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

(11) EP 1 748 181 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
31.01.2007 Bulletin 2007/05

(51) Int Cl.:
F02N 15/02 *(2006.01)*

(21) Application number: **06015088.5**

(22) Date of filing: **19.07.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **29.07.2005 JP 2005220105**

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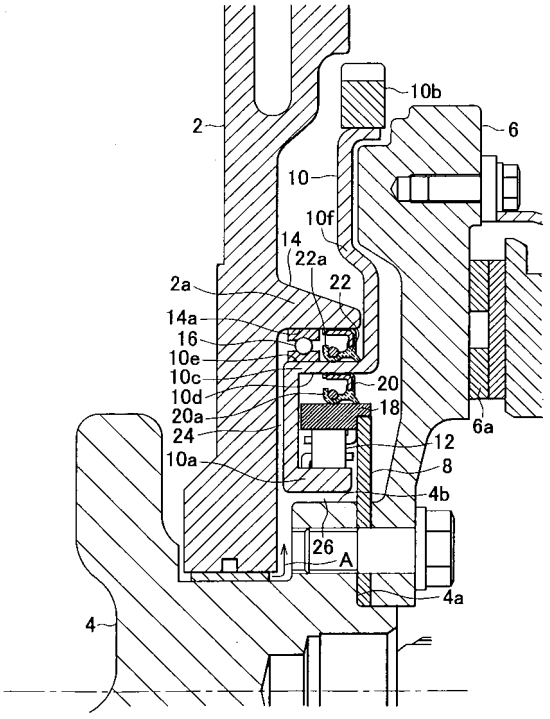
(54) Startup torque transmitting mechanism of an internal combustion engine

(57) A startup torque transmitting mechanism of an internal combustion engine, which, by means of a one-way clutch (12), both transmits torque generated by a starter motor to a crankshaft (4) side in one direction and prevents the transmission of torque in the other direction, includes a race connecting member (8) mounted on the crankshaft (4) side, which rotates in conjunction with the crankshaft (4) and is connected to one race (18) of a one-way clutch (12); and a ring gear (10) which is rotatably mounted to a main body side of the internal combustion engine via a bearing (16), and rotates according to torque received from the starter motor, and is connected to another race (10a) of the one-way clutch (12).

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The invention relates to a startup torque transmitting mechanism for an internal combustion engine, which, by means of a one-way clutch, both transmits torque generated by a starter motor to a crankshaft side in one direction and prevents the transmission of torque in the other direction.

2. Description of the Related Art

[0002] Japanese Patent Application Publication No. JP-A-2003-83216 (FIGS. 4 and 7), for example, discloses a startup torque transmitting mechanism of an internal combustion engine in a startup apparatus of an internal combustion engine, in which a one-way clutch (i.e., a reverse input interruption clutch) is provided between a starter motor and a crankshaft such that the starter motor side can be in constant mesh with a ring gear.

[0003] In the technology disclosed in Japanese Patent Application Publication No. JP-A-2003-83216, and in particular, according to related art, the ring gear (a reduction gear) is provided on the crankshaft via a bearing. Furthermore, a one-way clutch is arranged on the side opposite the abutting surface of the bearing so the ring gear is connected to a drive gear that moves in conjunction with the crankshaft via this one-way clutch. Accordingly, when the starter motor is driven, the one-way clutch engages so that torque is transmitted from the ring gear to the drive gear, thus enabling the crankshaft to be rotated by the starter motor.

[0004] However, because the ring gear is mounted to the crankshaft via the bearing, the bearing must always be operating while the internal combustion engine is operating even when the ring gear stops rotating after the internal combustion engine has started. As a result, a large amount of lubrication oil must be continuously supplied to the bearing during operation of the internal combustion engine.

[0005] Further, in the foregoing related art, the ring gear can not be separated from the crankshaft so vibration from the crankshaft ends up acting on the ring gear via the bearing.

[0006] It is thus an object of the invention to provide a startup torque transmitting mechanism of an internal combustion engine, in which the bearing can be rendered inoperative when the internal combustion engine is operating, and which enables the ring gear to be separated from the crankshaft.

SUMMARY OF THE INVENTION

[0007] In order to achieve the foregoing object, one aspect of the invention relates to a startup torque transmitting mechanism of an internal combustion engine, which, by means of a one-way clutch, both transmits torque generated by a starter motor to a crankshaft side in one direction and prevents the transmission of torque in the other direction, and which includes a race connecting member mounted on the crankshaft side, which rotates in conjunction with the crankshaft and is connected to one race of a one-way clutch; and a ring gear which is rotatably mounted to a main body side of the internal combustion engine via a bearing, and rotates according to torque received from the starter motor, and is connected to another race of the one-way clutch.

