

[Document Name] Description

[Title] Spinning Reel for Fishing

[Technical Field]

[0001]

The present invention relates to a spinning reel for fishing.

[Background]

[0002]

There is a known conventional spinning reel for fishing, in which a handle is removably provided in a reel body (see e.g., Patent Literature 1). In Patent Literature 1, a handle is mounted by screwing a handle shaft to a drive gear shaft of a reel body, and a cylindrical member is provided between the drive gear shaft and the handle shaft while a ball bearing rotatably supports the drive gear shaft. The drive gear shaft includes a drive gear and is rotatably supported by means of the ball bearing.

[0003]

The cylindrical member of the patent literature has a portion that faces an end of the drive gear shaft with a gap between the portion and the end. The cylindrical member is configured to be buckled as a result of making contact with the ball bearing supporting the drive gear shaft. Thus, Patent Literature 1 prevents the drive gear shaft from receiving an excessive thrust force of the handle shaft caused by the screwing of the handle shaft to the drive gear shaft.

[Prior Art]

[Patent Literatures]

[0004]

[Patent Literature 1] Japanese Unexamined Patent Application Publication No. 2017-108717

[Summary]

[Technical Problems]

[0005]

The structure disclosed in Patent Literature 1 prevents the load acting on the drive gear shaft by means of the cylindrical member provided between the drive gear shaft and the handle shaft, and thus the connecting structure between the drive gear shaft and the handle shaft is complex and the components need to be manufactured with high dimensional accuracy, which leads to an increase in cost.

[0006]

The present invention was created to solve these problems and an object thereof is to provide a spinning reel for fishing in which a connecting structure between a drive gear shaft and a handle shaft is simplified and the cost thereof is reduced.

[Solution to Problems]

[0007]

To solve the aforementioned problems, the present invention is a spinning reel for fishing, comprising: a reel body and a handle that is removably provided in the reel body. The present invention further comprises a drive gear shaft provided in the reel body; a ball bearing that is externally fitted on the drive gear shaft and rotatably supports the drive gear shaft; and a handle shaft that is provided in the handle and screwed to the drive gear shaft. On the handle shaft, a contact portion is integrally provided and contacts an inner ring of the ball bearing by means of the screwing to the drive gear shaft.

[0008]

In this spinning reel for fishing, when the handle shaft is screwed to the drive gear shaft, the contact portion of the handle shaft approaches and is pressed against the inner ring of the ball bearing, and the handle shaft is fixed to the drive gear shaft. In other words, the handle shaft is fixed to the drive gear shaft while the press-contacting force, produced by the screwing of the handle shaft, is restricted by a detent of the contact

portion against the inner ring of the left ball bearing. This prevents buckling of the end portion of the drive gear caused by the screwing of the handle shaft.

[0009]

Also, since the contact portion is integrally provided on the handle shaft, there is no need to provide a cylindrical member such as a conventional one between the drive gear shaft and the handle shaft. Thus, a connecting structure between the drive gear shaft and the handle shaft is simplified and the cost thereof is reduced.

Furthermore, since the contact portion is provided integrally on the handle shaft, the handle shaft is manufactured with high dimensional accuracy, and with more strength than the case using a cylindrical member such as a conventional one.

Also, even if the ball bearing is deformed as a result of excessive tightening of the handle shaft, only the ball bearing that is less expensive than the drive gear shaft needs to be replaced, and thus, its maintenance is easy and the repairing cost is reduced.

[0010]

Preferably, the handle shaft includes a large-diameter base and an insertion portion that is smaller in diameter than the base and inserted into the drive gear shaft. In this case, it is preferred that the contact portion is provided at a boundary between the base and the insertion portion.

[0011]

In this configuration, the contact portion is readily formed by using the stepped portion between the large-diameter base and the small-diameter insertion portion, and the connecting structure between the drive gear shaft and the handle shaft is simplified.

[0012]

Preferably, the handle shaft is formed of a high-strength material that is stronger than the ball bearing.

[0013]

In this configuration, when the handle shaft is excessively tightened, the ball bearing that is less expensive than the drive gear shaft is deformed. Thus, their maintenance is easy and the repairing cost is reduced.

