

[Document Name] Description

[Title] Spinning Reel for Fishing

[Technical Field]

[0001]

The present invention relates to a spinning reel for fishing, and particularly to a spinning reel for fishing assembled with a one-way clutch to prevent reverse rotation of a rotor.

[Background]

[0002]

A spinning reel for fishing includes a rotor and a spool that respectively rotate and move back and forth in coordination with the reeling-in operation of a handle. In general, a spinning reel for fishing is assembled with a reverse-rotation prevention mechanism that allows rotation of the rotor in the reel-in direction by means of the rotating operation of the handle and prevents the reverse rotation of the rotor when an attempt is made to rotate the handle in the opposite direction.

[0003]

As disclosed in Patent Literature 1, the reverse-rotation prevention mechanism is configured with, for example, a one-way clutch including: an inner ring that is fitted, in a detented manner, to a pinion gear which is integrally rotated by the rotating operation of a handle; a retainer that is disposed radially outwardly of the inner ring and retains a plurality of rolling members; and an outer ring disposed radially outwardly of the retainer.

[0004]

The rotor is mounted in such a manner that it rotates integrally with the pinion gear. In Patent Literature 1 described above, a recess is formed on the tip end side of the inner ring of the one-way clutch and extends out in the axial direction along the circumferential direction, and with the boss portion formed in the center of the rotor being fitted and seated in the recess and tightened with a

nut from the spool side, the rotor rotates integrally with the pinion gear.

[Prior Art]

[Patent Literature]

[0005]

[Patent Literature 1] Japanese Unexamined Patent Application Publication No. 2019-97431

[Summary]

[Technical Problems]

[0006]

To reduce the size of the one-way clutch described above, the diameter of the inner ring needs to be reduced. For example, when the size of the one-way clutch is reduced by reducing the diameter of the inner ring from the conventional $\phi 10$ to $\phi 9$, the above-described recess becomes thin if the diameter of the boss portion of the rotor is the same, and thus the structure to fit and fix the boss portion cannot be provided from the viewpoint of strength. For this reason, the tip end of the boss portion of the rotor may be configured to make contact with the tip end of the inner ring, with no recess formed at the tip end of the inner ring, but this means a long distance from the position (line roller) where the load is applied and results in a large moment to be applied. Thus, as described below, buckling of the boss portion of the rotor occurs at the portion at which it contacts the tip end of the inner ring.

[0007]

The present invention was made in view of the above-mentioned problems, and an object thereof is to provide a spinning reel for fishing assembled with a one-way clutch, with a structure including a reel body smaller in the size and weight with improved durability.

[Solution to Problems]

[0008]

In order to achieve the above-described object, a spinning reel for fishing according to the present invention comprises: a reel body; a handle that is rotatably supported on the reel body; a drive shaft that is rotated by rotating operation of the handle; a rotor that includes a boss portion fixed to the drive shaft by a fixing structure; and a one-way clutch that is disposed on the drive shaft and includes an inner ring, an outer ring and a retainer retaining a plurality of rolling members; wherein the fixing structure includes a cylinder member that has a first contact portion which is prepared separately from the inner ring so as to cover the boss portion and make contact with the rotor; and a second contact portion that is positioned radially inwardly of the first contact portion and makes contact with a tip end of the inner ring.

[0009]

According to the spinning reel for fishing of the configuration described above, the diameter of the inner ring is reduced as the fixing structure, for fixing the boss portion of the rotor to the drive shaft, does not cover the boss portion of the rotor by means of the inner ring of the one-way clutch, thereby allowing for reduction in the size and weight of the one-way clutch. Also, even when a large load is applied on the fishing line, and a large load (moment) is applied as a result on the boss portion of the rotor through the line roller, the load is received by the first contact portion near the line roller of the cylinder member, which is a member provided separately from the inner ring, and thus deformation (buckling) of the boss portion due to repeated application of loads is reduced, and thus the durability is improving.

[Advantageous Effects]

[0010]

The present invention provides a spinning reel for fishing assembled with a one-way clutch, with a structure

that enables reduction in the size and weight and improvement in the durability of a reel body.

[Brief Description of Drawings]

[0011]

[Fig. 1] Fig. 1 is an exploded perspective view of an embodiment of a spinning reel for fishing according to the present invention.

[Fig. 2] Fig. 2 is a perspective view showing the structure of a rotor of the spinning reel for fishing shown in Fig. 1.

