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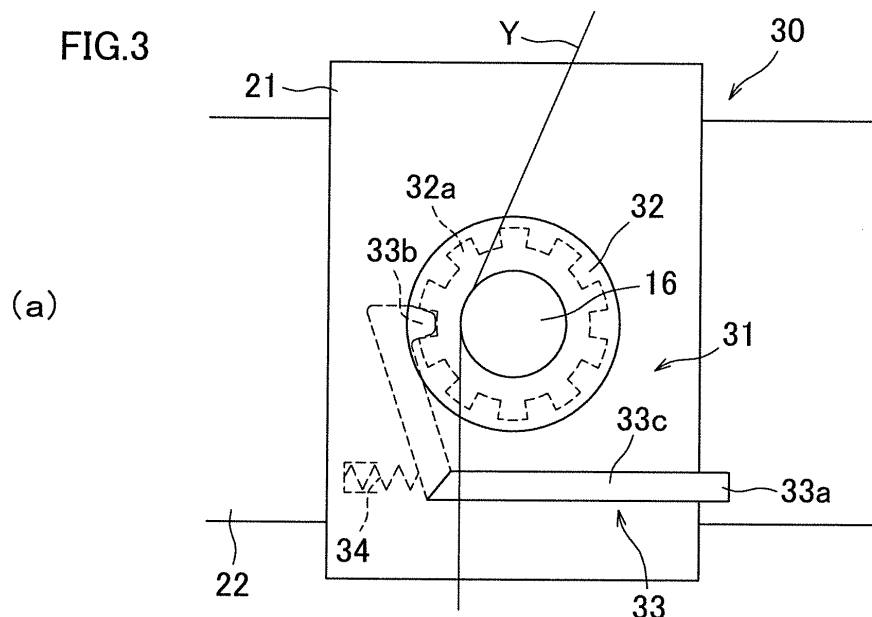
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(54) **YARN WINDING MACHINE**

(57) A yarn winder (10) in which local wearing of fulcrum guides (16) is suppressed and the cost for achieving the suppression of wearing is low is provided. Fulcrum guides (16) are rollers each having a central axis and have outer circumferential surfaces on which the yarns (Y) are placed. At least one of the fulcrum guides (16) is

arranged to be freely rotatable about the central axis. A switching mechanism (30) which prevents the at least one of the fulcrum guides (16) from rotating during yarn winding and cancels prevention of rotation of the at least one of the fulcrum guides (16) at a time other than the yarn winding is provided.

**FIG.3**



## Description

### BACKGROUND OF THE INVENTION

**[0001]** The present invention relates to a yarn winder configured to wind yarns onto bobbins attached to a winding shaft while traversing the yarns about fulcrum guides that are aligned in the axial direction of the winding shaft.

**[0002]** A known yarn winder is configured to wind yarns spun out from a spinning apparatus onto bobbins attached to a winding shaft, while traversing the yarns. In such a yarn winder, fulcrum guides that function as fulcrums when the yarns are traversed are aligned in the axial direction of the winding shaft. For example, in Patent Literatures 1 and 2 (Japanese Laid-Open Patent Publication No. 2013-23787 and Published Japanese Translation of a PCT application No. 2008-531438), roller-shaped fulcrum guides (guide rollers in Patent Literature 2) each having a central axis that is orthogonal to the axial direction of the winding shaft are provided, and yarns are placed on the outer circumferential surfaces of the fulcrum guides. In Patent Literature 1, the fulcrum guides are arranged not to rotate about each central axis, when the yarns are wound. In Patent Literature 2, the fulcrum guides are rollers arranged to be freely rotatable about each central axis.

### SUMMARY OF THE INVENTION

**[0003]** When the fulcrum guides do not rotate during yarn winding as described in Patent Literature 1, the fulcrum guides tend to be locally worn because yarns running at high speed are continuously in contact with the same parts of the outer circumferential surfaces of the fulcrum guides. The contact state between the yarns and the fulcrum guides may therefore be disadvantageously changed, with the result that the quality of the yarns may be deteriorated. In this connection, in Patent Literature 1, fulcrum guides are rotatable by a motor, and the contact position between the yarn and each fulcrum guide is changeable. However, there is a problem that the cost is high because a drive unit such as a motor for rotating the fulcrum guides is required.

**[0004]** Meanwhile, the fulcrum guides of Patent Literature 2 are arranged to be freely rotatable. On this account, the fulcrum guides always rotate due to the friction with the yarns during yarn winding, and hence the local wearing is suppressed. However, because the fulcrum guides rotate at high speed, bearings of the fulcrum guides tend to be broken soon. For this reason, there has been a problem of cost increase due to the need of maintenance of the bearings.

**[0005]** In consideration of the problem above, an object of the present invention is to provide a yarn winder in which local wearing of fulcrum guides is suppressed and the cost for achieving the suppression of wearing is low.

**[0006]** A yarn winder of the present invention is configured to wind yarns onto bobbins attached to a winding

shaft while traversing the yarns about fulcrum guides that are aligned in the axial direction of the winding shaft, the fulcrum guides being rollers each having a central axis and having outer circumferential surfaces on which the yarns are placed, at least one of the fulcrum guides being freely rotatable about the central axis, and the yarn winder comprising a switching mechanism which prevents the at least one of the fulcrum guides from rotating during yarn winding, and cancels prevention of rotation of the at least one of the fulcrum guides at a time other than the yarn winding.

**[0007]** In the present invention, the rotation of at least one fulcrum guide arranged to be freely rotatable is prevented by the switching mechanism during yarn winding. Because the fulcrum guide does not rotate at high speed due to the running of the yarn, the fulcrum guide may not be provided with a bearing. Even when a bearing is provided, the bearing is not broken soon because the bearing is not exposed to high-speed rotation for a long time. For this reason, it is possible to avoid cost increase due to maintenance of bearings. In addition to the above, because in the present invention the prevention of the rotation of the fulcrum guides is canceled by the switching mechanism during times other than the yarn winding, operations such as yarn threading to the fulcrum guides are performed during these times, and hence the fulcrum guides are easily rotated by utilizing the tension of the yarns when the yarns make contact with the fulcrum guides. It is therefore possible to suppress the local wearing of the fulcrum guides, and a drive unit such as a motor for rotating the fulcrum guides is not required. In this way, according to the present invention, local wearing of the fulcrum guides is suppressed and the cost for achieving this suppression is small. In this connection, because it is unnecessary to rotate a fulcrum guide where local wearing is not significant, such a fulcrum guide may not be arranged to be freely rotatable.

**[0008]** In the present invention, preferably, the at least one fulcrum guide includes two fulcrum guides that are outermost ones in the axial direction.

**[0009]** In a typical yarn winder, when fulcrum guides aligned in the axial direction of a winding shaft are compared to one another, the winding angle of a yarn on each guide increases from the central fulcrum guide toward the outermost fulcrum guides. When the winding angle of the yarn is large, the contact pressure of the yarn is large and hence the yarn tends to be disadvantageously worn. In this regard, when at least the two outermost fulcrum guides are arranged to be freely rotatable, the local wearing of the fulcrum guides is basically resolved.

**[0010]** In the present invention, preferably, the at least one fulcrum guide includes all fulcrum guides.

**[0011]** This arrangement makes it possible to reliably suppress the local wearing of all fulcrum guides.

**[0012]** In the present invention, preferably, the switching mechanism includes: a gear portion provided on either each of the fulcrum guides or a holding unit holding each of the fulcrum guides; an engaging member which

is engaged with the gear portion during the yarn winding so as to prevent the gear portion from rotating; and an engagement cancellation member which cancels engagement between the engaging member and the gear portion at a time other than the yarn winding.

**[0013]** With this arrangement, the fulcrum guide is switched to a state of freely rotatable as the engagement between the engaging member and the gear portion is canceled by the engagement cancellation member.

**[0014]** In the present invention, preferably, the yarn winder further includes a movement mechanism configured to move the fulcrum guides between winding positions where the yarn winding is performed and yarn threading positions where yarn threading is performed, the engagement cancellation member maintaining a state in which the engagement between the engaging member and the gear portion is canceled, when the fulcrum guides are at the yarn threading positions.