[0014]

Preferably, the outer diameter of an end of the drive gear shaft is smaller than the inner diameter of the ball bearing.

[0015]

In this configuration, a space is formed between the end of the drive gear shaft and the inner ring of the ball bearing to allow the buckled and deformed portion to escape. As a result, even if buckling occurs at the end of the drive gear shaft due to excessive tightening of the handle shaft, the effect is housed within the space for the buckling deformation. This makes it easy to perform maintenance work such as replacing the ball bearing.

[0016]

Preferably, the contact portion has a portion facing the ball bearing and a portion facing an end of the drive gear shaft, and forms a flat surface over both the portions.

[0017]

This configuration enhances workability of the handle shaft, and thus its cost is reduced.

[0018]

Preferably, when the handle shaft is screwed to the drive gear shaft, the contact portion contacts the inner ring of the ball bearing and an end surface of the drive gear shaft at the same time, or preferably, when the handle shaft is screwed to the drive gear shaft, the contact portion contacts an end surface of the drive gear shaft first and then contacts the inner ring of the ball bearing.

[0019]

In the configuration in which the contact portion contacts the inner ring of the ball bearing and an end of the drive gear shaft at the same time, the handle shaft is fixed to the drive gear shaft while the press-contacting force, produced by the screwing of the handle shaft, is restricted by a detent of the contact portion against the inner ring of the left ball bearing and the end of the drive gear shaft. In other words, the portion (area) that supports the axial force produced by the screwing of the handle shaft is increased, and so is the strength.

In the configuration in which the contact portion first contacts an end portion of the drive gear shaft and then contacts the inner ring of the ball bearing, the contact made by the contact portion first buckles the end portion of the drive gear shaft, and then the contact portion contacts the inner ring of the ball bearing. Thus, in this case also, the portion that supports the axial force produced by the screwing of the handle shaft is eventually increased, and so is the strength.

[Advantageous Effects]

[0020]

The present invention provides a spinning reel for fishing in which a connecting structure between a drive gear shaft and a handle shaft is simplified and the cost thereof is reduced.

[Brief Description of Drawings]

[0021]

[Fig. 1] Fig. 1 is a side view showing the overall configuration of a spinning reel for fishing according to a first embodiment of the present invention.

[Fig. 2] Fig. 2 is an end view of the cross section cut along line II-II of Fig. 1, viewed from the direction of the arrow.

[Fig. 3] Fig. 3 is a partially-enlarged sectional view showing a connecting structure between a drive gear shaft

and a handle shaft in the case that a handle is installed on the left side.

[Fig. 4] Fig. 4 is a partially-enlarged sectional view showing the structure of the right side of the drive gear shaft.

[Fig. 5] Fig. 5 is an enlarged sectional view showing a connecting structure between a drive gear shaft and a handle shaft in the case that a handle is installed on the right side.

[Fig. 6] Fig. 6 is a partially-enlarged sectional view showing a connecting structure between a drive gear shaft and a handle shaft in the case that a handle is installed on the left side, in a spinning reel for fishing according to a second embodiment of the present invention.

[Description of Embodiments]

[0022]

Now, a spinning reel 100 for fishing according to embodiments will be described with reference to the drawings. In the following description, the words "top", "bottom", "front", and "rear" are used in terms of the directions shown in Fig. 1, and "right" and "left" are used in terms of the directions shown in Fig. 2.

[0023]

(First Embodiment)

First, the basic structure of the spinning reel 100 for fishing will be described.

As shown in Fig. 1, the spinning reel 100 for fishing includes: a reel body 1 with a handle 3 mounted thereon; a rotor 4 that is provided on the front side of the reel body 1 and rotated by the reeling-in operation of the handle 3; and a spool 5 that is provided on the front side of the rotor 4 and reciprocated in the front-rear direction by the reeling-in operation of the handle 3.

[0024]

The reel body 1 has: a body 10 formed with a side opening 11 opened toward the left side; a foot 12 having,

at its tip end, a rod mounting portion 12a that extends upward from the top of the body 10 and is mounted on a fishing rod; a lid member 13 that closes the side opening 11; and a protective cover 14 mounted at the rear of the body 10.

