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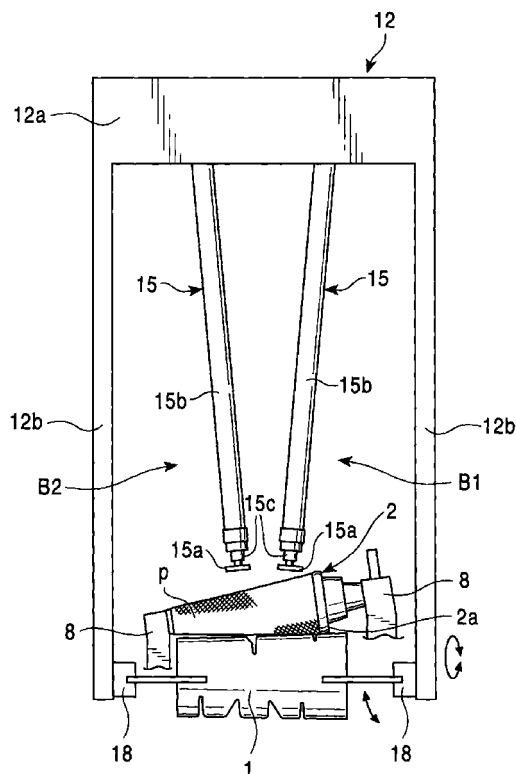
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(54) **Device for forming a start bunch in an automatic winder**

(57) The present invention relates to a doffing device of an automatic winder comprising a pair of winding-start bunch formation devices B1, B2 disposed therein for changing a position at which a winding-start bunch y1 is formed depending on a direction in which a rewound yarn has been twisted, that is, whether the yarn has been subjected to S or Z twisting. The position of the bunch can be changed depending on whether the yarn has been twisted in the S or Z direction. Consequently, when the yarn is drawn out upward from a winding package formed by the automatic winder, the drawing-out can be carried out in the direction in which the yarn is untwisted. As a result, possible snarl or kink in the unwound yarn is restrained to enable the yarn to be unwound in the form of a well-defined balloon, thereby reducing the occurrence of yarn breakage.

FIG. 2



Description

Field of the Invention

[0001] The present invention relates to a doffing device of an automatic winder for unwinding a spun yarn wound around a supplying package such as a ring spinning bobbin produced by a ring spinning machine and then rewinding the yarn around winding packages of various shapes.

Background of the Invention

[0002] In a preceding application, that is, Japanese Patent Application No. 9-105538 (Japanese Patent Application Laid Open (Tokkai-Hei) No. 10-297826), the applicant has proposed a doffing device of an automatic winder wherein a yarn cutting-gripping section of a yarn gripping device grips and transfers a supplying package side yarn retainably sucked by a yarn trap to a neighborhood of a cradle arm from which a full winding package has been ejected. The yarn is then gripped between the cradle arm and a winding bobbin, and the winding bobbin is brought in contact with a rotating traversing drum to wind the yarn around the winding bobbin at one end thereof using a yarn transferring device and the yarn gripping device, thereby forming a winding-start bunch.

[0003] When a yarn is unwound upward from a winding package held perpendicularly on a tray or the like, the unwound yarn is additionally twisted or untwisted depending on a direction in which the yarn has been twisted, that is, whether the yarn has been subjected to S or Z twisting. During this step of unwinding the yarn from the winding package, when the drawn-out yarn is additionally twisted to increase the number of twists, snarl or kink is likely to occur to hinder the yarn from being unwound from the package in the form of a well-defined balloon, resulting in yarn breakage. Thus, during this step, it is important to draw the yarn out from the winding package in a direction in which the drawn-out yarn is untwisted.

[0004] For example, in winding a winding-start bunch y1 is to be wound around an end of a conical winding bobbin 2 (hereafter referred to as a "corn bobbin") rotating in contact with a traversing drum 1, which is being rotatively driven, as shown in Figures 9 to 12, the winding-start bunch y1 is formed around the corn bobbin 2 at its larger diameter side 2a end, and then a yarn y is wound around the corn bobbin 2 except for both ends thereof, that is, around its central area, thereby forming a winding package p. As regards this, 3 is a traversing fulcrum guide.

[0005] The winding package p formed in this manner is held perpendicularly on a tray 4 in such a manner that the larger diameter side 2a of the corn bobbin 2 is placed closer to the tray 4 and the winding-start bunch y1 is located downward, as shown in Figure 13. Then, the yarn y wound around the winding package p is

drawn out upward.