**[0015]** According to this arrangement, because the fulcrum guides are freely rotatable during yarn threading to the fulcrum guides, it is possible to rotate the fulcrum guides when the yarns are threaded to the fulcrum guides.

**[0016]** In the present invention, preferably, the movement mechanism includes: sliders supporting the fulcrum guides; a guide rail to which the sliders are slidably attached; and a drive unit configured to move the sliders along the guide rail.

**[0017]** Such a movement mechanism is able to move the fulcrum guides by moving the sliders along the guide rail.

**[0018]** In the present invention, preferably, the sliders neighboring each other in a longitudinal direction of the guide rail are close to each other when the fulcrum guides move from the winding positions to the yarn threading positions.

**[0019]** This arrangement makes it easy to perform yarn threading because, when the fulcrum guides are at the yarn threading positions, the fulcrum guides are gathered to be close to one another.

**[0020]** In the present invention, preferably, the engaging member includes a protruding portion which protrudes from each of the sliders when the fulcrum guides are at the winding positions, and engagement between the engaging member and the gear portion is canceled as the protruding portion is pressed by a neighboring one of the sliders functioning as the engagement cancellation member, when the fulcrum guides move from the winding positions to the yarn threading positions.

**[0021]** According to this arrangement, since the adjacent slider functions as the engagement cancellation member, it is not necessary to newly provide an engagement cancellation member, and hence the increase in the number of parts can be suppressed.

**[0022]** In the present invention, preferably, the engagement cancellation member is fixed to either the guide rail or a fixing member to which the guide rail is directly or indirectly fixed, and engagement between the

engaging member and the gear portion is canceled as the engaging member is pressed by the engagement cancellation member, when the fulcrum guides move from the winding positions to the yarn threading positions.

**[0023]** With this arrangement, because one engagement cancellation member is shared between plural fulcrum guides, it is unnecessary to provide an engagement cancellation member for each fulcrum guide, and hence the number of engagement cancellation members can be reduced.

**[0024]** In the present invention, preferably the yarn winder further includes a biasing member arranged to bias the engaging member in a direction in which the engaging member is engaged with the gear portion.

**[0025]** With this biasing member, the rotation of the fulcrum guide is reliably prevented by the engaging member during yarn winding.

## BRIEF DESCRIPTION OF THE DRAWINGS

### **[0026]**

FIG. 1 is a profile of a spun yarn take-up apparatus of an embodiment.

FIG. 2 is a profile of a guide unit.

FIG. 3 shows how a switching mechanism of First Example operates.

FIG. 4 is a cross sectional view of the switching mechanism of First Example.

FIG. 5 shows how a switching mechanism of Second Example operates.

FIG. 6 shows the layout of an engagement cancellation member of Second Example.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0027]** With reference to drawings, the following will describe an embodiment in which a yarn winder of the present invention is applied to a spun yarn take-up apparatus.

### (Spun Yarn Take-Up Apparatus)

**[0028]** FIG. 1 is a profile of a spun yarn take-up apparatus of the present embodiment. In this specification, forward, rearward, leftward, rightward, upward, and downward directions shown in FIG. 1 will be referred to as forward, rearward, leftward, rightward, upward, and downward directions of the spun yarn take-up apparatus.

**[0029]** The spun yarn take-up apparatus 1 is configured to take up plural (16 in this embodiment) yarns Y spun out from a spinning apparatus 2 and includes godet rollers 3 and 4 and a yarn winder 10. The spinning apparatus 2 is provided above the spun yarn take-up apparatus 1 and is configured to spin out yarns Y which are made of synthetic resin. The godet rollers 3 and 4 are provided below the spinning apparatus 2 and are rotationally driven by an unillustrated motor. The yarns Y

spun out from the spinning apparatus 2 are sent to the yarn winder 10 via the godet rollers 3 and 4.

**[0030]** The yarn winder 10 is provided below the godet rollers 3 and 4. The yarn winder 10 includes two bobbin holders 13 (equivalent to winding shafts of the present invention) cantilevered by a turret 12 accommodated in a frame 11. The bobbin holders 13 extend in the front-rear direction (equivalent to an axial direction in the present invention) and are supported by the turret 12 at the rear end portions. It is possible to attach bobbins B to each bobbin holder 13 so that the bobbins B are aligned in the front-rear direction. The bobbin holders 13 are each rotationally driven about an axis by an unillustrated motor.

**[0031]** The turret 12 is a disc-shaped member having a rotational axis in parallel to the front-rear direction. The bobbin holders 13 are attached to an upper position and a lower position of the turret 12, respectively. The upper position and the lower position are deviated from each other in the circumferential direction by 180 degrees. As the turret 12 is rotated, the two bobbin holders 13 are moved between the upper and lower positions. At the bobbin holder 13 at the upper position, the yarns Y are wound onto the bobbins B and packages P are formed. Meanwhile, at the bobbin holder 13 at the lower position, the packages P are collected and new bobbins B are attached.

**[0032]** The yarn winder 10 includes a supporting frame 14 cantilevered by the frame 11. The supporting frame 14 is supported at its rear end portion by the frame 11. A guide unit 15 is provided above the supporting frame 14. On the guide unit 15, plural (16 in the present embodiment) fulcrum guides 16 are provided to be aligned in the front-rear direction. The number of the fulcrum guides 16 is identical with the number of the yarns Y. On the supporting frame 14, traverse units 17 are provided to be aligned in the front-rear direction. The number of the traverse units 17 is identical with the number of the yarns Y. The traverse unit 17 is configured to traverse the yarn Y in the front-rear direction about the corresponding fulcrum guide 16.

**[0033]** Below the supporting frame 14, a contact roller 18 rotatably supported by the supporting frame 14 is provided. The contact roller 18 makes contact with the outer circumferential surfaces of the packages P retained by the bobbin holder 13 at the upper position. As the contact roller 18 rotates while applying a predetermined contact pressure to each package P during yarn winding, the shape of the package P is adjusted.

(Guide Unit)

**[0034]** The structure of the guide unit 15 will be described. FIG. 2 is a profile of the guide unit 15. FIG. 2(a) shows a state in which the fulcrum guides 16 are at winding positions, whereas FIG. 2(b) shows a state in which the fulcrum guides 16 are at yarn threading positions. The winding positions are positions of the fulcrum guides

16 when the yarns Y are wound onto the bobbins B. The yarn threading positions are positions of the fulcrum guides 16 when the yarns Y are threaded to the fulcrum guides 16. The fulcrum guides 16 are arranged to be movable by a movement mechanism 20 between the winding positions and the yarn threading positions.

**[0035]** The guide unit 15 includes the fulcrum guides 16 and the movement mechanism 20. The movement mechanism 20 includes sliders 21, a guide rail 22, and an air cylinder 23 (equivalent to a drive unit of the present invention). The sliders 21 are identical in number with the fulcrum guides 16, and support the fulcrum guides 16 to be rotatable.

**[0036]** The fulcrum guides 16 are roller-shaped members that protrude rightward from the sliders 21 (see FIG. 5), and each of the fulcrum guides 16 has a central axis extending in a direction (left-right direction) orthogonal to the axial direction of the bobbin holder 13. The yarns Y are placed on the outer circumferential surfaces of the fulcrum guides 16. When the yarns Y are wound, the running yarns Y are in contact with the outer circumferential surfaces of the fulcrum guides 16. Each of all fulcrum guides 16 is freely rotatable about the central axis.

**[0037]** The guide rail 22 extends in the front-rear direction (equivalent to a longitudinal direction of the present invention) and is fixed to the supporting frame 14 through the intermediary of an unillustrated bracket. To the guide rail 22, the sliders 21 are attached to be lined up in the front-rear direction and to be slidable. Sliders 21 neighboring to each other in the front-rear direction are connected to each other by an unillustrated belt. The rear-most slider 21 is connected to a rod 23a of the air cylinder 23.

