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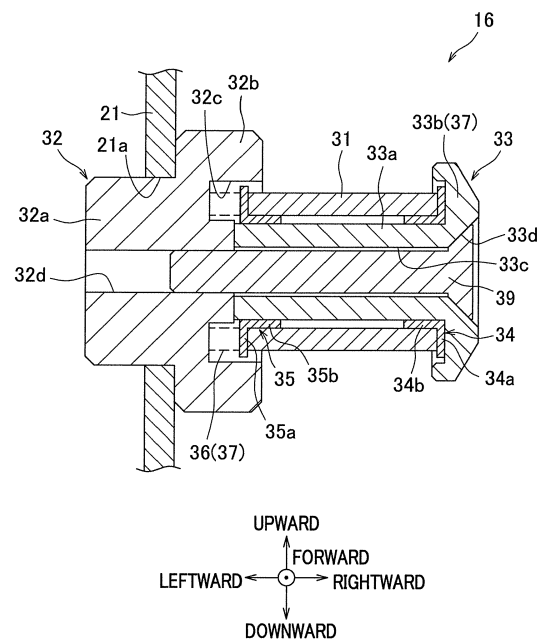
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(54) **GUIDE MEMBER AND YARN WINDER**

(57) A low-cost guide member with which a change in the yarn quality is suppressed is provided. A guide member 16 includes: a fulcrum guide 31 that functions as a fulcrum when a yarn is wound onto a bobbin while being traversed, the fulcrum guide 31 being hollow cylindrical in shape and rotatable about a central axis; and a rotational resistance imparting unit 37 which is configured to impart rotational resistance to the fulcrum guide 31 so that the fulcrum guide 31 is rotationally driven at circumferential speed lower than running speed of the yarn, when the fulcrum guide 31 receives a torque that is equal to or larger than a predetermined value from the yarn that is running while being in contact with the outer circumferential surface of the fulcrum guide 31.

FIG.3



Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a guide member including a fulcrum guide functioning as a fulcrum when a yarn is traversed and wound onto a bobbin, and further relates to a yarn winder including a guide member.

[0002] A known yarn winder is configured to wind yarns spun out from a spinning apparatus onto bobbins, while traversing the yarns. In such a yarn winder, fulcrum guides that function as fulcrums when the yarns are traversed is provided. 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), hollow-cylindrical fulcrum guides (guide rollers in Patent Literature 2) are provided, and yarns are placed on the outer circumferential surfaces of the fulcrum guides.

[0003] In Patent Literature 1, the fulcrum guides are arranged not to rotate about each central axis, when the yarns are wound. On this account, 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, according to Patent Literature 1, 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, in Patent Literature 2, the fulcrum guides are rollers arranged to be freely rotatable about each central axis. 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. Furthermore, because the rollers that are freely rotatable are used, a drive unit for rotating the fulcrum guides is unnecessary, and hence the cost is reduced.

SUMMARY OF THE INVENTION

[0005] However, according to Patent Literature 2, a delicate bearing structure is required because the fulcrum guides rotate at high speed. Such a delicate bearing structure is easily deteriorated. The deterioration lowers the rotation number of the fulcrum guides while the yarns are wound, with the result that the yarn quality may be unintentionally changed.

[0006] In consideration of the problem above, an object of the present invention is to provide a low-cost guide member with which a change in the yarn quality is suppressed.

[0007] The present invention relates to a guide member which includes: a fulcrum guide that functions as a

fulcrum when a yarn is wound onto a bobbin while being traversed, the fulcrum guide being hollow cylindrical in shape and rotatable about a central axis; and a rotational resistance imparting unit which is configured to impart rotational resistance to the fulcrum guide so that the fulcrum guide is rotationally driven at circumferential speed lower than running speed of the yarn, when the fulcrum guide receives a torque that is equal to or larger than a predetermined value from the yarn that is running while being in contact with an outer circumferential surface of the fulcrum guide.

[0008] According to the present invention, because the fulcrum guide is rotationally driven when receiving a torque that is equal to or larger than the predetermined value from the yarn, a part in contact with the yarn is changed on the outer circumferential surface of the fulcrum guide. Local wearing of the fulcrum guide is therefore suppressed. Furthermore, because a drive unit such as a motor is unnecessary for rotating the fulcrum guide, the cost is suppressed. Furthermore, as the fulcrum guide is rotated by the rotational resistance imparting unit at a circumferential speed lower than the running speed of the yarn, the frictional property between the fulcrum guide and the yarn is substantially constant and more or less identical with the frictional property when the fulcrum guide is fixed. This makes it possible to avoid a change in yarn quality even if the number of rotations of the fulcrum guide is varied to some degree. As described above, the present invention makes it possible to suppress a change in yarn quality with low cost.

[0009] In the present invention, the rotational resistance imparting unit imparts the rotational resistance to the fulcrum guide so that the circumferential speed of the fulcrum guide is preferably 5% or less, more preferably 3.5% or less of the running speed of the yarn.

[0010] A change in yarn quality can be further sufficiently suppressed when the circumferential speed of the fulcrum guide is sufficiently low, i.e., 5% or less of the running speed of the yarn.

[0011] In the present invention, the rotational resistance imparting unit imparts the rotational resistance to the fulcrum guide so that the number of rotations of the fulcrum guide is preferably 7400 rpm or less, more preferably 5000rpm or less.

[0012] When the number of rotations of the fulcrum guide is large, the fulcrum guide and a member in contact with the fulcrum guide tend to be worn, and smooth rotation of the fulcrum guide may be obstructed. In this connection, as described above, the number of rotations of the fulcrum guide is arranged to be small, i.e., equal to or smaller than 7400 rpm. This makes it possible to suppress the fulcrum guide and the member in contact with the fulcrum guide from being worn, and smooth rotation of the fulcrum guide is maintained.

[0013] In the present invention, preferably, the rotational resistance imparting unit includes: a pressed portion provided on one side in an axial direction of the fulcrum guide; and a pressing member which is configured

to press the fulcrum guide toward the pressed portion.

[0014] With this arrangement, the rotational resistance is imparted to the fulcrum guide by the pressing force of the pressing member.

[0015] In the present invention, preferably, an interposed member is provided between the fulcrum guide and the pressed portion and/or between the fulcrum guide and the pressing member.

[0016] With this arrangement, the pressing force acting on the fulcrum guide is adjustable by changing the shape, size, material, etc. of the interposed member, and hence the number of rotations and the circumferential speed of the fulcrum guide are easily adjustable.

[0017] In the present invention, preferably, the interposed member includes: a thrust bearing portion which is in contact with an end face of the fulcrum guide; and a radial bearing portion which is in contact with an inner circumferential surface of the fulcrum guide.

[0018] Because the interposed member is provided with the thrust bearing portion and the radial bearing portion, the fulcrum guide is further smoothly rotatable.

[0019] In the present invention, the pressing member is preferably a spring.

[0020] Because the pressing member is a spring, the pressing force acting on the fulcrum guide is easily adjustable, and hence the number of rotations and the circumferential speed of the fulcrum guide are easily adjustable.

[0021] In the present invention, preferably, the pressed portion is integrally formed with a shaft member that supports the fulcrum guide to be rotatable.

[0022] This arrangement reduces the number of parts of the guide member.

