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(54) **Bobbin holder support structure**

(57) The present invention provides a bobbin holder support structure that allows the natural frequency of a bobbin holder to be greatly varied in order to prevent resonance over a wide range of available rotations. The present invention enables a bobbin holder 5 to be rotatably supported at two root-side positions using support members 11, 12 so that the bobbin holder 5 can be supported like a cantilever, while enabling the tip side of the bobbin holder to be rotatably supported using a detachable support member, and provides an offset absorption member 14 in a support structure comprising one 12 of

the root-side support members. Consequently, with the tip of the bobbin holder 5 supported, the bobbin holder 5 is arrested and supported substantially at the two positions in a radial direction using the other root-side support member 11 and the tip-side support member 13. Interposing vibration absorption members 23, 23 are provided for a support structure comprising the other root-side support member 11. Interposing vibration absorption members 24, 24 are provided for a support structure comprising the tip-side support member 13 (Fig. 2A).

**FIG. 2A**

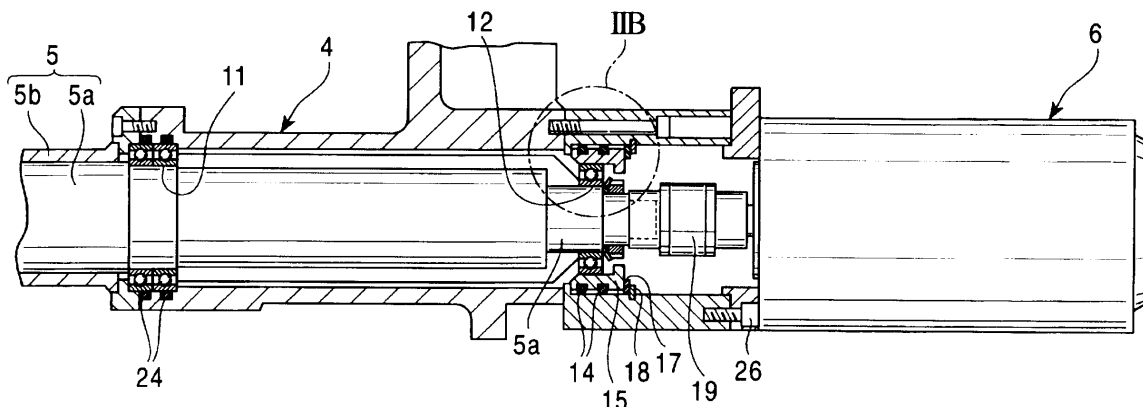
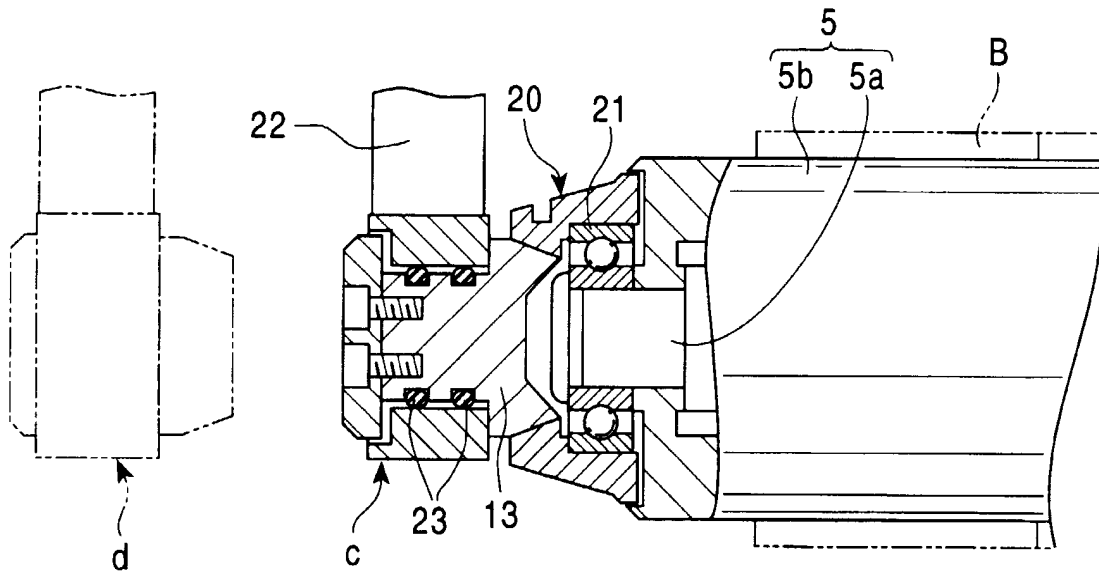