**[0038]** As shown in FIG. 2(a), when the rod 23a of the air cylinder 23 is retracted, the sliders 21 are lined up in the front-rear direction to be separated from one another. On this account, the fulcrum guides 16 are also lined up in the front-rear direction to be separated from one another. The positions of the fulcrum guides 16 in this state are the winding positions. When the fulcrum guides 16 are at the winding positions, the contact positions between the yarns Y and the fulcrum guides 16, i.e., the fulcrums of the traverse of the yarns Y are at equal intervals.

**[0039]** The yarn paths of the yarns Y distributed from a godet roller 4 to the fulcrum guides 16 at the winding positions are symmetrical with respect to a vertical plane that passes through the center of the fulcrum guides 16 in the front-rear direction. Eight yarns Y that are the front half of the yarns Y are placed on the front sides of the respective fulcrum guides 16, whereas eight yarns Y that are the rear half of the yarns Y are placed on the rear sides of the respective fulcrum guides 16. When the fulcrum guides 16 are compared to one another, the winding angle of the yarn Y on each fulcrum guide 16 increases from the central fulcrum guide 16 toward the outermost fulcrum guides 16. When the winding angle of the yarn Y is large, the contact pressure of the yarn Y is large and

hence the fulcrum guide 16 tends to be worn.

**[0040]** When the yarns are threaded to the fulcrum guides 16, the rod 23a is elongated by driving the air cylinder 23. In response to this, the rearmost slider 21 connected to the rod 23a moves forward. Subsequently, the rearmost slider 21 makes contact with the slider 21 immediately in front thereof and presses it forward. Likewise, each slider 21 makes contact with the slider 21 immediately in front thereof and presses it forward. The term "contact" here encompasses not only a form in which the sliders 21 are in direct contact with each other but also a form in which the sliders 21 are indirectly in contact with each other via another member.

**[0041]** When the frontmost slider 21 makes contact with an unillustrated stopper provided at a front end portion of the guide rail 22, the air cylinder 23 stops. As a result, all of the sliders 21 are gathered at the front end portion of the guide rail 22, in a state in which the sliders 21 are close to one another. The positions of the fulcrum guides 16 in this state are the yarn threading positions. Because the fulcrum guides 16 at the yarn threading positions are gathered at the front end portion of the guide rail 22 in a state in which the sliders 21 are close to one another, yarn threading to the fulcrum guides 16 can be easily done. In place of the above-described stopper, the front end portion of the guide rail 22 may be arranged to function as a stopper, or the rod 23a of the air cylinder 23 may be arranged to stop upon making contact with a stopper.

**[0042]** After the end of the yarn threading, the air cylinder 23 is driven to contract the rod 23a, with the result that the rearmost slider 21 moves rearward. When the belt connecting the rearmost slider 21 with the slider 21 directly in front thereof is maximally elongated, the second rearmost slider 21 is pulled rearward. Likewise, as each slider 21 is pulled rearward, the fulcrum guides 16 return to the winding positions shown in FIG. 2(a). The drive unit for moving the sliders 21 may be different from the air cylinder 23, and may be an actuator such as a motor.

(First Example of Rotation Mechanism)

**[0043]** The following will describe First Example of the rotation mechanism. FIG. 3 shows how a switching mechanism 30 of First Example operates. FIG. 4 is a cross-sectional view showing the switching mechanism 30 of First Example, and shows a cross section passing through the center of the fulcrum guide 16. FIG. 3(a) shows a state in which the fulcrum guide 16 is at a winding position, whereas FIG. 3(b) shows a state in which the fulcrum guide 16 is at a yarn threading position. The fulcrum guides 16 shown in FIG. 3 are the frontmost fulcrum guides 16.

**[0044]** In this example, each slider 21 is provided with a switching unit 31. A combination of the switching units 31 provided for the respective sliders 21 is termed a switching mechanism 30. The switching unit 31 includes

a gear portion 32a formed in a holding unit 32 holding the fulcrum guide 16, an engaging member 33 provided on the slider 21, and an adjacent slider 21 that functions as an engagement cancellation member of the present invention.

**[0045]** As shown in FIG. 4, the fulcrum guide 16 is fixed to the holding unit 32 and is rotatable together with the holding unit 32. The holding unit 32 is attached to an attachment hole 21a formed in the front surface (right surface) of the slider 21. In the holding unit 32, the gear portion 32a is formed on the back side (left side) of the front surface of the slider 21. The friction force between the holding unit 32 and the slider 21 is arranged to be small enough to allow the holding unit 32 to freely rotate about the central axis of the fulcrum guide 16. With this, the fulcrum guide 16 is freely rotatable about the central axis. The attachment hole 21a may be provided with a bearing for more smoothly rotating the holding unit 32.

**[0046]** The engaging member 33 is engaged with the gear portion 32a so as to prevent the gear portion 32a from rotating. In the engaging member 33, a protruding portion 33a, an engaging portion 33b, and a connecting portion 33c are integrated. The protruding portion 33a is a portion which protrudes rearward from the slider 21 when the fulcrum guide 16 is at the winding position. The engaging portion 33b is meshed with the gear portion 32a so as to prevent the gear portion 32a from rotating. The connecting portion 33c is a portion connecting the protruding portion 33a with the engaging portion 33b. The protruding portion 33a may not protrude rearward and may protrude in another direction, as long as the protruding portion 33a is positioned to be pressed by the posterior slider 21.

**[0047]** In the front surface of the slider 21, a guide groove 21b is formed to extend in the front-rear direction. The protruding portion 33a and a part of the connecting portion 33c (i.e., a part extending in the front-rear direction) are slidably engaged with the guide groove 21b. This arrangement allows the engaging member 33 to move in the front-rear direction along the guide groove 21b. The engaging portion 33b and the remaining part of the connecting portion 33c are provided on the back side of the slider 21.

**[0048]** By a spring 34, the engaging member 33 is biased rearward, i.e., in a direction in which the protruding portion 33a protrudes from the slider 21. The spring 34 (equivalent to the biasing member of the present invention) also functions as a member that biases the engaging member 33 in a direction in which the engaging portion 33b is engaged with the gear portion 32a.

**[0049]** To the fulcrum guide 16 shown in FIG. 3, a torque is imparted counterclockwise in FIG. 3 by the running of the yarn Y during yarn winding. In order to prevent the fulcrum guide 16 from being rotated by this torque, the switching mechanism 30 prevents the fulcrum guide 16 from rotating during the yarn winding. Specifically, as shown in FIG. 3(a), the engaging member 33 is biased rearward by the spring 34, so that the engaging portion

33b is meshed with the gear portion 32a and hence the rotation of the fulcrum guide 16 is prevented.

**[0050]** When the fulcrum guide 16 moves from the winding position to the yarn threading position, the protruding portion 33a of the engaging member 33 is pressed forward by the posterior slider 21. As a result, the engaging member 33 moves forward, the engaging portion 33b is disengaged from the gear portion 32a, and the engagement between the engaging member 33 and the gear portion 32a is canceled. On this account, when the fulcrum guide 16 is at the yarn threading position, the fulcrum guide 16 is allowed to freely rotate as shown in FIG. 3(b). Therefore the fulcrum guide 16 is easily rotated by the tension of the yarn Y, as the yarn Y makes contact with the outer circumferential surface of the fulcrum guide 16 in the yarn threading to the fulcrum guide 16. It is therefore possible to change the positions where the yarns Y make contact with the fulcrum guides 16 in the next yarn winding from the positions in the current yarn winding, with the result that the local wearing of the fulcrum guides 16 is reliably suppressed.

**[0051]** After the yarn threading to the fulcrum guide 16 is finished and the fulcrum guide 16 is returned from the yarn threading position to the winding position, the posterior slider 21 is separated. Due to this, the engaging member 33 is moved rearward by the biasing force of the spring 34, and the protruding portion 33a protrudes rearward from the slider 21 and the engaging portion 33b is meshed with the gear portion 32a. When the fulcrum guide 16 returns to the winding position and the winding of the yarn Y starts, a counterclockwise torque is applied to the fulcrum guide 16 due to the running of the yarn Y. However, because the rotation of the fulcrum guide 16 is prevented by the engaging member 33, the rotation of the fulcrum guide 16 does not occur.