[0023] In the present invention, preferably, the rotational resistance imparting unit is a contact portion that is formed between the fulcrum guide and a member in contact with the fulcrum guide, and at the contact portion, friction force is adjusted so that the circumferential speed of the fulcrum guide is lower than the running speed of the yarn.

[0024] This arrangement reduces the number of parts of the guide member because the above-described pressing member is unnecessary.

[0025] In the present invention, preferably, the contact portion that functions as the rotational resistance imparting unit is formed between an inner circumferential surface of the fulcrum guide and a member that is in contact with the inner circumferential surface of the fulcrum guide.

[0026] Because the inner circumferential surface of the fulcrum guide is typically larger in area than the end faces, the adjustment of the friction force can be easily done when the inner circumferential surface of the fulcrum guide is used as the rotational resistance imparting unit.

[0027] In the present invention, preferably, an interposed member is provided between the fulcrum guide and a shaft member that supports the fulcrum guide to be rotatable, and the contact portion that functions as the

rotational resistance imparting unit is formed between the inner circumferential surface of the fulcrum guide and the interposed member.

[0028] With this arrangement, the friction force at the contact portion is adjustable by changing the shape, size, material, etc. of the interposed member, and hence the number of rotations and the circumferential speed of the fulcrum guide are easily adjustable.

[0029] The present invention relates to a yarn winder winding yarns onto bobbins attached to a winding shaft, guide members each of which is the guide member of any one of the arrangements above being aligned in an axial direction of the winding shaft.

[0030] Such a yarn winder makes it possible to suppress a change in yarn quality with low cost.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031]

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 is a cross section of a guide member.

FIG. 4 shows a result of a verification experiment of yarn properties.

FIG. 5 is a cross section of an guide member of a modification.

FIG. 6 shows a result of a verification experiment of the modification.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0032] With reference to drawings, the following will describe an embodiment in which a yarn winder including a guide member of the present invention is applied to a spun yarn take-up apparatus.

(Spun Yarn Take-Up Apparatus)

[0033] FIG. 1 is a profile of a spun yarn take-up apparatus 1 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 1.

[0034] 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.

[0035] 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 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.

[0036] 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.

[0037] 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, guide members 16 are provided to be aligned in the front-rear direction. The number of the guide members 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 guide member 16.

[0038] 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)

[0039] 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 guide members 16 are at winding positions, whereas FIG. 2(b) shows a state in which the guide members 16 are at yarn threading positions. The winding positions are positions of the guide members 16 when the yarns Y are wound onto the bobbins B. The yarn threading positions are positions of the guide members 16 when the yarns Y are threaded to the guide members 16. The guide members 16 are arranged

to be movable between the winding positions and the yarn threading positions.

[0040] The guide unit 15 includes the guide members 16, sliders 21, a guide rail 22, and an air cylinder 23. The sliders 21 are identical in number with the guide members 16 and the guide members 16 are attached to the corresponding sliders 21, respectively. The guide rail 22 extends in the front-rear direction 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. Two neighboring slider 21 are connected to each other by an unillustrated belt. The air cylinder 23 is a driving unit for moving the guide members 16 between the winding positions and the yarn threading positions. The rearmost slider 21 is connected to a rod 23a of the air cylinder 23. The driving unit for moving the guide members 16 may be different from the air cylinder 23, and may be an actuator such as a motor.

[0041] 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. The positions of the guide members 16 in this state are the winding positions. Meanwhile, when the rod 23a of the air cylinder 23 is elongated as shown in FIG. 2(b), the sliders 21 are gathered at a front end portion of the guide rail 22. The positions of the guide members 16 in this state are the yarn threading positions.

[0042] As shown in FIG. 2(a), the yarn paths of the yarns Y distributed from a godet roller 4 to the guide members 16 at the winding positions are symmetrical with respect to a vertical plane that passes through the center of the guide members 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 guide members 16, whereas eight yarns Y that are the rear half of the yarns Y are placed on the rear sides of the respective guide members 16. When the guide members 16 are compared to one another, the winding angle of the yarn Y on each guide member 16 increases from the central guide member 16 toward the outermost guide members 16.

(Guide Member)

[0043] Now, the details of each guide member 16 will be described. FIG. 3 is a cross section of the guide member 16. The guide member 16 includes a fulcrum guide 31, a fixing member 32, and a shaft member 33. The fulcrum guide 31 extends in the left-right direction and is hollow cylinder in shape. The fulcrum guide 31 is supported by the shaft member 33 to be rotatable about the central axis. The yarns Y are placed on the outer circumferential surfaces of the fulcrum guides 31. When the yarns Y are wound, the running yarns Y are in contact with the outer circumferential surfaces of the fulcrum guides 31. When each fulcrum guide 31 receives a torque equal to or larger than a predetermined value from the yarn Y running on the outer circumferential surface of the

fulcrum guide 31, the fulcrum guide 31 is rotationally driven at a circumferential speed lower than the running speed of the yarn Y.

[0044] The fixing member 32 has a cylindrical small diameter portion 32a and a cylindrical large diameter portion 32b. The small diameter portion 32a is inserted into a circular attachment hole 21a formed in the slider 21. An annular recess 32c is formed at a right end portion of the large diameter portion 32b. A spring 36 (pressing member of the present invention) is provided in the recess 32c. The fixing member 32 has a female screw portion 32d penetrating the fixing member 32 in the left-right direction. The small diameter portion 32a of the fixing member 32 is inserted into the attachment hole 21a from the right side, and the fixing member 32 is then fixed to the slider 21 by an unillustrated bolt while a flange surface of the large diameter portion 32b is in contact with the slider 21.

[0045] The shaft member 33 is a member in which a shaft portion 33a and a flange portion 33b (pressed portion of the present invention) are integrally formed. The shaft portion 33a extends in the left-right direction and cylindrical in shape. The shaft portion 33a supports the fulcrum guide 31 externally fitted to the shaft portion 33a to be rotatable. The flange portion 33b is an annular portion that extends radially to the outside of the shaft portion 33a from a right end portion of the shaft portion 33a. The shaft member 33 has a through hole 33c penetrating the shaft member 33 in the left-right direction. The inner diameter of the right end portion of the through hole 33c increases rightward. This part forms a tapered surface 33d with which a head portion of the bolt 39 makes contact.

[0046] On the respective sides in the axial direction of the fulcrum guide 31, interposed members 34 and 35 both of which are made of resin are provided to be adjacent to the fulcrum guide 31. The interposed members 34 and 35 are annular members each of which is L-shaped in cross section, and include thrust bearing portions 34a and 35a extending in the radial direction of the fulcrum guide 31 and radial bearing portions 34b and 35b extending in the axial direction of the fulcrum guide 31. With such interposed members 34 and 35 made of resin, the wearing of the fulcrum guide 31 and the shaft member 33 is suppressed. The interposed members 34 and 35 are made of POM (polyacetal), for example.

[0047] The thrust bearing portion 34a of the right interposed member 34 is provided between the fulcrum guide 31 and the flange portion 33b of the shaft member 33 in the axial direction of the fulcrum guide 31, and is in contact with a right end face of the fulcrum guide 31. The thrust bearing portion 35a of the left interposed member 35 is provided between the fulcrum guide 31 and the spring 36 in the axial direction of the fulcrum guide 31, and is in contact with a left end face of the fulcrum guide 31. The radial bearing portions 34b and 35b are provided between the fulcrum guide 31 and the shaft portion 33a of the shaft member 33 in the radial direction of the ful-

crum guide 31, and are in contact with the inner circumferential surface of the fulcrum guide 31.

