one of the countersunk holes of the thrust plate, and may be positioned lower than the thrust bearing surface.

[0022] According to the above-described scroll compressor, even if a thrust plate having a thickness of 2 mm or less is, by direct screwing, fixed from the thrust bearing surface side with the countersunk screws, the thrust plate can be screwed and fixed without protrusion of the head portions of the countersunk screws from the bearing surface. It can be further ensured that movement of the thin plate-shaped thrust plate is restricted by screwing. This reduces or prevents the troubles caused by contact between the thrust plate and another component, such as

the anti-rotation mechanism or the housing, due to movement of the thrust plate.

[Advantageous Effects of Invention]

[0023] According to the present invention, movement of the thin plate-shaped thrust plate due to, e.g., an excessive thrust load or abrasion of the mound can be restricted, and therefore, troubles that failure, damage, etc. of the compressor are caused by contact between the thrust plate and another component, such as the anti-rotation mechanism or the housing, due to movement of the thrust plate can be reduced or prevented.

[Brief Description of Drawings]

[0024]

[Fig. 1] Fig. 1 is a longitudinal sectional view of a main portion of a scroll compressor of a first embodiment of the present invention.
[Fig. 2] Fig. 2 is an enlarged sectional view of part of the scroll compressor where a thrust plate is fixed.
[Fig. 3] Fig. 3 is an enlarged sectional view of part, where a thrust plate is fixed, of a scroll compressor of a second embodiment of the present invention.
[Fig. 4] Fig. 4 is an enlarged sectional view of part, where a thrust plate is fixed, of a scroll compressor of a third embodiment of the present invention.

[Description of Embodiments]

[0025] Embodiments of the present invention will be described below with reference to drawings.

[First Embodiment]

[0026] A first embodiment of the present invention will be described below with reference to Fig. 1.

[0027] Fig. 1 illustrates a longitudinal sectional view of a main portion of a scroll compressor of the first embodiment of the present invention, and Fig. 2 illustrates an enlarged sectional view of part of the scroll compressor where a thrust plate is fixed.

[0028] A scroll compressor 1 includes a housing 2 forming an outer shell of the scroll compressor 1. The housing 2 includes a cylindrical rear housing 3 formed in a cup shape, and a front housing 4 fitted into an opening of the rear housing 3 with a sealing member such as an O-ring being interposed therebetween and integrally joined to the rear housing 3 with, e.g., bolts to form the housing 2 with an enclosed structure.

[0029] A drive shaft 7 is rotatably supported by a main bearing 5 and a sub-bearing 6 at the front housing 4. The drive shaft 7 includes a crank pin 8 eccentric toward one end side with respect to a shaft center by a predetermined dimension, and is, on the other end side, configured to protrude from a bearing boss portion 4A of the front housing 4 to the outside. A not-shown pulley with an electromagnetic clutch is attached to the end of the drive shaft 7 protruding to the outside so that power can be input from an external drive source such as an engine. An opening of the housing 2 from which the drive shaft 7 protrudes is sealed from atmosphere by a lip seal 9.

[0030] A scroll compressor mechanism 10 is incorporated in the rear housing 3. The scroll compressor mechanism 10 includes a pair of a fixed scroll (not shown) and an orbiting scroll 11, each scroll being provided with a spiral wrap standing on one side of an end plate. The end plate of the fixed scroll is, with, e.g., bolts, fixed to the rear housing 3 which is a fixed member. On the other hand, the orbiting scroll 11 engages with the fixed scroll to form a compression chamber, and a back surface of the end plate 11A of the orbiting scroll 11 is supported by a thrust bearing 12 provided at the front housing 4. Moreover, the orbiting scroll 11 is provided so that the orbiting scroll 11 can be driven to orbit about the fixed scroll.

[0031] The orbiting scroll 11 includes a boss portion 11B at the back surface of the end plate 11A. Further, the orbiting scroll 11 is provided such that the boss portion 11B is, via a driven crank mechanism 15 including a drive bush 13 and an orbiting bearing 14, coupled to the crank pin 8 provided at one end of the drive shaft 7, and therefore, the orbiting scroll 11 can be driven to orbit about the fixed scroll. An anti-rotation mechanism 16, such as an Oldham's ring, interposed between the back surface of the end plate 11A and the thrust bearing 12 prevents the orbiting scroll 11 from rotating, and the orbiting scroll 11 is driven to orbit. Other methods such as a pin/link method may be, as the anti-rotation mechanism 16, used other than the method using the Oldham's ring.