**[0052]** While in this example the gear portion 32a and a part of the engaging member 33 including the engaging portion 33b are provided on the back side of the slider 21, they may be provided on the front side of the slider 21. Furthermore, because there is no slider 21 posterior to the rearmost fulcrum guide 16, the layout of the engaging member 33 shown in FIG. 3 is reversed in the front-rear direction for the rearmost fulcrum guide 16. In this case, the slider 21 in front of the rearmost fulcrum guide 16 functions as the engagement cancellation member.

(Effects of First Example)

**[0053]** The following will describe effects of this example. In the example, the rotation of at least one fulcrum guide 16 arranged to be freely rotatable is prevented by the switching mechanism 30 during yarn winding. Because the fulcrum guide 16 does not rotate at high speed due to the running of the yarn Y, the fulcrum guide 16 may not be provided with a bearing. Even when a bearing is provided, the bearing is not broken soon because the bearing is not exposed to high-speed rotation for a long

time. For this reason, it is possible to avoid cost increase due to maintenance of bearings. In addition to the above, because in the example the prevention of the rotation of the fulcrum guides 16 is canceled by the switching mechanism 30 during times other than the yarn winding, operations such as yarn threading to the fulcrum guides 16 are performed during these times, and hence the fulcrum guides 16 are easily rotated by utilizing the tension of the yarns Y when the yarns Y make contact with the fulcrum guides 16. It is therefore possible to suppress the local wearing of the fulcrum guides 16, and a drive unit such as a motor for rotating the fulcrum guides 16 is not required. In this way, according to the example, local wearing of the fulcrum guides 16 is suppressed and the cost for achieving this suppression is small.

**[0054]** In the example, the at least one fulcrum guide 16 includes two fulcrum guides 16 that are outermost ones in the axial direction. In a typical yarn winder 10, when fulcrum guides 16 aligned in the axial direction of a bobbin holder 13 are compared to one another, the winding angle of a yarn Y on each guide increases from the central fulcrum guide 16 toward the outermost fulcrum guides 16. When the winding angle of the yarn Y is large, the contact pressure of the yarn Y is large and hence the yarn Y tends to be disadvantageously worn. In this regard, when at least the two outermost fulcrum guides 16 are arranged to be freely rotatable, the local wearing of the fulcrum guides 16 is basically resolved.

**[0055]** In the example, the at least one fulcrum guide 16 includes all fulcrum guides 16. This arrangement makes it possible to reliably suppress the local wearing of all fulcrum guides 16.

**[0056]** In the example, the switching mechanism 30 includes the gear portion 32a formed on the holding unit 32 holding the fulcrum guide 16, the engaging member 33 engaged with the gear portion 32a and prevents the gear portion 32a from rotating during yarn winding, and the engagement cancellation member (adjacent slider 21) canceling the engagement between the engaging member 33 and the gear portion 32a at times other than the yarn winding. With this arrangement, the fulcrum guide 16 is switched to a state of freely rotatable as the engagement between the engaging member 33 and the gear portion 32a is canceled by the engagement cancellation member.

**[0057]** In the example, the movement mechanism 20 configured to move the fulcrum guides 16 between the winding positions where yarns are wound and the yarn threading positions where yarn threading is performed is provided. When the fulcrum guides 16 are at the yarn threading positions, the engagement cancellation member (adjacent slider 21) maintains the state in which the engagement between the engaging member 33 and the gear portion 32a is canceled. According to this arrangement, because the fulcrum guides 16 are freely rotatable during yarn threading to the fulcrum guides 16, it is possible to rotate the fulcrum guides 16 when the yarns Y are threaded to the fulcrum guides 16.

**[0058]** In the example, the movement mechanism 20 includes the sliders 21 supporting the fulcrum guides 16, the guide rail 22 to which the sliders 21 are slidably attached, and the air cylinder 23 configured to move the sliders 21 along the guide rail 22. Such a movement mechanism 20 is able to move the fulcrum guides 16 by moving the sliders 21 along the guide rail 22.

**[0059]** In the example, when the fulcrum guides 16 move from the winding positions to the yarn threading positions, the sliders 21 that neighbor each other in the longitudinal direction (front-rear direction) of the guide rail 22 are close to each other. This arrangement makes it easy to perform yarn threading because, when the fulcrum guides 16 are at the yarn threading positions, the fulcrum guides 16 are gathered to be close to one another.

**[0060]** In the example, the engaging member 33 includes the protruding portion 33a that protrudes from the slider 21 when the fulcrum guides 16 are at the winding positions. When the fulcrum guides 16 move from the winding positions to the yarn threading positions, the adjacent slider 21 functioning as the engagement cancellation member presses the protruding portion 33a, so that the engagement between the engaging member 33 and the gear portion 32a is canceled. According to this arrangement, since the adjacent slider 21 functions as the engagement cancellation member, it is not necessary to newly provide an engagement cancellation member, and hence the increase in the number of parts can be suppressed.

**[0061]** In the example, the spring 34 is provided to bias the engaging member 33 in the direction in which the engaging member 33 is engaged with the gear portion 32a. With this spring 34, the rotation of the fulcrum guide 16 is reliably prevented by the engaging member 33 during yarn winding.

(Second Example of Rotation Mechanism)

**[0062]** The following will describe Second Example of the rotation mechanism. The same arrangements as those in First Example may not be explained, and arrangements different from those of First Example are mainly described. FIG. 5 shows how a switching mechanism 40 of Second Example operates. FIG. 5(a) and FIG. 5(b) show states in each of which the fulcrum guide 16 is moving from the winding position to the yarn threading position. FIG. 6 shows the layout of an engagement cancellation member 44 of Second Example.

**[0063]** The switching mechanism 40 of the present example includes a gear portion 42a formed in a holding unit 42 holding each fulcrum guide 16, an engaging member 43 provided on each slider 21, and one engagement cancellation member 44 fixed to a guide rail 22. In the example, the gear portion 42a and the engaging member 43 are provided on the back side (left side) of the slider 21. Alternatively, these members may be provided on the front side (right side) of the slider 21.

**[0064]** The fulcrum guide 16 and the holding unit 32 are identical with those of First Example and the fulcrum guide 16 is freely rotatable about the central axis. The engaging member 43 is engaged with the gear portion 42a so as to prevent the gear portion 42a from rotating, and is provided on each slider 21. The engaging member 43 is a long member, one end portion thereof is a pressed portion 43a, whereas the other end portion is an engaging portion 43b. The pressed portion 43a protrudes downward from the slider 21, and is pressed by the engagement cancellation member 44 in a process in which the fulcrum guide 16 moves from the winding position to the yarn threading position. The engaging portion 43b is meshed with the gear portion 42a so as to prevent the gear portion 42a from rotating. A fulcrum 45 is provided at a central portion of the engaging member 43. The engaging member 43 is arranged to be rotatable about the fulcrum 45. The engaging member 43 is connected to a spring 46. The spring 46 is biased in the direction in which the engaging portion 43b is engaged with the gear portion 42a.

**[0065]** As shown in FIG. 6, the engagement cancellation member 44 is fixed to a front end portion of the guide rail 22, and extends rearward from the front end portion of the guide rail 22. A rear end portion of the engagement cancellation member 44 is a press portion 44a that presses the pressed portion 43a of each engaging member 43. The press portion 44a of the engagement cancellation member 44 is provided forward of the engaging member 43 when the fulcrum guides 16 are at the winding positions. A part of the engagement cancellation member 44, which extends in the front-rear direction, is positioned to be slightly separated downward from the slider 21. For this reason, the engagement cancellation member 44 does not make contact with the slider 21 but the engaging member 43 is able to make contact with the pressed portion 43a. The pressed portion 43a may protrude upward from the slider 21. In this case, a part of the engagement cancellation member 44 extending in the front-rear direction is positioned above the slider 21.