[0048] When the bolt 39 is inserted into the through hole 33c and the bolt 39 is fastened to the female screw portion 32d of the fixing member 32 while the fulcrum guide 31 is externally fitted to the shaft member 33, the shaft member 33 is fixed to the fixing member 32. At this stage, the fulcrum guide 31 is pressed toward the flange portion 33b by the biasing force of the spring 36 that is provided in the recess 32c of the fixing member 32.

[0049] Traditionally, in order to avoid local wearing of fulcrum guides due to continuous contact of yarns with the same parts of the outer circumferential surfaces of the fulcrum guides, the fulcrum guides are typically freely rotatable at a substantially same circumferential speed as the yarns. When such fulcrum guides that are freely rotatable are employed, a delicate bearing structure such as ball bearings is required. In accordance with the deterioration of the bearing structure, the number of rotations of the fulcrum guides may be lowered while the yarns are wound. As a result, the yarn quality may be unintentionally changed.

[0050] In order to avoid such a change in yarn quality, in the present embodiment, a rotational resistance imparting unit 37 which is configured to impart rotational resistance to the fulcrum guide 31 in order to arrange the circumferential speed of the fulcrum guide 31 to be lower than the running speed of the yarn Y. The rotational resistance imparting unit 37 is arranged to adjust the fulcrum guide 31 to be rotationally driven at a circumferential speed lower than the running speed of the yarn Y, when the fulcrum guide 31 receives a torque that is equal to or larger than a predetermined value from the yarn Y. To be more specific, the rotational resistance imparting unit 37 is formed of a spring 36 and a flange portion 33b of the shaft member 33. As the spring 36 presses the fulcrum guide 31 onto the flange portion 33b, the frictional resistance at the time of the rotation of the fulcrum guide 31 is increased, and hence the rotational resistance is imparted. This makes it possible to decrease the rotation number of the fulcrum guide 31.

[0051] The magnitude of the rotational resistance imparted to the fulcrum guide 31 is adjustable by changing the interposed members 34 and 35 or the spring 36. Alternatively, a spacer may be provided at a suitable position between the recess 32c of the fixing member 32 and the flange portion 33b of the shaft member 33 in order to adjust the biasing force of the spring 36. The rotational resistance imparting unit 37 adjusts the circumferential speed of the fulcrum guide 31 to be preferably 5% or less of the running speed of the yarn Y, or more preferably to be 3.5% or less of the running speed of the yarn Y. Alternatively, the rotational resistance imparting unit 37 adjusts the number of rotations of the fulcrum guide 31 to be preferably 7400rpm or less, or more preferably to be 5000rpm or less.

[0052] As the fulcrum guide 31 is rotated at low speed, the frictional property between the fulcrum guide 31 and

the yarn Y is substantially constant and more or less identical with the frictional property when the fulcrum guide 31 is fixed. This makes it possible to avoid a significant change in yarn quality even if the rotation number of the fulcrum guide 31 is varied to some degree during the winding of the yarn Y. Furthermore, when the rotation number of the fulcrum guide 31 is small, a delicate bearing structure such as ball bearings is unnecessary and a simple bearing structure such as slide bearings can be employed. The cost reduction is therefore achieved as a subsidiary effect.

[0053] At a guide member 16 where the contact angle (winding angle) with the yarn Y is large (i.e., a guide member 16 that is close to an edge among the guide members 16; see FIG. 2), the friction force between the yarn Y and the fulcrum guide 31 is large. On this account, in many cases, the torque acting on the fulcrum guide 31 exceeds the predetermined value from the start and the fulcrum guide 31 is rotationally driven always at a circumferential speed lower than the running speed of the yarn Y. Meanwhile, at a guide member 16 where the contact angle (winding angle) with the yarn Y is small (i.e., a guide member 16 that is close to the center among the guide members 16; see FIG. 2), the friction force between the yarn Y and the fulcrum guide 31 is small. In such a case, the torque acting on the fulcrum guide 31 may not exceed the predetermined value. This, however, is not particularly a problem.

[0054] If the torque acting on the fulcrum guide 31 due to the friction force generated by the contact with the yarn Y does not reach the predetermined value, i.e., if the fulcrum guide 31 is not rotationally driven by the running of the yarn Y, the yarn Y is kept in contact with the same part of the outer circumferential surface of the fulcrum guide 31 and local wearing occurs. When the fulcrum guide 31 is worn, the friction force generated by the contact with the yarn Y increases and the torque acting on the fulcrum guide 31 reaches the predetermined value, with the result that the fulcrum guide 31 is slightly rotationally driven. Thereafter, when the yarn Y makes contact with a part of the fulcrum guide 31, which is not worn, the fulcrum guide 31 does not rotate again. Such an action of the fulcrum guide 31 also suppresses a change in yarn quality due to constant contact between the yarn Y and the worn part of the fulcrum guide 31.

(Verification Experiment of Yarn Properties)

[0055] With the guide member 16 of the present embodiment, an experiment was done to verify whether a change in yarn quality was actually suppressed. To be more specific, when the fulcrum guide 31 was rotationally driven by the running of the yarn Y while the rotational resistance imparting unit 37 imparted the rotational resistance, whether the physical properties such as tension, strength, and elongation of the yarn Y were increased as compared to a case where the fulcrum guide 31 was fixed was verified. The thickness of the yarn Y

used in the experiment was 83 dtex, and the outer diameter of the fulcrum guide 31 was 10 mm. When the running speed of the yarn Y was 4600 m/min, the number of rotations of the fulcrum guide 31 was 120 rpm, and the circumferential speed of the fulcrum guide 31 was 3.8 m/min (i.e., 0.08% of the running speed of the yarn Y).

[0056] FIG. 4 shows a result of the verification experiment of the yarn properties. The number in each bar graph indicates an average value. In regard to the strength and elongation, a range of dispersion is also indicated together with each bar graph. "No rotation" indicates a case where the fulcrum guide 31 was fixed, whereas "with rotation" indicates a case where the fulcrum guide 31 was rotationally driven while rotational resistance was imparted by the rotational resistance imparting unit 37. Each of the yarn properties was more or less identical with that of the case where the fulcrum guide 31 was fixed, and changes in yarn quality were suppressed. The experimentation result indicates that, when the fulcrum guide 31 is rotated at low speed while rotational resistance is imparted thereto, a change in yarn quality during yarn winding is suppressed. The application range of the present invention is not limited to the range, an effect of which was verified by the verification experiment. For example, a change in yarn quality during yarn winding can be sufficiently suppressed when the circumferential speed of the fulcrum guide 31 is not higher than about 5% of the running speed of the yarn Y. Under the conditions of the verification experiment above, when the circumferential speed of the fulcrum guide 31 is 5% of the running speed of the yarn Y, the number of rotations of the fulcrum guide 31 is about 7400 rpm.