[0025]

To the reel body 1, a drive shaft cylinder (not shown) and a spool shaft 8 (partially shown in Fig. 2) are assembled to project forward from the front of the body 10. The rotor 4 is mounted at a front end of the drive shaft cylinder. The spool 5 is mounted at a front end of the spool shaft 8.

[0026]

As shown in Fig. 2, the lid member 13 has a cylindrical insertion portion 13a that is inserted into the side opening 11. A male thread portion is formed on an outer circumference surface of the insertion portion 13a. The male thread portion is in screw contact with a female thread portion formed on an inner circumference surface of the side opening 11. This screw contact integrates the body 10 and the lid member 13.

[0027]

In the body 10, a drive gear shaft 2 extending in the right-left direction and a spool reciprocating device 60 are provided as a configuration to drive the drive shaft cylinder and the spool shaft 8 in coordination with the operation of the handle 3.

As shown in Fig. 2, the drive gear shaft 2 has a drive gear 21 and a gear 22. The drive gear shaft 2 is rotatably supported on the lid member 13 and the body 10 by means of ball bearings 15, 16 on the right and left sides. On the drive gear shaft 2, a handle shaft 31 provided in the handle 3 is mounted by screwing. As a result, the handle 3 and the drive gear shaft 2 rotate in an integrated manner. Details of the drive gear shaft 2 and the handle 3 will be described below.

[0028]

The spool reciprocating device 60 includes a sliding element 61 and a coordinating gear 62, and the sliding element 61 is configured to move in the front-rear direction along a guide shaft (not shown) extending in the front-rear direction of the body 10. The sliding element 61 is fixed to a rear end of the spool shaft 8 and is provided with a guide groove 61a opened on the right side. The coordinating gear 62 is supported on a support member 63 provided on a right side wall 10a of the body 10, and meshed with the gear 22 of the drive gear shaft 2 and rotates. The coordinating gear 62 has an eccentric protrusion 62a that engages the guide groove 61a of the sliding element 61.

[0029]

As understood from the above description, when the drive gear shaft 2 and the gear 22 are rotated by the reeling-in operation of the handle 3, the coordinating gear 62 rotates and the rotational motion is converted into a back-and-forth motion of the sliding element 61 by means of the eccentric protrusion 62a and the guide groove 61a. As a result, the spool shaft 8 (spool 5) is reciprocated in the front-rear direction.

[0030]

Now, the drive gear shaft 2, the handle 3 and their connecting structure will be described in detail.

As shown in Fig. 2, the drive gear shaft 2 has a substantially cylindrical shape and is provided with a stepped circular outer circumference surface along the central axis 01 and screw holes 23, 23 opening on the left and right sides. The screw hole 23 on the left side allows the handle 3 to be mounted on the left side, and the screw hole 23 on the right side allows the handle 3 to be mounted on the right side (see Fig. 5).

[0031]

Each screw hole 23 has a large-diameter inner circumference surface 23a formed on the opening side and a small-diameter inner circumference surface 23b formed on the deeper side than the large-diameter inner circumference surface 23a, with a diameter smaller than that of the large-diameter inner circumference surface 23a. On the large-diameter inner circumference surface 23a on the left side and the small-diameter inner circumference surface 23b on the right side, female threads for screwing the handle shaft 31 are formed. The female thread of the large-diameter inner circumference surface 23a on the left side is a reverse thread in the opposite direction of the regular thread. On the other hand, the female thread on the small-diameter inner circumference surface 23b on the right side is a regular thread.

[0032]

On the outer circumference surface of the drive gear shaft 2, the drive gear 21 is integrally formed at a position deviated to the left from the center with respect to the right-left direction. Also, the gear 22 is integrally formed at a position deviated to the right from the center of the drive gear shaft 2 with respect to the right-left direction. The drive gear shaft 2 may be formed of stainless steel or steel, instead of an aluminum alloy, in the case of a spinning reel 100 for fishing for high-load reeling-in operation to reel in the fishing line under the high load conditions (hereinafter referred to as "spinning reel for fishing for high-load conditions").

[0033]

Referring now to Fig. 3, the connecting structure on the left side of the drive gear shaft 2 will be described in detail.