FIG. 3



## Description

### Field of the Invention

**[0001]** The present invention relates to a structure for supporting a bobbin holder provided in a winder for removably holding a bobbin and winding a yarn thereon.

### Background of the Invention

**[0002]** In order to improve the winding capability by holding a large number of bobbins on a bobbin holder that is rotationally driven, some yarn winders use longer bobbin holders. Structures for supporting longer bobbin holders include a structure capable of rotatably supporting a bobbin holder at two root-side positions using support members so that bobbins can be installed on and removed from the bobbin holder supported like a cantilever, while rotatably supporting the tip side of the bobbin holder using a detachable support member in order to restrain vibration that may occur during winding. When, however, a single bobbin holder is supported at the three points using the three support members (on the tip side of the bobbin holder and at the two root-side positions thereof) substantially arrested in a radial direction, the lifetime expectancy of the support members is significantly reduced due to offsets. Thus, this support structure must be avoided. In order to meet this requirement, a support structure described in Japanese Patent No. 2779609 couples the tip side of a bobbin holder and a support member on the tip side together using an easily deformed elastic ring comprising an elastic member such as rubber, in order to support a single bobbin holder substantially at two positions using two root-side support members.

**[0003]** Since, however, this support structure couples the tip side of the bobbin holder and the support member on the tip side together using the easily deformed elastic ring, the tip side of the bobbin holder significantly deflects from its proper position during rotations. Consequently, the natural frequency of the bobbin holder cannot be greatly varied, resulting in a narrow operational range in which the bobbin holder can be rotated without resonance.

**[0004]** Thus, an object of the present invention is to provide a bobbin holder support structure that restrains the deflection of the tip side of a bobbin holder to allow the natural frequency of the bobbin holder to be greatly varied in order to obtain a wide range of available rotations.

### Summary of the Invention

**[0005]** Means used by the aspect of the present invention to allow the natural frequency of a bobbin holder to be greatly varied from low to high rotation speeds in order to restrain resonance is a bobbin holder support structure capable of rotatably supporting a bobbin hold-

er at two root-side positions using support members so as to support the bobbin holder like a cantilever, while rotatably supporting the tip side of the bobbin holder using a detachable support member, characterized in that an offset absorption member is provided in a support structure comprising one of the root-side support members, that is, the support structure comprising one of the support member has a weaker radial arresting force than a support structure comprising the other support member in order to arrest and support the bobbin holder substantially at the two positions in a radial direction using the other root-side support member and the tip-side support member. The offset absorption member is interposed between a turret section (a bobbin holder root-side support member) for receiving a support reaction force transmitted from one of the root-side support members and the one of the root-side support members, or between the bobbin holder and the one of the support members, or between thereof, respectively.

**[0006]** According to the present invention, when bobbins are to be replaced, the bobbin holder can be supported like a cantilever using the two root-side support members without the need to support it using the tip-side support member, and during yarn winding, by rotatably supporting the tip side of the bobbin holder with the support member, the two positions of the bobbin holder are supported by the other root-side support member and the tip-side support member like a both side supporting, thereby restraining the bobbin holder from being resonated.

