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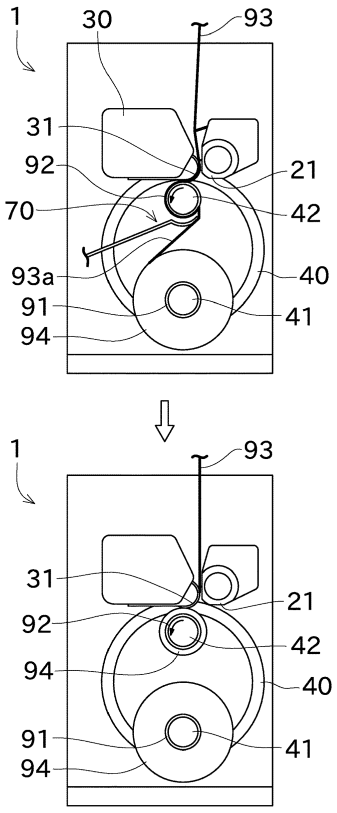
(54) **YARN WINDING MACHINE**

(57) A yarn winding machine 1 includes a turret plate 40 and a switching device 70. The turret plate 40 switches between a first state for manufacturing a package 94 by winding yarn 93 on a first bobbin 91, and a second state for manufacturing the package 94 by winding the yarn 93 on a second bobbin 92. The switching device 70 includes a winding guide, a restriction guide, and a disengagement prevention guide. The winding guide presses connecting yarn 93a and winds it on the second bobbin 92 during switching. The restriction guide restricts, in the axial direction of the second bobbin holder, a movement range of the yarn 93 on the second bobbin 92 side, when the connecting yarn 93a breaks during switching. The disengagement prevention guide prevents disengagement of the yarn 93 on the second bobbin 92 side from the restriction guide, when the connecting yarn 93a breaks during switching.

FIG. 5



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Description

Technical Field

[0001] The present invention mainly relates to a yarn winding machine including a plurality of bobbin holders.

Background Art

[0002] Patent Document 1 is Korean Patent No. 10-2000-0051263.

[0003] Patent Document 1 discloses a yarn winding machine that includes a first bobbin holder and a second bobbin holder. When yarn winding for a bobbin of the first bobbin holder is completed, the yarn winding machine switches the positions of the bobbin holders. Then, the yarn winding machine presses a plate against yarn between the first bobbin holder and the second bobbin holder, and thereby winds the yarn around the bobbin of the second bobbin holder. Then, the rotation speed of the first bobbin holder is decreased to cut the yarn, and winding of the yarn on the bobbin of the second bobbin holder is started.

Summary of Invention

[0004] In the yarn winding machine according to Patent Document 1, if the yarn disengages from the plate, for example, during deceleration of the first bobbin holder, the yarn after breakage moves largely. As a result, the yarn may be wound around an inappropriate region of the bobbin (a position outside the yarn winding width), or the yarn may be wound on the bobbin in a tangled state. Winding yarn around a bobbin in such a state to manufacture a package often results in occurrence of yarn tangling. Thus, in such a case, there is a risk of manufacturing packages with poor unwinding properties.

[0005] The present invention has been made in view of the circumstances described above, and a main object thereof is to provide a yarn winding machine that switches bobbins during winding of yarn, with a configuration for manufacturing packages with excellent unwinding properties.

Means for Solving Problems and Effects Thereof

[0006] The problems to be solved by the present invention are as described above. Next, the means for solving the problems and the effects thereof will be described.

[0007] According to an aspect of the present invention, a yarn winding machine having the following configuration is provided. That is, the yarn winding machine manufactures a package, by rotating a first bobbin or a second bobbin in a first direction about an axial direction, to wind yarn on the first bobbin or the second bobbin. The yarn winding machine includes a first bobbin holder, a second bobbin holder, a bobbin holder moving mechanism, and a switching device. The first bobbin holder holds the first bobbin. The second bobbin holder holds the second bobbin. The bobbin holder moving mechanism rotates in the first direction about a direction parallel to axial directions of the first bobbin holder and the second bobbin holder to change positions of the first bobbin holder and the second bobbin holder to switch between a first state for manufacturing the package by winding the yarn on the first bobbin, and a second state for manufacturing the package by winding the yarn on the second bobbin. The switching device acts on the yarn between the first bobbin and the second bobbin during switching from the first state to the second state. The switching device includes a winding guide, a restriction guide, and a disengagement prevention guide. The winding guide presses, during switching from the first state to the second state, yarn between the first bobbin and the second bobbin to wind the yarn on the second bobbin. The restriction guide restricts, in the axial direction of the second bobbin holder, a movement range of the yarn on the second bobbin side, when the yarn between the first bobbin and the second bobbin breaks during switching from the first state to the second state. The disengagement prevention guide prevents disengagement of the yarn on the second bobbin side from the restriction guide, when the yarn between the first bobbin and the second bobbin breaks during switching from the first state to the second state.

[0008] The disengagement prevention guide prevents disengagement of the yarn from the winding guide or the restriction guide. This makes disengagement of the yarn from the switching device during switching less frequent. Thus, it is possible to make the movement of the broken yarn small. Furthermore, restriction of the movement range of the broken yarn by the restriction guide makes it possible to make the movement of the broken yarn even smaller. Thus, the broken yarn can be wound at an appropriate position on the second bobbin while being suppressed from tangling. As a result, packages with excellent unwinding properties can be manufactured.

[0009] In the yarn winding machine, the restriction guide may be a slit-shaped guide that restricts the movement range of the yarn in the axial direction of the second bobbin holder.

[0010] The restriction guide with such a small width can heighten the effect of restricting the movement range of the broken yarn.

[0011] In the yarn winding machine, the disengagement prevention guide may be a guide that interferes with the yarn on the second bobbin side, in a case where the yarn moves away from the winding guide, when the yarn between the first bobbin and the second bobbin breaks.

[0012] This makes it possible to maintain the state in which the yarn is guided by the winding guide and the restriction guide (the switching device).

[0013] The restriction guide may be provided separately from the winding guide. The restriction guide may be located closer to the second bobbin than the winding guide.

[0014] Positioning the restriction guide closer to the

second bobbin than the winding guide makes it possible to restrict the yarn on the second bobbin side by the restriction guide located near the second bobbin, when the yarn breaks.

[0015] The second bobbin may include, along the axial direction of the second bobbin, a yarn layer formation region around which the yarn is wound for manufacturing the package. The second bobbin may further include an end region located further outside than the yarn layer formation region in the axial direction of the second bobbin. The switching device may be configured to wind a yarn around the yarn layer formation region of the second bobbin.

[0016] This makes it possible for the switching device to wind the yarn on the second bobbin without guiding the yarn to the end region.

[0017] In the yarn winding machine, the switching device may be configured to wind the yarn in a surface region of the second bobbin having no groove and a constant diameter.

[0018] This makes it possible for the switching device to wind the yarn around the second bobbin in which no groove is formed.

[0019] The yarn winding machine may be configured to wind elastic yarn to manufacture the package.

[0020] In this configuration, the present invention is applied to a type of yarn winding machine that winds elastic yarn to manufacture a package.

Brief Description of Drawings

[0021]

FIG. 1 is a front view of a yarn winding machine according to an embodiment of the present invention.

FIG. 2 is a side view of the yarn winding machine.

FIG. 3 is a block diagram of the yarn winding machine.

FIG. 4 is schematic front views of the yarn winding machine illustrating the first half of processing of switching from a first state to a second state.

FIG. 5 is schematic front views of the yarn winding machine illustrating the second half of the processing of switching from the first state to the second state.

FIG. 6 is schematic front views of a yarn winding machine according to a comparative example illustrating a state in which a switching device does not contact connecting yarn.

FIG. 7 is enlarged front views illustrating a change of a yarn path near a second bobbin before and after decrease of rotational speed of a first bobbin holder.

FIG. 8 is a perspective view of a distal end of a switching device.

FIG. 9 is a view of a first guide member when viewed in the thickness direction.

FIG. 10 is a view of a second guide member when viewed in the thickness direction.

FIG. 11 is enlarged front views illustrating a change of a yarn path near a second bobbin before and after decrease of rotational speed of a first bobbin holder, in a variation of the yarn winding machine.

FIG. 12 is a perspective view of a distal end of a switching device of the variation.

FIG. 13 is a view of the distal end of the switching device of the variation, when viewed in the thickness direction.

FIG. 14 is a view of a third guide member of the variation, when viewed in the thickness direction.

Description of Embodiments

[0022] Embodiments of the present invention will be described with reference to the drawings. FIG. 1 is a front view of a yarn winding machine 1 according to an embodiment of the present invention. FIG. 2 is a side view of the yarn winding machine 1. FIG. 3 is a block diagram of the yarn winding machine 1. In the following description, upstream or downstream in a yarn running direction may simply be referred to as "upstream" or "downstream".

[0023] An unillustrated spinning machine is arranged upstream of the yarn winding machine 1 illustrated in FIG. 1. The spinning machine manufactures yarn 93 and supplies the yarn 93 to the yarn winding machine 1. The yarn winding machine 1 winds the yarn 93 on a first bobbin 91 or a second bobbin 92 to manufacture a package 94.

[0024] FIG. 1 illustrates a state where the yarn 93 is wound on the first bobbin 91 to form a yarn layer so that the package 94 is manufactured. On the other hand, the second bobbin 92 is in an empty bobbin state where the yarn 93 is not wound yet. Examples of the yarn 93 includes an elastic yarn such as spandex. Further, the yarn 93 may be a synthetic yarn such as nylon or polyester.

[0025] As illustrated in FIG. 2, in the present embodiment, from the spinning machine to the yarn winding machine 1, a plurality of the yarns 93 arranged in an axial direction of the first bobbin holder 41 (the second bobbin holder 42) are supplied from a yarn feed roller 100. A plurality of the first bobbins 91 are arranged in the axial direction of the first bobbin holder 41 (the second bobbin holder 42). The yarn winding machine 1 winds each of the plurality of yarns 93 on a corresponding one of the first bobbins 91 to manufacture a plurality of the packages 94.

[0026] The yarn winding machine 1 will be described in detail below. As illustrated in FIGS. 1 to 3, the yarn winding machine 1 includes a control device 50, a frame 11, a first housing 20, a second housing 30, and a turret plate (a bobbin holder moving mechanism) 40.

[0027] The control device 50 is configured as a known computer including, for example, a CPU, RAM, and SSD. A CPU is a type of processor. Programs and data for controlling the yarn winding machine 1 are stored in the SSD in advance. The CPU loads the program into the RAM and executes the program. As a result, the control

device 50 controls various devices included in the yarn winding machine 1. The control device 50 may include an HDD or a flash memory instead of the SSD.

