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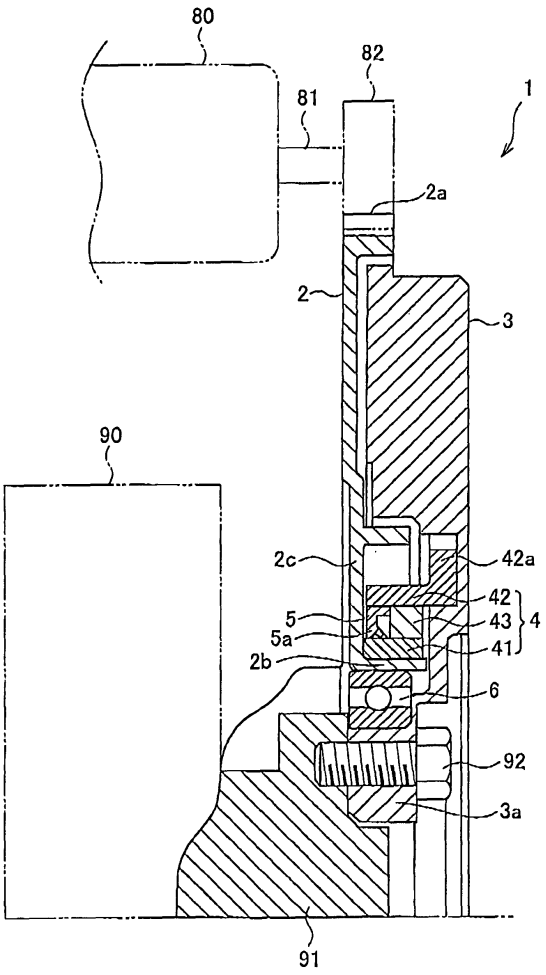
(54) Starting device for engines

(57) A starting device for engines (1) comprises a first rotor (2), a second rotor (3) and a one-way clutch (4). The one-way clutch (4) comprises a clutch inner (41) independently or integrally formed with the first rotor (2) and fixed to the first rotor (2); a clutch outer (42) disposed in an outer circumference side of the clutch Inner (41) and fixed to the second rotor (3); and a clutch engaging member (43) disposed in a space formed between the clutch Inner (41) and the clutch outer (42). A seal member (5) is disposed between the clutch-engaging member (43) and the first rotor (2), and between the clutch outer (42) and the clutch Inner (41). The seal member (5) comprises an outer circumference contacting an inner circumference of the clutch outer (42) and an inner circumference contacting an outer circumference of the clutch inner (41). Either the outer circumference side or the inner circumference side is fixed, while the other side is left free and provided with a lip portion (5a).

FIG.1



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Description

BACKGROUND OF THE INVENTION

Technical Field of the Invention

[0001] The present Invention relates to a starting device for engines comprising a one-way clutch that allows driving force to be transmitted only from a starter to an engine.

Description of the Related Art

[0002] Conventionally well known starters include an electromagnetic push-in type starter, which allows a pinion gear to be engaged with a ring gear in an engine side using electromagnetic force of an electromagnetic switch (electromagnet), and causes driving torque of a motor to be transmitted to the ring gear via the pinion gear to start an engine. The electromagnetic push-in type starter comprises a one-way clutch so that the rotation of the engine is not transmitted to an armature of the motor. Once a rotation speed of the engine at a complete combustion state by cranking exceeds a rotation speed of the starter, the one-way clutch runs idle and cuts off the rotation torque from the engine, so as to prevent the motor armature of the starter from overrunning.

[0003] A control system for automatically stopping and restarting an engine is also known (this system is called an idle-stop system). This system requires the engine to be restarted with much less time (for example, within 0.4 seconds) than the typical engine starting system which uses a key switch, after the engine automatically stops. However, the electromagnetic push-in starter, one of the devices for starting the engine, requires time for the pinion gear to be pushed out and engaged with the ring gear, which requires extra time to start the engine. Further, this starter generates noise when the pinion gear and the ring gear are engaged with each other.

[0004] Besides the devices described above, such a starter device has been proposed that comprises a driving gear engaged with a pinion gear of a starter at all times, and that the reduction gear is connected to a crank shaft of an engine via a one-way clutch (see, for example, Japanese Patent Application Laid-Open Publication No. 2000-274337 and German Patent Application Laid-Open Publication No. 10343400). In this starter device, the pinion gear and the driving gear are engaged with each other at all times, so that they do not have to be engaged when the engine is started. Therefore, this device can start the engine more quickly with less time than the electromagnetic push-in starter. Further, this starter device does not produce noise when the gears are engaged, which allows the engine to start noiselessly.

[0005] The conventional starting device for engines having the one-way clutch in the ring gear has to include a sealing construction between a clutch outer connected to and rotated with an engine and a clutch inner connected to the ring gear so as not to be rotated after the engine starts running, in order to prevent lubricating grease from leaking outside, and to prevent ambient water and the like from entering inside.

[0006] If a seal member is disposed on an outer circumference of the clutch outer, such a structure can cause the seal member to be large in diameter, and cause the circumference velocity of the seal lip of the seal member to become significantly great, resulting in increased friction loss and decreased durability of the seal member. The increased friction loss can increase the load of the engine being run, and worsen the fuel consumption of the engine. Further, this construction has to Include a seal retainer inside the ring gear, and the seal retainer as well as the outer circumference of the clutch outer has to be finished with a high degree of accuracy In order to provide sufficient sealing properties. In addition, this construction requires a large sealing space, which causes extra lubricating grease to be filled in an area other than the area the clutch is disposed where the lubricating grease has to be filled. This can cause economic loss.

SUMMARY OF THE INVENTION

[0007] The present invention has been made in order to solve the issue described above, and has as its object to provide a starting device for engines that allows a seal member used in the device to be smaller in Its diameter and to have an improved durability.