(Effects)

[0057] In the present embodiment, because the fulcrum guide 31 is rotationally driven when receiving a torque that is equal to or larger than the predetermined value from the yarn Y, a part in contact with the yarn Y is changed on the outer circumferential surface of the fulcrum guide 31. Local wearing of the fulcrum guide 31 is therefore suppressed. Furthermore, because a drive unit such as a motor is unnecessary for rotating the fulcrum guide 31, the cost is suppressed. Furthermore, as the fulcrum guide 31 is rotated by the rotational resistance imparting unit 37 at a circumferential speed lower than the running speed of the yarn Y, the frictional property between the fulcrum guide 31 and the yarn Y is substantially constant and more or less identical with the frictional property when the fulcrum guide 31 is fixed. This makes it possible to avoid a change in yarn quality even if the number of rotations of the fulcrum guide 31 is varied to some degree. It is therefore possible to suppress a change in yarn quality with low cost.

[0058] In the present embodiment, the rotational resistance imparting unit 37 imparts the rotational resistance to the fulcrum guide 31 so that the circumferential speed of the fulcrum guide 31 is preferably 5% or less of

the running speed of the yarn Y, or more preferably 3.5% or less of the running speed of the yarn Y. A change in yarn quality can be further sufficiently suppressed when the circumferential speed of the fulcrum guide 31 is sufficiently low, i.e., 5% or less of the running speed of the yarn Y.

[0059] In the present embodiment, the rotational resistance imparting unit 37 imparts the rotational resistance to the fulcrum guide 31 so that the number of rotations of the fulcrum guide 31 is equal to or smaller than 7400 rpm. When the number of rotations of the fulcrum guide 31 is large, the fulcrum guide 31 and a member in contact with the fulcrum guide 31 tend to be worn, and smooth rotation of the fulcrum guide 31 may be obstructed. In this connection, as described above, the number of rotations of the fulcrum guide 31 is arranged to be small, i.e., equal to or smaller than 7400 rpm. This makes it possible to suppress the fulcrum guide 31 and the member in contact with the fulcrum guide 31 from being worn, and smooth rotation of the fulcrum guide 31 is maintained.

[0060] In the present embodiment, the rotational resistance imparting unit 37 includes a flange portion 33b (pressed portion) provided on one side in the axial direction of the fulcrum guide 31 and a spring 36 (pressing member) pressing the fulcrum guide 31 toward the flange portion 33b. With this arrangement, the rotational resistance is imparted to the fulcrum guide 31 by the pressing force of the spring 36.

[0061] In the present embodiment, the interposed members 34 and 35 are provided between the fulcrum guide 31 and the flange portion 33b and between the fulcrum guide 31 and the spring 36. With this arrangement, the pressing force acting on the fulcrum guide 31 is adjustable by changing the shape, size, material, etc. of the interposed members 34 and 35, and hence the number of rotations and the circumferential speed of the fulcrum guide 31 are easily adjustable.

[0062] In the present embodiment, the interposed members 34 and 35 have thrust bearing portions 34a and 35a in contact with end faces of the fulcrum guide 31 and radial bearing portions 34b and 35b in contact with the inner circumferential surface of the fulcrum guide 31. Because the interposed members 34 and 35 are provided with the thrust bearing portions 34a and 35a and the radial bearing portions 34b and 35b, the fulcrum guide 31 is further smoothly rotatable.

[0063] In the present embodiment, the pressing member is a spring 36. Because the pressing member is a spring 36, the pressing force acting on the fulcrum guide 31 is easily adjustable, and hence the number of rotations and the circumferential speed of the fulcrum guide 31 are easily adjustable.

[0064] In the present embodiment, the flange portion 33b is integrally formed with the shaft member 33 that rotatably supports the fulcrum guide 31. This arrangement reduces the number of parts of the guide member 16.

(Other Embodiments)

[0065] The following will describe modifications of the above-described embodiment.

[0066] In the embodiment above, the shaft member 33 of the present invention is arranged so that the flange portion 33b which is equivalent to the pressed portion of the present invention is integrally formed with the shaft portion 33a. In this regard, the pressed portion of the present invention may be a member independent from the shaft portion 33a. Alternatively, the shaft portion 33a may be integrated with the fixing member 32. In this case, the fixing member 32 is equivalent to the shaft member of the present invention.

[0067] In the embodiment above, the pressing member of the present invention is formed by the spring 36. Alternatively, the pressing member may be formed by an elastic member such as an O-ring.

[0068] In the embodiment above, the spring 36 is provided in the recess of the fixing member 32. The spring 36 may be positioned in a different manner. For example, the spring 36 may be provided between the fulcrum guide 31 and the flange portion 33b. In this case, the fixing member 32 functions as the pressed portion of the present invention.

[0069] In the embodiment above, the interposed members 34 and 35 are provided. In this regard, the interposed members 34 and 35 may be omitted, or only one of the interposed members 34 and 35 may be provided. Specific shape and material of the interposed members 34 and 35 are not limited to those described in the embodiment above.

[0070] In the embodiment above, the guide members 16 are arranged to be movable between the winding positions and the yarn threading positions. In this regard, the guide members 16 may not be movable.

[0071] In the embodiment above, the rotational resistance imparting unit 37 is constituted by the spring 36 and the flange portion 33b. However, the specific arrangement of the rotational resistance imparting unit is not limited to this. FIG. 5 is a cross section of a guide member 16 of a modification. In the modification, a rotational resistance imparting unit is constituted by a fulcrum guide 31 and contact portions 41 and 42 that are formed between the fulcrum guide 31 and the interposed members 34 and 35 that are in contact with the fulcrum guide 31. The following will describe the details.

[0072] The contact portions 41 and 42 are formed between the inner circumferential surface of the fulcrum guide 31 and the radial bearing portions 34b and 35b of the interposed members 34 and 35. The friction force of the contact portions 41 and 42 is adjusted so that, when the fulcrum guide 31 is rotationally driven by the running yarn Y, the circumferential speed of the fulcrum guide 31 is lower than the running speed of the yarn Y. The contact between the end faces of the fulcrum guide 31 and the thrust bearing portions 34a and 35a of the interposed members 34 and 35 is loose to the extent that frictional

resistance is scarcely generated. In place of or in addition to the contact portions 41 and 42 between the inner circumferential surface of the fulcrum guide 31 and the radial bearing portions 34b and 35b, contact portions formed between the end faces of the fulcrum guide 31 and the thrust bearing portions 34a and 35a may function as a rotational resistance imparting unit. Alternatively, the interposed members 34 and 35 may be omitted, and a contact portion between the fulcrum guide 31 and the shaft member 33 may function as a rotational resistance imparting unit.

[0073] With the guide member 16 of the modification, an experiment was done to verify whether a change in yarn quality was actually suppressed. To be more specific, when the fulcrum guide 31 was rotationally driven by the running of the yarn Y while the contact portions 41 and 42 imparted the rotational resistance, whether the physical properties such as tension, strength, and elongation of the yarn Y were increased as compared to a case where the fulcrum guide 31 was fixed was verified. The thickness of the yarn Y used in the experiment was 33 dtex, and the outer diameter of the fulcrum guide 31 was 10 mm. When the running speed of the yarn Y was 4500 m/min, the number of rotations of the fulcrum guide 31 was 3000 to 5000 rpm, and the circumferential speed of the fulcrum guide 31 was 94 to 157 m/min (i.e., 2.1 to 3.5% of the running speed of the yarn Y).