[0028] The frame 11 is a member that holds each component provided in the yarn winding machine 1. The first housing 20 is attached with a traverse device 21. As a result of the traverse device 21 reciprocating in a winding width direction (the axial direction of the first bobbin holder 41 or the second bobbin holder 42) with a traverse guide 23 being engaged with the yarn 93, each of the yarns 93 fed downstream is traversed. As a result of traversing the yarn 93, a yarn layer is formed on the first bobbin 91 or the second bobbin 92. As illustrated in FIG. 3, the traverse device 21 includes a traverse cam 22 and the traverse guide 23.

[0029] The traverse cam 22 is a roller-shaped member arranged parallel to the first bobbin 91 or the package 94. A spiral cam groove is formed on an outer peripheral surface of the traverse cam 22. The traverse cam 22 is rotationally driven by a traverse motor 51.

[0030] Traverse motor 51 is controlled by the control device 50. The traverse guide 23 is a portion that is engaged with the yarn 93. A distal end of the traverse guide 23 includes, for example, a substantially U-shaped guide part that engages with the yarn 93 while sandwiching the yarn 93 in the winding width direction. A proximal end of the traverse guide 23 is positioned in a cam groove of the traverse cam 22. In this configuration, when the traverse cam 22 is rotationally driven, it is possible to reciprocate the traverse guide 23 in the winding width direction.

[0031] The second housing 30 is rotatably attached with a contact roller 31. When the yarn 93 is wound, the contact roller 31 is driven to rotate with a contact with the yarn layer of the package 94 with a predetermined pressure to forward the yarn 93 from the traverse guide 23 to the yarn layer of the package 94 and form a yarn layer shape of the package 94 into a shape. It is noted that the contact roller 31 may be rotationally driven by using a drive unit such as a motor.

[0032] As illustrated in FIG. 3, the yarn winding machine 1 includes a lifting and lowering device 60. The lifting and lowering device 60 lifts and lowers the first housing 20 and the second housing 30 all together. Specifically, the first housing 20 and the second housing 30 are attached to a lifting and lowering member 65. A ball nut 61 is attached to the lifting and lowering member 65. A screw rod 62 is attached to the frame 11. When the screw rod 62 is rotated by using a lifting and lowering motor 63, it is possible to lift and lower the first housing 20 and the second housing 30. The lifting and lowering motor 63 is controlled by the control device 50. It is noted that the lifting and lowering device 60 may be realized by using a cylinder instead of the ball screw.

[0033] An operation panel 32 is provided on the second housing 30. The operation panel 32 is a device operated by an operator. The operator applies an instruction to the yarn winding machine 1 by operating the operation panel 32. Examples of the instruction applied by the operator include starting winding, stopping winding, and changing a winding condition.

[0034] The turret plate 40 is a disk-shaped member. The turret plate 40 is rotatably attached to the frame 11. The turret plate 40 is rotatable about a rotation axis which is a normal line passing through the center of the disk. The turret plate 40 is rotationally driven by a turret motor 53 illustrated in FIG. 3. The turret motor 53 is controlled by the control device 50.

[0035] On the turret plate 40, the first bobbin holder 41 and the second bobbin holder 42 are provided at two locations facing each other across the center of the disk, respectively. A plurality of the first bobbins 91 can be attached on the first bobbin holder 41 by being arranged in the axial direction of the first bobbin holder 41. A plurality of the second bobbins 92 can be attached on the second bobbin holder 42 by being arranged in the axial direction of the second bobbin holder 42. By rotating the turret plate 40, the positions of the first bobbin holder 41 and the second bobbin holder 42 can be changed. The direction of the rotational axis of the turret plate 40 is parallel to the axial direction of the first bobbin holder 41 or the second bobbin holder 42. Further, the rotation direction of the turret plate 40 upon changing the positions of the first bobbin holder 41 and the second bobbin holder 42 (upon switching from a first state to a second state, which will be described later) is a first direction (counterclockwise in FIG. 4, which will be described later). It is noted that as long as the positions of the first bobbin holder 41 and the second bobbin holder 42 can be changed, another device may be used instead of the turret plate 40.

[0036] The first bobbin holder 41 can rotate about the axial position of the first bobbin holder 41 with respect to the turret plate 40. The first bobbin holder 41 is rotationally driven by a first bobbin holder motor 54 illustrated in FIG. 3. Similarly, the second bobbin holder 42 can rotate about the axial position of the second bobbin holder 42 with respect to the turret plate 40. The second bobbin holder 42 is rotationally driven by a second bobbin holder motor 55 illustrated in FIG. 3. The first bobbin holder motor 54 and the second bobbin holder motor 55 are controlled by the control device 50. When manufacturing the package 94 by winding the yarn 93 around the first bobbin 91, the first bobbin holder 41 and the first bobbin 91 rotate in the first direction about the axial direction (the axial direction of the first bobbin 91, the axial direction of the first bobbin holder 41). Similarly, when manufacturing the package 94 by winding the yarn 93 around the second bobbin 92, the second bobbin holder 42 and the second bobbin 92 rotate in the first direction about the axial direction (the axial direction of the second bobbin 92, the axial direction of the second bobbin holder 42). That is, the rotation directions of the first bobbin 91 and the second bobbin 92 when the package 94 is manufactured are the same as the rotation direction of the turret plate 40 when changing the positions of the first bobbin holder 41

and the second bobbin holder 42.

[0037] In FIG. 1, the first bobbin holder 41 and the second bobbin holder 42 are in a state of being arranged vertically. In this state, a higher position at which the first bobbin holder 41 is located is a winding position, and a lower position at which the second bobbin holder 42is located is a standby position. The yarn winding machine 1 winds the yarn 93 on the first bobbin holder 41 at the winding position to manufacture the package 94.

[0038] Once a predetermined amount of yarn 93 has been wound and full winding of the package 94 of the first bobbin holder 41 has been achieved, switching from the first state for manufacturing the package 94 by winding the yarn 93 on the first bobbin 91, to the second state for manufacturing the package 94 by winding the yarn 93 on the second bobbin 92 is performed. The processing of switching from the first state to the second state will be described below with reference to FIGS. 4 and 5.

[0039] The upper diagram in FIG. 4 illustrates the first state for manufacturing the package 94 by winding the yarn 93 on the first bobbin 91 of the first bobbin holder 41. Specifically, the traverse device 21 traverses the yarn 93 being wound around the first bobbin 91. The contact roller 31 contacts the first bobbin 91 (the package 94) and sends the yarn 93 being traversed by the traverse device 21 to the first bobbin 91 (the package 94). In this way, the yarn 93 is wound around the first bobbin 91 for manufacturing the package 94.

[0040] Once full winding of the package 94 of the first bobbin holder 41 has been achieved, switching from the first state to the second state is performed. It is noted that determination whether full winding of the package 94 has been achieved can be made based on detection value, for example, from a sensor that detects the position of the contact roller 31 or the like affected by thickening of the package 94, or a sensor that detects the length of the yarn 93 that has been wound.

[0041] When full winding of the package 94 of the first bobbin holder 41 has been achieved, the lifting and lowering device 60 moves the first housing 20 and the second housing 30 upward (the lower diagram in FIG. 4). Further, the turret plate 40 driven by the turret motor 53 switches the positions of the first bobbin holder 41 and the second bobbin holder 42 (the lower diagram in FIG. 4). As a result, the second bobbin holder 42 is located at the winding position, and the first bobbin holder 41 is located at the standby position. At this time, a part of the yarn 93 is stretched between the first bobbin 91 (the package 94) and the second bobbin 92. Hereinafter, the part of the yarn 93 will be referred to as connecting yarn 93a. Furthermore, when viewed in the axial direction of the first bobbin holder 41 or the second bobbin holder 42 (for example, the lower diagram in FIG. 4), the connecting yarn 93a is located on a first side (the left side in FIG. 4) in the horizontal direction with respect to the axial position of the second bobbin holder 42, and the connecting yarn 93a is wound around the package 94 from the first side (the left side in FIG. 4) in the horizontal direction with respect to the axial position of the first bobbin holder 41.

[0042] Next, processing of winding the yarn 93 around the second bobbin 92 is performed. Specifically, the lifting and lowering device 60 moves the first housing 20 and the second housing 30 downward (the upper view of FIG. 5). Furthermore, the second bobbin holder motor 55 rotationally drives the second bobbin holder 42 (the upper diagram in FIG. 5). In this state, the switching device 70 acts on the connecting yarn 93a (the upper diagram in FIG. 5).

[0043] The switching device 70 presses the connecting yarn 93a in such a manner that the connecting yarn 93a is pressed against the second bobbin 92. As a result, the winding angle of the yarn 93 with respect to the second bobbin 92 becomes larger than before being pressed by the switching device 70. The winding angle is the angle of a part of the yarn 93 that has been wound on the second bobbin 92, when viewed in the axial direction of the second bobbin holder 42. The yarn 93 is wound in a yarn layer formation region of the second bobbin 92 provided along the axial direction of the second bobbin 92. The yarn layer formation region is a region along the axial direction of the second bobbin 92 in which the yarn 93 is wound for manufacturing the package 94. Further, a region located further outside than the yarn layer formation region in the axial direction of the second bobbin 92 is referred to as an end region. Some bobbins have a groove (slit) formed in the end region, and the yarn may be guided to the groove to be fixed to the bobbin. In contrast, in the second bobbin 92 of the present embodiment, both of the yarn layer formation region and the end region do not include any groove. The second bobbin 92 has a cylindrical shape and has a constant diameter in a region where there is no groove.

[0044] The switching device 70 includes an unillustrated actuator (a cylinder, a solenoid, a motor, or the like) that realizes pressing of the connecting yarn 93a. The actuator of the switching device 70 is controlled by the control device 50. While the switching device 70 presses the connecting yarn 93a, the first bobbin holder motor 54 decreases the rotational speed of the first bobbin holder 41. Thereby, the yarn 93 can be wound around the second bobbin 92. Furthermore, winding the yarn 93 around the second bobbin 92 increases the tension applied to the connecting yarn 93a, and as a result, the connecting yarn 93a breaks. Since the connecting yarn 93a is bent by the switching device 70, the connecting yarn 93a basically breaks between the contact point with the switching device 70 and the first bobbin 91. Of the broken yarns 93, the yarn 93 on the second bobbin holder 42 side is wound around the second bobbin 92. Further, the broken yarns 93 on the first bobbin holder 41 side are wound around the package 94. In this way, switching from the first state to the second state is achieved.

[0045] Thereafter, the yarn winding machine 1 winds the yarn 93 on the second bobbin 92 to manufacture the package 94 (the lower diagram in FIG. 5). Further, the fully wound package 94 of the first bobbin holder 41 at

the standby position is removed, and a new first bobbin 91 around which the yarn 93 is not yet wound is attached to the first bobbin holder 41.

[0046] Next, with reference to FIG. 6, a package defect that may occur in switching from the first state to the second state will be described.

[0047] FIG. 6 illustrates a yarn winding machine 1 according to a comparative example. The yarn winding machine 1 according to the comparative example includes a switching device 170. The upper diagram of FIG. 6 illustrates a situation in which the switching device 170 is not in contact with the connecting yarn 93a at a time of breakage of the connecting yarn 93a as a result of winding the yarn 93 around the second bobbin 92 and then decreasing the rotational speed of the first bobbin holder 41.