**[0066]** When the fulcrum guide 16 is at the winding position, the engaging portion 43b of the engaging member 43 is engaged with the gear portion 42a due to the biasing force of the spring 46. Even after the fulcrum guide 16 starts the movement from the winding position to the yarn threading position, the engagement between the engaging member 43 and the gear portion 42a is maintained as shown in FIG. 5(a) until the pressed portion 43a of the engaging member 43 makes contact with the press portion 44a of the engagement cancellation member 44. When the pressed portion 43a of the engaging member 43 makes contact with the press portion 44a of the engagement cancellation member 44 while the fulcrum guide 16 is moving from the winding position to the yarn threading position, as shown in FIG. 5(b), the pressed portion 43a is pressed rearward so that the engaging member 43 rotates counterclockwise in FIG. 5 about the fulcrum 45. As a result, the engaging portion

43b of the engaging member 43 is disengaged from the gear portion 42a and the fulcrum guide 16 is switched to a state of freely rotatable.

**[0067]** As shown in FIG. 6, when all the fulcrum guides 16 move to the yarn threading positions, all the engaging members 43 are disengaged from the gear portions 42a, and the fulcrum guides 16 become in a state of freely rotatable. Therefore the fulcrum guide 16 is easily rotated by the tension of the yarn Y, as the yarn Y makes contact with the outer circumferential surface of the fulcrum guide 16 in the yarn threading to the fulcrum guide 16. It is therefore possible to change the positions where the yarns Y make contact with the fulcrum guides 16 in the next yarn winding from the positions in the current yarn winding, with the result that the local wearing of the fulcrum guides 16 is reliably suppressed.

**[0068]** When the yarn threading to the fulcrum guide 16 is finished and the fulcrum guide 16 is returned from the yarn threading position to the winding position, the engaging member 43 of each slider 21 is separated from the engagement cancellation member 44 during this returning process. As a result, the engaging member 43 is rotated clockwise by the biasing force of the spring 46, and hence the engaging portion 43b of the engaging member 43 is meshed with the gear portion 42a. On this account, even after the fulcrum guide 16 returns to the winding position and the winding of the yarn Y starts, the fulcrum guide 16 does not rotate at high speed on account of the running of the yarn Y.

(Effects of Second Example)

**[0069]** Effects of this example will be described. It is noted that effects identical with those of First Example are not described again. In the example, the engagement cancellation member 44 is fixed to the guide rail 22. When the fulcrum guides 16 move from the winding positions to the yarn threading positions, the engagement cancellation member 44 presses the engaging member 43 so that the engagement between the engaging member 43 and the gear portion 42a is canceled. With this arrangement, because one engagement cancellation member 44 is shared between plural fulcrum guides 16, it is unnecessary to provide an engagement cancellation member 44 for each fulcrum guide 16, and hence the number of engagement cancellation members 44 can be reduced. While only one engagement cancellation member 44 is provided in this example, two or more engagement cancellation members 44 may be provided. Further, it is not essential to fix the engagement cancellation member 44 to the guide rail 22, and the engagement cancellation member 44 may be attached to a fixing member (for example, the supporting frame 14 or the like) to which the guide rail 22 is directly or indirectly fixed.

(Other Embodiments)

**[0070]** The following will describe modifications of the

above-described embodiment.

**[0071]** In the embodiment above, the gear portion 32a, 42a is formed on the outer circumferential surface of the holding unit 32, 42 holding the fulcrum guide 16. Alternatively, the gear portion may be formed on the outer circumferential surface of the fulcrum guide 16.

**[0072]** In the embodiment above, when the fulcrum guides 16 move from the winding positions to the yarn threading positions, the switching mechanism 30, 40 switches the fulcrum guides 16 to a state of freely rotatable. Alternatively, the fulcrum guides 16 may be switched to the state of freely rotatable at a time other than the movement of the fulcrum guides 16. For example, the fulcrum guides 16 may be switched to the state of freely rotatable when the fulcrum guides 16 are at the winding positions but the winding of the yarns Y is not performed. In this case, a drive unit such as a motor may be provided for driving the engaging member 33, 43 of the embodiment above, and the fulcrum guides 16 may be switched to the state of freely rotatable by driving this drive unit. When this arrangement is employed, the fulcrum guides 16 may not be arranged to move between the winding positions and the yarn threading positions.

**[0073]** In the embodiment above, all of the fulcrum guides 16 are switched to the state of freely rotatable by the switching mechanism 30, 40, at a time other than the yarn winding. Alternatively, the switching mechanism 30, 40 may switch only some fulcrum guides 16 (e.g., the outermost fulcrum guides 16) that tend to involve the problem of local wearing to the state of freely rotatable. In this case, the other fulcrum guides 16 does not need to be freely rotatable and may be fixed to the sliders 21.

**[0074]** According to the embodiment above, when the fulcrum guides 16 are at the yarn threading positions, the fulcrum guides 16 are gathered at the front end portion of the guide rail 22 to be close to one another. In this regard, when the adjacent slider 21 does not function as the engagement cancellation member, the fulcrum guides 16 are not required to be close to one another at the yarn threading positions. To put it differently, the present invention can be applied to an arrangement in which fulcrum guides 16 move together between winding positions and yarn threading positions without changing the intervals therebetween.

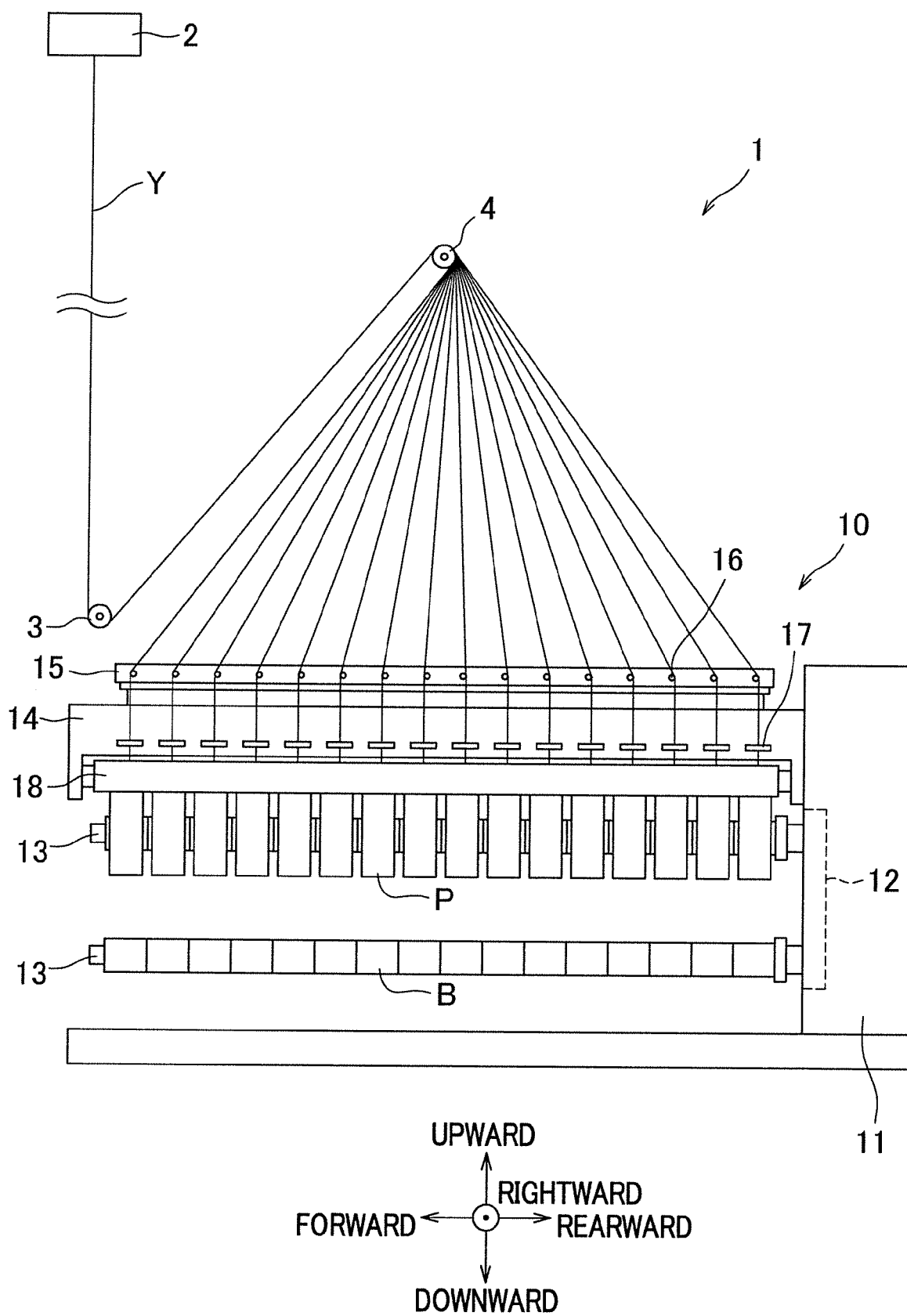
## Claims

1. A yarn winder (10) configured to wind yarns (Y) onto bobbins (B) attached to a winding shaft (13) while traversing the yarns (Y) about fulcrum guides (16) that are aligned in the axial direction of the winding shaft (13),

the fulcrum guides (16) being rollers each having a central axis and having outer circumferential surfaces on which the yarns (Y) are placed, at least one of the fulcrum guides (16) being free-