[0006] If the yarn has been twisted in a Z direction, the corn bobbin 2 is rotatively driven in contact with the traversing drum 1 so as to place the larger diameter side 2a on the right side as the automatic winder is seen from its front, as shown in Figure 9. At the same time, the yarn y is wound around the corn bobbin 2 from a front surface of the traversing drum 1 in a fashion being sandwiched between the traversing drum 1 and the corn bobbin 2, as shown in Figure 10. Thus, the winding-start bunch y1 is wound around the corn bobbin 2 at its larger diameter side 2a end. When the yarn y is unwound from the winding package p formed in the above manner, as shown in Figure 13, the unwinding is carried out while untwisting the yarn y. Thus, possible snarl or kink is restrained to enable the yarn to be unwound in the form of a well-defined balloon, thereby reducing the occurrence of yarn breakage.

[0007] In addition, if the yarn has been twisted in an S direction, the corn bobbin 2 is rotatively driven in contact with the traversing drum 1 so as to place the larger diameter side 2a on the left side as the automatic winder is seen from its front, as shown in Figure 11. At the same time, as in the twisting in the Z direction, the yarn y is wound around the corn bobbin 2 from the front surface of the traversing drum 1 in a fashion being sandwiched between the traversing drum 1 and the corn bobbin 2, as shown in Figure 12. Thus, the winding-start bunch y1 is wound around the corn bobbin 2 at its larger diameter side 2a end. When the yarn y is unwound from the winding package p formed in the above manner, as shown in Figure 13, the unwinding is carried out while untwisting the yarn y. Thus, possible snarl or kink is restrained to enable the yarn to be unwound in the form of a well-defined balloon, thereby reducing the occurrence of yarn breakage.

[0008] In the above example, although the winding bobbin is shown to be conical for convenience, the above description is applicable to a cylindrical winding bobbin, that is, a straight bobbin. That is, if the yarn has been twisted in the Z direction, the winding-start bunch is formed at the right-hand end of a straight bobbin, whereas if the yarn has been twisted in the S direction, the winding-start bunch is formed at the left-hand end of a straight bobbin. When the winding package formed in this manner is held perpendicularly in such a way that the winding-start bunch is located closer to the bottom of the automatic winder and the yarn is then drawn out upward, the yarn is unwound in the direction in which it is untwisted. Thus, possible snarl or kink is restrained to enable the yarn to be unwound in the form of a well-defined balloon, thereby reducing the occurrence of yarn breakage.

[0009] As described above, the bunch position must be changed between the right-hand end and left-hand end of the winding bobbin depending on whether the yarn has been twisted in the S or Z direction.

[0010] The above doffing device of the conventional

automatic winder, however, has only one winding-start bunch formation device disposed therein and comprising a yarn gripping device and a yarn transferring device to form the winding-start bunch, whereby the bunch position cannot be changed between the right-hand end and left-hand end of the winding package depending on whether the yarn has been twisted in the S or Z direction. Consequently, twisting may be added to the winding package while the yarn is being unwound therefrom, so that the yarn is unwound in a direction in which snarl or kink is likely to occur. As a result, the yarn is subjected to stress and cannot form a well-defined balloon extending from the package, resulting in an increase in occurrence of yarn breakage.

[0011] It is an object of the present invention to solve the problem of the doffing device in a conventional automatic winder.

Summary of the Invention

[0012] To attain this object, a first aspect of the present invention is that a doffing device of an automatic winder comprises a pair of winding-start bunch formation devices disposed so as to change a position at which a winding-start bunch is formed depending on a direction in which a wound yarn has been twisted, that is, whether the yarn has been subjected to S or Z twisting. A second aspect is that the doffing device has a switching means for switching a yarn gripping device and a yarn transferring device constituting the winding-start bunch formation device, between an operative state and an inoperative state. A third aspect is that a doffing device running along a winding unit has a switching means disposed therein for responding to a zone detecting instruction means disposed in a main body and that the zone detecting instruction means operates the switching means to make one of the pair of winding-start bunch formation devices operative or inoperative.

Brief Description of the Drawing

[0013]

Figure 1 is a schematic side view of an automatic winder and a doffing device.

Figure 2 is a partly schematic front view of the automatic winder and the doffing device.

Figure 3 is a partly enlarged side view of the automatic winder including a vertical cross section of a winding bobbin.

Figure 4 is a perspective view of a yarn transferring device of the doffing device.