[0008] A starting device for engines according to the invention for solving the above-mentioned problems will be described below with advantages thereof.

[0009] In the starting device for engines according to a first aspect, a starting device for engines comprises a first rotor having a gear engaged with a pinion gear of a starter at all times; a second rotor connected to a crank shaft of an engine; and a one-way clutch for transmitting driving force from only the starter to the engine. The one-way clutch comprises a clutch inner integrally or independently formed with the first rotor and fixed to the first rotor; a clutch outer disposed on an outer circumference side of the clutch inner and fixed to the second rotor; and a clutch-engaging member disposed in a space formed between the clutch inner and the clutch outer. The starting device for engines further comprises a seal member disposed between the clutch engaging member and the first rotor, and between the clutch outer and the clutch inner. The seal member comprises an outer circumference side contacting an inner circumference of the clutch outer and an inner circumference side contacting an outer circumference of the clutch inner. Either the outer circumference side or the inner circumference side is fixed, while the other side is left free and provided with a lip portion.

[0010] According to the above-mentioned composition, the starting device for engines comprises the seal member between the clutch engaging member and the first rotor and between the clutch outer and the clutch

inner, wherein the seal member comprises an outer circumference side contacting an inner circumference of the clutch outer and an inner circumference side contacting an outer circumference of the clutch inner, in which either the outer circumference side or the inner circumference side is fixed, while the other side is left free and provided with a lip. Accordingly, the starting device for engines can prevent lubricating grease, which is filled in a space where the clutch engaging member is disposed, from leaking outside, and also prevent ambient water or the like from entering inside the device. Further, the device can allow the seal member to be more compact in diameter than another type of seal member that is disposed on the outer circumference of the clutch outer. This can reduce the circumference velocity and friction loss of the lip portion of the seal member, and increase durability of the lip portion. Moreover, the device allows the space for the seal member in the one-way clutch to be small, which can reduce the amount of lubricating grease to be used. Also, the device does not require the outer circumference of the outer clutch to be finished with a high degree of accuracy, which allows the cost of production to be lowered.

[0011] In the starting device for engines according to a second aspect, the outer circumference of the seal member contacting the inner circumference of the clutch outer is fixed, while the Inner circumference contacting the outer circumference of the clutch inner is left free and provided with a lip portion.

[0012] In the starting device for engines according to a third aspect, the inner circumference of the seal member contacting the outer circumference of the clutch inner is fixed, while the outer circumference contacting the inner circumference of the clutch outer is left free and provided with the lip portion.

[0013] In the starting device for engines according to a forth aspect, the clutch outer has a smaller diameter portion contacting the seal member, and a larger diameter portion at which the clutch engaging member is disposed.

[0014] In the starting device for engines according to a fifth aspect, a starting device for engines comprises a first rotation member having a gear section that is always engaged with a pinion gear of a starter; a second rotation member connected to a crankshaft of an engine; and a one-way clutch that allows a driving force to be transmitted only from the starter to the engine. In this device, the one-way clutch comprises a clutch inner either integrally formed with the first rotation member or independently formed and fixed to the first rotation member; a clutch outer disposed at an outer circumference side of the clutch inner and fixed to the second rotation member; and a clutch engaging member disposed in a gap between the clutch inner and the clutch outer. The starting device for engines further comprises a seal member disposed between the clutch engaging member and the first rotation member and between the clutch outer and the clutch inner. The seal member has a first end contacting an inner circumference of the clutch outer and a second end contacting an outer circumference of the clutch inner, wherein the first end is fixed and the second end is left free and provided with a lip portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The present invention will be understood more fully from the detailed description herein below from the accompanying drawings of the preferred embodiments of the invention, which, however, should not be taken to limit the Invention to the specific embodiments but are for the purpose of explanation and understanding only.

[0016] In the accompanying drawings:

Fig. 1 is a cross sectional view showing a first preferred embodiment of a starting device for engines according to the present invention;
Fig. 2 Is an enlarged cross sectional view of a seal member;
Fig. 3 is a cross sectional view of a modified starting device for engines of the first preferred embodiment;
Fig. 4 is a cross sectional view showing a second preferred embodiment of the starting device for engines according to the present invention;
Fig. 5 is a cross sectional view showing a modified starting device for engines having a lip portion on the outer circumference of the seal member; and
Fig. 6 Is a cross sectional view showing a modified starting device for engines shown in Fig. 5.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] Detailed preferred embodiments of the starting device for engines according to the present invention will be described referring to the drawings.

[0018] A first embodiment of the present invention will be described referring to Figs. 1 and 2. Fig. 1 Is a cross sectional view showing a starting device for engines of the embodiment, and Fig. 2 is an enlarged cross sectional view of a seal member included in the device 1.

[0019] The starting device for engines 1 comprises a first rotation member 2 having a ring gear 2a that is engaged with a pinion gear 82 at all times. The pinion gear 82 is fixed to an output axis 81 of a starter 80. The device 1 also comprises a second rotation member 3 connected to a crankshaft 91 of an engine 90. The device 1 further comprises a one-way clutch 4 provided between the first rotation member 2 and the second rotation member 3. The one-way clutch allows a driving force to be transmitted only from the starter 80 to the engine 90. The device 1 further comprises a seal member 5 for preventing lubricating grease filled in the one-way clutch 4 from leaking outside and preventing ambient water and the like from entering inside.

[0020] The first rotation member 2 has a circular-disk shape, and comprises a ring gear 2a at its outermost,

which is engaged with the pinion gear 82 at all times. The member 2 also comprises at its Innermost an inner circumference portion 2b, which bends toward the axial direction, forming an L-shape in cross section. The first rotation member 2 also comprises at an outer side of the inner circumference portion 2b a flange portion 2c nearby which the one-way clutch 4 is disposed.