[0048] The moment the connecting yarn 93a breaks, the tension applied to the yarn 93 disappears. Thus, the movement of the yarn 93 is no longer restricted, and the broken yarn 93 on the second bobbin 92 side moves largely. Thus, the yarn 93 on the second bobbin 92 side may be wound at an inappropriate position in the second bobbin 92 (a position outside the winding width of the yarn 93), or the yarn 93 may be wound around the second bobbin 92 in a tangled state. When the package 94 is manufactured by winding the yarn 93 around the second bobbin 92 in such a state, the risk of tangling between the yarn 93 wound at the inappropriate position or the tangled yarn 93 and the yarn 93 wound thereon may increase. The tangling of the yarn 93 results in the manufactured package 94 with low unwinding properties.

[0049] The switching device 70 of the present embodiment includes a plurality of yarn guides which decrease the risk of occurrence of such a situation. The detailed configuration of the switching device 70 will be described below. As illustrated in FIGS. 7 and 8, the switching device 70 includes a first guide member 71 and a second guide member 72. A winding guide 81, a restriction guide 82, and a tapered portion 83 are formed in the first guide member 71. A disengagement prevention guide 84 and a slope portion 85 are formed in the second guide member 72.

[0050] The first guide member 71 is a member that serves as a base of the switching device 70. The first guide member 71 is a member that moves by being driven by the actuator described above. As illustrated in FIG. 8, the second guide member 72 is fixed to the first guide member 71 by a fastener 111. Specifically, the first guide member 71 has a tapped hole, and the second guide member 72 has a through hole. By aligning the tapped hole of the first guide member 71 with the through hole of the second guide member 72 and inserting the fastener 111 such as a screw to fasten, the second guide member 72 is fixed to the first guide member 71. The fixing method is not limited to this, and the first guide member 71 and the second guide member 72 may be fixed to each other with a bolt and a nut, or a rivet, or may be welded to each other. Fixing the first guide member 71 to the second guide member 72 makes it possible for the first guide member 71 and the second guide member 72 (i.e., the winding guide 81, the restriction guide 82, and the disengagement prevention guide 84) to move together.

[0051] The first guide member 71 and the second guide member 72 are members formed from a plate material. The first guide member 71 and the second guide member 72 are arranged on top of each other in the thickness direction. In the present embodiment, the second guide member 72 is arranged upstream of the first guide member 71 in the running direction of the yarn 93. Thus, the winding guide 81 and the disengagement prevention guide 84 are arranged on top of each other in the thickness direction (in particular, the disengagement prevention guide 84 is arranged on the upstream side). Moreover, the restriction guide 82 and the disengagement prevention guide 84 are arranged on top of each other in the thickness direction (in particular, the disengagement prevention guide 84 is arranged on the upstream side). However, the second guide member 72 may be arranged downstream of the first guide member 71.

[0052] As described above, in the yarn winding machine 1 of the present embodiment, the plurality of second bobbins 92 are arranged along the axial direction of the second bobbin holder 42. In the switching device 70, a combination of the winding guide 81, the restriction guide 82, and the disengagement prevention guide 84 is provided for each of the second bobbins 92. Thus, the switching device 70 of the present embodiment includes a plurality of combinations of the winding guide 81, the restriction guide 82, and the disengagement prevention guide 84. A plurality of combinations of the winding guide 81 and the restriction guide 82 may be formed together in one first guide member 71, or each of the combinations may be formed in a corresponding one of separate first guide members 71. A plurality of disengagement prevention guides 84 may be formed together in one second guide member 72 or each of the disengagement prevention guides 84 may be formed in a corresponding one of separate second guide members 72.

[0053] Hereinafter, details of each guide formed in the first guide member 71 and the second guide member 72 will be explained.

[0054] As illustrated in FIGS. 8 and 9, a slit-shaped recess is formed in the first guide member 71. The slit-shaped recess is formed at a position aligned with the center of the yarn layer formation region in the axial direction of the second bobbin 92. The winding guide 81 is a portion of the contour of the slit-shaped recess that is closest to the base (a portion opposite to the distal end). The winding guide 81 formed in the first guide member 71 comes into contact with and presses the connecting yarn 93a during switching from the first state to the second state. Thereby, the connecting yarn 93a can be wound around the second bobbin 92.

[0055] The portion other than the winding guide 81 of the slit-shaped recesses formed in the first guide member 71 (in other words, a portion having two opposing edges)

is the restriction guide 82. During switching from the first state to the second state, the winding guide 81 presses the connecting yarn 93a. That is, the connecting yarn 93a is located in a region formed by the winding guide 81 and the restriction guide 82. During switching from the first state to the second state, the connecting yarn 93a breaks at a location between the winding guide 81 and the first bobbin 91. The restriction guide 82 restricts, in the winding width direction (the axial direction of the second bobbin holder 42), movement of the broken yarn 93 on the second bobbin 92 side. Thus, it is possible to make the movement of the broken yarn 93 small. As a result, the yarn 93 is wound around the second bobbin 92 at an appropriate position (in a range included in the winding width of the yarn 93), and the risk of tangling of the yarn 93 when the yarn 93 is wound around the second bobbin 92 is reduced. In particular, if the connecting yarn 93a breaks at a location closer to the first bobbin 91 than the switching device 70, the broken yarn 93 on the second bobbin 92 side tends to move largely. Thus, in such a case, the above-mentioned effect of the restriction guide 82 is even more beneficial.

[0056] The tapered portion 83 is formed to be more to the distal end side than the restriction guide 82. The tapered portion 83 has a tapered shape that widens towards the distal end of the switching device 70. In other words, the width of the tapered portion 83 increases towards the distal end of the switching device 70. The restriction guide 82 is connected to the base of the tapered portion 83. The width of the tapered portion 83 includes a portion wider than the slit width of the tapered portion 83. Since the restriction guide 82 is provided at the center of the yarn layer formation region in the axial direction of the second bobbin 92, during switching from the first state to the second state, the traverse operation of the traverse device 21 guides the yarn 93 into the tapered portion 83. Alternatively, in a case where the yarn 93 is disengaged from the traverse device 21 during switching from the first state to the second state, the yarn 93 is guided to the tapered portion 83 by its own tension. During switching from the first state to the second state, the connecting yarn 93a is guided by the tapered portion 83, passes through the restriction guide 82, and comes into contact with the winding guide 81. That is, the tapered portion 83 has a function of guiding the connecting yarn 93a toward the winding guide 81. It is noted that the shape of the winding guide 81, the restriction guide 82, or the tapered portion 83 may be different from that of the present embodiment. Further, the first guide member 71 may not include the tapered portion 83.

[0057] As illustrated in FIGS. 8 and 10, the disengagement prevention guide 84 formed in the second guide member 72 has a portion facing the winding guide 81. In other words, the disengagement prevention guide 84 closes a part of the open side of the slit-shaped recess formed by the winding guide 81 and the restriction guide 82.

[0058] The disengagement prevention guide 84 suppresses disengagement of the yarn 93 on the second bobbin 92 side from the winding guide 81 and the restriction guide 82 when the connecting yarn 93a breaks during switching from the first state to the second state. As a result, the yarn 93 on the second bobbin 92 side is wound around the second bobbin 92 at an appropriate position (in a range included in the winding width of the yarn 93), and the risk of tangling of the yarn 93 on the second bobbin 92 side when the yarn 93 on the second bobbin 92 side is wound around the second bobbin 92 is reduced. In particular, if the connecting yarn 93a breaks at a location closer to the first bobbin 91 than the switching device 70, the broken yarn 93 on the second bobbin 92 side tends to move largely and disengage from the restriction guide 82. Thus, in such a case, the above-mentioned effect of the disengagement prevention guide 84 is even more beneficial.

[0059] Further, when the connecting yarn 93a breaks during switching from the first state to the second state, the centrifugal force of the rotation of the second bobbin holder 42 may largely move the broken yarn 93 on the second bobbin 92 side in such a manner that the broken yarn 93 swings radially outward. In such a case, in the present embodiment including the disengagement prevention guide 84, the disengagement prevention guide 84 interferes with the yarn 93 on the second bobbin side that swings radially outward. Thus, it is possible to make radially outward swing movement of the broken yarn 93 on the second bobbin side small.

[0060] As illustrated in FIGS. 8 and 10, the slope portion 85 is formed on the distal end side of the disengagement prevention guide 84. The slope portion 85 has a shape that slopes so as to widen towards the base. The slope portion 85 guides the connecting yarn 93a toward the winding guide 81 and the restriction guide 82 along the slope.

[0061] As illustrated in FIG. 7, the switching device 70 (the first guide member 71) of the present embodiment has a portion having an arc shape when viewed in the axial direction of the second bobbin holder 42. The arc-shaped portion helps the distal end of the switching device 70 to be placed closer to the second bobbin holder 42. In other words, the location where movement in the winding width direction is restricted by the first guide member 71 is close to the location where the broken yarn 93 is wound. Thus, the yarn 93 can be wound around the second bobbin 92 while being prevented from largely moving.

[0062] Next, a variation of the yarn winding machine 1 will be described with reference to FIGS. 11 to 14. In the following description, the same or similar members as those in the above-described embodiment are denoted by the same reference numerals in the drawings, and their description may be omitted.

[0063] The yarn winding machine 1 according to the variation differs from the above embodiment in that the winding guide 81 is provided separately from the restriction guide 82. As illustrated in FIGS. 11 and 12, the

switching device 70 of the variation further includes a third guide member 73. In the variation, the restriction guide 82 is formed in the first guide member 71, the disengagement prevention guide 84 is formed in the second guide member 72, and the winding guide 81 is formed in the third guide member 73. The third guide member 73 (the winding guide 81) is arranged downstream of the first guide member 71 (the restriction guide 82) in the running direction of the yarn 93 before breakage. Thus, the distance from the restriction guide 82 to the second bobbin 92 is shorter than the distance from the winding guide 81 to the second bobbin 92. In other words, the restriction guide 82 is located closer to the second bobbin 92 than the winding guide 81.

[0064] The third guide member 73 is fixed to the first guide member 71 by a fastener 112. A fixing structure between the first guide member 71 and the third guide member 73 is similar to the fixing structure between the first guide member 71 and the second guide member 72. As illustrated in FIG. 11, the third guide member 73 has a bent portion. As a result, the base side of the third guide member 73 is in contact with the first guide member 71, and the distal end side of the third guide member 73 is spaced from the first guide member 71. The first guide member 71, the second guide member 72, and the third guide member 73 move together.