The outer circumference surface of the left side of the drive gear shaft 2 is formed with a first outer circumference portion 24 that is continuous with the left side of the drive gear 21, and a second outer circumference

portion 25 that is continuous with the left side of the first outer circumference portion 24 and has a smaller diameter than the first outer circumference portion 24. Between the first outer circumference portion 24 and the second outer circumference portion 25, a ring-shaped stepped surface 25a that is perpendicular to the central axis O1 (see Fig. 2, hereinafter the same) is formed. The outer circumference surface of the second outer circumference portion 25 serves as a seating surface to which a left ball bearing 15 is externally fitted. The stepped surface 25a serves as a positioning surface on which a right side surface of an inner ring 15a of the left ball bearing 15 is positioned by means of an annular washer 24a.

The left ball bearing 15 includes an outer ring 15b that is fitted into the circular inner circumference surface of the lid member 13 formed around the central axis O1 as its center.

[0034]

The left end of the second outer circumference portion 25 is dimensioned to protrude to the left side more than the left side surface of the inner ring 15a of the left ball bearing 15. An outer circumference surface 25b of the left end of the second outer circumference portion 25 is a tapered, inclined surface that is narrowed toward the left end and is separated from the inner ring 15a of the left ball bearing 15. As a result, the outer diameter of the left end of the drive gear shaft 2 is smaller than the inner diameter of the left ball bearing 15.

Here, the left and right ball bearings 15, 16 are formed of stainless steel.

[0035]

Referring now to Fig. 4, the connecting structure on the right side of the drive gear shaft 2 will be described in detail.

On the outer circumference surface of the right side of the drive gear shaft 2, a third outer circumference portion 26 that is continuous with the right side of the gear 22 is formed. The third outer circumference portion 26 is provided with, on its outer circumference surface, a positioning protrusion 27 that protrudes radially outwardly. On the right side of the positioning protrusion 27, the outer circumference surface of the third outer circumference portion 26 serves as a seating surface to which a right ball bearing 16 is externally fitted. A right side surface 27a of the positioning protrusion 27 serves as a positioning surface on which the left side surface of an inner ring 16a of the right ball bearing 16 is positioned.

In the right side wall 10a of the reel body 1, an outer ring 16b of the right ball bearing 16 is fitted into, by means of a washer 10c, on the left side of an annular inner circumference portion 10b formed around the central axis O1 as its center. A cover member 17 is also mounted on the right side wall 10a (see Fig. 2).

[0036]

The right end of the third outer circumference portion 26 is dimensioned to protrude to the right side more than the right side surface of the inner ring 16a of the right ball bearing 16. Likewise the outer circumference surface 25b of the left end described above, an outer circumference surface 26b of the right end of the third outer circumference portion 26 is a tapered, inclined surface that is narrowed toward the right end, and separated from the inner ring 16a of the right ball bearing 16. As a result, the outer diameter of the right end of the third outer circumference portion 26 is smaller than the inner diameter of the right ball bearing 16.

[0037]

Now, the handle 3 will be described. As shown in Fig. 2, the handle 3 includes an arm portion 32 and the handle shaft 31 that is connected to the arm portion 32 and has a

stepped circular outer circumference surface along the central axis 01. A cover member 3a is mounted on the connecting portion of the arm portion 32 and the handle shaft 31.

[0038]

The handle shaft 31 includes a large-diameter base 33 connected to the arm portion 32, and a small-diameter insertion portion 34 that is continuous with the base 33, formed smaller in diameter than the base 33 and inserted into the screw hole 23 of the drive gear shaft 2. The handle shaft 31 is formed of a high-strength material such as stainless steel and steel, which is stronger than the drive gear shaft 2. The handle shaft 31 may be made of other high-strength materials such as a titanium alloy and aluminum alloy.