[0008] According to this structure, the ring gear is mounted via a bearing to the main body side of the internal combustion engine instead of to the crankshaft side. Therefore, the bearing operates only while the ring gear is being rotated by the starter motor at startup of the internal combustion engine, and stops rotating when the starter motor stops after startup. Accordingly, the bearing does not rotate while the internal combustion engine is operating. Since the bearing only needs to operate only for a short period of time during startup in this way, the bearing does not need to be supplied with a large amount of lubrication oil.

[0009] Also, the ring gear is not directly connected to and supported by the crankshaft, but rather is mounted to the crankshaft via the one-way clutch. Therefore, the ring gear can be mounted away from the crankshaft which is advantageous in that it allows for a higher degree of freedom in terms of design layout.

The ring gear may also be provided in a state in which it does not contact the crankshaft side.

[0010] Accordingly, the ring gear can be completely separated from the crankshaft. As a result, it is possible to inhibit vibration from the crankshaft being transmitted to the ring gear while the internal combustion engine is operating.

[0011] The race connecting member may be connected to an outer race of the one-way clutch and the ring gear may be connected to an inner race of the one-way clutch.

[0012] Accordingly, the one-way clutch in particular can be completely covered when viewed from the outside by a structure in which the race connecting member and the outer race are connected. Thus, a design is possible in which a high degree of sealability can easily be realized even if a large amount of lubrication oil is supplied to the one-way clutch during operation of the internal combustion engine because the one-way clutch, for which an oil seal is particularly necessary, can be completely covered.

[0013] The race connecting member may also be arranged on the opposite side of the ring gear from the main body of the internal combustion engine.

[0014] According to this structure, the ring gear is on the main body side of the internal combustion engine and the race connecting member is on the opposite side of the ring gear from the main body of the internal combus-

tion engine. As a result, the one-way clutch can be covered from the outside of the internal combustion engine, particularly from the transmission side, by the race connecting member and the outer race. Therefore, it is possible to both easily realize a high degree of sealability of the one-way clutch with respect to the outside of the internal combustion engine and provide an oil seal while the one-way clutch is completely separated from the transmission side. Accordingly, oil used to lubricate the internal combustion engine can also be used to lubricate the one-way clutch.

[0015] Also, the bearing may be arranged so as to encircle the one-way clutch.

[0016] According to this structure, the ring gear can be mounted to the internal combustion engine by the one-way clutch and the bearing.

[0017] A first oil seal member may be arranged in a gap between the outer race of the one-way clutch and the ring gear, and a second oil seal member may be arranged in a gap between the ring gear and the main body of the internal combustion engine.

[0018] Arranging the first oil seal member and the second oil seal member in this way makes it possible to seal the inside of the startup torque transmitting mechanism of an internal combustion engine so that oil does not leak out both easily and with a high degree of sealability. As a result, the startup torque transmitting mechanism of an internal combustion engine can be lubricated using the oil that is used to lubricate the internal combustion engine.

[0019] A cylindrical portion may be formed around the crankshaft on a portion of the ring gear, the first oil seal member may be arranged on an inner peripheral side of this cylindrical portion, and the second oil seal member may be arranged on an outer peripheral side of the cylindrical portion.

[0020] According to this structure, the oil seals can be easily arranged by insertion. Also, a reliable seal can be provided for the lubrication oil supplied to the bearing by arranging the second seal member and the bearing in this manner.

[0021] The second oil seal member and the bearing may be arranged parallel to each other in the gap between the ring gear and the main body of the internal combustion engine, with the bearing being toward the inside of the main body of the internal combustion engine.

[0022] Arranging the second seal member and the bearing in this manner enables a reliable seal to be provided for the lubrication oil supplied to the bearing.

[0023] The second oil seal member may be integrally incorporated into the inner peripheral side of the outer race of the bearing.

Forming the second oil seal member so that it is integrated with the bearing as an assembled body enables the work of assembling it to the internal combustion engine to be done efficiently.

[0024] Also, the ring gear may be a disc in which a curved portion is formed in the radial direction thereof. This structure makes the ring gear itself more rigid, which enables the ring gear to have a high mechanical strength as well as improves the suppression function against vibration.

[0025] Also, a bearing mounting portion to which the bearing mounts and a clutch mounting portion to which the one-way clutch mounts may be formed in the curved portion.

Accordingly, this structure makes it possible to effectively utilize space for mounting the bearing and the one-way clutch using the curved portion, in turn enabling the overall structure of the startup torque transmitting mechanism of the internal combustion engine to be made more compact.