[0065] As illustrated in FIGS. 12 to 14, the winding guide 81 of the variation is formed at the distal end of the third guide member 73, and has a V-shape that has a width increasing towards the distal end side. This configuration makes it possible to guide the connecting yarn 93a toward the inside of the V-shaped groove, when the switching device 70 presses the connecting yarn 93a. The winding guide 81 is formed at a position aligned with the center of the yarn layer formation region in the axial direction of the bobbin. This makes it difficult for the connecting yarn 93a to move to a position outside the winding width when the yarn breaks.

[0066] In this variation, the first guide member 71 moves toward the connecting yarn 93a to cause the winding guide 81 of the third guide member 73 to press the connecting yarn 93a and wind the yarn 93 around the second bobbin 92 by a predetermined angle. Then, the rotational speed of the first bobbin holder 41 is decreased to change the yarn path. The yarn path is bent by the winding guide 81. Thus, a strong force is applied to the connecting yarn 93a at the point of contact with the winding guide 81, and thus the connecting yarn 93a breaks at a location between the winding guide 81 and the first bobbin 91.

[0067] The movement of the broken yarn 93 in the winding width direction is restricted by the restriction guide 82 of the first guide member 71, as in the above embodiment. Furthermore, the disengagement prevention guide 84 of the second guide member 72 suppresses the broken yarn 93 from disengaging from the switching device 70, and from swinging outward in the radial direction. Thus, the yarn 93 can be wound around the second bobbin 92 while being prevented from largely moving.

[0068] It is noted that the shape of the winding guide 81 is merely an example, and the winding guide 81 may be a rectangular groove instead of the V-shaped groove, or a groove may not be formed.

[0069] As described above, the yarn winding machine 1 according to the above-described embodiment manufactures the package 94, by rotating the first bobbin 91 or the second bobbin 92 in the first direction about the axial direction, to wind yarn 93 on the first bobbin 91 or the second bobbin 92. The yarn winding machine 1 includes the first bobbin holder 41, the second bobbin holder 42, the turret plate 40, and the switching device 70. The first bobbin holder 41 holds the first bobbin 91. The second bobbin holder 42 holds the second bobbin 92. The turret plate 40 rotates in the first direction about a direction parallel to axial directions of the first bobbin holder 41 and the second bobbin holder 42 to change positions of the first bobbin holder 41 and the second bobbin holder 42 to switch between a first state for manufacturing the package 94 by winding the yarn 93 on the first bobbin 91, and a second state for manufacturing the package 94 by winding the yarn 93 on the second bobbin 92. The switching device 70 acts on the yarn 93 between the first bobbin 91 and the second bobbin 92 during switching from the first state to the second state. The switching device 70 includes the winding guide 81, the restriction guide 82, and the disengagement prevention guide 84. The winding guide 81 presses, during switching from the first state to the second state, the connecting yarn 93a between the first bobbin 91 and the second bobbin 92 to wind the yarn 93 on the second bobbin 92. The restriction guide 82 restricts, in the axial direction of the second bobbin holder 42, a movement range of the yarn 93 on the second bobbin 92 side, when the connecting yarn 93a between the first bobbin 91 and the second bobbin 92 breaks during switching from the first state to the second state. The disengagement prevention guide 84 prevents disengagement of the yarn 93 on the second bobbin 92 side from the restriction guide 82, when the connecting yarn 93a between the first bobbin 91 and the second bobbin 92 breaks during switching from the first state to the second state.

[0070] The disengagement prevention guide 84 prevents disengagement of the yarn from the winding guide 81 or the restriction guide 82. This makes disengagement of the connecting yarn 93a from the switching device 70 during switching less frequent. Thus, it is possible to make the movement of the broken yarn 93 small. Furthermore, restriction of the movement range of the broken yarn 93 by the restriction guide 82 makes it possible to make the movement of the broken yarn 93 even smaller. Thus, the broken yarn 93 can be wound at an appropriate position on the second bobbin 92 while being suppressed from tangling. As a result, packages 94 with excellent unwinding properties can be manufactured.

[0071] In the yarn winding machine 1 according to the present embodiment, the restriction guide 82 is a slit-

shaped guide restricts the movement range of the yarn 93 in the axial direction of the second bobbin holder 42.

[0072] The restriction guide 82 with such a small width can heighten the effect of restricting the movement range of the broken yarn 93.

[0073] In the yarn winding machine 1 according to the present embodiment, the disengagement prevention guide 84 is a guide that interferes with the connecting yarn 93a on the second bobbin 92 side guided by the winding guide 81, in a case where the yarn 93a moves away from the winding guide 81, when the connecting yarn 93a between the first bobbin 91 and the second bobbin 92 breaks.

[0074] This makes it possible to maintain the state in which the connecting yarn 93a is guided by the winding guide 81 and the restriction guide 82 (the switching device 70).

[0075] In the variation of the yarn winding machine 1, the restriction guide 82 is provided separately from the winding guide 81. The restriction guide 82 is located closer to the second bobbin 92 than the winding guide 81.

[0076] Positioning the restriction guide 82 closer to the second bobbin 92 than the winding guide 81 makes it possible to restrict the yarn 93 on the second bobbin 92 side by the restriction guide 82 located near the second bobbin 92, when the yarn breaks.

[0077] In the yarn winding machine 1 according to the present embodiment, the second bobbin 92 includes, along the axial direction of the second bobbin 92, the yarn layer formation region around which the yarn 93 is wound for manufacturing the package 94, and the end region located further outside than the yarn layer formation region in the axial direction of the second bobbin 92. The switching device 70 winds the yarn 93 around the yarn layer formation region of the second bobbin 92.

[0078] This makes it possible for the switching device 70 to wind the yarn 93 on the second bobbin 92 without guiding the yarn 93 to the end region.

[0079] In the yarn winding machine 1 according to the present embodiment, the switching device 70 winds the yarn 93 in a region of the second bobbin 92 having no groove and a constant diameter.

[0080] This makes it possible for the switching device 70 to wind the yarn around the second bobbin 92 in which no groove is formed.

[0081] The yarn winding machine 1 according to the present embodiment winds elastic yarn 93 to manufacture the package 94.

[0082] In this case, the present technique is applied to a type of yarn winding machine 1 that winds elastic yarn to manufacture a package 94.

[0083] Although preferred embodiments of the present invention have been described above, the above configurations may be modified, for example, as follows.

[0084] In the embodiment described above, switching the bobbin holder subjected to winding the yarn 93 from the first bobbin holder 41 to the second bobbin holder 42 is performed, in a state where the first bobbin holder 41 holding a fully wound package 94 is at the standby position and the second bobbin holder 42 to be used for producing a new package 94 is at the winding position. However, the positions of the first bobbin holder 41 and the second bobbin holder 42 when switching the bobbin holder subjected to winding the yarn 93 is performed are not limited to those.

[0085] Although the traverse device 21 of the above embodiment is of cam drum type, the traverse device 21 may have a different configuration as long as it is possible to reciprocate the traverse guide 23 in the winding width direction. For example, instead of the traverse device 21, a belt-type traverse device may be used.

Claims

1. A yarn winding machine (1) for manufacturing a package (94), by rotating a first bobbin (91) or a second bobbin (92) in a first direction about an axial direction, to wind yarn (93) on the first bobbin (91) or the second bobbin (92), the yarn winding machine (1) comprising:

   a first bobbin holder (41) configured to hold the first bobbin (91);
   a second bobbin holder (42) configured to hold the second bobbin (92);
   a bobbin holder moving mechanism (40) configured to rotate in the first direction about a direction parallel to axial directions of the first bobbin holder (41) and the second bobbin holder (42) to change positions of the first bobbin holder (41) and the second bobbin holder (42) to switch between a first state for manufacturing the package (94) by winding the yarn (93) on the first bobbin (91), and a second state for manufacturing the package (94) by winding the yarn (93) on the second bobbin (92); and
   a switching device (70) configured to act on the yarn (93) between the first bobbin (91) and the second bobbin (92) during switching from the first state to the second state, wherein
   the switching device (70) includes,

      a winding guide (81) configured to press, during switching from the first state to the second state, yarn (93a) between the first bobbin (91) and the second bobbin (92) to wind the yarn (93) on the second bobbin (92),
      a restriction guide (82) configured to restrict, in the axial direction of the second bobbin holder (42), a movement range of the yarn (93) on the second bobbin (92) side, when the yarn (93a) between the first bobbin (91) and the second bobbin (92) breaks during switching from the first state to the second

state, and
a disengagement prevention guide configured to prevent disengagement of the yarn (93a) on the second bobbin (92) side from the restriction guide (82), when the yarn (93a) between the first bobbin (91) and the second bobbin (92) breaks during switching from the first state to the second state.

2. The yarn winding machine (1) according to claim 1, wherein
the restriction guide (82) is a slit-shaped guide configured to restrict the movement range of the yarn (93) in the axial direction of the second bobbin holder (42).

3. The yarn winding machine (1) according to claim 1 or 2, wherein
the disengagement prevention guide is a guide configured to interfere with the yarn (93a) on the second bobbin (92) side, in a case where the yarn (93a) moves away from the winding guide (81), when the yarn (93a) between the first bobbin (91) and the second bobbin (92) breaks.

4. The yarn winding machine (1) according to any one of claims 1 to 3, wherein

the restriction guide (82) is provided separately from the winding guide (81), and
the restriction guide (82) is located closer to the second bobbin (92) than the winding guide (81).

5. The yarn winding machine (1) according to any one of claims 1 to 4, wherein

the second bobbin (92) includes, along the axial direction of the second bobbin (92), a yarn layer formation region around which the yarn (93) is wound for manufacturing the package (94), and an end region located further outside than the yarn layer formation region in the axial direction of the second bobbin (92), and
the switching device (70) is configured to wind the yarn (93) around the yarn layer formation region of the second bobbin (92).

6. The yarn winding machine (1) according to any one of claims 1 to 5, wherein
the switching device (70) is configured to wind the yarn (93) in a region of the second bobbin (92) having no groove and a constant diameter.

7. The yarn winding machine (1) according to any one of claims 1 to 6, wherein
the yarn winding machine (1) winds elastic yarn (93) to manufacture the package (94).