[0074] FIG. 6 shows a result of the verification experiment of the yarn properties. The number in each bar graph indicates an average value. A range of dispersion is also indicated together with each bar graph. "No rotation" indicates a case where the fulcrum guide 31 was fixed, whereas "with rotation" indicates a case where the fulcrum guide 31 was rotationally driven while rotational resistance was imparted by the rotational resistance imparting unit 37. As described above, even though the number of rotations and the circumferential speed of the fulcrum guide 31 slightly varied, each of the yarn properties was more or less identical with that of the case where the fulcrum guide 31 was fixed, and changes in yarn quality were suppressed. The experimentation result indicates that, when the fulcrum guide 31 is rotated at low speed while rotational resistance is imparted thereto, a change in yarn quality during yarn winding is suppressed. Under the conditions of the verification experiment above, when the circumferential speed of the fulcrum guide 31 is 5% of the running speed of the yarn Y, the number of rotations of the fulcrum guide 31 is about 7200 rpm.

[0075] The spring 36 of the embodiment above is unnecessary in this modification. This reduces the number of parts of the guide member 16.

[0076] In the modification, the contact portions 41 and 42 as the rotational resistance imparting unit are formed between the inner circumferential surface of the fulcrum guide 31 and other members (interposed members 34 and 35) in contact with the inner circumferential surface of the fulcrum guide 31. Because the inner circumferen-

tial surface of the fulcrum guide 31 is typically larger in area than the end faces, the adjustment of the friction force can be easily done when the inner circumferential surface of the fulcrum guide 31 is used as the rotational resistance imparting unit.

[0077] In the modification, the interposed members 34 and 35 are provided between the shaft member 33 rotatably supporting the fulcrum guide 31 and the fulcrum guide 31, and the contact portions 41 and 42 as the rotational resistance imparting unit are formed between the inner circumferential surface of the fulcrum guide 31 and the interposed members 34 and 35. With this arrangement, the friction force at the contact portions 41 and 42 is adjustable by changing the shape, size, material, etc. of the interposed members 34 and 35, and hence the number of rotations and the circumferential speed of the fulcrum guide 31 are easily adjustable.

Claims

1. A guide member (16) comprising: a fulcrum guide (31) that functions as a fulcrum when a yarn (Y) is wound onto a bobbin (B) while being traversed,

the fulcrum guide (31) being hollow cylindrical in shape and rotatable about a central axis; and a rotational resistance imparting unit (37, 41, 42) which is configured to impart rotational resistance to the fulcrum guide (31) so that the fulcrum guide (31) is rotationally driven at circumferential speed lower than running speed of the yarn (Y), when the fulcrum guide (31) receives a torque that is equal to or larger than a predetermined value from the yarn (Y) that is running while being in contact with an outer circumferential surface of the fulcrum guide (31).

2. The guide member (16) according to claim 1, wherein, the rotational resistance imparting unit (37, 41, 42) imparts the rotational resistance to the fulcrum guide (31) so that the circumferential speed of the fulcrum guide (31) is 5% or less of the running speed of the yarn (Y).
3. The guide member (16) according to claim 2, wherein, the rotational resistance imparting unit (37, 41, 42) imparts the rotational resistance to the fulcrum guide (31) so that the circumferential speed of the fulcrum guide (31) is 3.5% or less of the running speed of the yarn (Y).
4. The guide member (16) according to any one of claims 1 to 3, wherein, the rotational resistance imparting unit (37, 41, 42) imparts the rotational resistance to the fulcrum guide (31) so that the number of rotations of the fulcrum guide (31) is 7400 rpm or less.

5. The guide member (16) according to claim 4, wherein, the rotational resistance imparting unit (37, 41, 42) imparts the rotational resistance to the fulcrum guide (31) so that the number of rotations of the fulcrum guide (31) is 5000 rpm or less. 5
6. The guide member (16) according to any one of claims 1 to 5, wherein, the rotational resistance imparting unit (37) includes: 10
- a pressed portion (33b) provided on one side in an axial direction of the fulcrum guide (31); and a pressing member (36) which is configured to press the fulcrum guide (31) toward the pressed portion (33b). 15
7. The guide member (16) according to claim 6, wherein, an interposed member (34) is provided between the fulcrum guide (31) and the pressed portion (33b) and/or between the fulcrum guide (31) and the pressing member (36). 20
8. The guide member (16) according to claim 7, wherein, the interposed member (34) includes: 25
- a thrust bearing portion (34a) which is in contact with an end face of the fulcrum guide (31); and a radial bearing portion (34b) which is in contact with an inner circumferential surface of the fulcrum guide (31). 30
9. The guide member (16) according to any one of claims 6 to 8, wherein, the pressing member (36) is a spring. 35
10. The guide member (16) according to any one of claims 6 to 9, wherein, the pressed portion (33b) is integrally formed with a shaft member (33) that supports the fulcrum guide (31) to be rotatable. 40
11. The guide member (16) according to any one of claims 1 to 5, wherein, 45
- the rotational resistance imparting unit is a contact portion (41, 42) that is formed between the fulcrum guide (31) and a member (34, 35) in contact with the fulcrum guide (31), and at the contact portion (41, 42), friction force is adjusted so that the circumferential speed of the fulcrum guide (31) is lower than the running speed of the yarn (Y). 50
12. The guide member (16) according to claim 11, wherein, the contact portion (41, 42) that functions as the rotational resistance imparting unit is formed between an inner circumferential surface of the fulcrum guide (31) and a member (34, 35) that is in contact with the inner circumferential surface of the 55
- fulcrum guide (31).
13. The guide member (16) according to claim 12, wherein, 60
- an interposed member (34, 35) is provided between the fulcrum guide (31) and a shaft member (33) that supports the fulcrum guide (31) to be rotatable, and the contact portion (41, 42) that functions as the rotational resistance imparting unit is formed between the inner circumferential surface of the fulcrum guide (31) and the interposed member (34, 35).
14. A yarn winder (10) winding yarns (Y) onto bobbins (B) attached to a winding shaft (13), guide members each of which is the guide member (16) of any one of claims 1 to 13 being aligned in an axial direction of the winding shaft (13).