- ly rotatable about the central axis, and the yarn winder (10) comprising a switching mechanism (30, 40) which prevents the at least one of the fulcrum guides (16) from rotating during yarn winding, and cancels prevention of rotation of the at least one of the fulcrum guides (16) at a time other than the yarn winding.
2. The yarn winder (10) according to claim 1, wherein, the at least one of the fulcrum guides (16) include two fulcrum guides (16) that are outermost ones in the axial direction.
  3. The yarn winder (10) according to claim 2, wherein, the at least one of the fulcrum guides (16) include all of the fulcrum guides (16).
  4. The yarn winder (10) according to any one of claims 1 to 3, wherein, the switching mechanism (30, 40) includes:
    - a gear portion (32a, 42a) provided on either each of the fulcrum guides (16) or a holding unit (32, 42) holding each of the fulcrum guides (16);
    - an engaging member (33, 43) which is engaged with the gear portion (32a, 42a) during the yarn winding so as to prevent the gear portion (32a, 42a) from rotating; and
    - an engagement cancellation member (21, 44) which cancels engagement between the engaging member (33, 43) and the gear portion (32a, 42a) at a time other than the yarn winding.
  5. The yarn winder (10) according to claim 4, further comprising
    - a movement mechanism (20) configured to move the fulcrum guides (16) between winding positions where the yarn winding is performed and yarn threading positions where yarn threading is performed,
    - the engagement cancellation member (21, 44) maintaining a state in which the engagement between the engaging member (33, 43) and the gear portion (32a, 42a) is canceled, when the fulcrum guides (16) are at the yarn threading positions.
  6. The yarn winder (10) according to claim 5, wherein, the movement mechanism (20) includes:
    - sliders (21) supporting the fulcrum guides (16);
    - a guide rail (22) to which the sliders (21) are slidably attached; and
    - a drive unit (23) configured to move the sliders (21) along the guide rail (22).
  7. The yarn winder (10) according to claim 6, wherein, the sliders (21) neighboring each other in a longitudinal direction of the guide rail (22) are close to each other when the fulcrum guides (16) move from the winding positions to the yarn threading positions.
  8. The yarn winder (10) according to claim 7, wherein, the engaging member (33) includes a protruding portion (33a) which protrudes from each of the sliders (21) when the fulcrum guides (16) are at the winding positions, and engagement between the engaging member (33) and the gear portion (32a) is canceled as the protruding portion (33a) is pressed by a neighboring one of the sliders (21) functioning as the engagement cancellation member, when the fulcrum guides (16) move from the winding positions to the yarn threading positions.
  9. The yarn winder (10) according to claim 6 or 7, wherein, the engagement cancellation member (44) is fixed to either the guide rail (22) or a fixing member to which the guide rail (22) is directly or indirectly fixed, and engagement between the engaging member (43) and the gear portion (42a) is canceled as the engaging member (43) is pressed by the engagement cancellation member (44), when the fulcrum guides (16) move from the winding positions to the yarn threading positions.
  10. The yarn winder (10) according to any one of claims 4 to 9, further comprising a biasing member (34) arranged to bias the engaging member (33) in a direction in which the engaging member (33) is engaged with the gear portion (32a).

FIG. 1



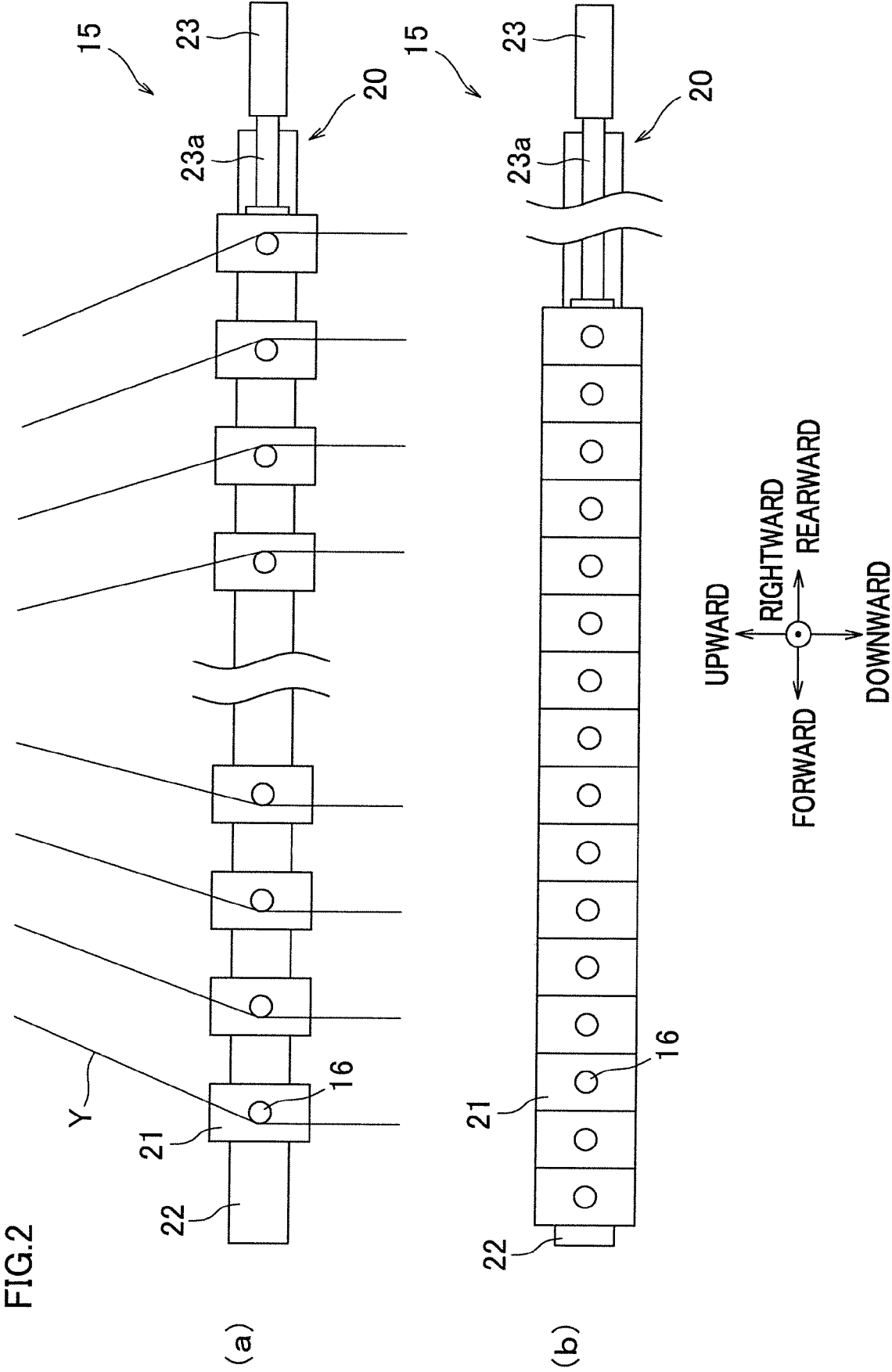
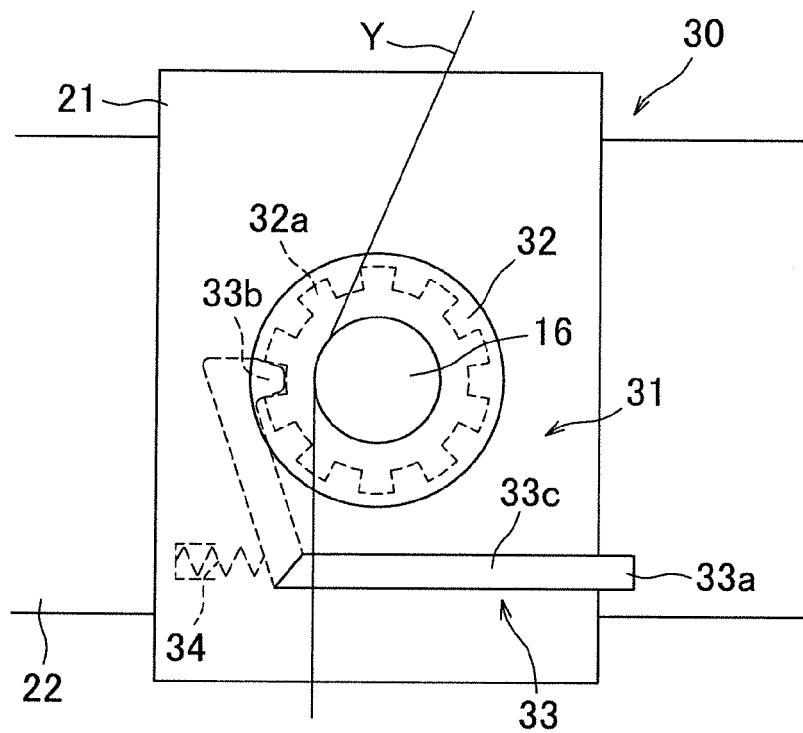