[0026] Moreover, the startup torque transmitting mechanism of an internal combustion engine according to another aspect of the invention may also be structured such that the ring gear is formed as a separate structure that is separated from the flywheel, while a middle portion of the ring gear is supported by an outer wall of the internal combustion engine via the bearing and a center open portion of the ring gear is supported by the crankshaft via the one-way clutch.

[0027] According to this structure, when startup of the internal combustion engine by the starter motor is complete and the rotation speed of the crankshaft becomes faster than the rotation speed of the ring gear, the one-way clutch releases. As a result, less lubrication oil can be supplied to the bearing. Also, the ring gear is supported by the outer wall of the internal combustion engine via the bearing, as well as by the crankshaft via the one-way clutch.

[0028] Accordingly, the ring gear is supported in suspension from the crankshaft. Therefore, when the internal combustion engine is in a steady running mode, such that the one-way clutch is released, drive vibration of the internal combustion engine transmitted from the crankshaft is largely suppressed by the one-way clutch. As a result, the vibration characteristics of the ring gear can be improved, which in turn enables the characteristics of noise produced by the ring gear to be improved.

Further, the one-way clutch may be supported by the crankshaft via the race connecting member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] The foregoing and further objects, features and advantages of the invention will become apparent from the following description of preferred embodiments with reference to the accompanying drawings, wherein like numerals are used to represent like elements and wherein:

FIG 1 is a longitudinal sectional view of a startup torque transmitting mechanism of an internal combustion engine according to an embodiment of the invention; and

FIG 2 is a longitudinal sectional view of an area

around an assembly according to a modified example of the embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0030] An embodiment of the invention will now be described with reference to FIG. 1, which is an enlarged longitudinal sectional view of the upper half, with respect to the axial center of a crankshaft, of a main portion of a startup torque transmitting mechanism of an internal combustion engine for a vehicle, at an area on the rear side of the internal combustion engine where power is output to the transmission side.

[0031] A rear end of a crankshaft 4 that is rotatably supported by a ladder beam, not shown, is arranged below a cylinder block 2 of an internal combustion engine. A flywheel 6 and an outer race support plate 8 (which can be regarded as a race connecting member) that supports an outer race 18 are mounted to the rear end of the crankshaft 4. A ring gear 10 is mounted to the cylinder block 2.

[0032] The flywheel 6, the upper half of which is shown in FIG. 1, is substantially disc-shaped, with the center portion being open in the shape of a circle. A ring-shaped clutch disc 6a, which serves as a portion of a clutch mechanism for transmitting torque to and from a transmission, is mounted to the flywheel 6 on the side opposite the side that contacts the outer race support plate 8. The clutch mechanism may also be formed separately.

[0033] The outer race support plate 8, the upper portion of which is shown in FIG 1, is formed in a flat circular shape with the center portion open. The outer race support plate 8 is fixed by a bolt both to the flywheel 6 and to a rear end surface 4a of the crankshaft 4 at a portion around the center opening. As a result, the outer race support plate 8 rotates in conjunction with both the flywheel 6 and the crankshaft 4.

[0034] The ring gear 10, the upper half of which is shown in FIG 1, is a circular disc in which the center portion is largely open and which has bent portions (i.e., a flange portion 10a, a cylindrical portion 10c, and a curved portion 10f) in the radial direction. The flange portion 10a functions as a mounting portion for a one-way clutch 12 and the cylindrical portion 10c functions as a mounting portion for a bearing 16. The flange portion 10a is formed at the center open portion of the ring gear 10 and an inner race of a one-way clutch 12 is mounted to that flange portion 10a. For the sake convenience, in the following description the reference character 10a will also be used to denote the inner race portion because the inner race of the one-way clutch is mounted to the flange portion 10a. Also, a ring-shaped groove portion which has a cross-section in the shape of the letter C is formed in the ring gear 10 by the flange portion 10a and the cylindrical portion 10c. In this groove portion are housed the one-way clutch 12, the outer race 18, and a second oil seal 20.

[0035] Meanwhile, a ring-shaped gear portion 10b with which a starter motor, not shown, can engage is provided on an outer peripheral portion of the ring gear 10. This ring gear 10 is such that the portion with the inner race 10a (i.e., the flange portion) is positioned closest to the center of the crankshaft. The ring gear 10 is not supported by crankshaft 4 via the inner race 10a, however, but rather is suspended from a peripheral surface 4b of the crankshaft 4.

[0036] A semicircular peripheral surface portion 2a is formed protruding on the rear portion side of the cylinder block 2. Similarly, a semicircular surface portion that continues on from this semicircular surface portion 2a on the cylinder block 2 side is also provided on the rear portion side of an oil pan arranged below the cylinder block 2. When the oil pan, not shown, is assembled to the cylinder block 2, the semicircular surface portion 2a on the cylinder block 2 side and the semicircular surface portion on the oil pan side connect, forming a short circumferential surface portion 14 which encloses the entire periphery of the crankshaft 4 and is short in axial direction of the crankshaft.