FIG. 1

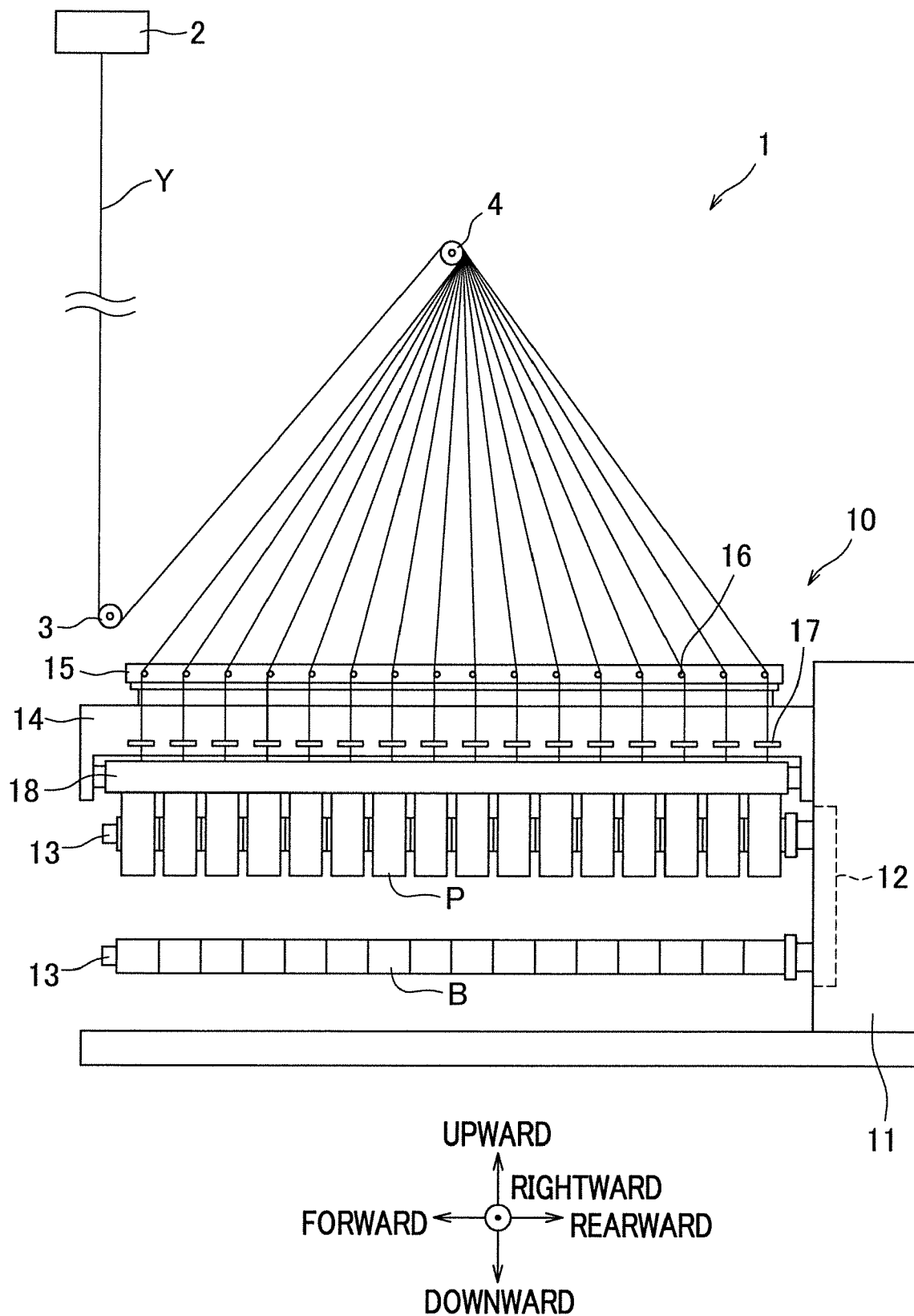


FIG.2

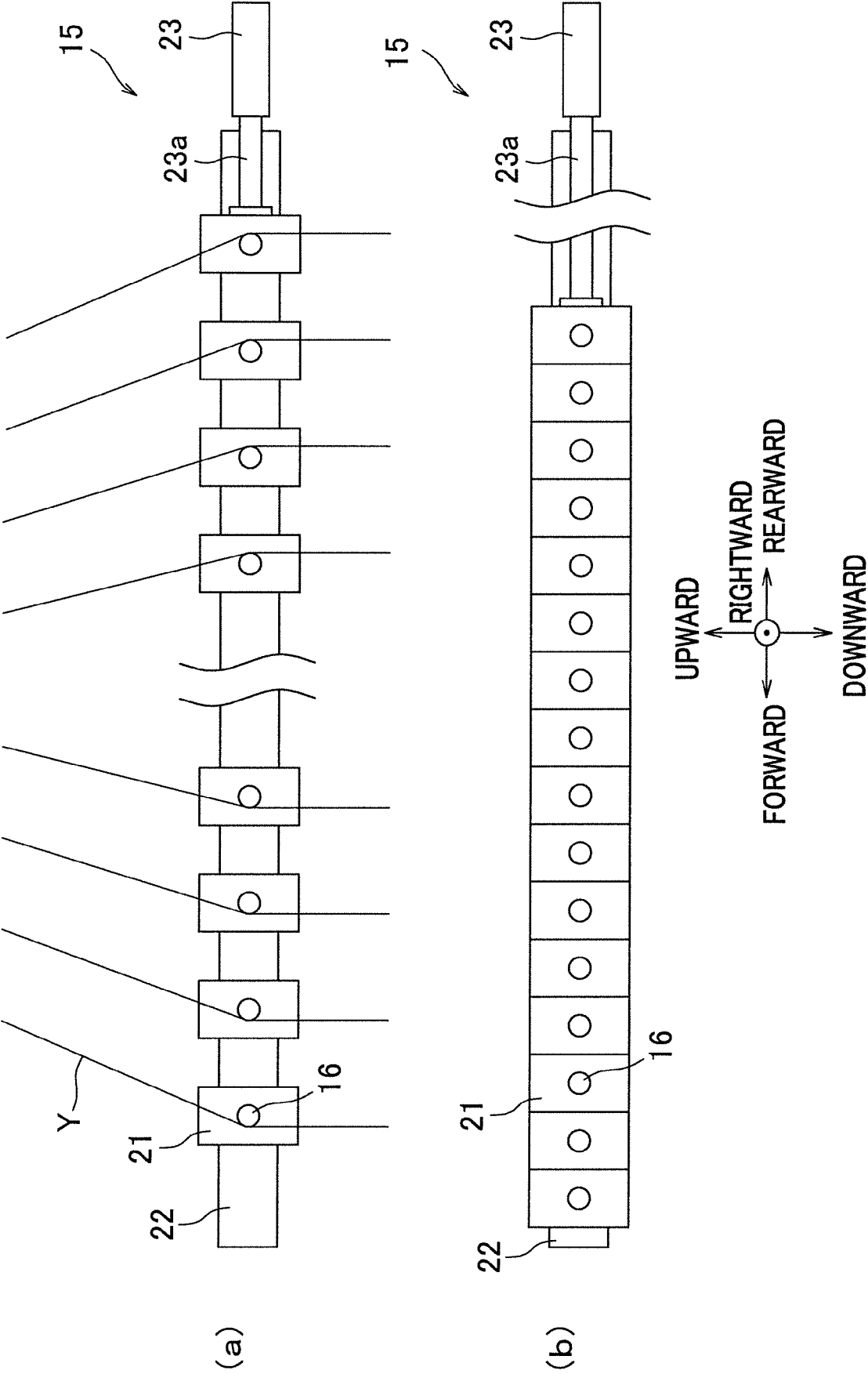


FIG.3

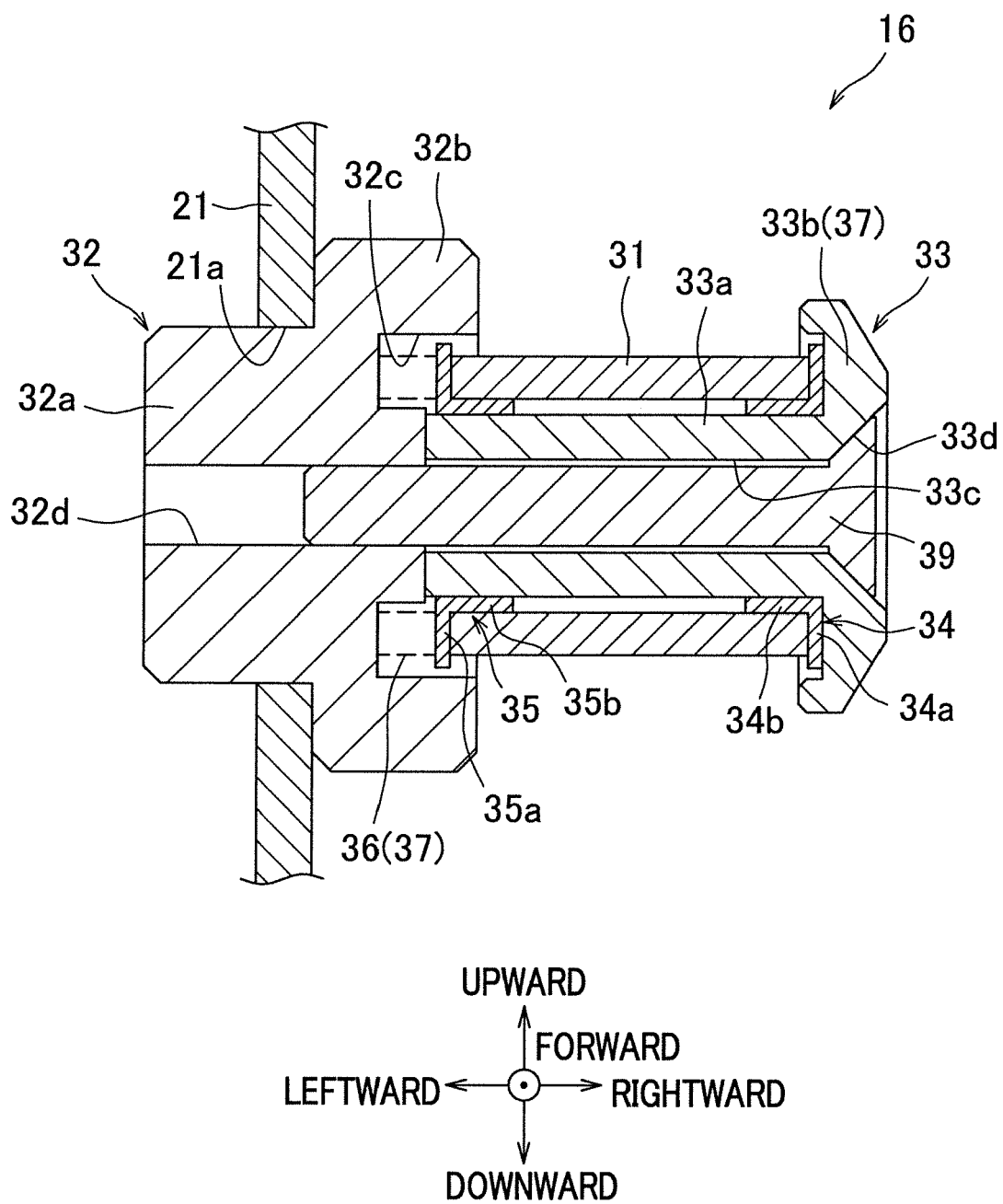