[Fig. 3] Fig. 3 is a sectional view showing the main structure of the inside of the spinning reel for fishing shown in Fig. 1 with: an example with a cylinder member (upper half; after installation) and an example without a cylinder member (lower half; before installation).

[Fig. 4] Fig. 4 is a sectional view showing the main structure of the inside of the spinning reel for fishing shown in Fig. 1, with a modified embodiment of the cylinder member disposed at the boss portion of the rotor.

[Description of Embodiments]

[0012]

Figs. 1 to 3 show an embodiment of a spinning reel for fishing according to the present invention. First, an outline of the overall configuration of the spinning reel for fishing will be described. In the following description, front and rear mean the directions shown in Fig. 2.

[0013]

A spinning reel for fishing (hereinafter referred to as "reel") 1 according to the present embodiment comprises a reel body 2, and a reel foot 2A to be mounted on a fishing rod is integrally formed on the reel body 2. In the front of the reel body 2, a rotor 3 is rotatably supported and a spool (not shown) is supported in such a manner that it moves back and forth, synchronized with the rotational motion of the rotor 3.

[0014]

The rotor 3 includes a pair of arms 3a that rotates around the spool, and at front ends of the arms 3a, bail support members 3b are supported in such a manner that they are rotatable between a fishing-line reel-in position and a fishing-line casting position, with base ends of a bail 5 mounted on the bail support member 3b. In this case, one base end of the bail 5 is mounted on a fishing-line guide portion (line roller) 6 integrally provided on the bail support member 3b.

[0015]

A handle shaft is rotatably supported in the reel body 2 by means of a bearing, and a handle is mounted on a protruding end of the handle shaft. A driving-force transmission mechanism is provided on the handle shaft and when the handle is rotated, transmits the driving force to the rotor 3 to rotate the rotor.

[0016]

As is known, the driving-force transmission mechanism includes a drive gear that is mounted on the handle shaft in such a manner that it integrally rotates with the handle shaft, and a pinion 11 that has pinion teeth meshing with the drive gear. The pinion 11 extends in the front-rear direction perpendicular to the handle shaft and serves as a rotary portion (drive shaft) formed with a cavity 11a extending in the axial direction inside. In this case, a spool shaft is inserted into the cavity 11a and engages with a known oscillating mechanism that moves the spool back and forth when the handle is rotated, and the spool is mounted on a tip end of the spool shaft.

[0017]

The pinion 11 is rotatably supported on the reel body 2. The pinion 11 extends toward the spool side, and the rotor 3 is integrally-rotatably mounted on a tip end of the pinion 11. The rotor 3 has a boss portion 3A with a through hole 3c formed in the center, which is fitted externally

onto a tip end of the pinion 11, and tightening a nut (not shown) from the front side toward the rear side fixes the rotor 3. On the pinion 11, a one-way clutch 20 is disposed and constitutes a reverse-rotation prevention device.

[0018]

With the above configuration, when the handle is operated to reel in, the rotor 3 is rotated by means of the driving-force transmission mechanism and the spool reciprocates in the front-rear direction by means of the oscillating mechanism and the spool shaft. Thus, the fishing line is evenly wound around the spool by means of the fishing-line guide portion 6 of the rotor 3 that is rotated.

[0019]

The rotor 3 described above includes a cylindrical portion 30 formed between the pair of arms 3a. The front side of the cylindrical portion 30 is sealed by a front wall 32, and the rear end is opened substantially in a circular shape. The rear end of the cylindrical portion 30 is provided with a ring-shaped portion 33 that is integrally formed to radially swells out in an arc-shape substantially in the same plane, and this ring-shaped portion 33 forms the rear end of the rotor and is integrated with the pair of arms 3a by connecting the bases of the pair of arms 3a to each other.

[0020]

The front wall 32 includes a flat bridge 32A having a width and radially connecting the edge of the open front end of the cylindrical portion 30; and a cap member 32B mounted on a surface of the bridge 32A. The cap member 32B has a circumferential wall 32a, an annular flange 32b projecting radially outwardly at an upper opening edge of the circumferential wall, and a bottom portion 32c with a rectangular opening 32d formed in a central region. The circumferential wall 32a has a pair of arc walls 32a' that hangs down in an arc shape at two opposite spots, and the

underside surface of the bottom portion 32c has bosses 32e formed at four spots (may be any number, and the positions are also not limited) to be mounted on the bridge 32A.