[0032] A mound 12B having a predetermined height is formed at the outer periphery of a thrust bearing surface 12A of the thrust bearing 12, on which the orbiting scroll 11 slides by orbiting thereof, so that a thin plate-shaped thrust plate 17 formed of an abrasion-resistant material such as a steel plate can be placed to prevent seizure. The scroll compressor 1 having the above-described configuration is not a special compressor, but has been known conventionally and broadly. The features of the present embodiment are the following improvements in installation and structure of the thrust plate 17 described above.

[0033] The thrust plate 17 described herein is a thin plate having a thickness of 2 mm or less and having a doughnut discoid shape, and can be placed on the thrust bearing surface 12A of the thrust bearing 12 inside the mound 12B. At the outer periphery of the thrust plate 17, a plurality of hook-shaped locking claws 18 with hook portions 18A are, as illustrated in Fig. 2, provided at at least two points, preferably at three or more points, at a predetermined interval (equal interval) in a circumferential direction, the locking claws 18 being locked by elastically deforming by an opposite-bearing-surface-side portion of the thrust bearing 12.

[0034] Each hook portion 18A of the hook-shaped locking claws 18 is locked at the opposite-bearing-surface-side portion of the thrust bearing 12 via a cutout 12C formed at an outer peripheral surface of the thrust bearing 12, and as a result, the thin plate-shaped thrust plate 17 is fixed to the thrust bearing surface 12A of the thrust bearing 12.

[0035] Each hook portion 18A of the hook-shaped locking claws 18 is not limited to the hook portion 18A in a shape bending at three points as illustrated in Fig. 2, and may be deformable in various shapes such as a shape bending at right angle at two points, a shape bending in a triangular shape at two points, a shape curving smoothly, and a shape in which a hooking portion is bent back.

[0036] In the present embodiment, the portion of the thrust bearing 12 on which the hook portions 18A of the hook-shaped locking claws 18 are hooked has been described as the opposite-bearing-surface-side portion on which the hook portions 18A of the locking claws 18 are hooked using the narrow portion 4A which protrudes from the front housing 4 to engage with the rear housing 3. However, the present invention is not limited to such a configuration. For example, the configuration may be employed, in which a hooking portion is optionally formed at the outer peripheral surface of the thrust bearing 12.

[0037] The following features and advantageous effects are exhibited by the above-described configuration of the present embodiment.

[0038] In the above-described scroll compressor 1, when the electromagnetic clutch is turned on to rotate the drive shaft 7 by drive force from the external drive source, the orbiting scroll 11 is driven to orbit about the fixed scroll, and accordingly, compression is performed as conventionally known. In this state, thrust generated by compression reactive force acting on the orbiting scroll 11 is supported by the thrust bearing 12 via the thrust plate 17 on which the back surface of the end plate 11A slides.

[0039] The thrust plate 17 of the present embodiment is, as described above, fixed onto the thrust bearing surface 12A of the thrust bearing 12 in such a manner that the hook portions 18A of the elastically-deformable hook-shaped locking claws 18 provided respectively at plural points of the outer periphery of the thrust plate 17 are locked at the thrust bearing 12. Thus, a thin plate-shaped thrust plate 17 having a thickness of even 2 mm or less can be directly fixed onto the thrust bearing surface 12 of the thrust bearing 12A.

[0040] This restricts movement of the thin plate-shaped thrust plate 17 due to an excessive thrust load caused by, e.g., liquid compression or abrasion of the mound 12B. Consequently, the following troubles can be reduced or prevented with a simple configuration: failure, damage, etc. of the compressor 1 caused by contact between the thrust plate 17 and another component, such as the anti-rotation mechanism 16 or the housing 2, due to movement of the thrust plate 17.