[0037] A groove portion of the ring gear 10, i.e., the flange portion 10a and the cylindrical portion 10c, are arranged in a space formed inside this short circumferential surface portion 14. The bearing (a roller bearing is used in this embodiment) 16 is fitted to an inner peripheral surface 14a of the short circumferential surface portion 14 in the space formed between that inner peripheral surface 14a and the cylindrical portion 10c. Accordingly, the ring gear 10 is supported by the main body side of the internal combustion engine via the bearing 16. Therefore, when the one-way clutch 12 is released, the ring gear 10 can rotate freely, independently of the rotation of the crankshaft 4.

[0038] The gear portion 10b of the ring gear 10 is in constant mesh with a pinion gear of the starter motor that is arranged below the crankshaft 4. When this gear portion 10b receives torque from the starter motor via the pinion gear, the entire ring gear 10 rotates, thus driving the crankshaft 4 via the one-way clutch 12, which will be described later.

[0039] An outer race 18 is mounted to the outer peripheral portion of the outer race support plate 8, opposite the inner race 10a (i.e., the flange portion) formed on the center open portion of the ring gear 10 such that the one-way clutch 12 is formed between the ring gear 10 and the outer race support plate 8.

[0040] The one-way clutch 12 engages the outer race support plate 8 with the ring gear 10 when the starter motor rotates the ring gear 10 via the pinion gear during startup of the internal combustion engine, i.e., when the ring gear 10 is rotated in the direction that will enable torque to be transmitted to the outer race support plate 8 during startup of the internal combustion engine. As a result, the starter motor can rotate the crankshaft 4.

[0041] When the internal combustion engine starts to operate under its own power such that the crankshaft 4

rotates according to output of the internal combustion engine, the outer race support plate 8 which rotates in conjunction with the crankshaft 4 rotates faster than the ring gear 10 does from the starter motor. As a result, the ring gear 10 effectively rotates in the other direction relative to the outer race support plate 8 so the one-way clutch 12 releases. Therefore, even if the pinion gear and the ring gear 10 are in a state of constant mesh, overspeed of the starter motor after startup of the internal combustion engine can be prevented.

[0042] Engine oil is supplied as lubrication oil to the bearing 16 and the one-way clutch 12 via oil passages in the cylinder block 2 or the crankshaft 4, as shown by the arrow A in the FIG.1. However, the one-way clutch 12 is arranged between the outer race support plate 8 and the ring gear 10 so it is necessary to prevent oil from leaking out. Accordingly, a ring-shaped first oil seal member 20 is arranged between the outer race 18 that is integrally mounted to the outer race support plate 8 and the cylindrical portion 10c of the ring gear 10. This first oil seal member 20 is fixed to the ring gear 10 side by being fitted to the inner peripheral surface 10d of the cylindrical portion 10c. A seal lip 20a which is formed on the inner peripheral side of the first oil seal member 20 is urged to slidably contact the outer peripheral surface of the outer race 18 by spring force of a spring provided in the seal lip 20a, thus providing an oil seal.

[0043] A second oil seal member 22 which has a larger diameter than the first oil seal member 20 is arranged parallel with the bearing 16 described above on the side of the cylindrical portion 10c opposite the inner peripheral side where the first oil seal member 20 is arranged (i.e., the second oil seal member 22 is arranged on the outer peripheral side of the cylinder portion 10c). The bearing 16 is arranged on the inside in the axial direction with respect to the short circumferential surface portion 14 and the second oil seal member 22 is arranged on the outside in the axial direction with respect to the short circumferential surface portion 14. This second oil seal member 22 is fixed the position shown in the drawing by being fitted to the inner peripheral surface 14a of the short circumferential surface portion 14, similar to the bearing 16. Accordingly, a seal lip 22a which is formed on the inner peripheral side of the second oil seal member 22 slidably contacts an outer peripheral surface 10e of the cylindrical portion 10c, similar to the first oil seal member 20, thus providing an oil seal.

[0044] The embodiment described above can achieve the following effects.

(I). The ring gear 10 is mounted via the bearing 16 to the main body side of the internal combustion engine (the cylinder block 2 and the oil pan in this embodiment), not the crankshaft 4 side. Thus, the bearing 16 only actually functions (i.e., rotates) while the ring gear 10 is being rotated by the starter motor during startup of the internal combustion engine. It is therefore possible to have the bearing 16 not rotate while the internal combustion engine is operating because the bearing 16 stops rotating when the starter motor stops after the internal combustion engine has started.