Figure 5 is a partly enlarged top view of the auto-

matic winder and the doffing device.

Figure 6 is a schematic top view of a drive mechanism for a yarn gripping device and the yarn transferring device both provided in the doffing device.

Figure 7 is a partly enlarged side view of the drive mechanism for the yarn transferring device of the doffing device.

Figure 8 is a schematic side view of a drive mechanism for the yarn gripping device of the doffing device.

Figure 9 is a schematic front view of a traversing drum, a winding bobbin, etc. in the automatic winder.

Figure 10 is a schematic side view of the traversing drum, the winding bobbin, etc. in the automatic winder.

Figure 11 is a schematic front view similar to Figure 9 showing the traversing drum, the winding bobbin, etc. in the automatic winder.

Figure 12 is a schematic side view similar to Figure 10 showing the traversing drum, the winding bobbin, etc. in the automatic winder.

Figure 13 is a front view showing how a yarn is drawn out from a winding package formed by an automatic winder.

Figure 14 is a schematic front view of an automatic winder and a doffing device.

Detailed Description of the Preferred Embodiments

[0014] An embodiment of the present invention will be described below with reference to Figures 1 to 14, but the present invention is not limited to this embodiment as long as the spirits thereof are met.

[0015] In the figures, 5 is a supplying package held perpendicularly on a tray 4. A spun yarn y drawn out upward from the supplying package 5 passes through a yarn clearer 6 having a cutter 6a and detecting a yarn defect and then through a yarn splicing device 7. Then, the yarn y comes in contact with a traversing drum 1, which is being rotatively driven, and is then wound around a rotating winding bobbin 2 (in this embodiment, a corn bobbin is used) into a winding package.

[0016] 8 is a cradle arm for gripping the corn bobbin 2, that is, the winding bobbin between two arms in a fashion sandwiching the bobbin there between, and 9 is a yarn trap acting as yarn end trapping means for retainably sucking a supplying package 5 side yarn y cut by the cutter 6a of the yarn clearer 6. 10 is a guide member

disposed behind the traversing drum 1, and 11 is a conveyor disposed behind the guide member 10 for transferring a full winding package.

[0017] When a winding package p becomes full, a control device (not shown in the drawings) issues a full winding package signal to operate the cutter 6a of the yarn clearer 6 in order to cut the yarn y. The supplying package 5 side yarn y thus cut is sucked and trapped by the yarn trap 9, while the traversing drum 1 side yarn y is wound around the full winding package. Then, the cradle arm 8, which is gripping the full winding package, is rotatively moved in a direction in which it leaves the traversing drum 1, and a cradle arm extension member (not shown in the drawings) extends the cradle arm 8 to load the full winding package on the guide member 10. The full winding package placed on the guide member 10 rolls on the guide member 10 toward the conveyor 11, where it is loaded and then transferred to a predetermined place.

[0018] 12 is a doffing device capable of running along a rail 14 disposed on a horizontal section 13a of an appropriate frame 13, and the doffing device 12 has a pair of, that is, two yarn gripping devices 15 disposed thereon in such a way as to extend generally perpendicularly and each having a yarn cutting-gripping member 15a at its tip. The yarn gripping device 15 has a cylinder 15b having an upper end pivotably supported on a pin 16 attached to an enclosure section 12a of the doffing device 12 and also has a piston rod 15c. The piston rod 15c has the yarn cutting-gripping member 15a disposed at its tip and which can cut and grip the yarn. The yarn gripping device 15 is constructed to approach or leave the traversing drum 1 by means of a cam device, which will be described below.

[0019] 17 is bunch guides each attached to a corresponding one of the two arms of the cradle arm 8 for gripping the corn bobbin 2. The bunch guide 17 is constructed, for example, as a hook having an opening in the direction of a central section of the traversing drum 1 and has a function of cooperating with the above yarn gripping device 15 in holding the yarn y around the corn bobbin 2 at a winding-start bunch formation position located at a larger diameter side 2a end of the corn bobbin 2.