[0021]

An opening 30A is formed in the cylindrical portion 30 to reduce weight. The opening of the present embodiment is formed in an arc-shape along the circumferential direction from the upper side of the cylindrical portion 30 to the region of the ring-shaped portion 33. By forming this opening 30A in the cylindrical portion 30, both sides of the cylindrical portion 30 on the front side are connected by a semi-ring frame 30a.

[0022]

In the center of the bridge 32A, the boss portion 3A having the through hole 3c protrudes toward the reel body, and as described above, the nut fixed to the pinion 11 is mounted on this portion from the front toward the rear. Further, holes 3f are formed in the bridge 32A at four spots (may be any number, and the positions are also not limited) corresponding to the bosses 32e so that the bosses of the cap member 32B are fitted into. The bridge 32A bridges the front end side of the cylindrical portion 30 between the arms 3a, and a space is formed on both sides of the bridge 32A between it and the semi-ring frames 30a.

[0023]

The cap member 32B is mounted on the bridge 32A and constitutes the front wall 32 together with the bridge, with the bottom portion 32c of the cap member 32B making contact with the surface of the bridge and the bosses 32e, protruding from the holes 3f, welded or the like. In this state, the space between the bridge 32A and the semi-ring frames 30a on both sides of the bridge 32A are sealed by the bottom portion 32c and the arc walls 32a' of the cap member 32B, which efficiently reduces the weight of the rotor. Although the bosses 32e are protruding in Fig. 1, they may be smashed when welded.

[0024]

Now, the one-way clutch 20 described above will be described.

As shown in Fig. 1, on the spool side of the reel body 2, a base 2B substantially in a disc shape is disposed, and a cylinder portion 2C is formed on the surface of the base 2B toward the axial direction. The pinion 11 penetrates the center of the cylinder portion 2C and is rotatably supported, and the one-way clutch 20 is disposed in the middle thereof.

[0025]

The pinion 11 is rotated by means of the drive gear by the rotating operation of the handle, and the one-way clutch 20 serves to allow the rotation of the pinion 11 in the reel-in direction and to prevent its reverse rotation.

As known, the one-way clutch 20 includes an inner ring 21, an outer ring 27 and a retainer 23 retaining a plurality of rolling members 25, and these elements (or some of the elements) may be pre-unitized.

[0026]

The inner ring 21 is detented against the pinion 11. Specifically, the pinion 11 has a cross section in a shape partially formed with a non-circular portion, and with a non-circular portion of the inner ring 21 fitted to this portion, the inner ring 21 rotates integrally with the pinion 11.

[0027]

The retainer 23 is disposed radially outwardly of the inner ring 21 and retains a plurality of rolling members 25 disposed along the circumferential direction. The inner circumference surface of the outer ring 27 has a wedge region that prevents rotation of the respective rolling members 25 and a free region that allows the rolling members 25 to rotate freely, and the rolling members are always biased toward the wedge region by a biasing spring.

[0028]

At a portion of the outer ring 27, a protruding piece 27a is provided to radially outwardly protrude. This protruding piece serves as a detent to restrict rotation of the outer ring 27, and in the present embodiment, is provided in a pair at intervals of 180°. The cylinder portion 2C protruding on the reel body 2 is formed with a radially penetrating notch. This notch is formed to the extent that the protruding piece 27a of the outer ring 27 is fitted into it, and the outer ring 27 is fixed in a detented manner (its rotation is restricted) with the protruding piece 27a fitted into the notch.

[0029]

The one-way clutch 20 constructed as described above is unitized and assembled into the cylinder portion 2C. In this case, a cover member of the retainer 23 or an electric-corrosion-resistant plate (corrosion-resistant plate) or the like may be mounted on the surface of the outer ring 27. Also, a restriction plate may be disposed adjacent to the one-way clutch 20 so as to restrict movement of the one-way clutch in the axial direction. Alternatively, as shown in Figs. 1 and 3, a magnetic seal mechanism 50 may be disposed to enhance the waterproofing and dustproofing effect on the one-way clutch 20.

[0030]

As is known, the magnetic seal mechanism 50 includes: ring-shaped magnetic plates (pole plates) 51, 52 disposed with a minute gap between them and the outer circumference surface of the inner ring 21, and a ring-shaped magnet 53 held between the magnetic plates, with a ferrofluid filled in the gap between the inner ring 21 and the magnetic plates 51, 52.