**[0007]** Means used by the aspect of the present invention to absorb an exciting force from the bobbin holder to further restrain vibration is a bobbin holder support structure, wherein interposing vibration absorption member is provided for a support structure comprising the other root-side support member. The vibration absorption member is interposed between the turret section for receiving a support reaction force transmitted from the other root-side support member and the other support member, or between the bobbin holder and the other support member, or between thereof, respectively.

**[0008]** According to the present invention, an exciting force effected by the bobbin holder being rotated is absorbed by the vibration absorption member to enable winding while restraining vibration.

**[0009]** Means used by the aspect of the present invention to absorb an exciting force from the bobbin holder to further restrain vibration is a bobbin holder support structure, wherein interposing vibration absorption member is provided for a support structure comprising the tip-side support member. The vibration absorption member is interposed between a holding means for holding the tip-side support member and the tip-side support member, or between the bobbin holder and the tip-side support member, or between thereof, respectively.

**[0010]** According to the present invention, an exciting force effected by the bobbin holder being rotated is ab-

sorbed by the vibration absorption member to enable winding while restraining vibration.

#### Brief Description of the Drawing

**[0011]** Figure 1 is a side view showing the overall yarn winder comprising a first embodiment of the present support structure.

**[0012]** Figure 2A is a side sectional view showing a root side in this embodiment and Figure 2B is an enlarged view of the part enclosed by the one-dot chain line IIB in Figure 2A.

**[0013]** Figure 3 is a top sectional view showing a tip side in this embodiment.

**[0014]** Figure 4 is a side sectional view showing a root side in a second embodiment of the present support structure.

#### Detailed Description of the Preferred Embodiments

**[0015]** A bobbin holder support structure according to the present invention (hereafter referred to as the "present support structure") will be described below with reference to the embodiment shown in the drawings.

**[0016]** Figures 1 to 3 show the first embodiment of the present support structure.

**[0017]** A yarn winder (a take-up winder) 1 is principally comprised of a turret section 4 that swivels around a horizontal shaft 3 relative to a main frame 2 by 180 degrees at a time, two bobbin holders 5, 5 projected from the turret section 4 like a cantilever, an induction motor 6 for rotationally driving each bobbin holder 5, an elevating and lowering frame 7 that can be elevated and lowered relative to the main frame 2, and a touch roller 8 and a traverse device 9 provided on the elevating and lowering frame 7, as shown in Figure 1. The elevating and lowering frame 7 has its loads supported by a contact pressure cylinder 10 provided at its proximal end so that the difference between the total weight of the elevating and lowering member and the lifting force of the contact pressure cylinder 10 corresponds to a contact pressure force between each package P and the touch roller 8. As the turret section 4 swivels, each bobbin holder 5 is alternately located at an upper winding position (a) and a lower standby position (b). At the lower standby position (b), empty bobbins D are exchanged for a plurality of packages P, while at the upper winding position (a), a yarn (synthetic fiber filament yarn) is wound around each bobbin D.

**[0018]** As shown in Figures 2 and 3, the present support structure for supporting each bobbin holder 5 can rotatably support two root-side positions of the bobbin holder 5 on the turret section 4 using support members 11, 12 while rotatably supporting a tip side of the bobbin holder 5 at its winding position using a support member 13. A support structure comprising one (closer to the root) 12 of the root-side support members 11, 12 is constructed to have a reduced radial arresting force via eas-

ily elastically deformed offset absorption members 14, 14, where as a support structure comprising the other root-side support member 11 (closer to the tip) and a support structure comprising the support member 13 on the tip side of the bobbin holder are constructed to have a higher radial arresting force. The present support structure can support the bobbin holder 5 located at the upper winding position (a) and around which a yarn is being wound, substantially at two positions on the respective sides using the root-side support member 11 and the tip-side support member 13, in order to prevent the support positions on the respective sides from becoming eccentric. Furthermore, the present support structure can use the root-side support members 11, 12 to support, substantially at two positions, one side of the bobbin holder 5 located at the lower standby position (b) in order to prevent the holder 5 from suspending forward.