FIG. 1

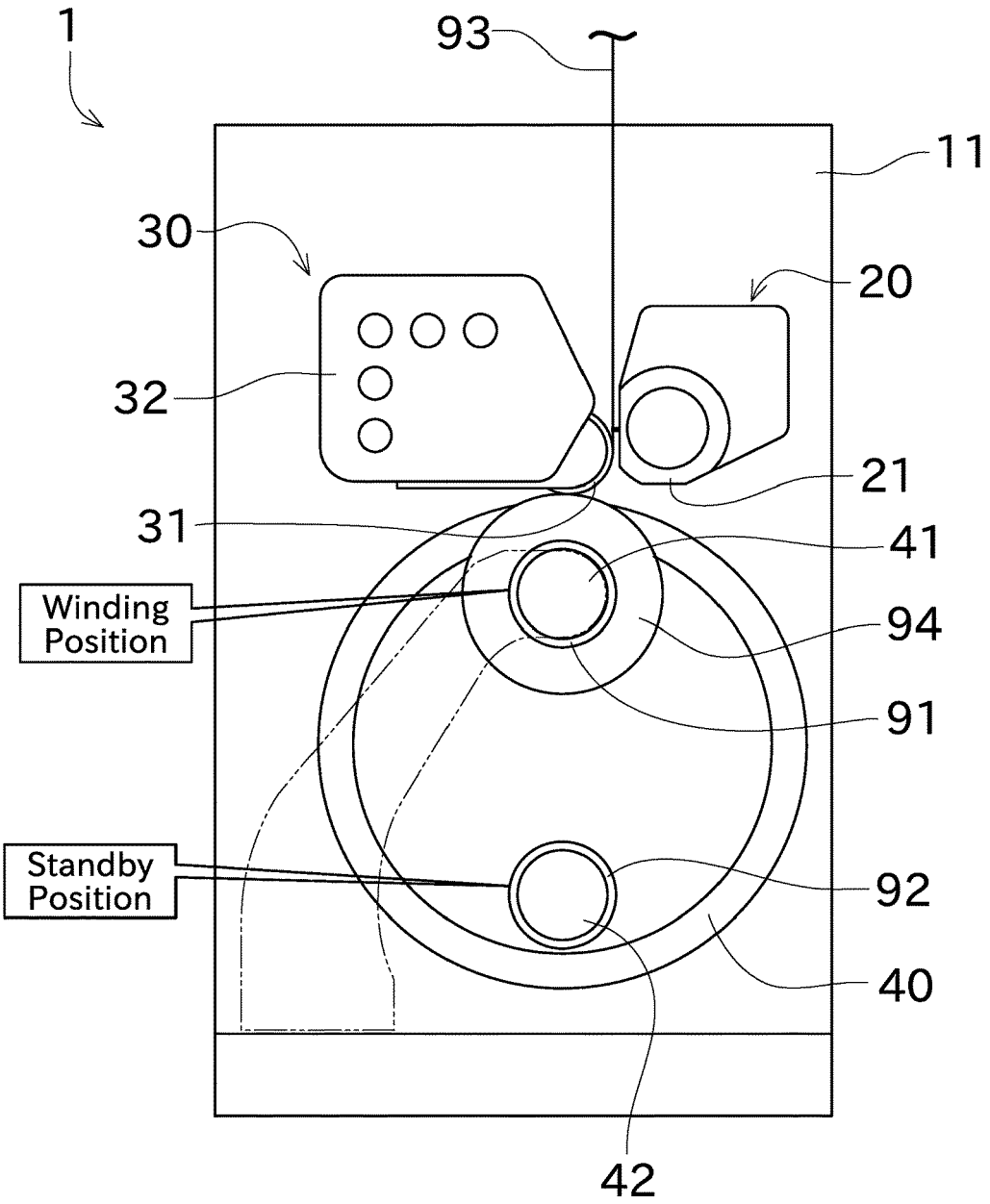

1
93
11
30
20
32
21
31
41
Winding Position
94
91
Standby Position
92
40
42

FIG. 2

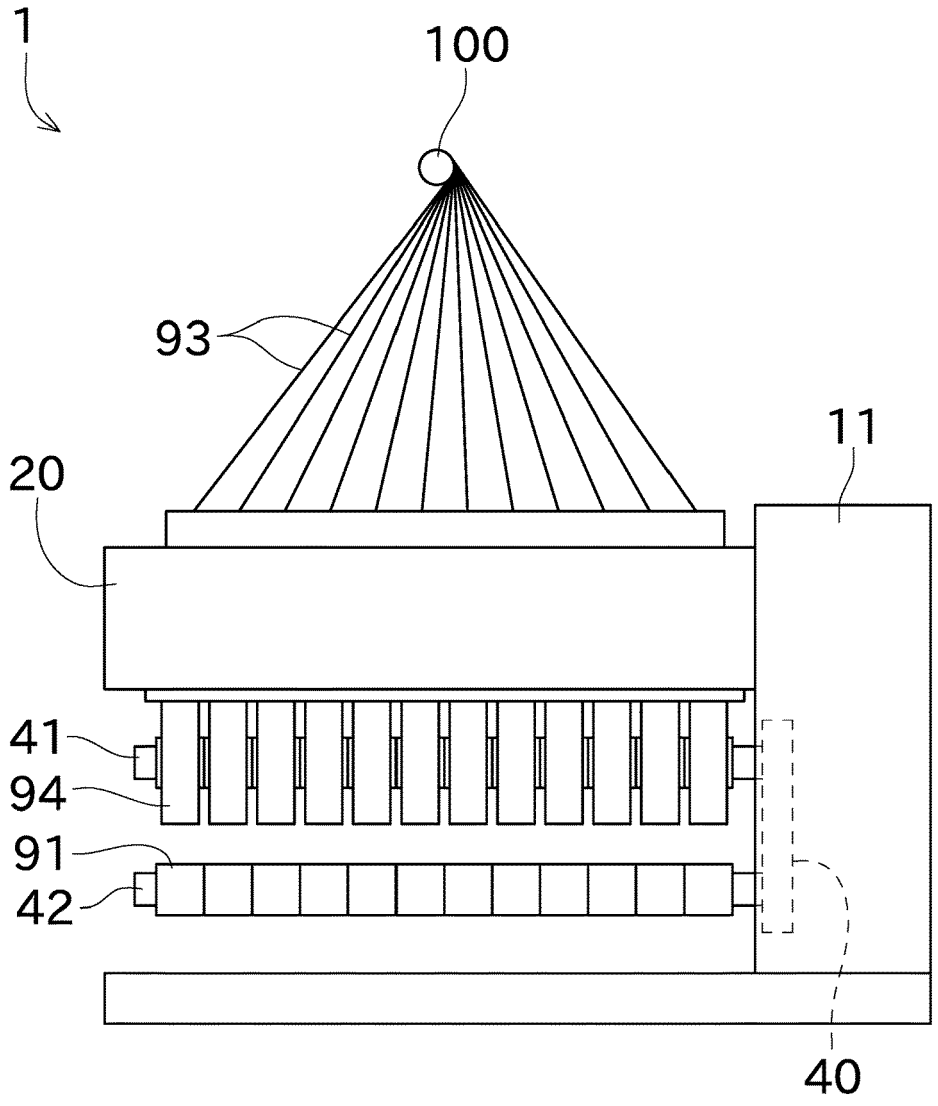


FIG. 3

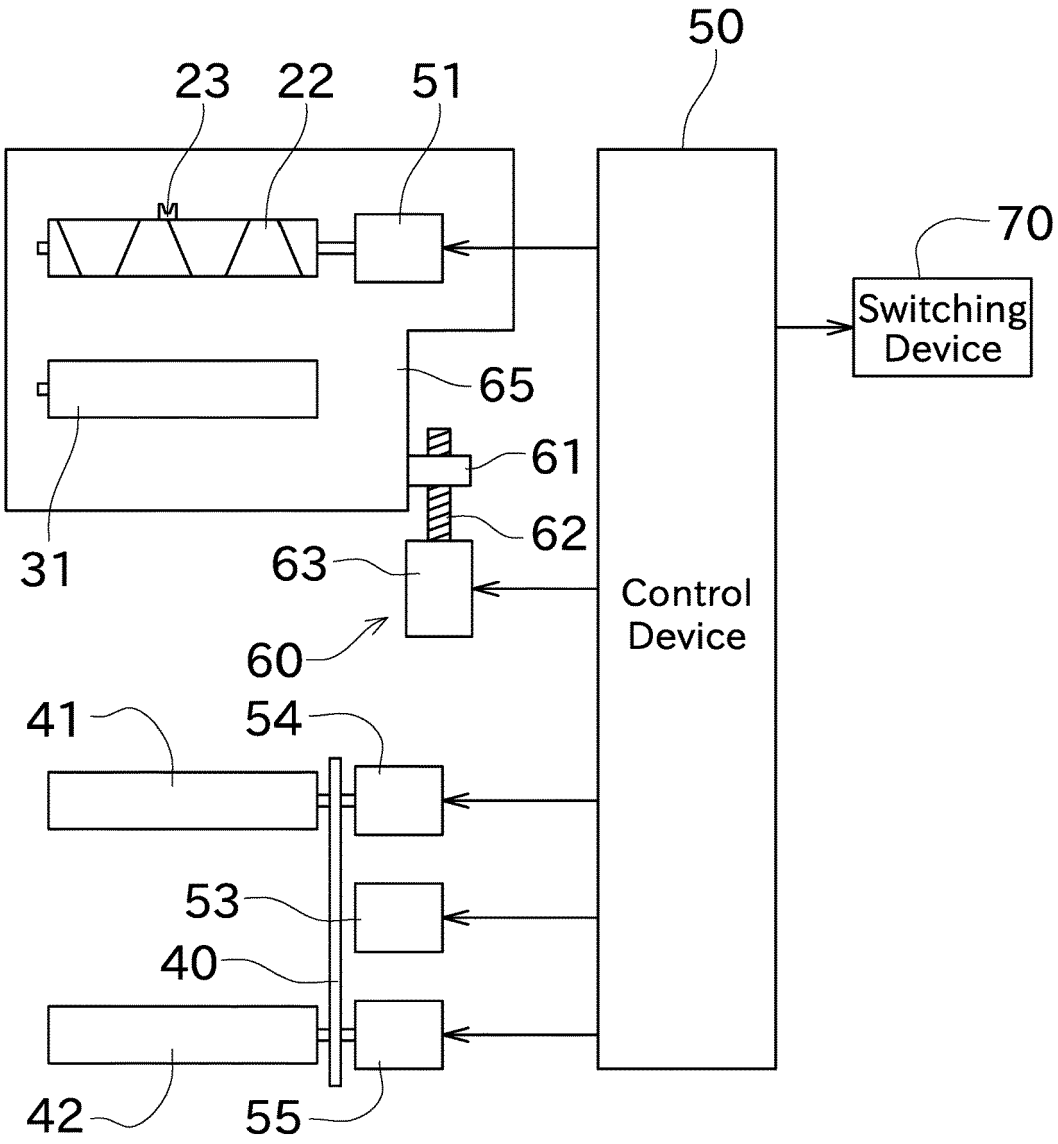

50
23
22
51
70
Switching Device
65
61
62
31
63
Control Device
60
41
54
53
40
42
55