FIG.3

(a)



(b)

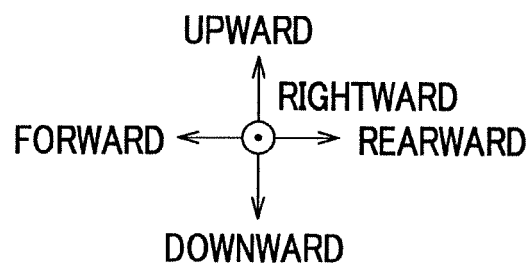
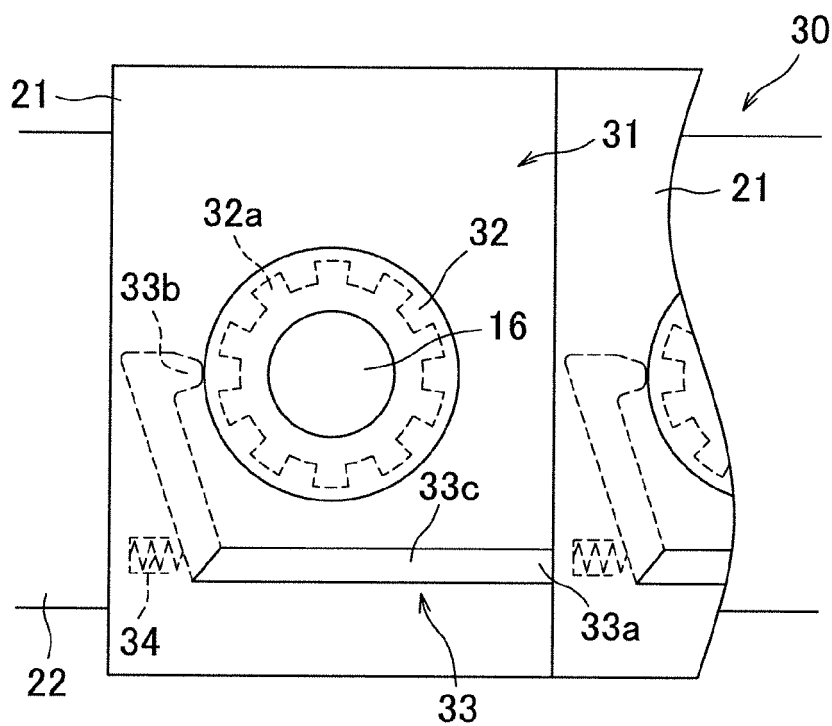


FIG.4

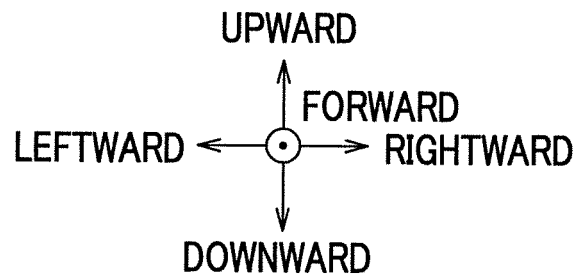
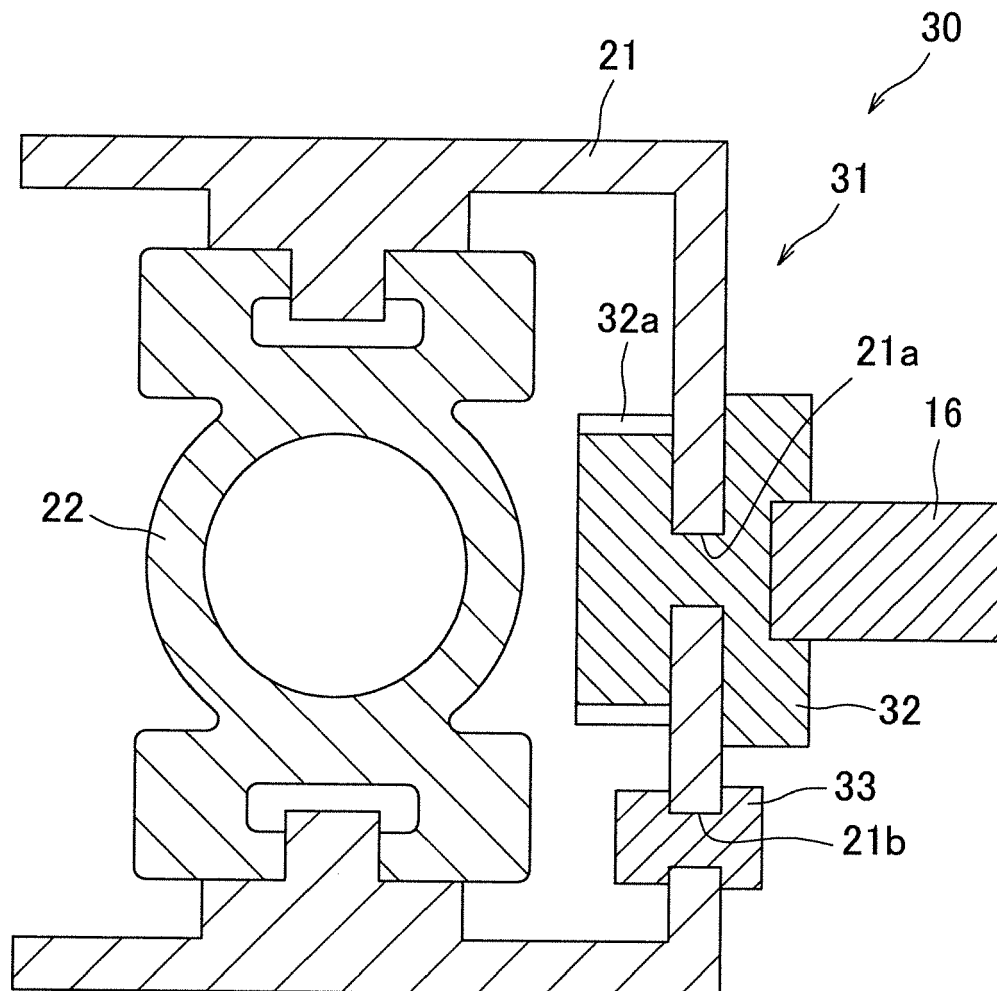
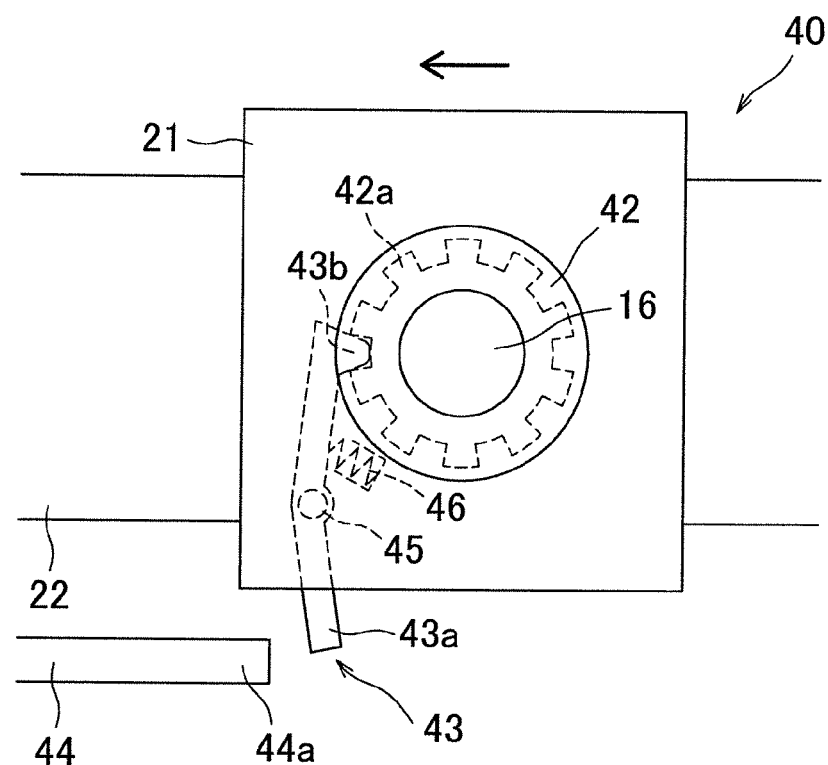