[0041] Since the hook-shaped locking claws 18 are provided at at least two points of the outer periphery of the thrust plate 17 at the predetermined interval, the thrust plate 17 is, at two or more points, locked at the thrust bearing 12 by the hook portions 18A of the hook-shaped locking claws 18, and therefore, the thrust plate 17 can be directly fixed onto the thrust bearing surface 12A of the thrust bearing 12. Thus, it can be further ensured that the thin plate-shaped thrust plate 17 is hooked by the locking claws 18 to restrict the movement. This reduces or prevents the troubles caused by contact between the thrust plate 17 and another component, such as the anti-rotation mechanism 16 or the housing 2, due to movement of the thrust plate 17.

[Second Embodiment]

[0042] Next, a second embodiment of the present invention will be described with reference to Fig. 3.

[0043] The present embodiment is different from the above-described first embodiment in that a thrust plate 17 is fixed using weld nuts and bolts. Since the present embodiment is similar to the first embodiment in other points, description thereof will not be repeated.

[0044] In the present embodiment, as illustrated in Fig. 3, weld nuts 19 are, at a predetermined interval (equal interval), welded to plural points (two or more points, and preferably three or more points) of the back side of the outer periphery of the thin plate-shaped thrust plate 17 provided on a thrust bearing surface 12A of a thrust bearing 12.

[0045] Each weld nut 19 is disposed in a corresponding one of a plurality of recesses 12D formed respectively at plural points of the thrust bearing surface 12A. Moreover, a bolt 20 provided with a hexagonal hole 20A at a head portion thereof is screwed into each weld nut 19 from an opposite bearing surface side of the thrust bearing 12 so that the thin plate-shaped thrust plate 17 having a thickness of 2mm or less can be fixed onto the thrust bearing surface 12A inside a mound 12B. For example, a bolt having favorable thermal resistance or abrasion resistance, more specifically an SCH bolt etc., may be used as the bolt 20.

[0046] With the above-described configuration, a thin plate-shaped thrust plate 17 having a thickness of even 2 mm or less can be, by direct bolting, fixed onto the thrust bearing surface 12A of the thrust bearing 12 via the bolts 20. This restricts movement of the thin plate-shaped thrust plate 17 due to an excessive thrust load or abrasion of the mound 12B. Consequently, the following troubles can be reduced or prevented: failure, damage, etc. of a compressor 1 caused by contact between the thrust plate 17 and another component, such as an anti-rotation mechanism 16 or a housing 2, due to movement of the thrust plate 17.

[0047] Each bolt 20 fastening and fixing the thrust plate 17 is provided with the hexagonal hole 20A at the head portion thereof. Thus, even if a sufficient space cannot be ensured on the opposite bearing surface side of the

thrust bearing 12, the thrust plate 17 can be, by direct bolting using the hexagonal holes 20A, fixed onto the thrust bearing surface 12A of the thrust bearing 12. Thus, it can be further ensured that movement of the thin plate-shaped thrust plate 17 is restricted by bolting. This reduces or prevents the troubles caused by contact between the thrust plate 17 and another component, such as the anti-rotation mechanism 16 or the housing 2, due to movement of the thrust plate 17.

[Third Embodiment]

[0048] Next, a third embodiment of the present invention will be described with reference to Fig. 4.

[0049] The present embodiment is different from the above-described first and second embodiments in that a thrust plate 17 is fixed using countersunk screws. Since the present embodiment is similar to the first and second embodiments in other points, description thereof will not be repeated.

[0050] In the present embodiment, in order to fix the thin plate-shaped thrust plate 17 onto a thrust bearing surface 12A with countersunk screws 21, countersunk screw holes 12E are formed respectively at plural points of the circumference of the thrust bearing surface 12A of the thrust bearing 12, and countersunk holes 22 formed respectively with bent portions 22A to be fitted respectively into the countersunk screw holes 12E are formed at the peripheral edge of the thrust plate. The thrust plate 17 is fixed onto the thrust bearing 12 via the countersunk screws 21 fitted respectively into the countersunk holes 22.

[0051] With the above-described configuration, a thin plate-shaped thrust plate 17 having a thickness of even 2 mm or less can be, by direct bolting, fixed onto the thrust bearing surface 12A of the thrust bearing 12 such that a head portion of each countersunk screw 21 does not protrude from the bearing surface. This restricts movement of the thin plate-shaped thrust plate 17 due to an excessive thrust load or abrasion of a mound 12B. Consequently, the following troubles can be reduced or prevented: failure, damage, etc. of a compressor 1 caused by contact between the thrust plate 17 and another component, such as an anti-rotation mechanism 16 or a housing 2, due to movement of the thrust plate 17.