FIG. 4

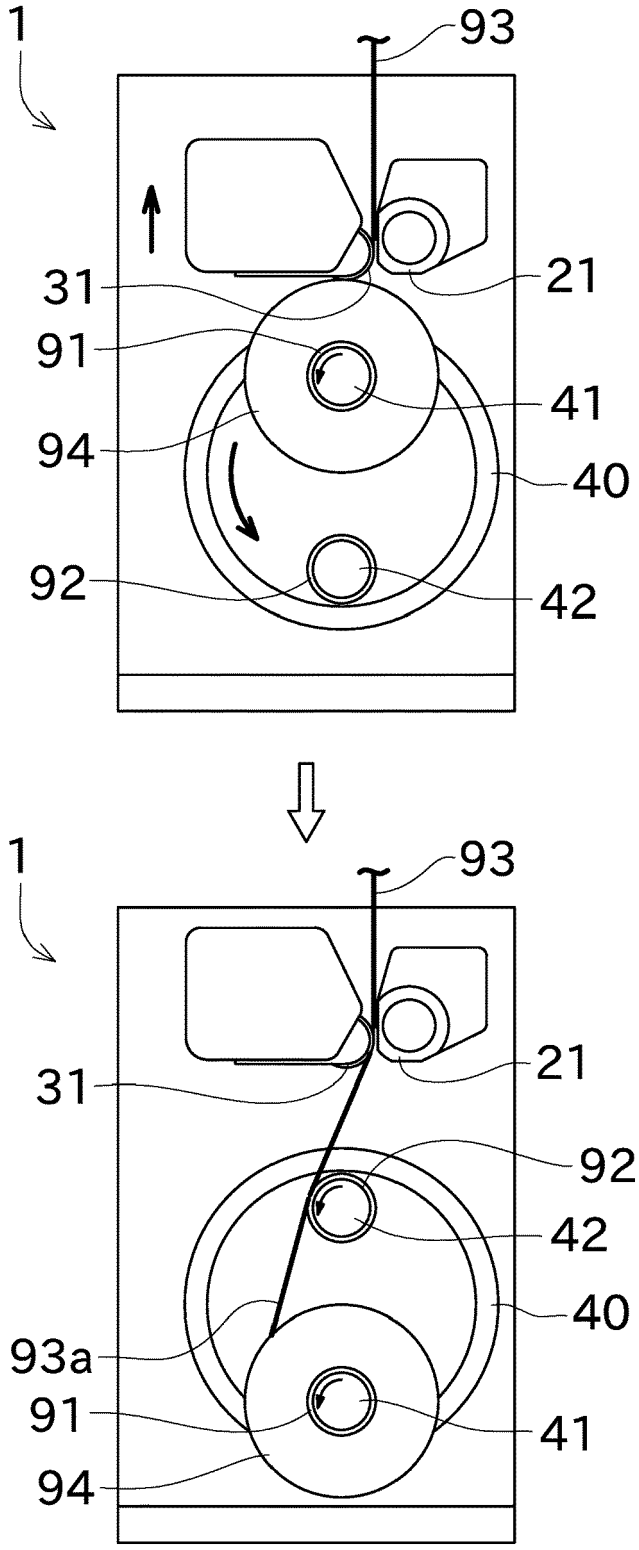


FIG. 5

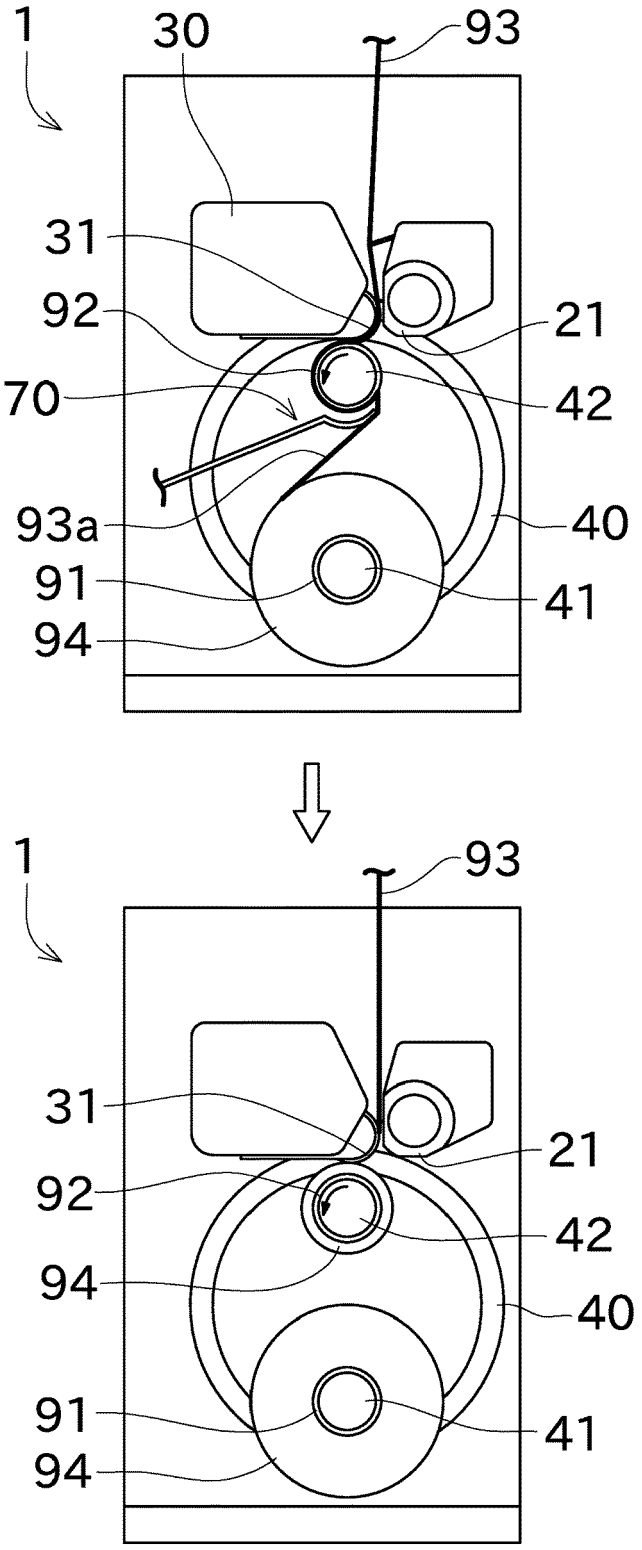


FIG. 6

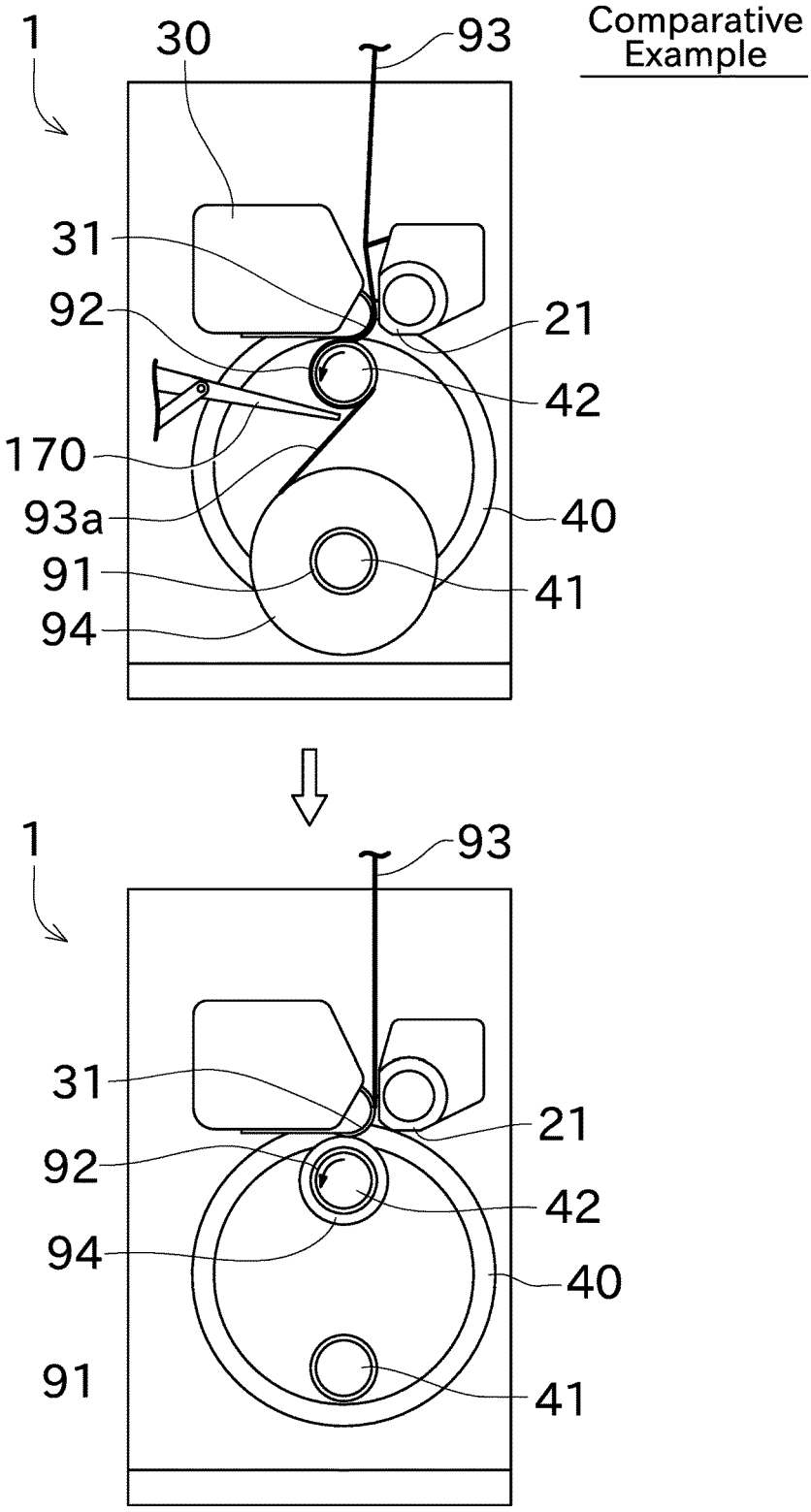

Comparative Example
1
30
93
31
92
21
42
170
93a
40
91
41
94
1
93
31
21
92
42
94
40
91
41