The pole plates 51, 52 and the magnet 53 may be unitized as a magnet assembly (magnet assy) and may be fixed to the cylinder portion 2C of the reel body or assembled with a waterproof cap 60 described below.

[0031]

In this embodiment, the reel body is provided with a waterproof cap 60 so as to enclose the cylinder portion 2C and the one-way clutch 20. This waterproof cap 60 has a shape including a cylinder portion 61 that surrounds the one-way clutch 20 and a cover portion 62 that seals the opening on the spool side, and the magnetic plate 51 of the magnetic seal mechanism 50 is stuck to the inner surface of the cover portion 62.

[0032]

The one-way clutch 20 of the above-described configuration prevents rotation (reverse rotation) of the handle (rotor 3) in the casting direction.

Specifically, when the pinion 11 is rotated in response to rotation of the handle in the reel-in direction, the inner ring 21 also rotates in the same direction together with the pinion 11. At this time, the rolling member 25 retained in the retainer 23 moves to the free region of the outer ring 27, and thus the rotational force of the inner ring 21 is not transmitted to the outer ring 27 and the rotor 3 rotates with the pinion 11 with no problem.

[0033]

In contrast, when the inner ring 21 together with the pinion 11 is about to rotate in the reverse direction (with the rotor 3 rotating in the casting direction), the rolling member 25 retained in the retainer 23 comes to be located in the wedge region of the outer ring 27 by means of the biasing spring, and the rotational force of the inner ring 21 is transmitted to the outer ring 27. Since rotation of the outer ring 27 is restricted by the protruding piece 27a, this serves as a stopper and prevents the reverse rotation of the pinion 11 and the rotor 3.

[0034]

Unlike a conventional configuration, the outer ring 27 is not detented with a notch, a protrusion or the like formed on the inner circumference surface of the cylinder

portion, which allows to reduce the diameter of the one-way clutch 20 as much as possible and to reduce the size and weight of the reel body. As a result, the size of the inner ring 21 is also reduced, and conventional ones of a diameter of e.g., $\phi 10$ to $\phi 9$ can be used.

[0035]

To reduce the diameter of the inner ring 21, this embodiment includes a fixing structure 70 for fixing the boss portion 3A of the rotor 3 to the pinion, and the fixing structure 70 is configured as follows.

Instead of the rotor being fitted into the inner ring 21 of the one-way clutch, the fixing structure 70 includes a member that is provided separately from the inner ring 21 so that the boss portion 3A and the inner ring 21 do not contact each other. Specifically, the fixing structure 70 has a cylinder member 71 that is provided with a first contact portion 71a covering the outer circumference surface of the boss portion 3A of the rotor 3 and making contact with the rotor from the axial direction; and a second contact portion 71b that is positioned radially inwardly of the first contact portion 71a and makes contact with a tip end of the inner ring 21.

[0036]

In this case, the cylinder member 71 of the present embodiment is integrated with the second contact portion 71b, and the reel body side of the cylinder member 71 is integrally formed substantially in a cap shape with the outer circumference surface bent radially inwardly by 90° to reduce the diameter. In other words, the portion of the reduced diameter is held between an end surface 3A1 of the boss portion 3A on the reel body side and an end surface 21A1 of the inner ring 21 on the rotor side, and the second contact portion 71b is in contact with the end surface 21A1 of the inner ring 21. The tip end of the inner ring 21 thus does not contact the boss portion 3A. The first contact portion 71a of the cylinder member 71 makes contact with

and is seated on a step portion 3A2 formed radially outwardly of the boss portion 3A.

[0037]

In the fixing structure described here, unlike in the conventional one, the end surface of the inner ring 21 having a reduced diameter does not include a recess for the boss portion 3A to be fitted in, and thus reduction in the durability of the one-way clutch caused by, e.g., deformation of the inner ring 21, does not happen. This also allows to reduce the diameter of the inner ring 21, and thereby to reduce the size and weight of the reel body. In addition, since the first contact portion 71a and the second contact portion 71b are integrally formed in the cylinder member 71, the cylinder member is easy to assemble.