[0052] The surface of the head portion of each countersunk screw 21 is embedded in a corresponding one of the countersunk holes 22 of the thrust plate 17, and is positioned lower than the thrust bearing surface. Thus, even if the thrust plate 17 having a thickness of 2 mm or less is, by direct screwing, fixed from the thrust bearing surface 12A side with the countersunk screws 21, the thrust plate 17 can be screwed and fixed without protrusion of the head portions of the countersunk screws 21 from the bearing surface. It can be further ensured that movement of the thin plate-shaped thrust plate is restricted by screwing. This reduces or prevents the troubles caused by contact between the thrust plate 17 and another component, such as the anti-rotation mechanism or the housing, due to movement of the thrust plate.

[0053] The present invention is not limited to the above-described embodiments, and variations may be optionally made. For example, in the above-described embodiments, the example where the present invention is applied to the open type scroll compressor driven by power supplied from the outside has been described. Needless to say, the present invention is applicable to a scroll compressor provided with a motor incorporated in a housing.

[Reference Signs List]

[0054]

1	scroll compressor
2	housing
3	rear housing (fixed member)
4	front housing
11	orbiting scroll
11A	end plate
12	thrust bearing
12A	thrust bearing surface
12E	countersunk screw hole
17	thrust plate
18	hook-shaped locking claw
18A	hook portion
19	weld nut
20	bolt
20A	hexagonal hole
21	countersunk screw
22	countersunk hole
22A	bent portion

Claims

1. A scroll compressor comprising:

a fixed scroll including an end plate fixed to a fixed member;

an orbiting scroll engaging with the fixed scroll to form a compression chamber, having an end plate back surface supported by a thrust bearing, and driven to orbit about the fixed scroll; and

a thin plate-shaped thrust plate provided on a thrust bearing surface of the thrust bearing and formed of an abrasion-resistant material, the orbiting scroll sliding on the thrust plate at the end plate back surface,

wherein the thrust plate

includes a plurality of elastically-deformable hook-shaped locking claws provided respectively at plural points of an outer periphery of the thrust plate, and

is fixed in such a manner that hook portions of the locking claws are locked on a thrust bearing

side.

2. The scroll compressor of claim 1, wherein the hook-shaped locking claws are provided respectively at at least two points at a predetermined interval at the outer periphery of the thrust plate.

3. A scroll compressor comprising:

a fixed scroll including an end plate fixed to a fixed member;
an orbiting scroll engaging with the fixed scroll to form a compression chamber, having an end plate back surface supported by a thrust bearing, and driven to orbit about the fixed scroll; and
a thin plate-shaped thrust plate provided on a thrust bearing surface of the thrust bearing and formed of an abrasion-resistant material, the orbiting scroll sliding on the thrust plate at the end plate back surface,
wherein the thrust plate

includes a plurality of weld nuts provided respectively at plural points of an outer periphery on a back side of the thrust plate, and is fixed via bolts screwed respectively into the weld nuts from an opposite bearing surface side of the thrust bearing.

4. The scroll compressor of claim 3, wherein each bolt is provided with a hexagonal hole at a head portion thereof.

5. A scroll compressor comprising:

a fixed scroll including an end plate fixed to a fixed member;
an orbiting scroll engaging with the fixed scroll to form a compression chamber, having an end plate back surface supported by a thrust bearing, and driven to orbit about the fixed scroll; and
a thin plate-shaped thrust plate provided on a thrust bearing surface of the thrust bearing and formed of an abrasion-resistant material, the orbiting scroll sliding on the thrust plate at the end plate back surface,
wherein a plurality of countersunk screw holes are formed respectively at plural points of a circumference of the thrust bearing,
countersunk holes formed respectively with bent portions to be fitted respectively into the countersunk screw holes are formed at a peripheral edge of the thrust plate, and
the thrust plate is fixed onto the thrust bearing via countersunk screws fitted respectively into the countersunk holes.