[0021] The second rotation member 3 integrally formed with a flywheel has a circular-disk shape and is connected at its inner circumference portion 3a to the crankshaft 91 of the engine 90 with bolts 92. A bearing 6 is provided between an inner surface of the inner circumference portion 2b of the first rotation member 2 and an outer surface of the inner circumference portion 3a of the second rotation member 3. This, with the unlocked one-way clutch 4, allows the first rotation member 2 and the second rotation member 3 to be rotated in relative directions.

[0022] The one-way clutch 4 comprises a clutch inner 41, a clutch outer 42 and a clutch-engaging member 43.

[0023] The clutch inner 41 has a cylindrical shape, and is fixed to the first rotation member 2. As shown in Fig. 1, the clutch inner 41 can be independently formed and fixed to the outer circumference of the inner circumference portion 2b of the first rotation member 2, or it can be integrally formed with the inner circumference portion 2b.

[0024] The clutch outer 42 has a larger cylindrical shape than the clutch Inner 41, and is disposed at an outer side of the clutch inner 41. An inner circumference of the clutch outer 42 faces against an outer circumference of the clutch inner 41 via a gap, and a flange-shaped base portion 42a of the clutch outer 42 is fixed to the second rotation member 3. The gap between the clutch Inner 41 and the clutch outer 42 for disposing the clutch engaging member 43 allows lubricating grease to be filled therein to permit the clutch engaging member 43 which allows the action of engagement to be smooth.

[0025] The seal member 5 is made of rubber in a ring form, and is disposed between the clutch-engaging member 43 and the first rotation member 2 and between the clutch outer 42 and the clutch inner 41. The seal member 5 prevents the lubricating grease, which is filled in the gap between the clutch inner 41 and the clutch outer 42 where the clutch engaging member 43 is disposed, from leaking outside and prevents ambient water and the like from entering. The seal member 5 has an outer circumference contacting the inner circumference of the clutch outer 42, which is fixed to the clutch outer 42 by press fitting or the like. The seal member 5 also has an inner circumference contacting the outer circumference of the clutch inner 41, which is left free and provided with a lip portion 5a. As shown in Fig. 2, the lip portion 5a is provided with a groove at its inner circumference along the circumference direction, substantially forming a Y-shape in cross section, in order to improve sealing property of the seal member 5.

[0026] The operation of the starting device for engines 1 according to the embodiment will be described below. The pinion gear 82 and the ring gear 2a of the first rotation member 2 are always engaged with each other. In order to start the engine 90, the rotational force of the output axis 81 generated by applying current to the starter 80 is transmitted to the first rotation member 2 through the pinion gear 82 and the ring gear 2a. The rotational force generated by the starter 80 and transmitted to the clutch inner 41 via the first rotation member 2 allows the clutch inner 41 and the clutch outer 42 to be engaged and locked with each other, which allows the rotation of the clutch inner 41 to be transmitted to the clutch outer 42. This allows both clutches 41 and 42 to rotate together. Accordingly, the second rotation member 3 to which the clutch outer 42 Is fixed and the flywheel is integrated causes the crankshaft 91 to rotate with the second rotation member 3, which permits the engine 90 to crank.

[0027] When the rotational speed of the clutch outer 42 exceeds the rotational speed of the clutch inner 41 as the rotation of the engine 90 is transmitted to the second rotation member 3 via the crankshaft 91 after the engine is started, the clutch outer 42 runs idle. This causes the first rotation member 2 and the second rotation member 3 to rotate in relative directions via the bearings 6. Accordingly, driving force of the crankshaft 91 is not transmitted to the first rotation member 2, which prevents the driving force from being transmitted to the pinion gear 82 and the starter 80.

[0028] As described in detail hereinbefore, the starting device for engines 1 according to the preferred embodiment of the invention comprises the first rotation member 2 having the ring gear 2a always engaged with the pinion gear 82 of the starter and the second rotation member 3 connected to the crankshaft 91 of the engine 90. The clutch inner 41 is Integrally formed with the first rotation member 2 or independently formed and fixed to the first rotation member 2, and the clutch outer 42 disposed at the outer circumference of the clutch inner 1 and fixed to the second rotation member 3. Further, the one-way clutch 4 has the clutch-engaging member 43 disposed in the gap formed between the clutch inner 41 and the clutch outer 42, and allows the driving force to be transmitted only from the starter 80 to the engine 90. Furthermore, this device 1 also comprises the ring-shaped seal member 5 disposed between the clutch engaging member 43 and the first rotation member 2, and between the clutch outer 42 and the clutch inner 41. This seal member 5 includes the outer circumference contacting the inner circumference of the clutch outer 42, which is fixed to the inner circumference of the clutch outer 42, and the inner circumference contacting the outer circumference of the clutch inner 41, which is left free and provided with the lip portion 5a. Accordingly, the device 1 can prevent the lubricating grease, which is filled in the gap where the clutch engaging member 43 is disposed, from leaking outside, and can prevent ambient water and the like from entering.

[0029] Further, the device 1 allows the seal member 5

to be more compact in diameter than another type of seal member that is disposed at the outer circumference of the clutch outer 42. This can reduce the circumferential velocity and friction loss of the lip portion 5a, and improve durability of the lip portion 5a. Moreover, the device 1 allows the sealing gap to be small where the one-way clutch 4 is disposed, which can reduce the amount of lubricating grease to be used. Further, the outer circumference of the clutch outer 42 does not to have to be finished with a high degree of accuracy, which leads to low production cost.

[0030] A modification of the starting device for engines according to the first preferred embodiment will be described referring to the drawing. Fig. 3 is a cross sectional view showing the modification of the starting device for engines 1. The same reference numerals are used for the same members In the above first embodiment, and detailed descriptions of those members are omitted.