[0020] 18 is a yarn transferring device disposed in a lower part of each of a pair of vertical frames 12b suspending from corresponding opposite end portions of an enclosure section 12a of the doffing device 12. The yarn transferring device 18 has an oscillating arm 18b rotatably pivotably attached to a vertical shaft 18a attached to the vertical frame 12b, and a generally T-shaped yarn transferring lever 18c pivotably supported at a tip portion of the oscillating arm 18b. The yarn transferring lever 18c has a yarn catching section 18c' at its tip, and the yarn transferring lever 18c has an elongate slot 18c'' formed therein. 18d is a connecting arm rotatably pivotably attached to the shaft 18a and having a pin 18d' disposed at its tip. The pin 18d' is fitted in the

elongate slot 18c'' formed in the yarn transferring lever 18c. In addition, a coil spring 18e fitted on the shaft 18a has one end engagingly locked on the shaft 18a and the other end engagingly locked on the connecting arm 18d so that the urging force of the coil spring 18e can place the connecting arm 18d at a traversing drum 1 side end of the elongate slot 18c'' in a standby state where the yarn transferring lever 18c is separate from the traversing drum 1 as shown in Figure 4. 18f is a connecting rod having one end pivotably supported by the oscillating arm 18b and the other end pivotably supported at one end of a generally V-shaped bell crank 18g, and the bell crank 18g has its central section rotatably pivotably supported by a shaft 18h. The bell crank 18g has the other end pivotably supported by a link lever 19 moved in a vertical direction by means of the cam device described below.

[0021] When the cam device described below moves the link lever 19 downward, the bell crank 18g is rotatively moved clockwise around the shaft 18h, and accordingly the oscillating arm 18b is rotatively moved clockwise around the shaft 18a via the connecting rod 18f. The clockwise rotative movement of the oscillating arm 18b rotatively moves the yarn transferring lever 18c clockwise, that is, toward the traversing drum 1, and at the same time, the coil spring 18e causes the connecting arm 18d, which is being urged clockwise, to be also rotatively moved toward the traversing drum 1. In this manner, the clockwise rotative movement of the bell crank 18g associated with the downward movement of the link lever 19 integrally rotatively moves the oscillating arm 18b, the yarn transferring lever 18c and the connecting arm 18d toward the traversing drum 1 via the connecting rod 18f. The connecting rod 18f, however, comes in contact with a stopper (not shown in the drawings) at a position close to the traversing drum 1, where its rotative movement is prevented, and subsequently the oscillating arm 18b and the yarn transferring lever 18c are integrally rotatively moved toward the traversing drum 1. As the oscillating arm 18b and the yarn transferring lever 18c integrally continue their rotative movement toward the traversing drum 1, the rotative movement of a tip of the yarn transferring lever 18c around the pin 18d' located at the end of the connecting rod 18f farther from the traversing drum 1 is added to the rotative movement of the oscillating arm 18b and the yarn transferring lever 18c toward the traversing drum 1. As a result, the portion of the yarn transferring lever 18c in which the yarn-catching section 18c' is formed moves generally parallel with the axis of the traversing drum 1 toward an end of the traversing drum 1.

[0022] As described above, the bunch guides 17 are each attached to a corresponding one of the two arms of the cradle arm 8 gripping the corn bobbin 2, and the doffing device 12 has the pair of yarn gripping devices 15 and the pair of yarn transferring devices 18 disposed around the central section of the traversing drum 1. The yarn gripping device 15 and the yarn trans-

ferring device 18 cooperated with the bunch guide 17 located at one end of the traversing drum 1 constitute one B1 of two winding-start bunch formation devices, while the yarn gripping device 15 and the yarn transferring device 18 cooperated with the bunch guide 17 located at the other end of the traversing drum 1 constitute the other winding-start bunch formation device B2. That is, the doffing device according to the present invention has the pair of, that is, two winding-start bunch formation devices B1, B2 each comprising the yarn gripping device 15 and the yarn transferring device 18. The winding-start bunch formation device B1 is for Z twisting and the winding-start bunch formation device B2 is for S twisting.

[0023] Next, a drive mechanism for the yarn gripping device 15 and the yarn transferring device 18 will be described principally referencing Figures 6 to 8.

[0024] 20 is a cam shaft supported on an appropriate bearing disposed in the doffing device 12, and the cam shaft 20 is constructed to be rotated via a pulley 22 as appropriate by means of a belt 21 run by a motor (not shown in the drawings). Rotational timings or the like for the cam shaft 20 are controlled by instructions from a control device for the doffing device 12 so as to agree with operational timings for a doffing operation.