[0038]

According to the fixing structure 70 described above, even when a large load is applied on the fishing line, and a large load (moment) is applied as a result on the boss portion 3A side of the rotor 3 through the line roller 6, the load (load applied in the axial direction) is received by the step portion 3A2, near the line roller 6, of the first contact portion 71a of the cylinder member 71, which is a member provided separately from the inner ring 21, and thus deformation of the boss portion 3A caused by repeated application of loads is reduced. In other words, since the portion on which the boss portion 3A is seated is the first contact portion 71a on the step portion 3A2 formed radially outwardly, no large load (moment) is applied on the region of the second contact portion 71b that is a long distance away from the line roller 6, and thus buckling does not occur in the end region of the boss portion 3A of the rotor, thereby improving the durability.

[0039]

In Fig. 3, with the central axis of the pinion 11 as the dividing line, the upper half of the structure shows an

(after installation) example with the cylinder member 71 disposed therein, and the lower half of the structure shows a (before installation) example with no cylinder member disposed. In the example of the lower half, the end surface of the inner ring 21 includes no recess for the boss portion 3A of the rotor to be fitted in, and the end surface (3A1') of the boss portion 3A is in direct contact with the end surface of the inner ring 21.

[0040]

In the structure shown in the lower half, when a large load is applied through the line roller 6, buckling easily occurs at the end surface 3A1' of the boss portion 3A, which reduces the durability of the rotor 3 and further the durability of the inner ring 21 that makes contact with the end surface 3A1'. In the present embodiment, as shown in the upper half of the structure, the cylinder member 71 is disposed and covers the boss portion 3A so that the load is applied to the first contact portion 71a on the step portion 3A2 near the line roller 6, thereby improving the durability with the boss portion 3A not subjected to buckling.

[0041]

In the embodiment described above, the cylinder member 71 includes the first contact portion 71a and the second contact portion 71b integrally formed, but they may be configured as separate members. For example, as shown in Fig. 4, the second contact portion 71b' may be configured separately from the cylinder member 71a, as a disc member (washer) placed between the inner ring 21 and the boss portion 3a.

By preparing the second contact portion 71b as a separate member, the same advantageous effects as those of the above-described embodiment are obtained and the processing cost is reduced as there is no need to process the cylinder member into a U-shape (with a simply

cylindrical member, a washer may be used as a substitute for the second contact portion).

[0042]

In the configuration described above, the cylinder members 71, 71A may be formed of a non-magnetic material such as SUS, aluminum and hard resin. With a cylinder member formed of one of these materials, the ferrofluid is prevented from being attracted and maintains its sealing function in the case that the magnetic seal mechanism 50 is disposed on the inner ring 21.

[0043]

Although the embodiments of the present invention are described above, the present invention is not limited to those embodiments and may be modified in various ways.

The present invention is characterized in that the load applied on the portion fixing the rotor is received with the use of the cylinder member (collar) 71, 71A without forming a recess in the end of the inner ring 21 of the one-way clutch 20, and other configurations may be modified as desired. For example, the configurations of the rotor 3, the one-way clutch 20 and the magnetic seal mechanism 50 are not limited to the structures shown in the figures.

[Reference Signs List]

[0044]

1 spinning reel for fishing

2 reel body

2C cylinder portion

3 rotor

20 one-way clutch

27 outer ring

70 fixing structure

71, 71A cylinder member

71a first contact portion

71b second contact portion

[Document Name] Claims

[Claim 1]

A spinning reel for fishing, comprising:

a reel body;

a handle that is rotatably supported on the reel body;

a drive shaft that is rotated by rotating operation of the handle;

a rotor that includes a boss portion fixed to the drive shaft by a fixing structure; and

a one-way clutch that is disposed on the drive shaft and includes an inner ring, an outer ring and a retainer retaining a plurality of rolling members; wherein

the fixing structure includes a cylinder member that has a first contact portion which is prepared separately from the inner ring so as to cover the boss portion and make contact with the rotor; and a second contact portion that is positioned radially inwardly of the first contact portion and makes contact with a tip end of the inner ring.

[Claim 2]

The spinning reel for fishing according to claim 1, wherein the cylinder member is integrally formed with the first contact portion and the second contact portion.

[Claim 3]

The spinning reel for fishing according to claim 1, wherein the second contact portion is configured with a disc member that is prepared separately from the cylinder member and placed between the inner ring and the boss portion.

[Claim 4]

The spinning reel for fishing according to any one of claims 1 to 3, wherein the first contact portion of the cylinder member contacts the rotor so that a tip end of the inner ring is kept from contacting the boss portion.

[Claim 5]

The spinning reel for fishing according to any one of claims 1 to 4, wherein the cylinder member is a non-

magnetic material, and a magnetic seal mechanism is disposed on the inner ring.