**[0019]** As shown in Figure 2, one 11 of the support members 11, 12 supporting the root side of the bobbin holder 5 comprises one or more ball bearings and includes an outer race internally fitted in the turret section 4 so as to be fixed and an inner race externally fitted on a center shaft section 5a of the bobbin holder 5 so that a reaction force from the bobbin holder 5 is directly transmitted to the turret section 4. The other support member 12 comprises a ball bearing and includes an outer race internally fitted in the turret section 4 via a holding case 15 and offset absorption members 14, 14 located between the turret section 4 and the support member 12, and an inner race externally fitted on the center shaft portion 5a of the bobbin holder 5. The holding case 15 has annular recess grooves 15a, 15b in its outer circumferential surface 15a, and easily deformed offset absorption members 14, 14 comprising O-rings or band rings of flexible rubber are fitted in the annular recess grooves 15b, 15b so as to abut on the turret section 4 for elastic deformation. An annular flat ring 17 comprising flexible rubber so as to be easily deformed is interposed between the holding case 15 and a locking ring 16 fitted in the turret section 4 so that by elastically deforming the offset absorption members 14, 14 and the annular flat ring 17, the holding case 15 can be displaced by a small amount in both a radial and an axial directions (for example, 0.3 to 0.6 mm in a radial direction) together with the center shaft portion 5a of the bobbin holder 5.

**[0020]** The easily deformed offset absorption member 14 may be interposed not only between the holding case 15 and the turret case 4 but also between the other support member 12 and the center shaft section 5a of the bobbin holder 5 (not shown in the drawings), or between the inner race of the support member 12 having the outer race directly internally fitted in the turret section 4 and the center shaft section 5a of the bobbin holder 5 with the holding case 15 omitted.

**[0021]** The induction motor 6 is locked on the turret section 4 via a screw 26 and has its output shaft coupled

to an axial end of the bobbin holder 5 via a coupling 19 that uses as a coupling member an elastic member such as rubber, so as to absorb the offset between the motor output shaft and the shaft of the bobbin holder 5.

**[0022]** The bobbin holder 5 comprises the center shaft section 5a and an outer cylinder section 5b for holding the bobbin D, and includes an annular supported member 20 rotatably provided on the tip side of the center shaft section 5a via a bearing 21 comprising such as a ball bearing, as shown in Figure 3. The tip-side support member 13 supporting the supported member 20 is disposed on the tip side of a holding member 22 provided so as to advance and withdraw to the main frame 2 (see Figure 1), and the tip-side support member 13 advances and withdraws between a support position (c) and a standby position (d) according to an operation performed by an advancement and withdrawal operation member (not shown in the drawings). A support structure comprising the tip-side support member 13 internally fits the support member 13 in the holding member 22 while interposing vibration adsorption members 23, 23 between the holding member 22 and the support member 13 so that the vibration absorption members 23, 23 can absorb fine vibration that may occur in the bobbin holder 5 being rotationally driven.

**[0023]** The vibration absorption members 23 comprises such as an O-ring or annular ring made of rubber and are difficult to deform because they are installed so as to have a higher elastic modulus than the offset absorption member 14 (see Figure 2). When formed of, for example, a rubber O-ring comprising the same material as the offset absorption member 14, the vibration absorption member 23 is installed while it is hard after compression, so as to have a high elastic modulus after installation. That is, unlike the offset absorption member 14 for absorbing offsets, the vibration absorption member 23 absorbs vibration, so it is adapted to apply a higher arresting force to the bobbin holder 5 than the offset absorption member 14. The tip-side support member 13 and the supported member 20 have abutting surfaces formed like recess-head cones so that they can easily abut on each other concentrically.

**[0024]** The vibration absorption member 23 may not only be interposed between the holding member 22 and the support member 13 but may also be interposed only between the supported member 20 of the bobbin holder 5 and the tip-side support member 13, or both between the holding member 22 and the support member 13 and between the supported member 20 and the tip-side support member 13 (not shown in the drawings).