Here, the strength of the materials of the drive gear shaft 2, the ball bearings 15, 16 and the handle shaft 31 satisfies the relation of handle shaft 31 > ball bearings 15, 16 > drive gear shaft 2. For a spinning reel 100 for fishing for high-load conditions, their strength may be set to satisfy the relation of handle shaft 31 $\approx$ drive gear shaft 2 > ball bearings 15, 16. Or, the strength may also be set to satisfy the relation of ball bearings 15, 16 > handle shaft 31 $\approx$ drive gear shaft 2. When the strength of the ball bearings 15, 16 is set to be higher than that of the handle shaft 31 and the drive gear shaft 2, damage to the ball bearings 15, 16 is reduced, which maintains a good rotational feel of the handle 3 over a long period of time. In particular, in a spinning reel 100 for fishing for high-load conditions, it is desirable to increase the strength of the ball bearings 15, 16 because the load applied on the drive gear shaft 2 is high.

[0039]

The base 33 has a substantially cylindrical shaped with a bottom and is hollow inside. The insertion portion 34 has a substantially circular column shape and is

provided with a first insertion portion 34a that is continuous with the bottom of the base 33 and a second insertion portion 34b that is continuous with the first insertion portion 34a. The first insertion portion 34a has an outer circumference surface that is smaller in diameter than the base 33. A contact portion 36 is integrally provided at a boundary between the base 33 and the first insertion portion 34a.

[0040]

As shown in Fig. 3, the contact portion 36 has a protruding portion 36a and a contact surface 36b. The protruding portion 36a has a circular annular shape and protrudes to the right from an outer circumference edge of the base 33. The protruding portion 36a has a substantially rectangular cross-sectional. The protruding portion 36a faces the left side surface of the inner ring 15a of the left ball bearing 15 and is configured to make contact with the left side of the inner ring 15a in the process of tightening the handle shaft 31 to the drive gear shaft 2.

[0041]

The contact surface 36b continues radially inwardly with the protruding portion 36a and is a ring-shaped flat surface perpendicular to the central axis O1. The contact surface 36b faces the left end surface of the second outer circumference portion 25 of the drive gear shaft 2 and is configured to make contact with the left end surface of the second outer circumference portion 25 in the process of tightening the handle shaft 31 to the drive gear shaft 2.

[0042]

In this embodiment, the contact surface 36b is set to contact the left end surface of the second outer circumference portion 25 at the same time as the protruding portion 36a contacts the left side surface of the inner ring 15a.

In other words, both the protruding portion 36a and the contact surface 36b of the contact portion 36 are used

to make contact with the second outer circumference portion 25 of the drive gear shaft 2 and the inner ring 15a.

[0043]

There is a gap S1 formed radially inwardly of the protruding portion 36a. The gap S1 has a substantially triangular cross-section and is defined by the radially-inner circumference surface of the protruding portion 36a, the contact surface 36b, the outer circumference surface 25b of the left end of the second outer circumference portion 25, and the inner ring 15a of the left ball bearing 15.

[0044]

In the present embodiment, as described above, the contact surface 36b is set to contact the left end surface of the second outer circumference portion 25 at the same time as the protruding portion 36a contacts the left side surface of the inner ring 15a, but the present invention is not limited thereto. For example, a gap may be formed between the left end surface of the second outer circumference portion 25 and the contact surface 36b when the protruding portion 36a is in contact with the left side surface of the inner ring 15a. In other words, the handle shaft 31 may be configured to be fixed to the drive gear shaft 2 by the press-contacting of the protruding portion 36a against the inner ring 15a.

[0045]

Or, oppositely to the above configuration, the contact surface 36b may be configured to first contact the left end surface of the second outer circumference portion 25, and then the protruding portion 36a may contact the left side surface of the inner ring 15a, in the process of tightening the handle shaft 31 to the drive gear shaft 2.

[0046]

In this case, in the process of tightening, the contact surface 36b first contacts the left end surface of the second outer circumference portion 25, so that the

contact made by the contact portion 36 formed of a high-strength material makes the protruding portion 36a press-contact against the left side surface of the inner ring 15a while facilitating buckling and deforming the left end of the second outer circumference portion 25. At this time, the gap S1 formed at the left end of the second outer circumference portion 25 serves as a space to release the buckled and deformed portion. In other words, the protruding portion 36a press-contacts the left side surface of the inner ring 15a while facilitating suitable buckling deformation of the left end of the second outer circumference portion 25.