FIG.5

(a)



(b)

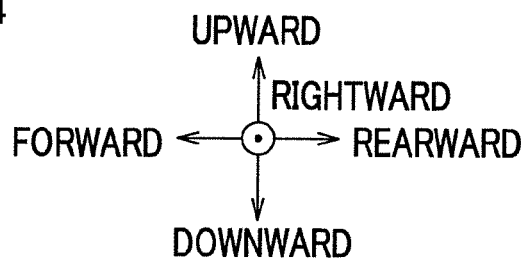
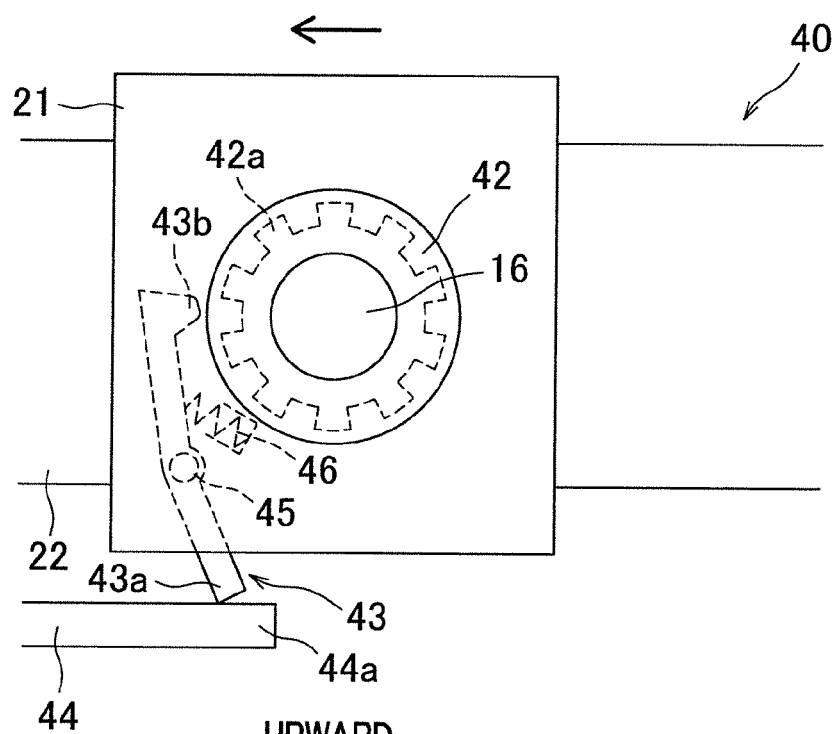
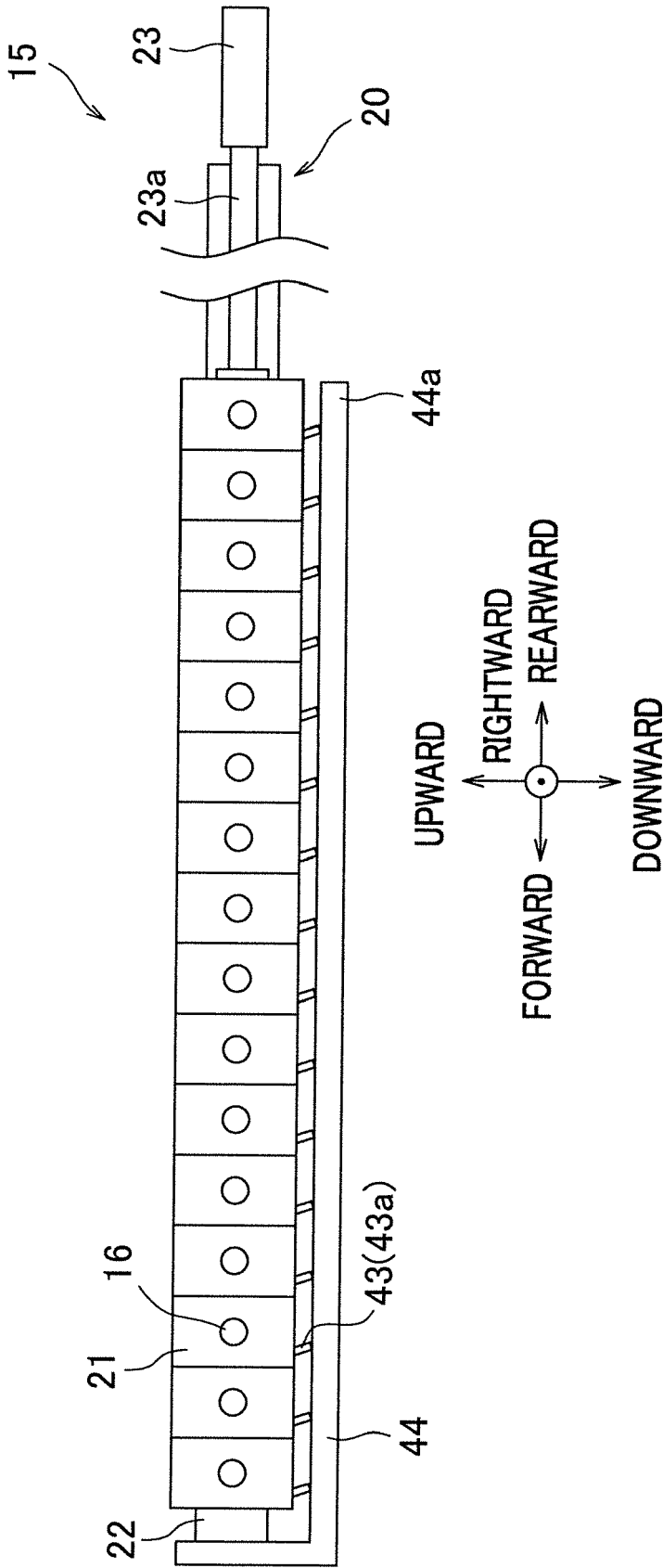


FIG.6





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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                             |                                                             |                                             |
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| 1 The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                             |                                                             |                                             |
| Place of search<br><b>The Hague</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                             | Date of completion of the search<br><b>22 February 2022</b> | Examiner<br><b>Pussemier, Bart</b>          |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                                                                             |                                                             |                                             |

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**REFERENCES CITED IN THE DESCRIPTION**

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