**[0025]** According to the present support structure, as shown in Figure 2, the vibration absorption members 24, 24 formed like the vibration absorption members 23, 23 are interposed into the support structure comprising the other root-side support member 11 as required, thereby further absorbing fine vibration that may occur in the bobbin holder 5 being rotationally driven. The vibration absorption members 24, 24 are interposed between the

turret section 4 and the support member 11, or between the bobbin holder 5 and the support member 11, or between thereof, respectively. Like the vibration absorption members 23, 23, the vibration absorption members 24, 24 are adapted to apply a high radial arresting force to the bobbin holder 5.

**[0026]** According to the present support structure, when the root-side support members 11, 12 support the bobbin holder 5 at the lower standby position (b) (see Figure 1) like a cantilever, the package P can be exchanged for the empty bobbin D. In addition, since when the support member 13 rotatably supports the tip side of the bobbin holder 5 at the upper winding position (a), a support structure comprising one 12 of the root-side support members 11, 12 is allowed to be eccentric, the bobbin holder 5 being rotationally driven is supported substantially at the two positions and between the root-side support member 11 and the tip-side support member 13, thereby enabling a yarn to be wound while allowing the natural frequency of the bobbin holder 5 to be greatly varied over a wide range of rotation speeds in order to restrain resonance, and as a result, high-quality packages can be obtained.

**[0027]** Besides, the tip side of the bobbin holder 5 is supported while being arrested in a radial direction to reduce the deflection of the tip side of the bobbin holder 5 from its proper position during rotations.

**[0028]** Furthermore, according to the present support structure, the vibration absorption members 23, 23, 24, 24 absorb an exciting force that may occur in the bobbin holder 5 being rotationally driven due to a small amount of unbalance remaining in the bobbin holder 5 or the deflection of the tip, thereby enabling the yarn to be wound while further restraining vibration.

**[0029]** Figure 4 is a side sectional view showing a root side in the second embodiment of the present support structure.

**[0030]** This embodiment differs from the first embodiment in that the induction motor 6 is coupled to a holding case 25 holding the root-side support member 12. The other configurations are substantially the same as in the first embodiment, and identical reference numerals denote identical component members. According to this embodiment, the bobbin holder 5 located at the upper winding position (a) has its tip side rotatably supported by the support member 13, as shown in Figure 3.

**[0031]** The present support structure provides the support members at the two positions on the root side of the bobbin holder. Thus, when the bobbin holder at the standby position is exchanged for the bobbin holder at the winding position or a bobbin is installed on or removed from the bobbin holder at the standby position, the bobbin holder, which is in a cantilever support state, is supported at the two root-side positions and thus prevented from significantly suspending frontward despite the cantilever support. In addition, during winding, the bobbin holder is supported substantially between the other root-side support member and the tip-side support

member to minimize the deflection of the tip side of the bobbin holder from its proper position during rotations.

**[0032]** This configuration also enables a yarn to be wound while allowing the natural frequency of the bobbin holder to be greatly varied over a wide range of rotation speeds in order to restrain resonance, thereby providing high-quality packages.

**[0033]** Moreover, since the bobbin holder is substantially supported at the two positions on the one tip side portion and the one root side position, and is not fixed at the three positions while winding, reduction of lifetime of support members such as bearing can be avoided.

**[0034]** The present support structures uses the vibration absorption members to absorb an exciting force that may occur in the bobbin holder being rotated, thereby enabling the yarn to be wound while further restraining vibration. As a result, high-quality packages can be obtained.