[0047]

Fig. 5 is an enlarged sectional view showing the connecting structure between the drive gear shaft 2 and the handle shaft 31 in the case that the handle is installed on the right side.

When the handle is installed on the right side, the second insertion portion 34b on the tip end side of the handle shaft 31 is screwed to the small-diameter inner circumference surface 23b on the deeper side of the screw hole 23. The protruding portion 36a of the contact portion 36 faces the right side surface of the inner ring 16a of the right ball bearing 16 and contacts the right side surface of the inner ring 16a in the process of tightening the handle shaft 31 to the drive gear shaft 2.

[0048]

The contact surface 36b faces the right end surface of the third outer circumference portion 26 of the drive gear shaft 2 and contacts the right end surface of the third outer circumference portion 26 in the process of tightening the handle shaft 31 to the drive gear shaft 2. In this case also, the contact surface 36b is set to contact the right end surface of the third outer circumference portion 26 at the same time as the protruding portion 36a contacts the right side surface of the inner ring 16a.

In other words, the entire left side surface of the contact portion 36 is used to contact the third outer circumference portion 26 of the drive gear shaft 2 and the inner ring 16a.

[0049]

In the case that the handle is installed on the right side also, a gap S1 is formed radially inwardly of the protruding portion 36a. The gap S1 has a substantially triangular cross-section and is defined by the radially-inner circumference surface of the protruding portion 36a, the contact surface 36b, the outer circumference surface 26b of the right end of the third outer circumference portion 26, and the inner ring 16a of the right ball bearing 16.

[0050]

In the above description, the contact surface 36b is set to contact with the right end surface of the third outer circumference portion 26 at the same time as the protruding portion 36a contacts the right side surface of the inner ring 16a, but the present invention is not limited thereto. For example, a gap may be formed between the right end surface of the third outer circumference portion 26 and the contact surface 36b when the protruding portion 36a is in contact with the right side surface of the inner ring 16a. In other words, the handle shaft 31 may be configured to be fixed to the drive gear shaft 2 as a result of the protruding portion 36a mainly press-contacting the right side surface of the inner ring 16a.

[0051]

Or, oppositely to the above configuration, the present invention may be configured in such a manner that the contact surface 36b first contacts the right end surface of the third outer circumference portion 26 and then the protruding portion 36a contacts the right side surface of the inner ring 16a, in the process of tightening the handle shaft 31 to the drive gear shaft 2.

[0052]

In this case, in the process of tightening, the contact surface 36b first contacts the right end surface of the third outer circumference portion 26, so that the contact made by the contact portion 36 formed of a high-strength material makes the protruding portion 36a press-contact the left side surface of the inner ring 16a while facilitating buckling and deforming the right end of the third outer circumference portion 26. At this time, the gap S1 formed at the right end of the third outer circumference portion 26 serves as a space to release the buckled and deformed portion. In other words, the protruding portion 36a press-contacts the right side surface of the inner ring 16a while facilitating suitable buckling deformation of the right end of the third outer circumference surface 26.

[0053]

According to the present embodiment described above, for example, in the case that the handle is installed on the left side, when the handle shaft 31 is screwed onto the drive gear shaft 2, the contact portion 36 (protruding portion 36a) of the handle shaft 31 approaches and is pressed against the inner ring 15a of the left ball bearing 15 and the handle shaft 31 is fixed to the drive gear shaft 2. In other words, the handle shaft 31 is fixed to the drive gear shaft 2 while the press-contacting force, produced by the screwing of the handle shaft 31, is restricted by a detent of the contact portion 36 against the inner ring 15a of the left ball bearing 15. This prevents buckling of the end portion of the drive gear shaft 2 caused by the screwing of the handle shaft 31.

[0054]

Also, since the contact portion 36 is integrally provided on the handle shaft 31, there is no need to provide a cylindrical member such as a conventional one between the drive gear shaft 2 and the handle shaft 31. As a result, the connecting structure between the drive gear

shaft 2 and the handle shaft 31 is simplified and the cost thereof is reduced.

[0055]

Furthermore, since the contact portion 36 is provided integrally on the handle shaft 31, the handle shaft 31 is manufactured with high dimensional accuracy, and with more strength than the case using a cylindrical member such as a conventional one.