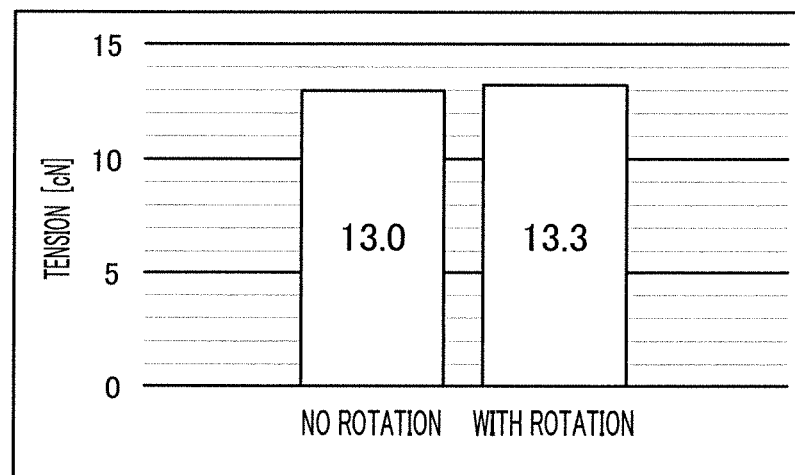
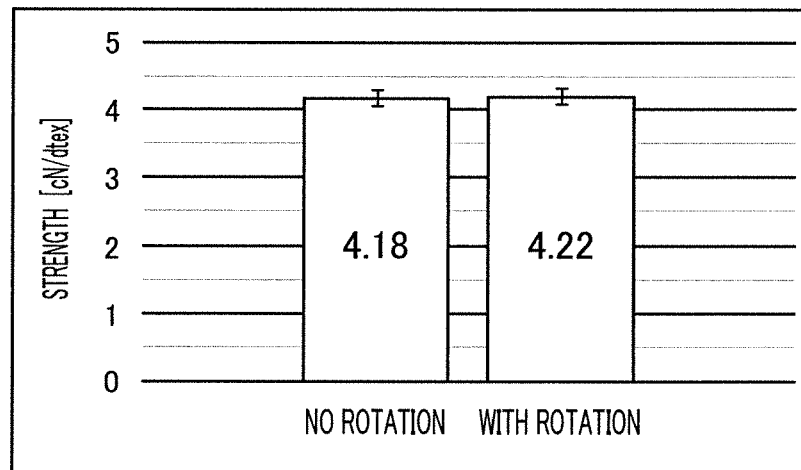


FIG.4

(a)



(b)



(c)