[0031] The above-described first embodiment comprises the clutch outer 42 whose inner diameter is constant in the axial direction. The modified device 1, on the other hand, comprises the clutch outer 42 whose inner diameter is varied: the inner diameter R1 contacting the seal member 5 is smaller than the inner diameter R2 at which the clutch engaging member 43 is disposed.

[0032] Accordingly, this modified device 1 can further allow the seal member 5 to be more compact in diameter than that in the above described first embodiment.

[0033] A second embodiment of the present invention will be described referring to Fig. 4, which is a cross sectional view showing a starting device for engines 101 according to this embodiment. The same reference numerals are used for the same members and detailed descriptions of those members are omitted.

[0034] The device 1 in the first embodiment comprises the seal member 5 whose outer circumference contacting the inner circumference of the clutch outer 42 is fixed, and whose inner circumference contacting the outer circumference of the clutch inner 41 is left free and provided with the lip portion 5a in the radial direction. The second embodiment, on the other hand, comprises a seal member 105 whose outer circumference contacting the inner circumference of the clutch outer 42 is fixed, and whose inner circumference contacting the flange portion 2c of the first rotation member 2 is left free and provided with a lip portion 105a that forwards In the axial direction.

[0035] Accordingly, the starting device for engine 1 can prevent the lubricating grease, which is filled In the gap where the clutch engaging member 43 is disposed, from leaking outside, and prevent ambient water and the like from entering, like the first embodiment. Further, the device 1 allows the seal member 105 to be more compact in diameter than another type of seal member 105 that is disposed at the outer circumference of the clutch outer 42. This can reduce the circumferential velocity and friction loss of the lip portion 105a, and can improve durability of the lip portion 105a. Moreover, the device 1 allows the sealing gap to be small where the one-way clutch 4 is disposed, which can reduce the amount of lubricating grease to be used. Further, the outer circumference of the clutch outer 42 does not have to be finished with a high degree of accuracy, which can result in low production cost.

[0036] While the present invention has been disclosed in terms of the preferred embodiments in order to facilitate better understanding thereof, It should be appreciated that the invention can be embodied In various ways without departing from the principle of the invention.

[0037] For example, each of the above-described embodiments has such a structure that the second rotation member 3 is integrally formed with the flywheel, but instead, the flywheel can be separated from the second rotation member 4.

[0038] Further, the first embodiment comprises the seal member 5 whose outer circumference contacting the inner circumference of the clutch outer 42 is fixed, and whose inner circumference contacting the outer circumference of the clutch inner 41 Is left free and provided with the lip portion 5a. Instead of such a structure, the seal member 5 can be such that its inner circumference contacting the outer circumference of the clutch inner 41 is fixed, and its outer circumference contacting the inner circumference of the clutch outer 42 is left free and provided with the lip portion 5a. Fig. 5 is a cross sectional view showing a modified starting device for engines 1 having the lip portion 5a at the outer circumference of the seal member 5. As is shown, the seal member 5 has to comprise the outer circumference contacting the Inner circumference of the clutch outer 42 and the inner circumference contacting the outer circumference of the clutch Inner 41, and either the outer or inner circumferences has to be fixed while the other has to be free and provided with the lip portion 5a.

[0039] Despite the above-mentioned description, the seal member 5 having the lip portion 5a at the free inner circumference contacting the outer circumference of the clutch inner 41 is advantageous in that it can make the lip portion 5a more compact in diameter, and that it can reduce the circumference velocity of the portion sliding against the one-way clutch 4.

[0040] In the structure where the outer circumference contacting the inner circumference of the clutch outer 42 is left free and provided with the lip portion 5a, the clutch outer 42 should have such a structure that its inner diameter contacting the seal member 5 should be set smaller than its another portion's inner diameter where the clutch engaging member 43 is disposed nearby, in order to allow the lip portion 5a to be smaller in diameter and to reduce the circumference velocity of the lip portion 5a. Fig. 6 is a cross sectional view showing the modified starting device for engines shown in Fig. 5 in which the Inner diameter R1 of the clutch outer 42 contacting the seal member 5 Is set smaller than the inner diameter R2 of the clutch outer at which the clutch engaging member 43 Is disposed.

[0041] The present invention is useful in making a seal

member compact in diameter, which is used to prevent lubricating grease filled for a one-way clutch of a starting device for engines from leaking outside, and to prevent water and the like from entering inside.

Claims

1. A starting device for engines comprising:

a first rotation member having a gear section that is always engaged with a pinion gear of a starter;
a second rotation member connected to a crankshaft of an engine; and
a one-way clutch that allows a driving force to be transmitted only from the starter to the engine, the one-way clutch comprising:

a clutch inner either integrally formed with the first rotation member or independently formed and fixed to the first rotation member;
a clutch outer disposed on an outer circumference side of the clutch inner and fixed to the second rotation member; and
a clutch-engaging member disposed in a gap formed between the clutch inner and the clutch outer;

wherein the starting device for engines further comprises a seal member disposed between the clutch engaging member and the first rotation member and between the clutch outer and the clutch Inner, and
the seal member has a first end contacting an inner circumference of the clutch outer and a second end contacting an outer circumference of the clutch inner, either one of the first and second ends is fixed, and the other is left free and provided with a lip portion.

2. The starting device for engines of claim 1, wherein the first end of the seal member contacting the inner circumference of the clutch outer is fixed, while the second end contacting the outer circumference of the clutch inner is left free and provided with the lip portion.

3. The starting device for engines as claimed in claim 1, wherein the second end of the seal member contacting the outer circumference of the clutch inner is fixed, while the first end contacting the Inner circumference of the clutch outer is left free and provided with the lip portion.

4. The starting device for engines of claim 1, wherein the clutch outer has a smaller diameter portion contacting the seal member, and a larger diameter portion at which the clutch engaging member is disposed.