[0056]

Also, since the contact surface 36b contacts the left end surface of the second outer circumference portion 25 at the same time as the protruding portion 36a contacts the left side surface of the inner ring 15a, the portion (area) that supports the axial force produced by the screwing of the handle shaft 31 is increased, and so is the strength.

[0057]

Furthermore, since the handle shaft 31 is formed of a high-strength material that is stronger than the left ball bearing 15, in the case that a gap is formed between the left end surface of the second outer circumference portion 25 and the contact surface 36b when the protruding portion 36a is in contact with the left side surface of the inner ring 15a, the following advantageous effects are obtained. That is, even if the left ball bearing 15 is deformed as a result of being pushed by the protruding portion 36a, due to excessive tightening of the handle shaft 31, only the left ball bearing 15 that is less expensive than the drive gear shaft 2 needs to be replaced, and thus, its maintenance is easy and the repairing cost is reduced.

[0058]

Or, oppositely to this, when the present invention is configured in such a manner that the contact surface 36b first contacts the left end surface of the second outer circumference portion 25 and then the protruding portion 36a contacts the left side surface of the inner ring 15a, the contact made by the contact portion 36 buckles and

deforms the left end of the second outer circumference portion 25 and then, the contact portion 36 contacts the inner ring 15a. Thus, in this case also, the portion that supports the axial force produced by the screwing of the handle shaft 31 is eventually increased, and so is the strength.

These advantageous effects are also obtained in the case that the handle shaft 31 is screwed on the right side of the drive gear shaft 2.

[0059]

(Second Embodiment)

With reference to Fig. 6, a spinning reel for fishing according to a second embodiment of the present invention will be described. This embodiment differs from the first embodiment described above in that a contact portion 36A is configured with a flat surface.

[0060]

The contact portion 36A has a contact surface 37 perpendicular to the central axis O1. The contact surface 37 forms a flat surface over both a portion facing the left side surface of the inner ring 15a and a portion facing the left end surface of the second outer circumference portion 25.

Meanwhile, the left side surface of the inner ring 15a and the left end surface of the second outer circumference portion 25 are also flush with each other in a direction perpendicular to the central axis O1, set to be flat corresponding to the contact surface 37 of the contact portion 36A.

[0061]

With this, in the process of tightening the handle shaft 31 to the drive gear shaft 2, the contact surface 37 of the contact portion 36A contacts the left side surface of the inner ring 15a and the left end surface of the second outer circumference portion 25 at the same time.

This also works in the same manner with the connecting structure in the case that the handle installed on the right side.

[0062]

In this embodiment, instead of the gap S1 described in the first embodiment, a gap S2 of a different shape is formed at the left end of the second outer circumference portion 25. The gap S2 is formed with a stepped surface of a small diameter that is formed on the outer circumference surface 25c of the left end of the second outer circumference portion 25.

[0063]

According to the present embodiment described above, in addition to the same advantageous effects as those described in the first embodiment, workability of the handle shaft 31 is improved since the contact surface 37 that forms a flat surface is provided. As a result, its cost is reduced.

[0064]

In the present embodiment, the contact surface 37 of the contact portion 36A is set to contact the left side surface of the inner ring 15a and the left end surface of the second outer circumference portion 25 at the same time, but the present invention is not limited thereto. For example, it may be set in such a manner that a gap is formed between the left end surface of the second outer circumference portion 25 and the contact surface 37 when the contact surface 37 is in contact with the left side surface of the inner ring 15a. In other words, the handle shaft 31 may be configured to be fixed to the drive gear shaft 2 by the press-contacting of the contact surface 37 against the inner ring 15a. In this case also, since the contact surface 37 is a flat surface, workability of the handle shaft 31 is improved and the cost thereof is reduced.

[0065]

Also, even if the left ball bearing 15 is deformed as a result of being pushed by the contact portion 36A, due to excessive tightening of the handle shaft 31, only the left ball bearing 15 that is less expensive than the drive gear shaft 2 needs to be replaced, and thus, its maintenance is easy and the repairing cost is reduced.