[0025] 23a is a yarn transferring device driving cam attached to the cam shaft 20. 24 is an arm support shaft disposed parallel with the cam shaft 20, and the arm support shaft 24 has a generally V-shaped operation lever 23b attached thereto and having a cam follower 23c disposed thereon in a fashion abutting on the yarn transferring device driving cam 23a. A coil spring 23e is extended between a tip of one 23b' of two branches of the generally V-shaped operation lever 23b and a pin 23d attached to a frame of the doffing device 12 for urging the operation lever 23b in such a manner that the cam follower 23c disposed on the operation lever 23b abuts on the yarn transferring device driving cam 23a. The coil spring 23e urges the operation lever 23b so as to rotate counterclockwise in Figure 7. In addition, the generally V-shaped operation lever 23b has an upper end portion of the above link lever 19 pivotably supported at a tip of the other branch 23b" thereof.

[0026] 23f is a generally L-shaped stop lever having its middle portion pivotably supported by a shaft 23g. The stop lever 23f has one end 23f' located near the branch 23b' of the operation lever 23b, whereas it has the other end 23f" pivotably supported by a piston rod 23h' of a cylinder 23h disposed in the frame of the doffing device 12. When the cylinder 23h is operated to move the piston rod 23h' forward, the stop lever 23f is rotatively moved counterclockwise around the shaft 23g, so that its one end 23f' is located above the branch 23b' of the operation lever 23b. Then, when the cam shaft 20 and thus the yarn transferring device driving cam 23a are rotated to move the cam follower 23c from a larger diameter portion to a smaller diameter portion of the yarn transferring device driving cam 23a, the

operation lever 23b is rotatively moved counterclockwise around the arm support shaft 24, whereby the link lever 19 pivotably supported at the tip of the other branch 23b" of the operation lever 23b moves downward. With this downward movement of the link lever 19, the portion of the yarn transferring lever 18c in which the yarn catching section 18c' is formed moves generally parallel with the axis of the traversing drum 1 toward the end of the traversing drum 1, as described above.

[0027] In addition, when the piston rod 23h' recedes, the stop lever 23f is rotatively moved clockwise around the shaft 23g, so that its one end 23f' is located close to the branch 23h' of the operation lever 23b. In this state where the one end 23f' of the stop lever 23f is located close to the branch 23b' of the operation lever 23b, even if the cam shaft 20 and thus the yarn transferring device driving cam 23a are rotated to move the cam follower 23c from the larger diameter portion to the smaller diameter portion of the yarn transferring device driving cam 23a in order to rotatively move the operation lever 23b counterclockwise around the arm support shaft 24, the branch 23b' of the operation lever 23b abuts on the one end 23f' of the stop lever 23f to hinder the counterclockwise rotative movement of the operation lever 23b, thereby preventing the downward movement of the link lever 19 and thus operation of the yarn transferring device 18.

[0028] A pair of, that is, two such yarn transferring device driving cams 23a constituting the above drive mechanism for the yarn transferring device 18 are attached to the cam shaft 20 at a predetermined interval so as to correspond to the pair of winding-start bunch formation devices B1, B2 each comprising the yarn gripping device 15 and the yarn transferring device 18. The operation lever 23b, the stop lever 23f and so on also have a pair so as to correspond to the pair of yarn transferring device driving cams 23a.

[0029] The cam shaft 20 has a yarn gripping device driving cam 25a attached thereto, and the arm support shaft 24 has an operation lever 25c attached thereto having a cam follower 25b disposed thereon in a fashion abutting on the yarn gripping device driving cam 25a. A link rod 25d is disposed between one end 25c' of the operation lever 25c located on a side with the cam follower 25b and the cylinder 15b of the above yarn gripping device 15. In addition, a coil spring 25f is extended between the other end 25c" of the operation lever 25c and the cylinder 15b for urging the operation lever 25c in such a manner that the lever 25c is rotatively moved counterclockwise around the arm support shaft 24 and that the cam follower 25b disposed on the operation lever 25c abuts on the yarn gripping device driving cam 25a.

[0030] 25g is a generally L-shaped stop lever having its middle portion pivotably supported by the shaft 23g. The stop lever 25g has one end 25g' located near the end 25c" of the operation lever 25c, whereas it has the other end 25g" pivotably supported by the piston rod

23h' of the cylinder 23h disposed in the frame of the doffing device 12. When the cylinder 23h is operated to move the piston rod 23h' forward, the stop lever 25g is rotatively moved counterclockwise around the shaft 23g, so that its one end 25g' is located above the end 25c" of the operation lever 25c. Then, when the cam shaft 20 and thus the yarn gripping device driving cam 25a are rotated to move the cam follower 25b from a larger diameter portion to a smaller diameter portion of the yarn gripping device driving cam 25a, the operation lever 25c is rotatively moved in a counterclockwise direction in Figure 8 around the arm support shaft 24. Accordingly, the cylinder 15b of the yarn gripping device 15 can move counterclockwise around the pin 16, that is, toward the traversing drum 1, via the link rod 25d disposed at the end 25c' of the operation lever 25c.