FIG. 7

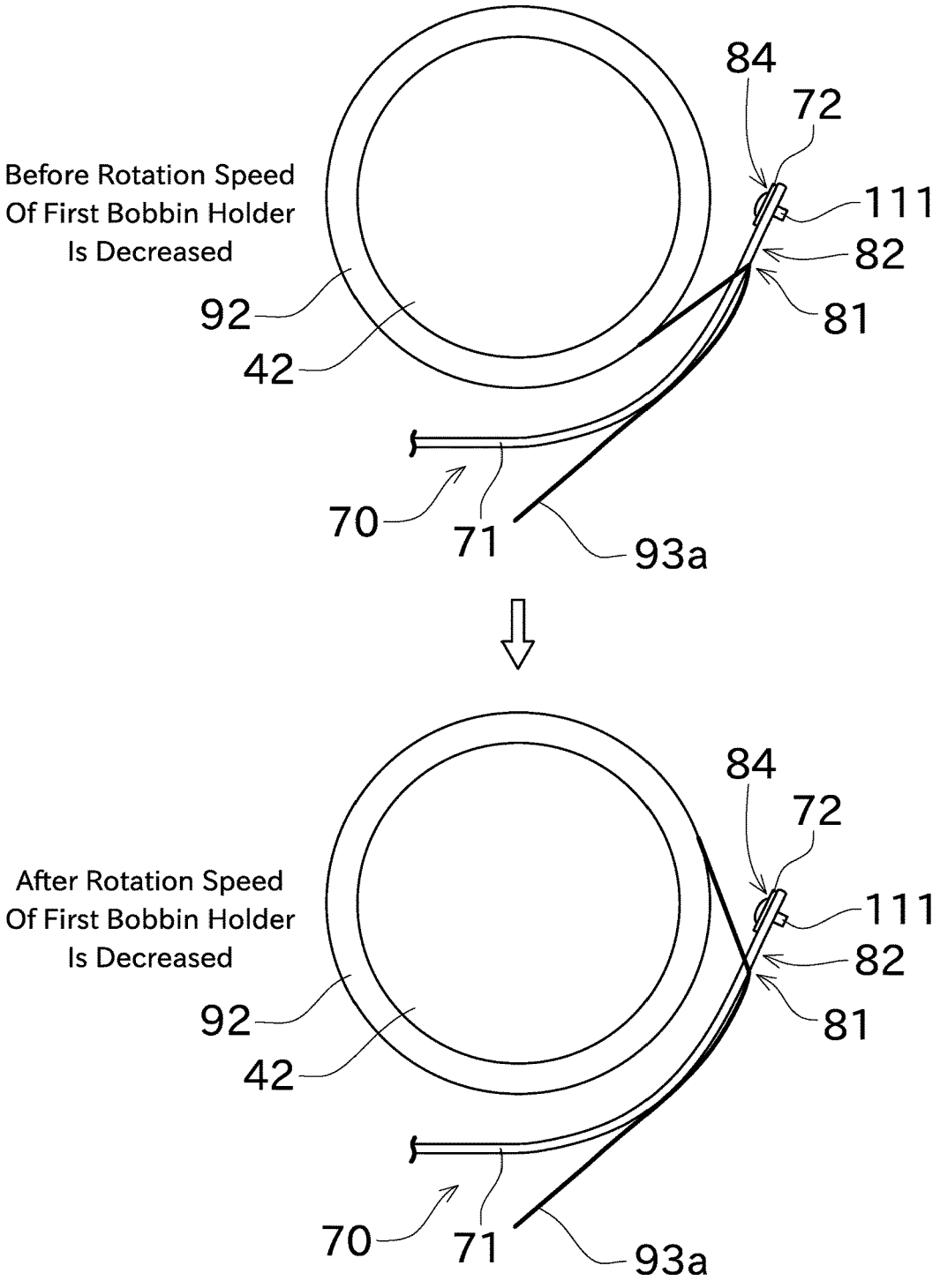

Before Rotation Speed
Of First Bobbin Holder
Is Decreased
84
72
111
82
81
92
42
70
71
93a
After Rotation Speed
Of First Bobbin Holder
Is Decreased
84
72
111
82
81
92
42
70
71
93a