[0045] Since the bearing 16 only rotates for a short period of time at startup in this way, a large amount of lubrication oil does not need to be supplied to the bearing 16. Moreover, the bearing 16 itself does not need to be large from providing a plurality of rows of balls or rollers or the like which is another reason why a large amount of lubrication oil does not need to be supplied. Therefore, as shown in FIG. 1, the bearing 16 can be sufficiently lubricated with the lubrication oil that is supplied only through a gap 24 between the cylinder block 2 and the ring gear 10. As a result, special consideration does not have to be given to providing a lubrication oil passage for the bearing 16, which enables the lubrication oil passages to be simplified, as well as contributes to an overall reduction in size of the internal combustion engine.

[0046] (II). The ring gear 10 is not supported by the crankshaft 4, but rather is mounted via the one-way clutch 12 so it is separated from and does not contact the crankshaft 4. That is, the ring gear 10 can be arranged across a gap 26 from the peripheral surface 4b of the crankshaft 4, as shown in FIG. 1. Therefore, vibration from the crankshaft 4 when the internal combustion engine is operating is not transmitted to the ring gear 10 so wear due to vibration at the point of contact between the gear portion 10b and the pinion gear can be reduced and noise from sound radiation from the ring gear 10 can be suppressed. Also, this gap 26 makes it easier to supply lubrication oil to the one-way clutch 12. In particular, sufficient lubrication oil can be supplied to the one-way clutch 12 which slides when the internal combustion engine is operating, thereby increasing the durability of the one-way clutch 12.

[0047] (III). The outer race support plate 8 as the race connecting member is connected to the outer race 18 which forms part of the one-way clutch 12, and the ring gear 10 is connected to the inner race 10a which also forms part of the one-way clutch 12. As a result, in particular it is possible to completely cover the one-way clutch 12 by the connecting body of the outer race support plate 8 and the outer race 18 when viewed from one direction, e.g., when viewed from the transmission side. Thus, a high degree of sealability can easily be realized even when a large amount of lubrication oil is supplied to the one-way clutch 12 during operation of the internal combustion engine because the one-way clutch 12 for which an oil seal is particularly necessary can be completely covered.

[0048] In this way, an oil seal can be provided by the first oil seal member 20 while the one-way clutch 12 is completely separated from the transmission side. Accordingly, the oil used to lubricate the internal combustion engine can also be introduced through the gap 26 and used to lubricate the one-way clutch 12.

[0049] (IV). Moreover, the first oil seal member 20 is arranged as described above, and the second oil seal member 22 is arranged in the gap between the ring gear 10 and the main body side of the internal combustion

engine, while the bearing 16 is arranged parallel with and to the inside, in the axial direction, of this second oil seal member 22 in the same gap. Therefore, the inside of the startup torque transmitting mechanism of an internal combustion engine can be easily sealed with a high degree of sealability.

[0050] In this way it is possible to lubricate the startup torque transmitting member of an internal combustion engine with oil used to lubricate the internal combustion engine.

(V). The first oil seal member 20 is arranged on the inner peripheral surface 10d side of the cylindrical portion 10c formed in the ring gear 10 and the second oil seal member 22 and the bearing 16 are arranged on the outer peripheral surface 10e of that cylindrical portion 10c. Therefore, the oil seal members 20 and 22 and the bearing 16 can be arranged easily by being fitted into place, making it possible to reliably form the bearing and oil seals.

[0051] (VI). The outer race 18 of the one-way clutch 12 is arranged, via the first oil seal member 20, on the inner peripheral surface 10d of the cylindrical portion 10c of the ring gear 10, which is on the opposite side of the cylindrical portion 10c than the outer peripheral surface 10e on which the bearing 16 is arranged. Therefore, the cylindrical portion 10c does not directly contact the one-way clutch 12. Also, the inner race 10a (i.e., the flange portion) of the one-way clutch 12 is formed on the inner peripheral side of the ring gear 10, but shock force on the inner race 10a generated when the one-way clutch 12 engages is applied in the direction which reduces the holding force on the bearing 16 by the cylindrical portion 10c and the short circumferential surface portion 14.

[0052] Thus, as opposed to a structure in which the bearing is provided between the inner race 10a and the crankshaft 4, in this embodiment the bearing 16 is arranged in the position shown in FIG. 1, which alleviates the problem of shock force being applied to the bearing 16 when the one-way clutch 12 engages. Accordingly, an excessive load is not applied to the bearing 16 even when the one-way clutch 12 engages. Hence, this embodiment makes it possible to prevent damage to the bearing 16.