6. The scroll compressor of claim 5, wherein a surface of a head portion of each countersunk screw is embedded in a corresponding one of the countersunk holes of the thrust plate, and is positioned lower than the thrust bearing surface.

FIG. 1

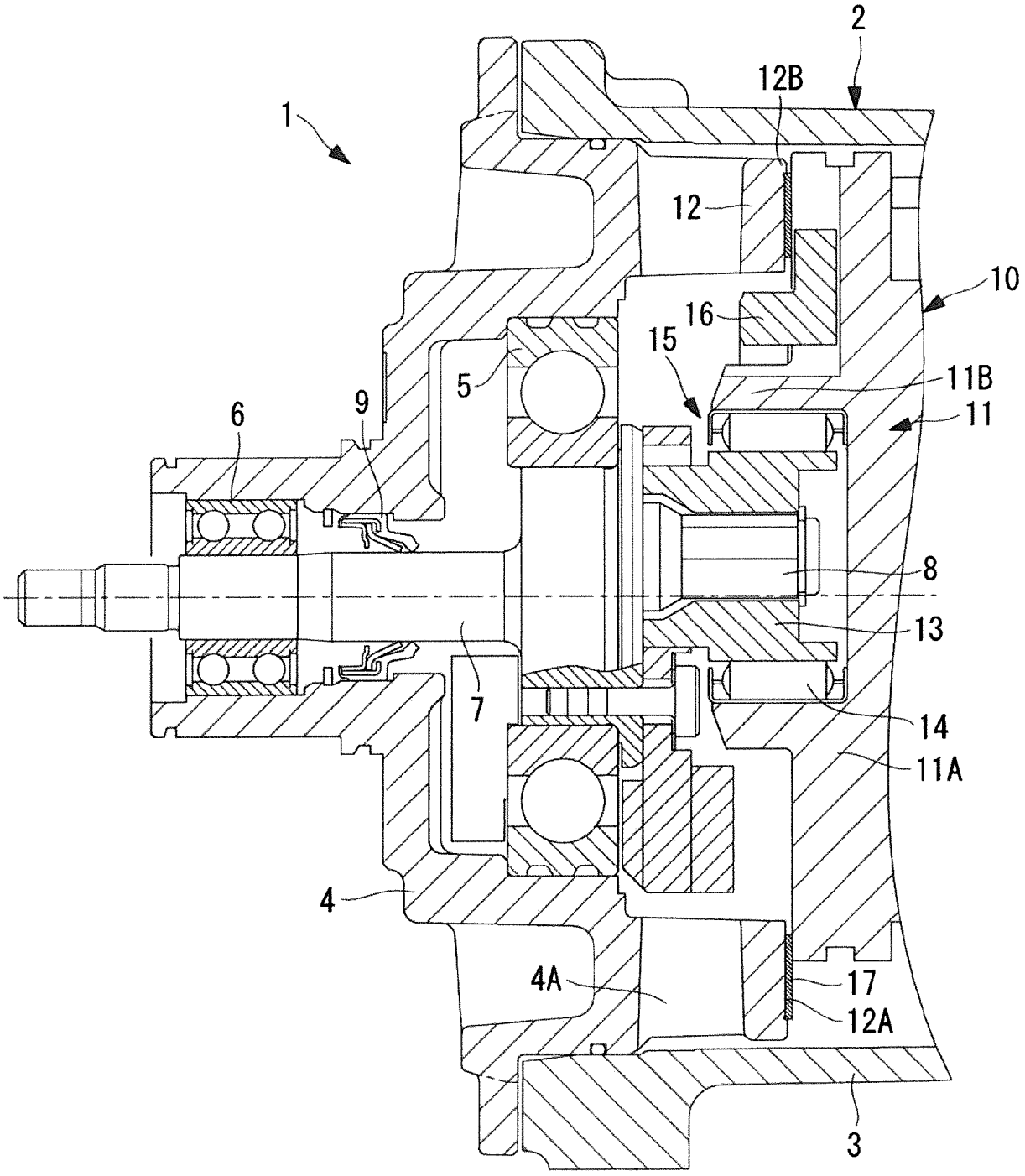


FIG. 2

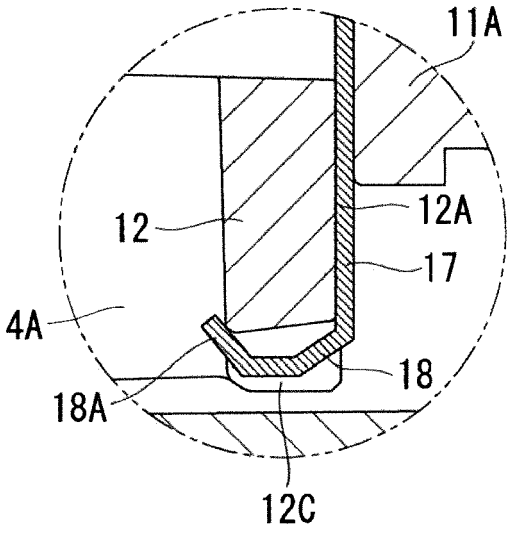


FIG. 3

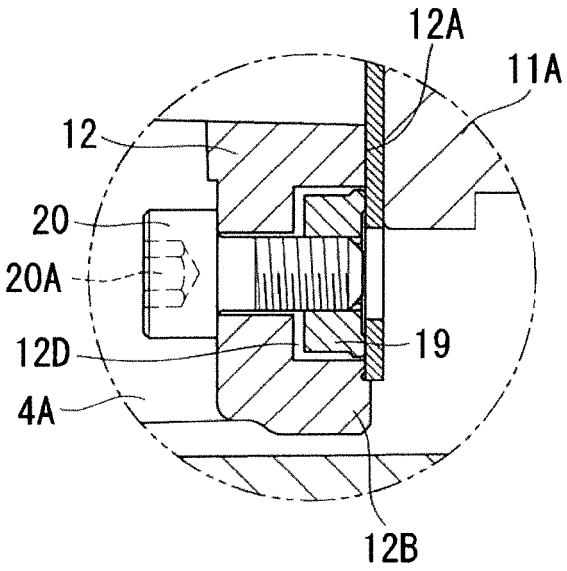
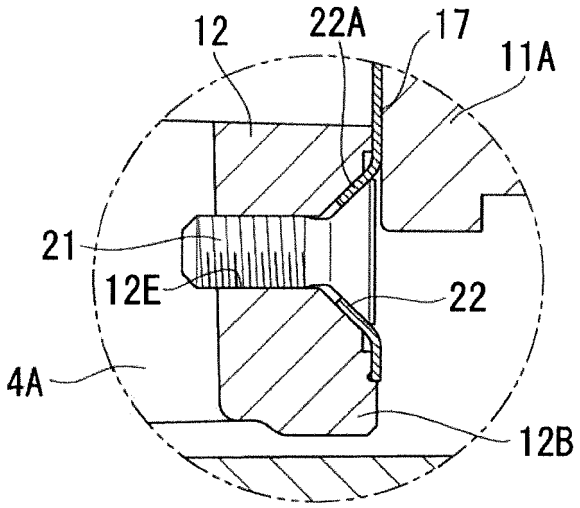


FIG. 4



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 16 15 5379

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 867 876 A2 (MITSUBISHI HEAVY IND LTD [JP]) 19 December 2007 (2007-12-19) * paragraph [0015] - paragraph [0034] * * figures 1-4 * -----	1-6	INV. F04C18/02
A	US 5 853 287 A (IIDA NOBORU [JP] ET AL) 29 December 1998 (1998-12-29) * column 1, line 61 - column 2, line 33 * * column 3, line 35 - column 4, line 54 * * figures 1,3 * -----	1-6	

TECHNICAL FIELDS SEARCHED (IPC)

F04C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 June 2016	Papastefanou, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 16 15 5379

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-06-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1867876 A2	19-12-2007	CN 101089393 A	19-12-2007
		EP 1867876 A2	19-12-2007
		JP 5039327 B2	03-10-2012
		JP 2007332851 A	27-12-2007
		US 2007292294 A1	20-12-2007
US 5853287 A	29-12-1998	JP H09228967 A	02-09-1997
		US 5853287 A	29-12-1998

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2002242859 A **[0004]**
- JP 2004060469 A **[0004]**