[0031] In addition, when the piston rod 23h' of the cylinder 23h recedes, the stop lever 25g is rotatively moved clockwise around the shaft 23g, so that its one end 25g' is located close to the end 25c" of the operation lever 25c. In this state where the one end 25g' of the stop lever 25g is located close to the end 25c" of the operation lever 25c, even if the cam shaft 20 and thus the yarn gripping device driving cam 25a are rotated to move the cam follower 25b from the larger diameter portion to the smaller diameter portion of the yarn gripping device driving cam 25a in order to rotatively move the operation lever 25c counterclockwise around the arm support shaft 24, the end 25c" of the operation lever 25c abuts on the one end 25g' of the stop lever 25g to hinder the counterclockwise rotative movement of the operation lever 25c, thereby preventing the movement of the link rod 25d and thus the movement of the cylinder 15b of the yarn gripping device 15 toward the traversing drum 1.

[0032] A pair of, that is, two such yarn gripping device driving cams 25a constituting the above drive mechanism for the yarn gripping device 15 are attached to the cam shaft 20 at a predetermined interval so as to correspond to the pair of winding-start bunch formation devices B1, B2 each comprising the yarn gripping device 15 and the yarn transferring device 18. The operation lever 25c and the stop lever 25g also have a pair so as to correspond to the pair of yarn gripping device driving cams 25a. The two stop levers 23f, 25g are simultaneously operated by the single cylinder 23h.

[0033] Next, operation of the doffing device of the automatic winder will be explained which has the pair of winding-start bunch formation devices B1, B2 disposed therein and each comprising the yarn gripping device 15, and the yarn transferring device 18.

[0034] As shown in Figure 9, if the yarn y has been subjected to Z twisting, the corn bobbin 2 is rotatively moved in contact with the traversing drum 1 in a manner such that the larger diameter side 2a is located on the right side as the automatic winder is seen from its front, and the winding-start bunch y1 is formed at the larger diameter side 2a end of the corn bobbin 2. In rotatively

moving the corn bobbin 2 in contact with the traversing drum 1 in a manner such that the larger diameter side 2a is located on the right side, the winding-start bunch formation device B1 is operated which is located on the right side and which comprises the yarn gripping device 15 and the yarn transferring device 18. In this case, the piston rod 23h' of the cylinder 23h of the winding-start bunch formation device B2 disposed on the left side is allowed to recede to rotatively move the stop lever 23f clockwise, so that its one end 23f' is located close to the branch 23b' of the operation lever 23b. In this manner, since the one end 23f' of the stop lever 23f is located close to the branch 23b' of the operation lever 23b, even if the cam shaft 20 and thus the yarn transferring device driving cam 23a are rotated to move the cam follower 23c from the larger diameter portion to the smaller diameter portion of the yarn transferring device driving cam 23a in order to rotatively move the operation lever 23b counterclockwise around the arm support shaft 24, the branch 23b' of the operation lever 23b abuts on the one end 23f' of the stop lever 23f to hinder the counterclockwise rotative movement of the operation lever 23b, thereby preventing the downward movement of the link lever 19 and thus operation of the yarn transferring device 18 of the winding-start bunch formation device B2 disposed on the left side. Similarly, the stop lever 25g is rotatively moved clockwise to locate its one end 25g' close to the end 25c" of the operation lever 25c. In this manner, since the one end 25g' of the stop lever 25g is located close to the end 25c" of the operation lever 25c, even if the cam shaft 20 and thus the yarn gripping device driving cam 25a are rotated to move the cam follower 25b from the larger diameter portion to the smaller diameter portion of the yarn gripping device driving cam 25a in order to rotatively move the operation lever 25c counterclockwise around the arm support shaft 24, the end 25c" of the operation lever 25c abuts on the one end 25g' of the stop lever 25g to hinder the counterclockwise rotative movement of the operation lever 25c, thereby preventing the movement of the link rod 25d and thus operation of the yarn gripping device 15 of the winding-start bunch formation device B2 disposed on the left side.