[0066]

Or, oppositely to this, the present invention may be set in such a manner that the contact surface 37 first contacts the left end surface of the second outer circumference portion 25, and then contacts the left side surface of the inner ring 15a. In this case also, since the contact surface 37 is a flat surface, workability of the handle shaft 31 is improved and the cost thereof is reduced.

In this case, strength is improved since the contact made by the contact surface 37 first buckles and deforms the left end of the second outer circumference portion 25, and then the contact surface 37 contacts the inner ring 15a, which eventually increases the portion that supports the axial force produced by the screwing of the handle shaft 31.

The above described advantageous effects are also obtained in the case that the handle shaft 31 is screwed on the right side of the drive gear shaft 2.

[0067]

Although the embodiments are described above, the present invention is not limited to the examples described in the embodiments.

For example, in the above embodiments, the contact portions 36, 36A are configured by using a stepped structure formed at a boundary between the base 33 and the insertion portion 34 of the handle shaft 31, but the present invention is not limited thereto. The present invention may be configured in such a manner that a flange-shaped circumference wall or the like protruding outwardly

in the circumferential direction is partially formed on the outer circumference portion of the handle shaft 31, and using its side surface, contact with the inner rings 15a, 16a is made. In this case also, the same advantageous effects as those described in the above embodiments are obtained.

[0068]

In the above embodiments, the gaps S1, S2 formed with the drive gear shaft 2 are described, but the present invention is not limited thereto, and they may not necessarily be provided if no buckling deformation occurs in the configuration. The shapes of the left end of the second outer circumference portion 25 and the right end of the third outer circumference portion 26, for forming the gaps S1 and S2, may be of various shapes.

[0069]

Also, the handle shaft 31 connected to the arm portion 32 is described in the above embodiments, but the present invention is not limited thereto, and the handle shaft 31 may be integrally provided on the arm portion 32.

[0070]

Furthermore, the lid member 13 of the spinning reel 100 for fishing described in the above embodiments is screwed to the side opening 11, but the present invention is not limited thereto, and the present invention is also be suitably applied to a spinning reel for fishing in which the lid member is fixed to the reel body using a screw or other fixing means.

[Reference Signs List]

[0071]

- 1 reel body
- 2 drive gear shaft
- 3 handle
- 15 left ball bearing (ball bearing)
- 15a inner ring
- 16 right ball bearing (ball bearing)

16a inner ring
31 handle shaft
33 base
34 insertion portion
36, 36a contact portion
100 spinning reel for fishing

[Document Name] Claims

[Claim 1]

A spinning reel for fishing, comprising:
a reel body;
a handle that is removably provided in the reel body;
a drive gear shaft provided in the reel body;
a ball bearing that is externally fitted on the drive gear shaft and rotatably supports the drive gear shaft; and
a handle shaft that is provided in the handle and screwed to the drive gear shaft; wherein
on the handle shaft, a contact portion is integrally provided and contacts an inner ring of the ball bearing by means of the screwing to the drive gear shaft.

[Claim 2]

The spinning reel for fishing according to claim 1, wherein the handle shaft includes a large-diameter base and an insertion portion that is smaller in diameter than the base and inserted into the drive gear shaft; and the contact portion is provided at a boundary between the base and the insertion portion.

[Claim 3]

The spinning reel for fishing according to claim 1 or 2, wherein the handle shaft is formed of a high-strength material that is stronger than the ball bearing.

[Claim 4]

The spinning reel for fishing according to any one of claims 1 to 3, wherein the outer diameter of an end of the drive gear shaft is smaller than the inner diameter of the ball bearing.

[Claim 5]

The spinning reel for fishing according to any one of claims 1 to 4, wherein the contact portion has a portion facing the ball bearing and a portion facing an end of the drive gear shaft, and forms a flat surface over both the portions.

[Claim 6]

The spinning reel for fishing according to any one of claims 1 to 5, wherein when the handle shaft is screwed to the drive gear shaft, the contact portion contacts the inner ring of the ball bearing and an end surface of the drive gear shaft at the same time, or when the handle shaft is screwed to the drive gear shaft, the contact portion contacts an end surface of the drive gear shaft first and then contacts the inner ring of the ball bearing.