## Claims

1. A bobbin holder support structure capable of rotatably supporting a bobbin holder at two root-side positions using support members so as to support the bobbin holder like a cantilever, while rotatably supporting the tip side of the bobbin holder using a detachable support member, characterized in that an offset absorption member is provided in a support structure comprising one of said root-side support members in order to substantially arrest and support said bobbin holder at the two positions in a radial direction using said other root-side support member and said tip-side support member.
2. A bobbin holder support structure as in Claim 1, characterized in that interposing vibration absorption member is provided for a support structure comprising said other root-side support member.
3. A bobbin holder support structure as in Claim 1 or Claim 2, characterized in that interposing vibration absorption member is provided for a support structure comprising said tip-side support member.
4. A bobbin holder support structure as in Claim 2 or Claim 3, characterized in that the offset absorption member and the vibration absorption member both comprise rubber rings and in that the vibration absorption member applies a higher radial arresting force to the bobbin holder than the offset absorption member.
5. A bobbin holder support structure as in any one of Claims 1 to 4, characterized in that a motor for rotationally driving the bobbin holder is fixed to a bobbin holder root-side support member and in that an output shaft of the motor and an axial end of the

bobbin holder are coupled together using a coupling including an elastic member as a coupling member.

6. A bobbin holder support structure as in any one of Claims 1 to 5, characterized in that two bobbin holders are alternately located at a winding position and a standby position, respectively, and in that a support member is engaged with and detached from a tip side of the bobbin holder at the winding position.