[0053] (VII). Further, the ring gear is provided with the curved portion which increases the rigidity of the ring gear itself and thus enables the ring gear to have a high mechanical strength. As a result, the vibration characteristics, i.e., the vibration suppression function, can be improved such that noise from the ring gear can be suppressed, enabling quieter operation of the internal combustion engine itself.

[0054] (VIII). Also, in the embodiment, the bearing mounting portion and the clutch mounting portion are formed on the curved portion which makes it possible to ensure space for mounting the bearing and the one-way clutch using the curved portion. As a result, the overall structure of the startup torque transmitting mechanism of the internal combustion engine can be made more compact.

[0055] Next, a modified example of the embodiment of the invention will be described with reference to FIG 2. In this modified example, a bearing 52 and a second oil seal member 54 are unitized as an assembly 50. All other structure is the same as it is in the foregoing embodiment. Thus, portions shown in FIG. 2 that are the same as portions shown in FIG 1 will be denoted by like reference characters and redundant descriptions thereof will be omitted.

[0056] An outer race 52a of the bearing 52 is formed wider than an inner race 52b, and the assembly 50 is formed with the second oil seal member 54 being fit beforehand to the inner peripheral side of this outer race 52a. Therefore, during assembly of the internal combustion engine, both the bearing 52 and the second oil seal member 54 can be mounted at one time by fitting the assembly 50 to the inner peripheral surface 14a of the short circumferential surface portion 14. In order to more completely seal the area between the outer race 52a and the inner peripheral surface 14a of the short circumferential surface portion 14, an O-ring 56 may be provided therebetween, as shown in FIG 2.

[0057] This modified embodiment enables the following effects to be achieved.

(I). The same effects achieved with the foregoing embodiment are also achieved with this modified example.

(II). The internal combustion engine can be efficiently assembled because the bearing 52 and the second oil seal member 54 can be simultaneously mounted to the internal combustion engine by inserting the assembly 50.

[0058] Although the invention has been described herein with reference to specific embodiments, it is not limited to those embodiments. To the contrary, the invention may be embodied in various other forms without departing from the spirit or essential characteristics thereof. For example, the invention may also be implemented with the following modifications.

[0059] For example, in each of the foregoing embodiments, the outer race support plate 8 is fastened by a bolt to the flywheel 6, as shown in FIG. 1. Alternatively, however, the outer race support plate 8 may be fastened to a drive plate that is connected to a cover of a torque converter, instead of being fastened to the flywheel 6.

[0060] Also, the inner race of the one-way clutch 12 is mounted to the outside of the flange portion 10a that is at the center open portion of the ring gear 10. Alternatively, however, the outer race 18 may be mounted to the inside of the flange portion 10a, i.e., the one-way clutch may be arranged farther toward the rotational center side.

Claims

1. A startup torque transmitting mechanism of an internal combustion engine, which, by means of a one-way clutch (12), both transmits torque generated by a starter motor to a crankshaft (4) side in one direction and prevents the transmission of torque in the

other direction, **characterised by** comprising:

a race connecting member (8) mounted on the crankshaft (4) side, which rotates in conjunction with the crankshaft (4) and is connected to one race (18) of the one-way clutch (12); and
a ring gear (10) which is rotatably mounted to a main body side of the internal combustion engine via a bearing (16), and rotates according to torque received from the starter motor, and is connected to another race (10a) of the one-way clutch (12).

2. The startup torque transmitting mechanism of an internal combustion engine according to claim 1, wherein the ring gear (10) is provided in a state not contacting the crankshaft side.

3. The startup torque transmitting mechanism of an internal combustion engine according to claim 1 or 2, wherein the race connecting member (8) is connected to an outer race of the one-way clutch (12) and the ring gear (10) is connected to an inner race of the one-way clutch (12).

4. The startup torque transmitting mechanism of an internal combustion engine according to claim 3, wherein the race connecting member (8) is arranged on the opposite side of the ring gear (10) from the main body of the internal combustion engine.

5. The startup torque transmitting mechanism of an internal combustion engine according to any one of claims 1 to 4, wherein the bearing is arranged so as to encircle the one-way clutch (12).

6. The startup torque transmitting mechanism of an internal combustion engine according to any one of claims 1 to 5, wherein a first oil seal member (20) is arranged in a gap between the outer race of the one-way (12) clutch and the ring gear (10), and a second oil seal member (22) is arranged in a gap between the ring gear (10) and the main body of the internal combustion engine.

7. The startup torque transmitting mechanism of an internal combustion engine according to claim 6, wherein a cylindrical portion is formed around the crankshaft (4) on a portion of the ring gear (10), the first oil seal member (20) is arranged on an inner peripheral side of this cylindrical portion, and the second oil seal member (22) is arranged on an outer peripheral side of the cylindrical portion.