[0035] As described above, in forming the winding-start bunch y1 at the larger diameter side 2a end of the corn bobbin 2 by placing the corn bobbin 2 in the traversing drum 1 in a manner such that its larger diameter side 2a is located on the right side, the winding-start bunch formation device B1 located on the right side is operated, while the winding-start bunch formation device B2 located on the left side is kept inoperative, thereby performing a doffing operation in the doffing device of the automatic winder. That is, when the winding package p becomes full, the control device (not shown in the drawings) issues the full winding package signal to operate the cutter 6a of the yarn clearer 6 in order to cut the yarn y. The supplying package 5 side yarn y thus cut is sucked and trapped by the yarn trap 9,

while the traversing drum 1 side yarn y is wound around the full winding package p. Then, the cradle arm 8, which is gripping the full winding package p, is rotatively moved in a direction in which it leaves the traversing drum 1, and the cradle arm extension member (not shown in the drawings) extends the cradle arm 8 to load the full winding package p on the guide member 10. The full winding package p placed on the guide member 10 rolls on the guide member 10 toward the conveyor 11, where it is loaded and then transferred to a predetermined place.

[0036] In addition, the cylinder 15b of the yarn gripping device 15 is operated to move the piston rod 15c downward in order to allow the yarn cutting-gripping member 15a to grip the yarn y sucked and trapped by the yarn trap 9 while cutting the yarn trap 9 side yarn y. Then, the piston rod 15c is allowed to recede to elevate the yarn cutting-gripping member 15a, which is gripping a yarn end, to a position above the cradle arm 8, and the cam shaft 20 and thus the yarn gripping device driving cam 25a are rotated to move the cylinder 15b of the yarn gripping device 15 toward the traversing drum 1 via the link rod 25d disposed at the end 25c' of the operation lever 25c as described above.

[0037] Further, the cam shaft 20 and thus the yarn transferring device driving cam 23a are rotated to rotatively move the yarn transferring lever 18c constituting the yarn transferring device 18 toward the traversing drum 1. During the rotative movement of the yarn transferring lever 18c toward the traversing drum 1, the yarn y, which is being gripped by the yarn cutting-gripping member 15a of the yarn gripping device 15, is trapped by the yarn catching section 18c' of the yarn transferring lever 18c and then moved toward the bunch guide 17 attached to the cradle arm 8, followed by the insertion of the yarn y into the bunch guide 17. In this case, once the yarn transferring lever 18c has approached the bunch guide 17, the portion of the yarn transferring lever 18c in which the yarn catching section 18c' is formed moves generally parallel with the axis of the traversing drum 1 toward the end of the drum 1, whereby the yarn transferring lever 18c can easily and reliably insert the yarn y into the bunch guide 17.

[0038] Next, a corn bobbin supply device (not shown in the drawings) places the corn bobbin 2 between the extended cradle arms 8, and the two arms of the cradle arm 8 are moved in a direction in which they approach each other, so that the cradle arm 16 can grip the corn bobbin 2. In this case, the yarn y, which has been inserted into the bunch guide 17 and gripped by the yarn cutting-gripping member 15a of the yarn gripping device 15, is located between the cradle arm 8 on the larger diameter side 2a of the corn bobbin 2 and the larger diameter side 2a of the corn bobbin 2, which is gripped by the corn bobbin supply device (not shown in the drawings). Consequently, the operation of gripping the corn bobbin 2 between the cradle arms 8 allows the yarn y to be sandwiched between the cradle

arm 8 and the corn bobbin 2. Once the yarn y has been sandwiched between the cradle arm 8 and the corn bobbin 2, the yarn end is released from gripping by the yarn cutting-gripping member 15a of the yarn gripping device 15.

[0039] Then, the cradle arms 8, which are gripping the corn bobbin 2, are rotatively moved toward the traversing drum 1, which is rotating at low speeds, so that the corn bobbin 2 comes in contact with the traversing drum 1. Then, the corn bobbin 2 is rotated to operate the bunch guide 17, and the yarn y, which is held at the winding-start bunch position on the larger diameter side 2a of the corn bobbin 2, is wound around the corn bobbin at this position to form the winding-start bunch y1.

[0040] Simultaneously with the formation of the winding-start bunch y1 or before or after it, the yarn transferring device 18 and the yarn gripping device 15 leave the traversing drum 1 to return to standby positions. The separation of the yarn transferring device 18 from the traversing drum 1 causes the yarn y, which has been inserted into the bunch guide 17, to slip out from the bunch guide 17 due to the tension of the yarn y. The yarn is inserted into a traversing groove formed in the traversing drum 1 to resume traversing. At this point, the traversing drum 1 is rotated at a normal rotation speed.