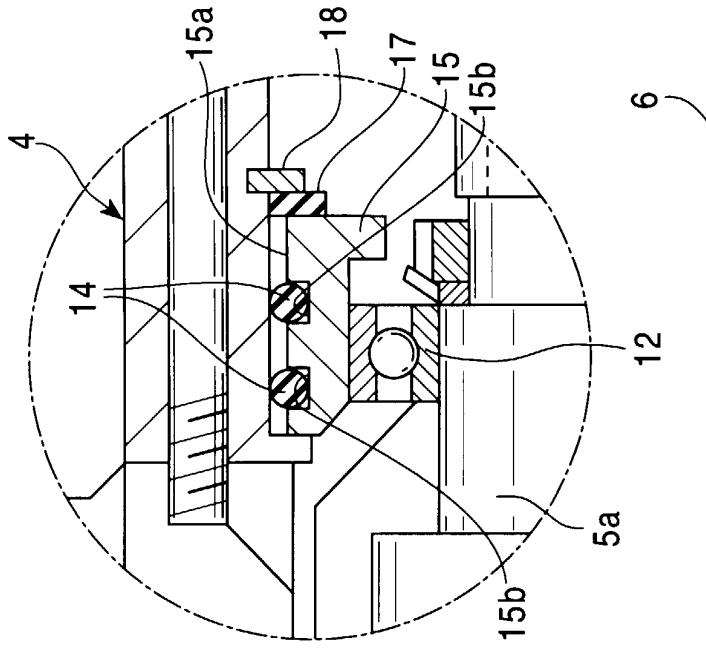


FIG. 2B

FIG. 2A

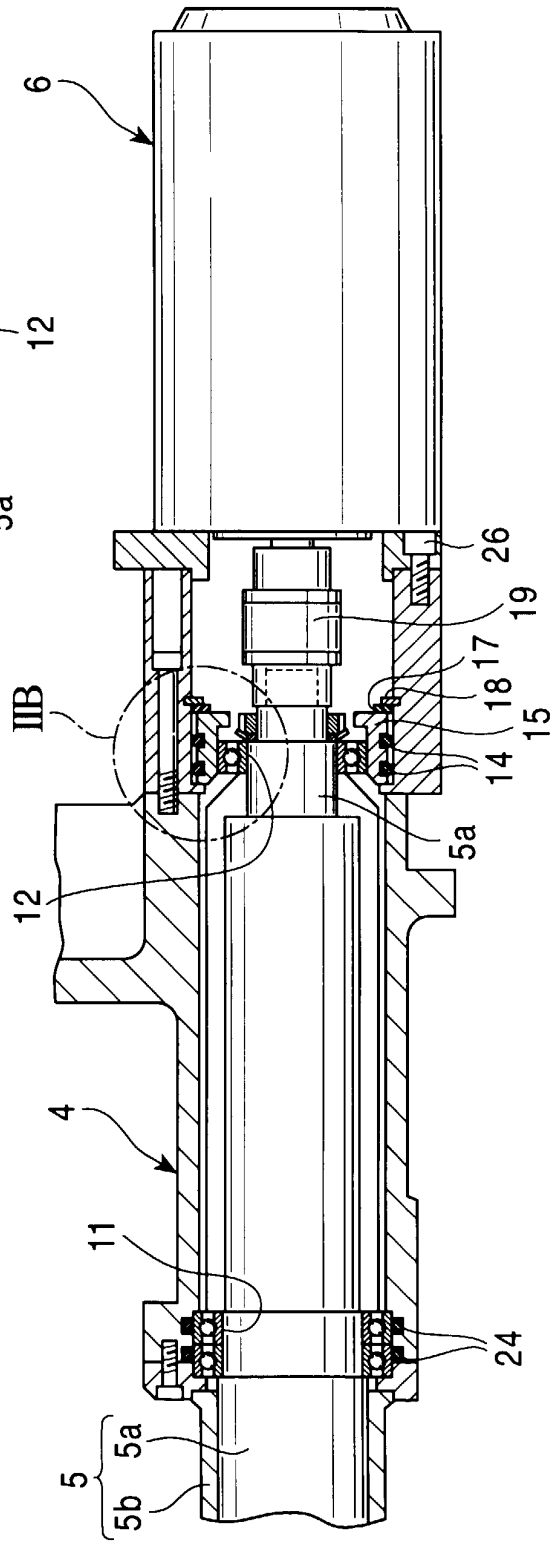


FIG. 3

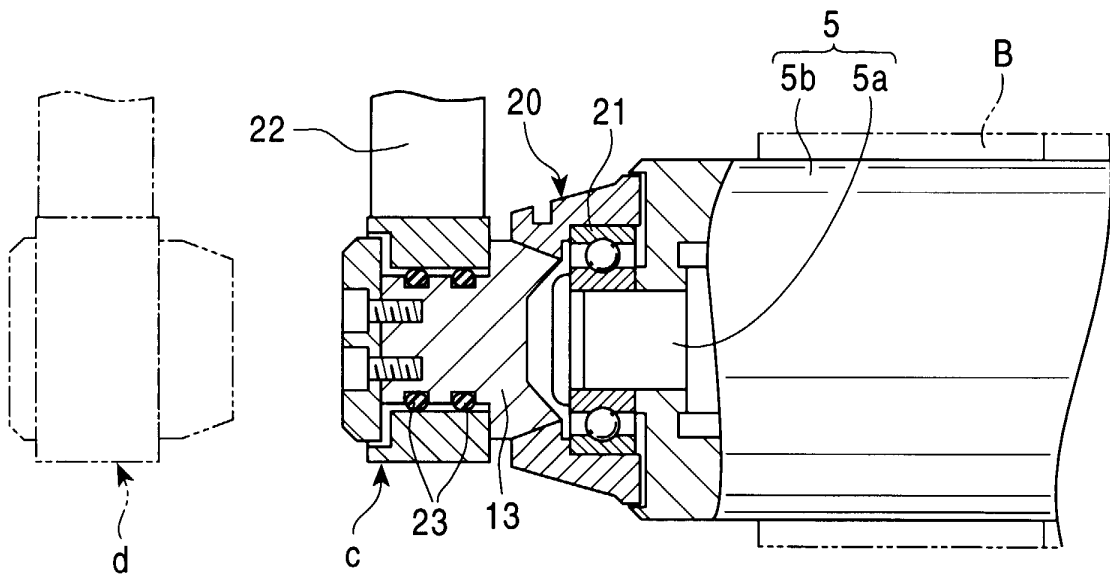


FIG. 4