8. The startup torque transmitting mechanism of an internal combustion engine according to claim 6 or 7, wherein the second oil seal member (22) and the bearing (16) are arranged parallel to each other in a gap between the ring gear (10) and the main body of the internal combustion engine, with the bearing (16) being toward the inside of the main body of the internal combustion engine.

9. The startup torque transmitting mechanism of an internal combustion engine according to claim 8, wherein the second oil seal member (22) is integrally incorporated into the inner peripheral side of the outer race of the bearing (16).

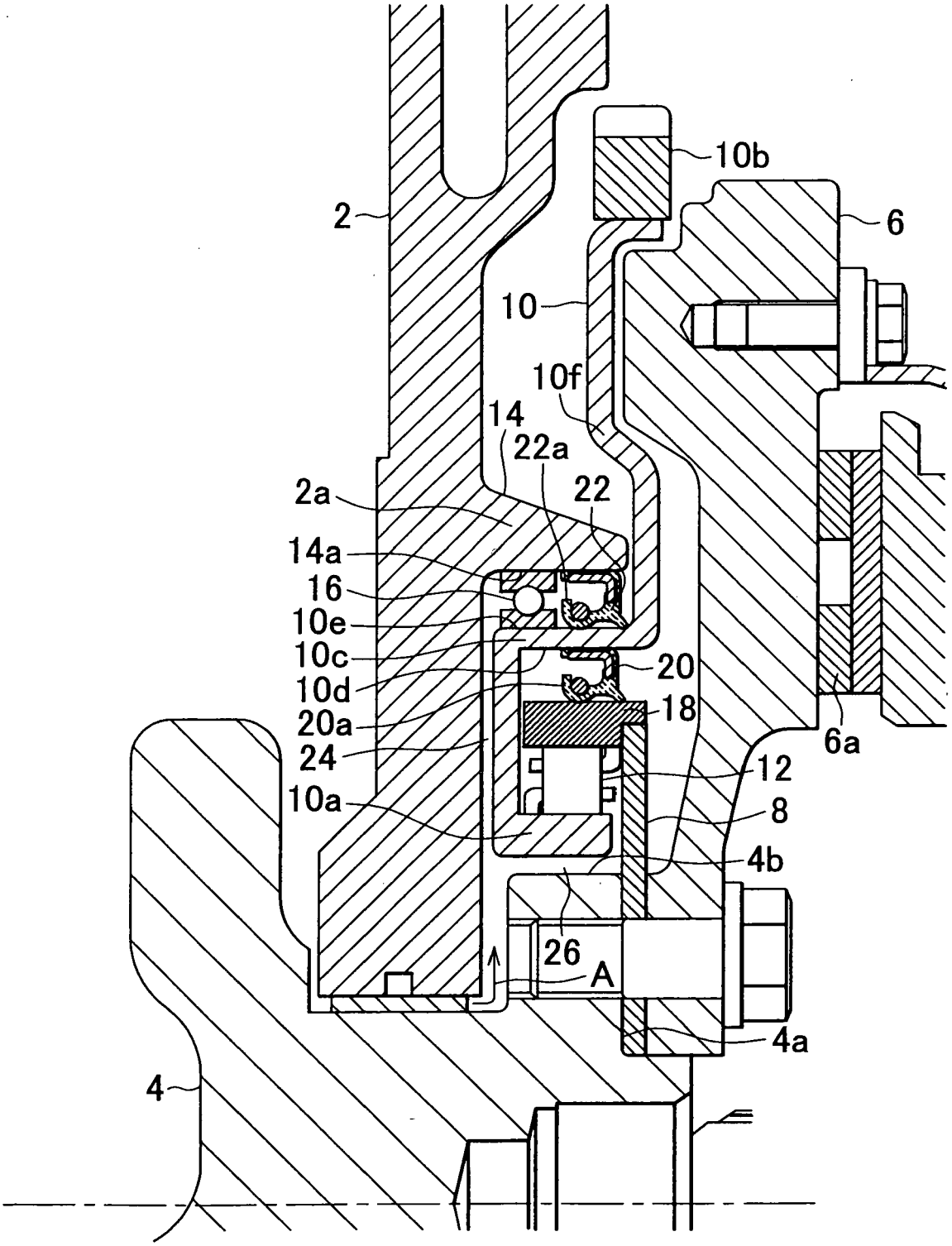
10. The startup torque transmitting mechanism of an internal combustion engine according to any one of claims 1 to 9, wherein the ring gear (10) is a disc in which a curved portion is formed in the radial direction thereof.

11. The startup torque transmitting mechanism of an internal combustion engine according to any one of claims 1 to 10, wherein a bearing mounting portion (2a,10c) to which the bearing mounts and a clutch mounting portion (2a,10c) to which the one-way clutch mounts are formed in the curved portion.