FIG. 8

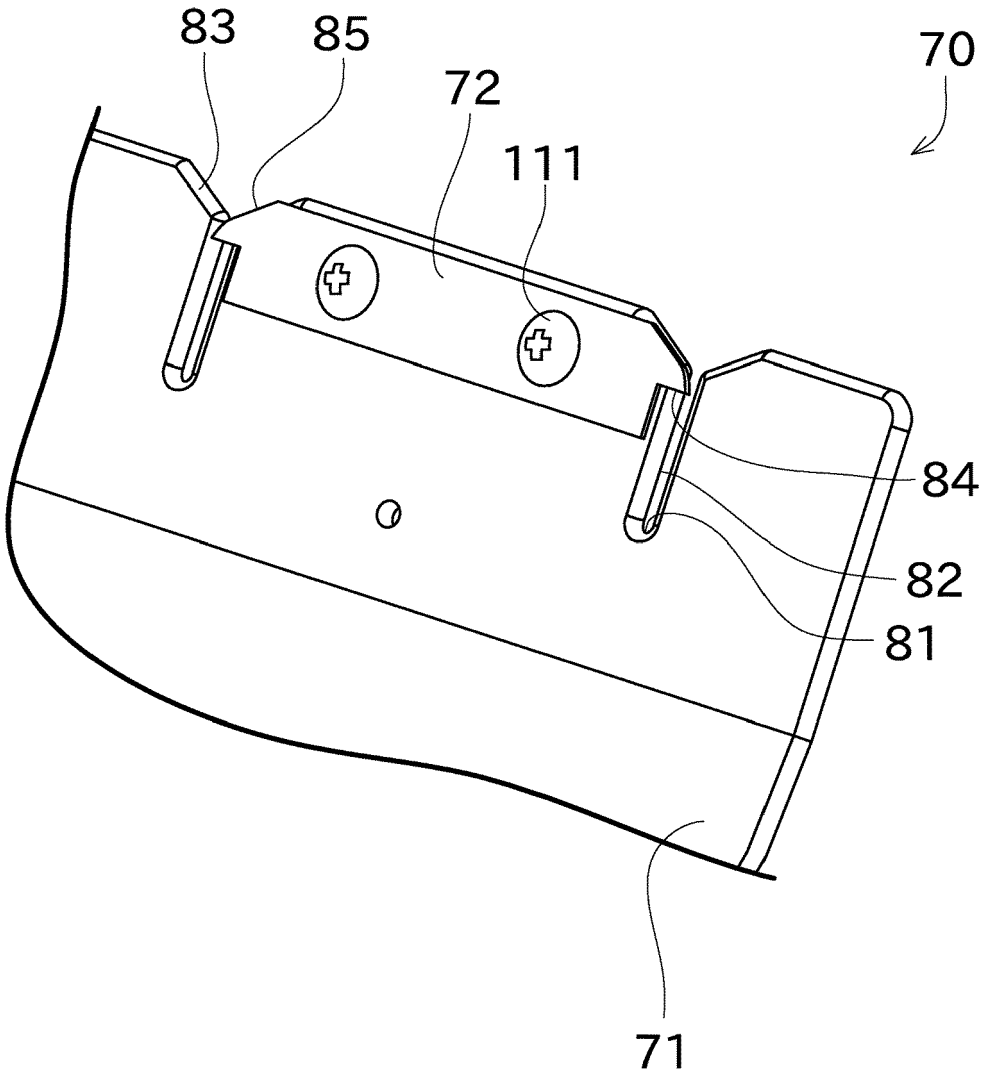


FIG. 9

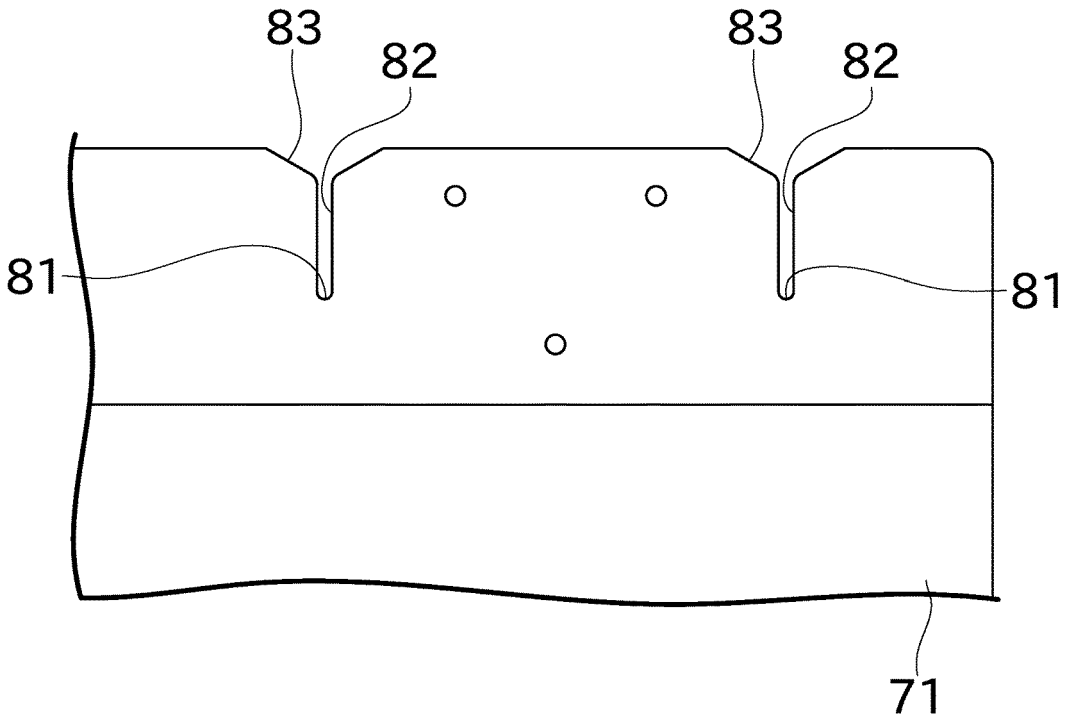


FIG. 10

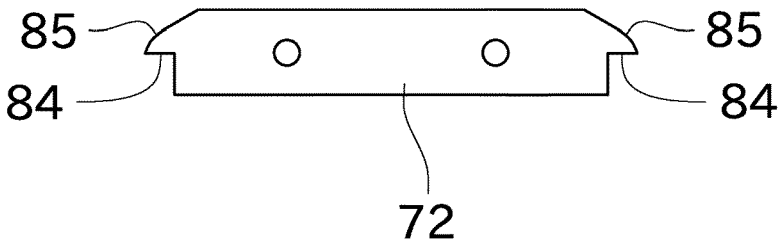


FIG. 11

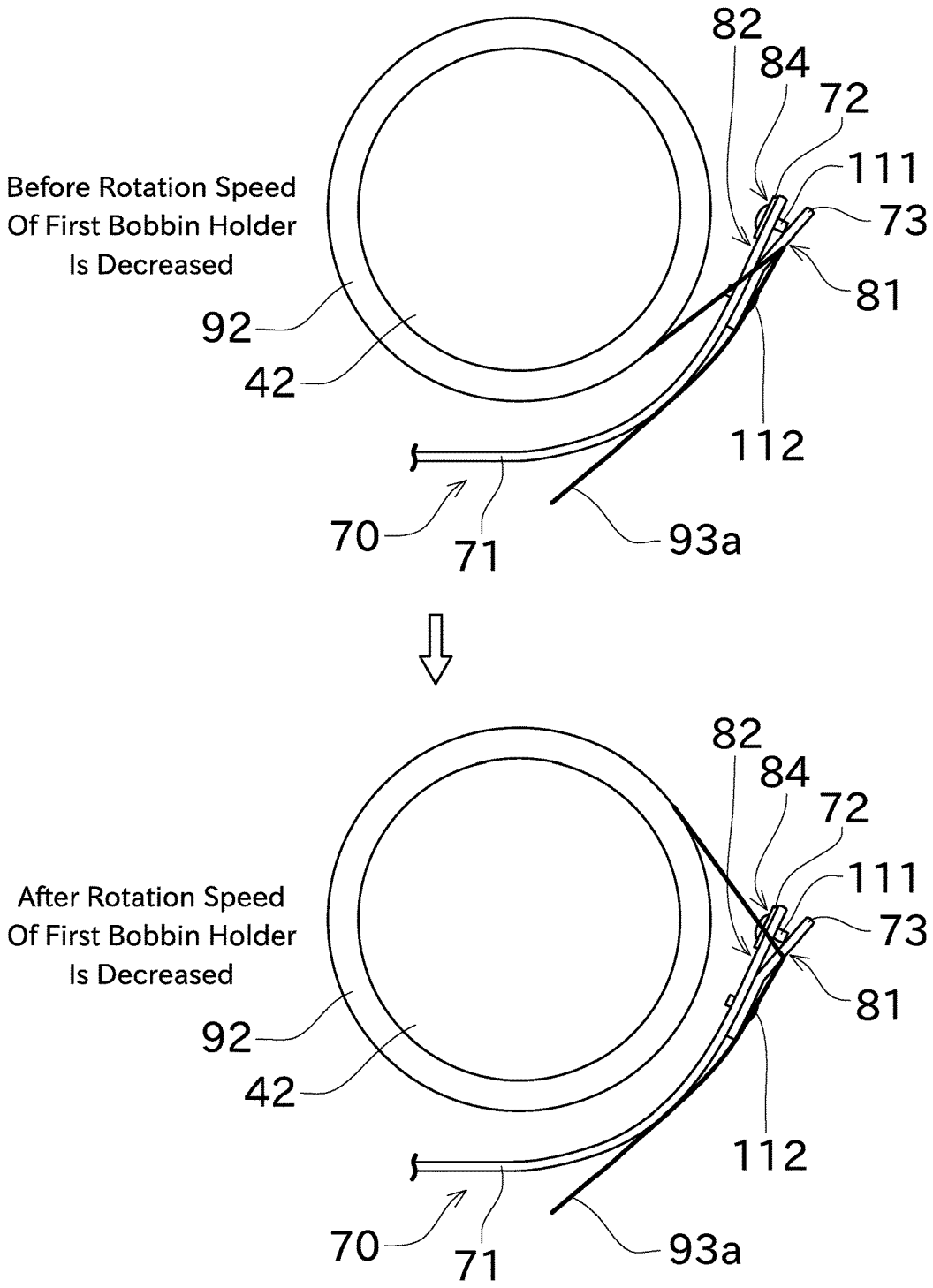

Before Rotation Speed
Of First Bobbin Holder
Is Decreased
82
84
72
111
73
81
92
42
112
70
71
93a
After Rotation Speed
Of First Bobbin Holder
Is Decreased
82
84
72
111
73
81
92
42
112
70
71
93a

FIG. 12

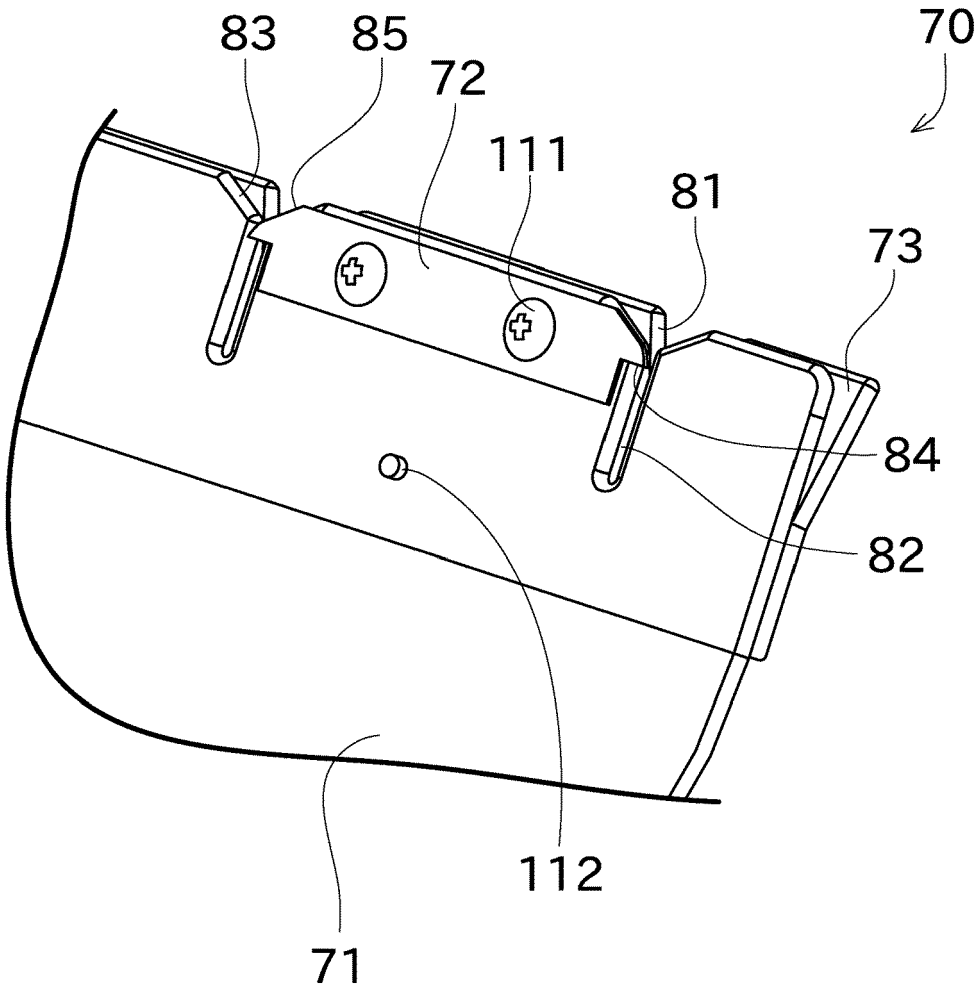


FIG. 13

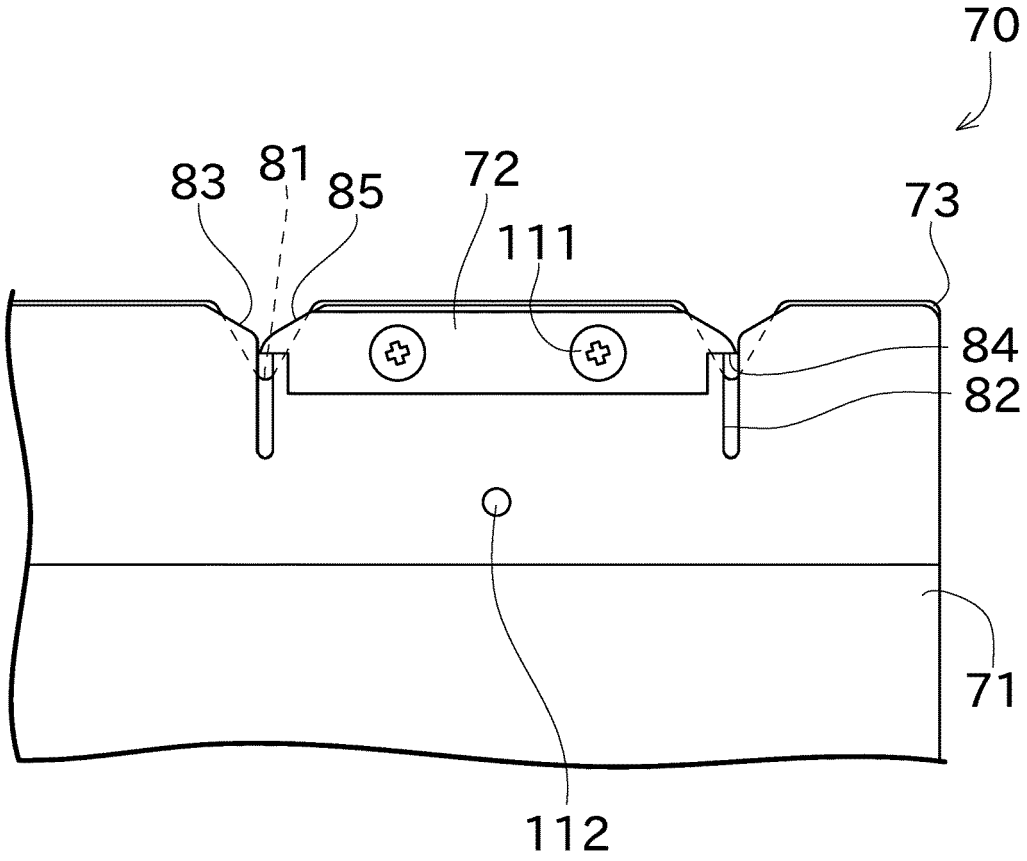
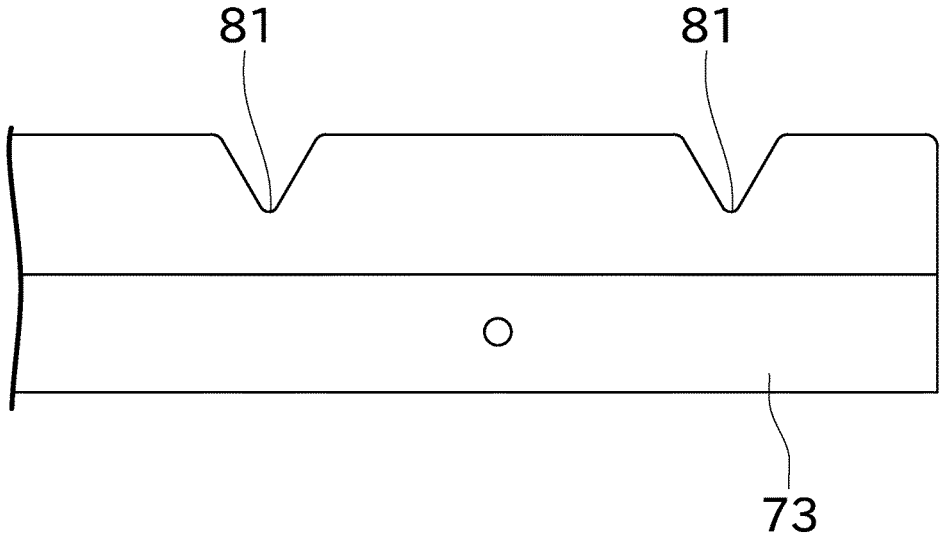


FIG. 14



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EUROPEAN SEARCH REPORT

Application Number
EP 24 15 6302

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	KR 100 478 654 B1 (ILJIN A TECH CO LTD) 28 March 2005 (2005-03-28) * page 2, paragraph 1 * * page 3 - page 4 * * figures 2a,3b, 4a-4d *	1-7	
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B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 July 2024	Guisan, Thierry

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22-07-2024

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