5. The starting device for engines of claim 2, wherein the clutch outer has a smaller diameter portion contacting the seal member, and a larger diameter portion at which the clutch engaging member is disposed.

6. The starting device for engines of claim 3, wherein the clutch outer has a smaller diameter portion contacting the seal member, and a larger diameter portion at which the clutch engaging member is disposed.

7. A starting device for engines comprising:

a first rotation member having a gear section that is always engaged with a pinion gear of a starter;
a second rotation member connected to a crankshaft of an engine; and
a one-way clutch that allows a driving force to be transmitted only from the starter to the engine;
the one-way clutch comprises:

a clutch inner either integrally formed with the first rotation member or independently formed and fixed to the first rotation member;
a clutch outer disposed at an outer circumference side of the clutch inner and fixed to the second rotation member; and
a clutch-engaging member disposed In a gap between the clutch inner and the clutch outer;

wherein the starting device for engines further comprises a seal member disposed between the clutch engaging member and the first rotation member and between the clutch outer and the clutch inner, and
the seal member has a first end contacting an inner circumference of the clutch outer and a second end contacting an outer circumference of the clutch inner, the first end is fixed and the second end is left free and provided with a lip portion.

FIG.1

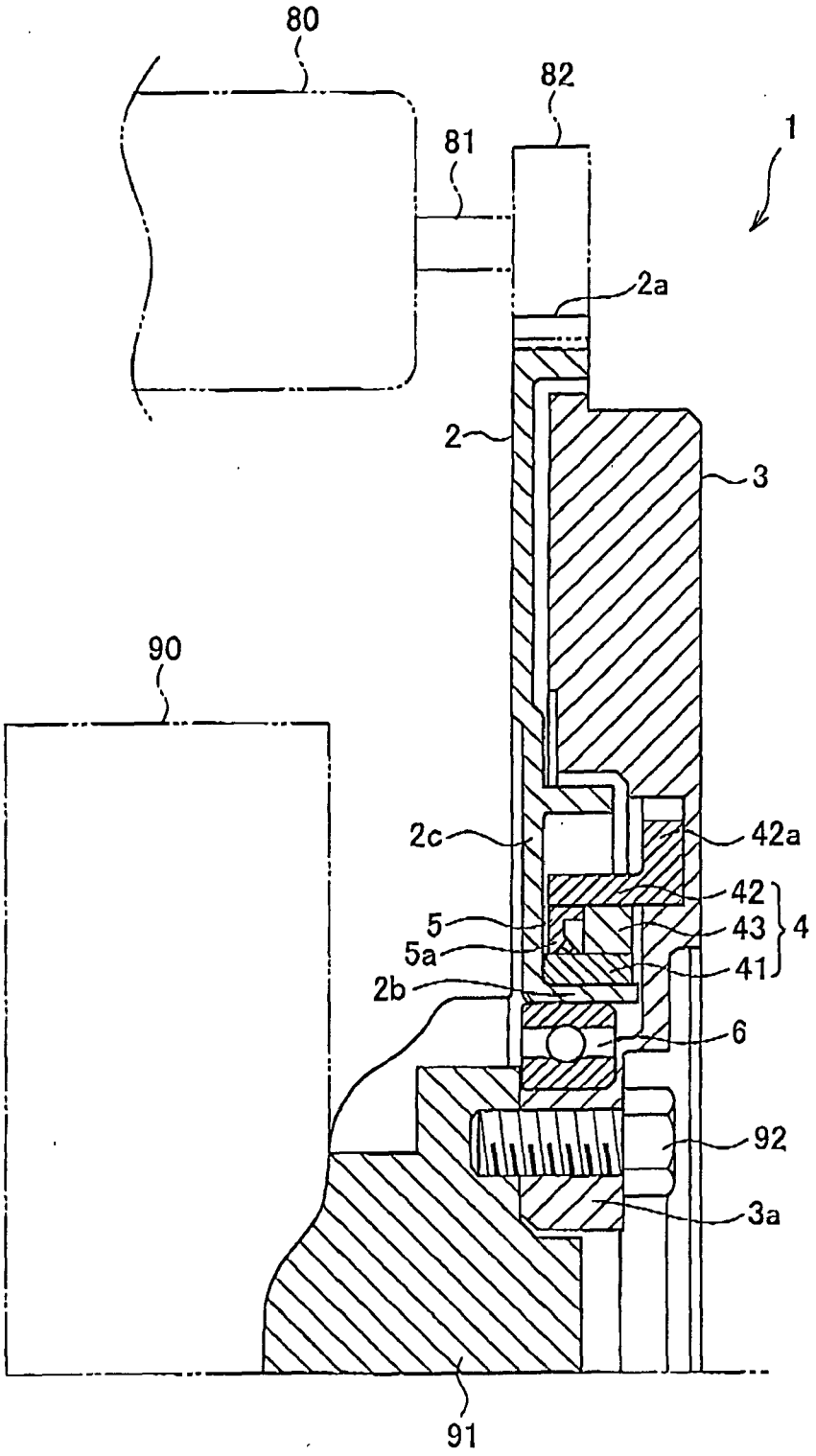


FIG.2

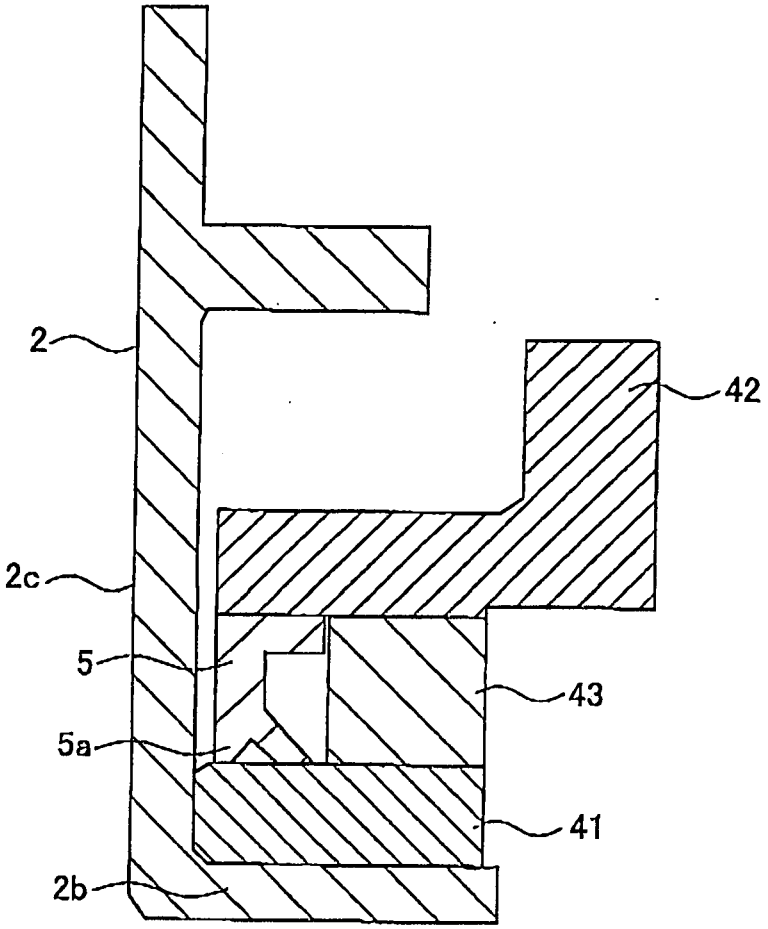


FIG.3

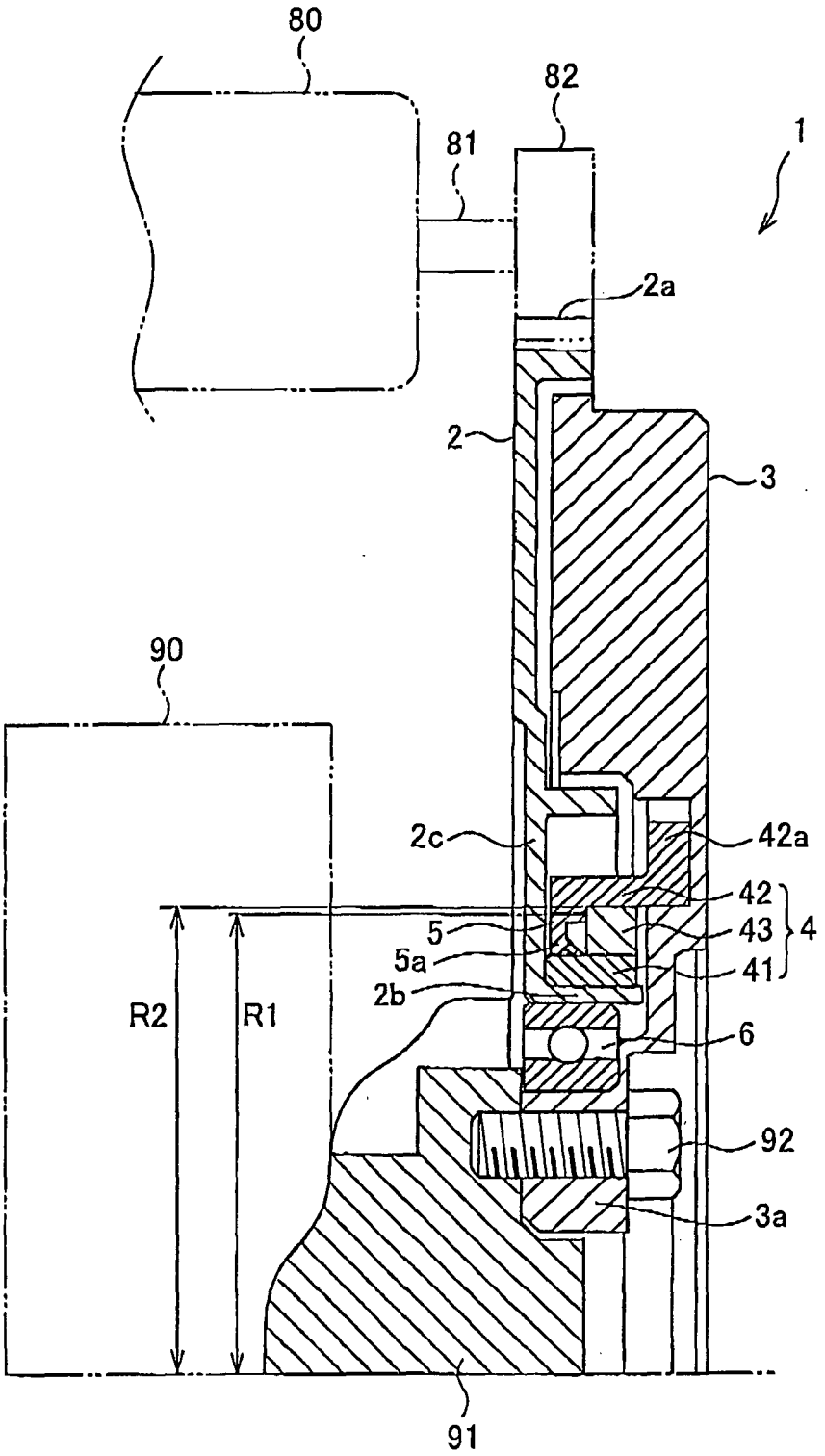


FIG.4

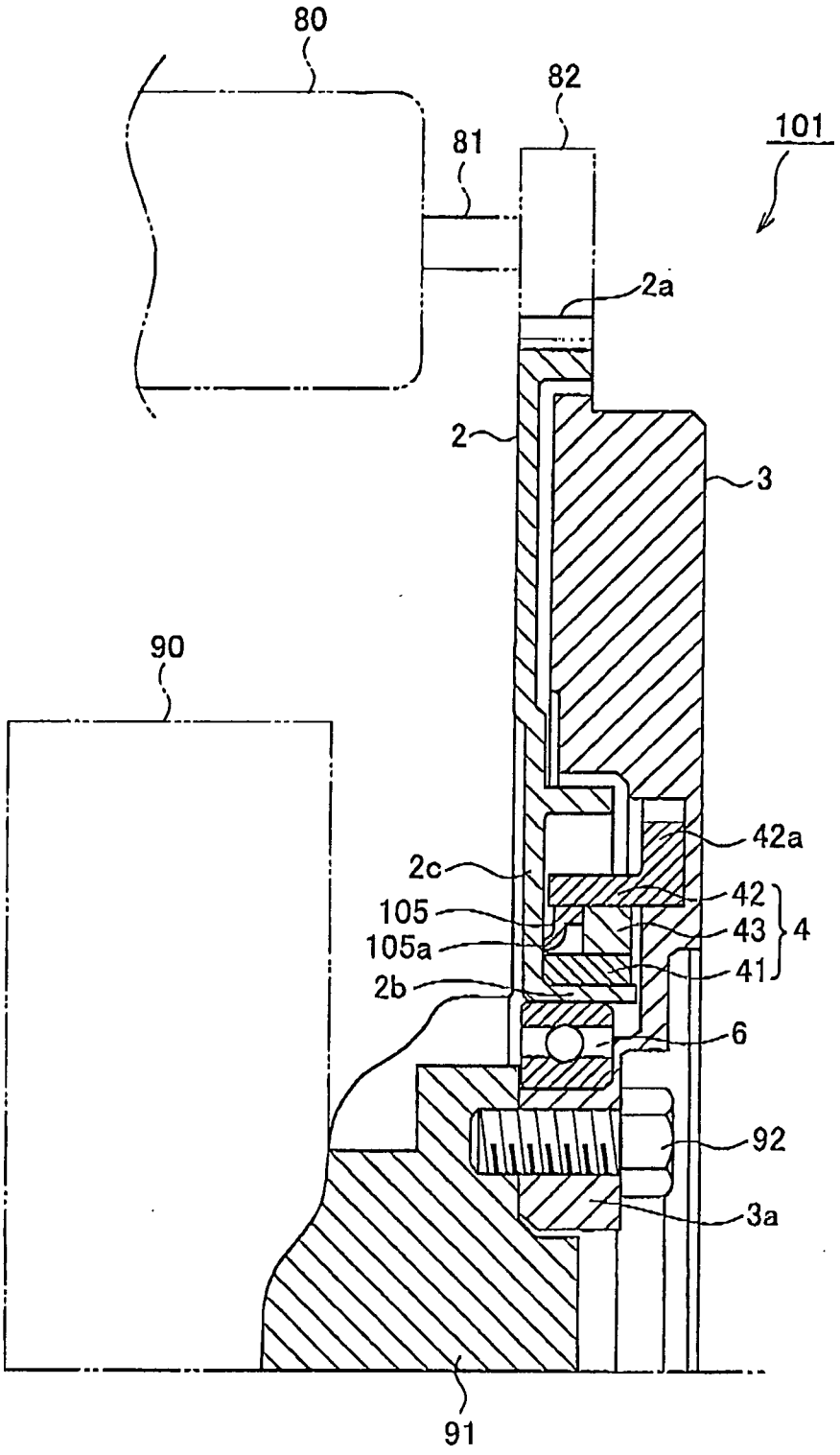


FIG.5

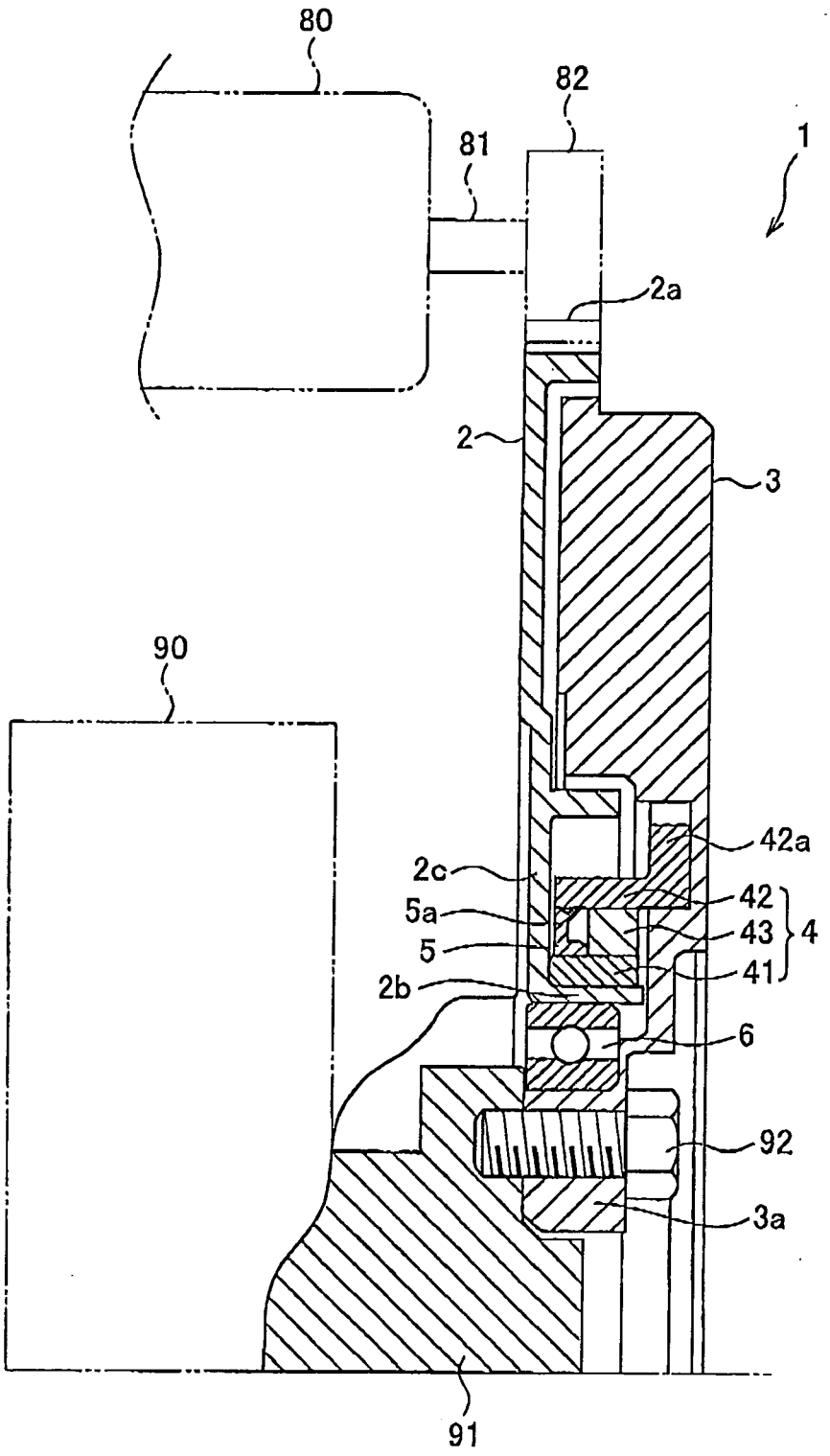
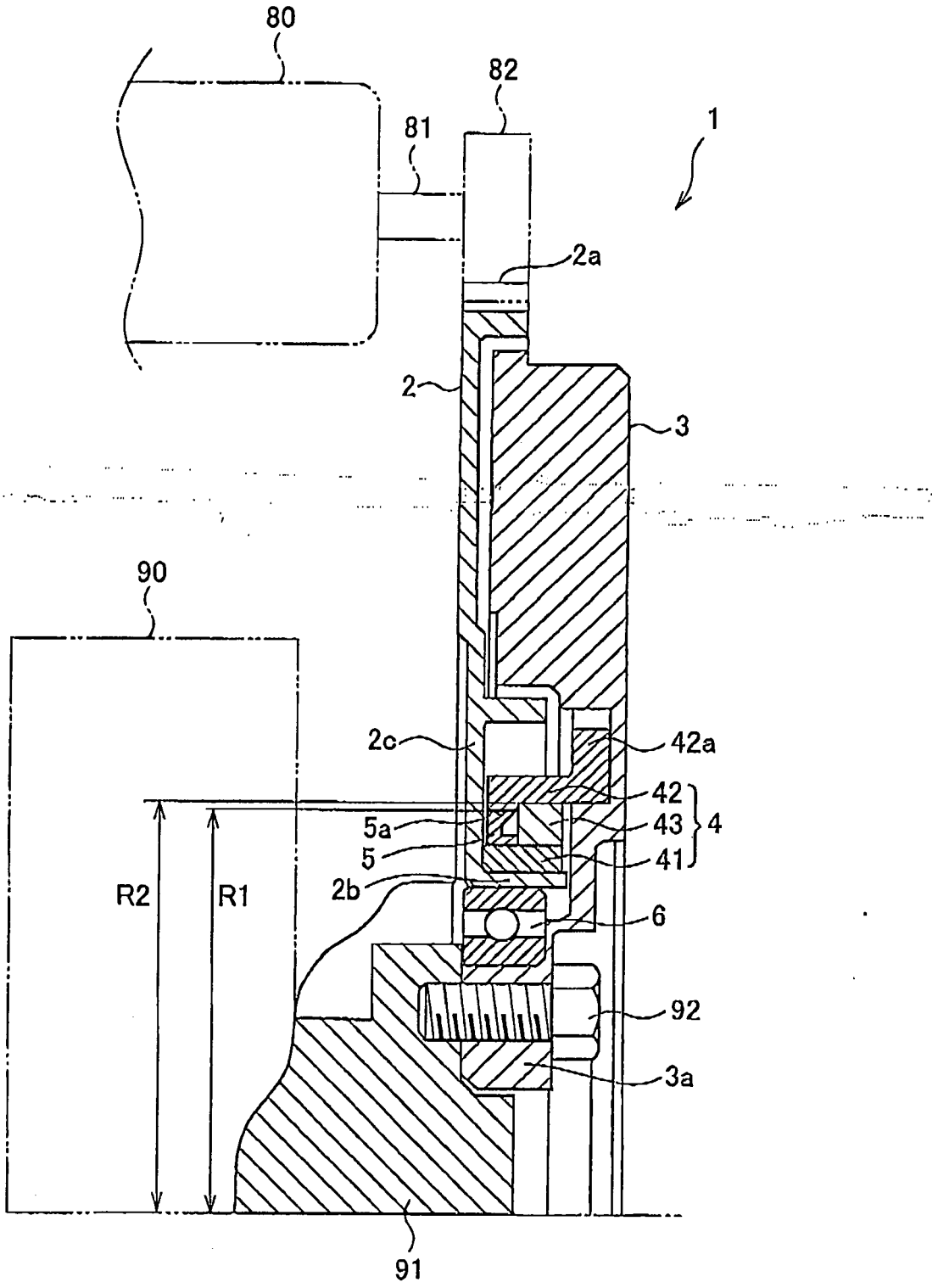


FIG.6



REFERENCES CITED IN THE DESCRIPTION

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