12. The startup torque transmitting mechanism of an internal combustion engine according to claim 1, wherein the ring gear (10) is formed as a separate structure that is separated from the flywheel (6), while a middle portion of the ring gear (10) is supported by an outer wall of the internal combustion engine via the bearing (16) and a center open portion of the ring gear is supported by the crankshaft (4) via the one-way clutch (12).

13. The startup torque transmitting mechanism of an internal combustion engine according to claim 12, wherein the one-way clutch (12) is supported by the crankshaft (4) via the race connecting member (8).

FIG. 1


10b
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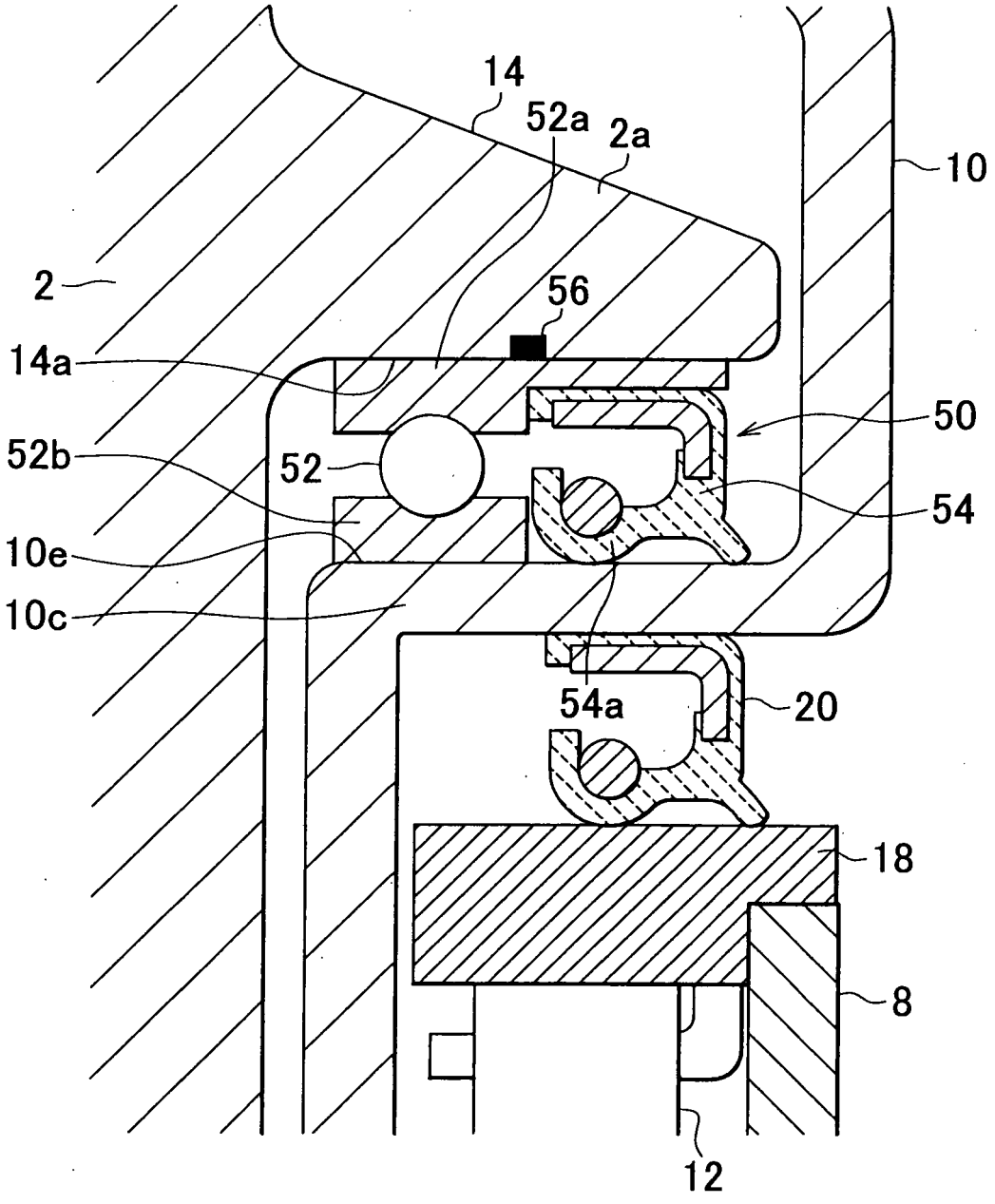
10c
10d
20a
24
10a
20
18
6a
12
8
4b
26
A
4a
4

FIG. 2



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2003083216 A **[0002] [0003]**