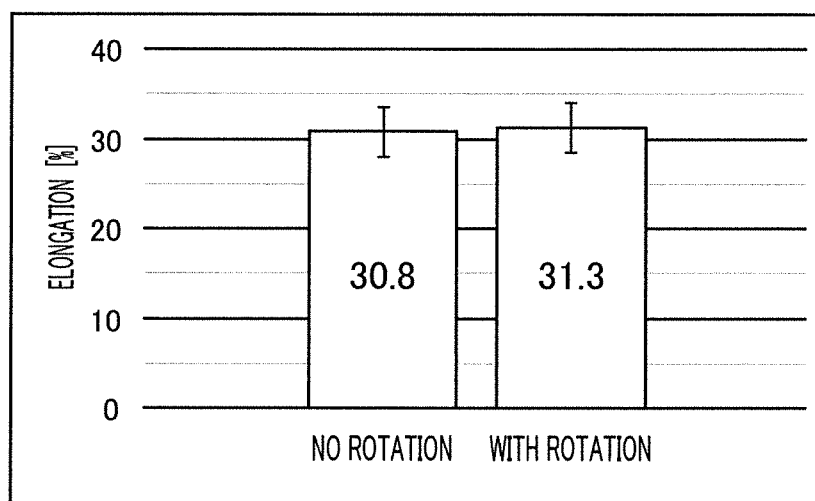


FIG.5

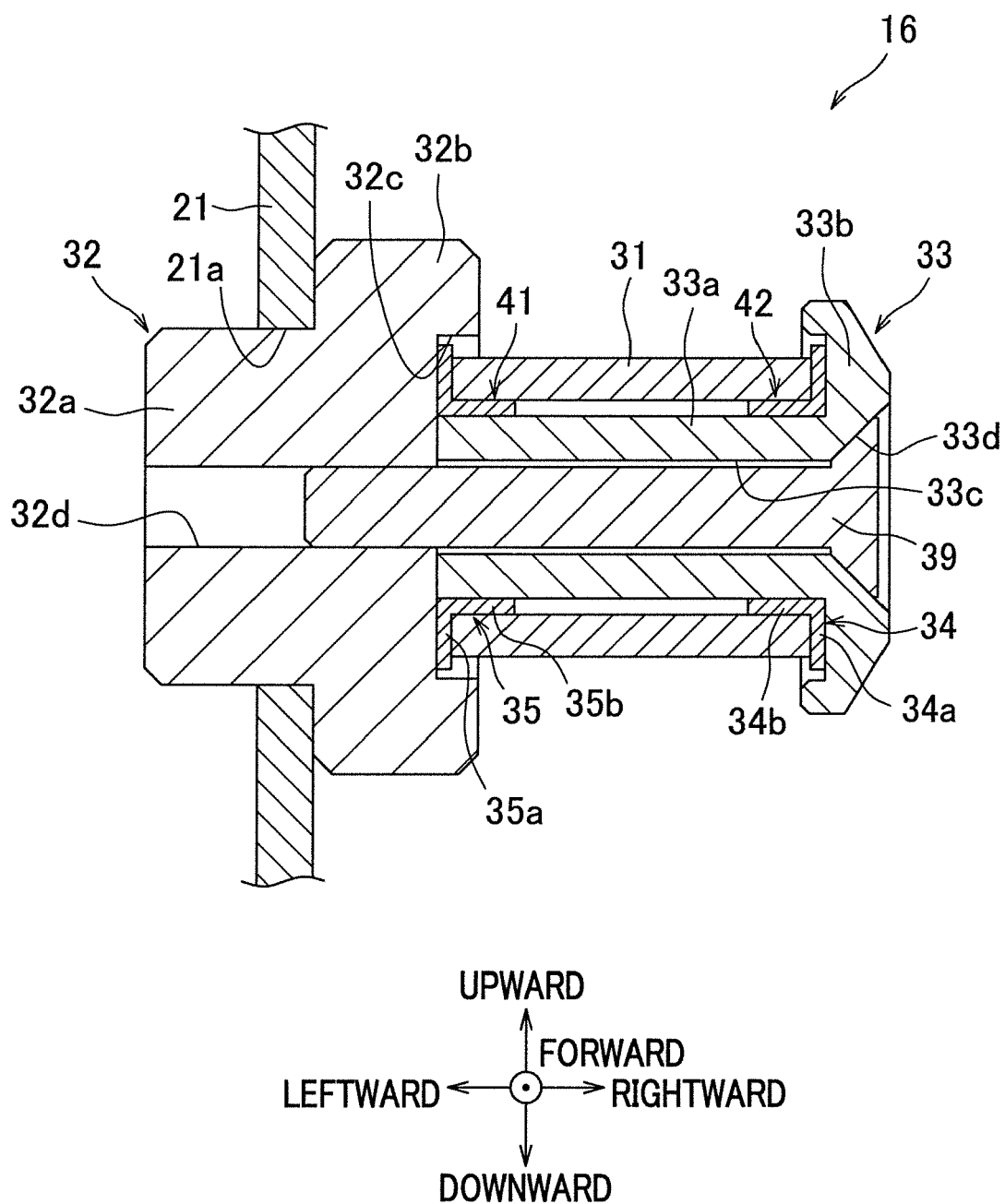
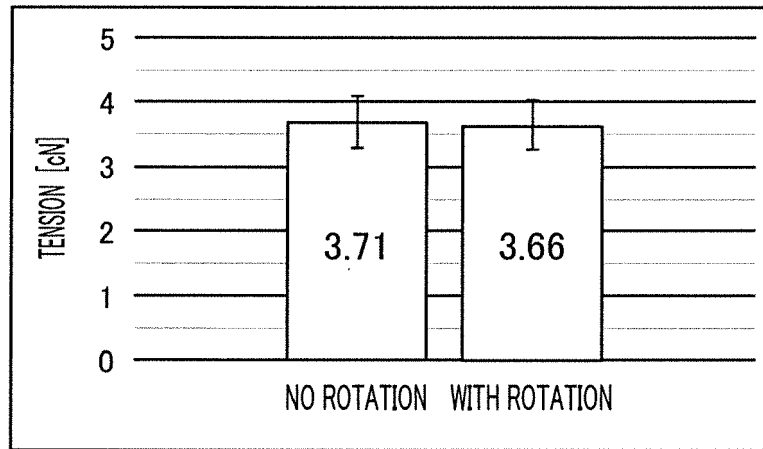
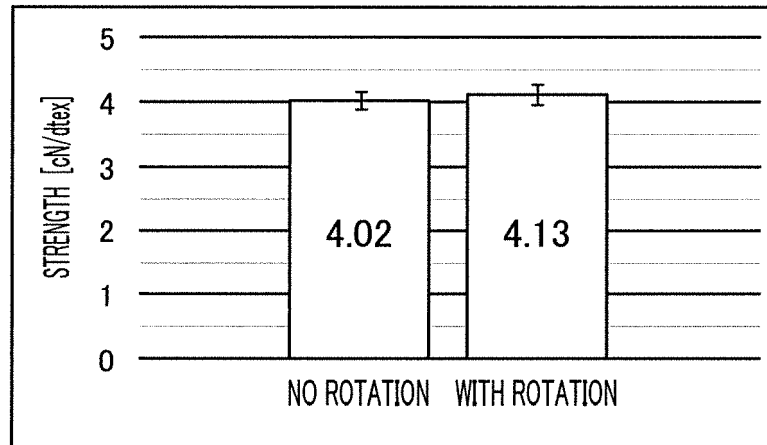


FIG.6

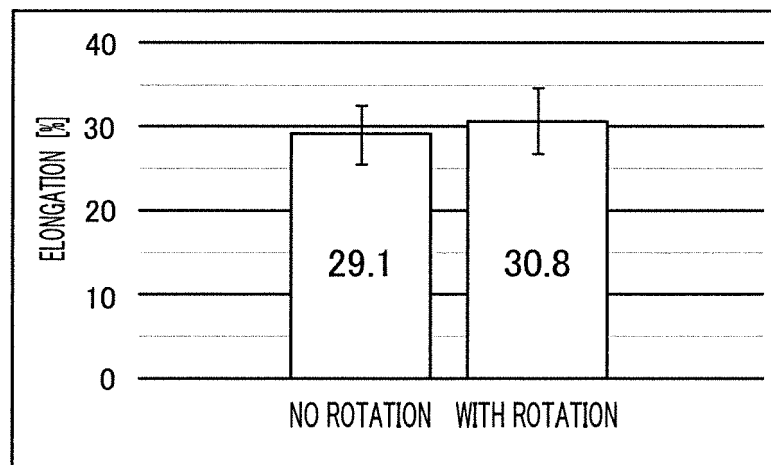
(a)



(b)



(c)





EUROPEAN SEARCH REPORT

Application Number

EP 21 21 5063

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EPO FORM 1503 03.82 (P04C01)

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Y	* paragraphs [0006], [0009], [0012],	14	
A	[0054] - [0056], [0093] - [0097]; figures 4, 4A *	8-10, 12, 13	
Y	DE 10 2013 001889 A1 (OERLIKON TEXTILE GMBH & CO KG [DE]) 7 August 2014 (2014-08-07) * paragraphs [0004], [0005], [0008], [0009], [0029] - [0036]; figures 1, 3, 4 *	14	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 1 June 2022	Examiner Pussemier, Bart
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