[0041] After the above winding-start bunch formation operation has been finished, the rotation of the cam shaft 20 is stopped.

[0042] In addition, if the yarn y has been subjected to S twisting, the corn bobbin 2 is rotatively driven in contact with the traversing drum 1 so that its larger diameter side 2a is located on the left side as the automatic winder is seen from its front, and the winding-start bunch y1 is formed at the larger diameter side 2a end of the corn bobbin 2, as shown in Figure 11. If the corn bobbin 2 is rotatively driven in contact with the traversing drum 1 so that its larger diameter side 2a is located on the left side in the above manner, then the stop levers 23f, 25g are used to hinder operation of the winding-start bunch formation device B1 disposed on the right side, while the winding-start bunch formation device B2 is operated which is disposed on the left side and which comprises of the yarn gripping device 15, and the yarn transferring device 18. The operational procedure is similar to the one described above and is thus omitted.

[0043] According to the present invention, as described above, the pair of, that is, two winding-start bunch formation devices B1, B2 comprising the yarn gripping device 15, and the yarn transferring device 18 are disposed so that one of the winding-start bunch formation devices B1, B2 is hindered from operation while the other is operated depending on whether the yarn has been twisted in the S or Z direction. Thus, in drawing out the yarn upward from the winding package formed by the automatic winder, the yarn is drawn out while being untwisted, thereby effectively restraining possible snarl or kink in the unwound yarn to allow the

yarn to be unwound in the form of a well-defined balloon. As a result, the occurrence of yarn breakage decreases.

[0044] In the above embodiment, one of the winding-start bunch formation devices B1, B2 becomes operative or inoperative based on the positions of the stop levers 23f, 25g. However, the yarn transferring device driving cam 23a and the yarn gripping device driving cam 25a may be disposed on the constantly rotatively moved cam shaft for free movement, and a clutch drive cam having a clutch latch may be attached to the cam shaft at a location close to the yarn transferring device driving cam 23a and the yarn gripping device driving cam 25a. In this construction, the clutch latch is engaged with the yarn transferring device driving cam 23a or the yarn gripping device driving cam 25a via a cylinder or an appropriate lever so as to transmit driving by the cam shaft to the yarn transferring device driving cam 23a or the yarn gripping device driving cam 25a.

[0045] Figure 14 shows an automatic winder comprising a large number of winding units w provided in juxtaposition and each comprising the traversing drum 1, the yarn clearer 6 and the yarn-splicing device 7. This figure shows an example in which those winding units w located on the left half of the automatic winder each have the cone bobbin 2 disposed in a manner such that its larger diameter side 2a is located on the right side, whereas those winding units w located on the right half of the automatic winder each have the cone bobbin 2 disposed in a manner such that its larger diameter side 2a is located on the left side. Thus, during a doffing operation for the winding units w located on the left half of the automatic winder, the winding-start bunch formation device B1 is operated which is disposed in a doffing device running along the winding units w and which is located on the right side, while during a doffing operation for the winding units w located on the right half of the automatic winder, the left-hand winding-start bunch formation device B2 is operated which is disposed in the doffing device and which is located on the left side. In this case, a zone detecting instruction means d1 such as a magnet is disposed on the horizontal section 13a of the frame 13 at an appropriate position, the frame 13 being located between the winding units w with their larger diameter side 2a located on the left side and winding units w with their larger diameter side 2a located on the right side, or the zone detecting instruction means d1 is disposed on a front surface of the rail 14 at an appropriate position. The doffing device 12 has a switching means d2 such as a lead switch which is disposed thereon to respond to the zone detecting instruction means d1. Thus, the switching means d2 of the doffing device 12 can be switched to operate the above cylinder 23h via a control device (not shown in the drawings) in order to change the positions of the stop levers 23f, 25g, thereby causing one of the pair of winding-start bunch formation devices B1, B2 disposed

in the doffing device to become operative or inoperative. Of course, the number and arrangement of the winding units w with their larger diameter side 2a located on the left or right side can be set as appropriate without being limited to the above examples. This construction enables the automatic winder to be divided as appropriate into the winding units w with their larger diameter side 2a located on the left side and the winding units w with their larger diameter side 2a located on the right side, thereby improving the versatility and availability of the automatic winder. The bunch guides 17 need not be necessarily installed at the two cradle arms 8 respectively. The bunch guide 17 is only installed at the cradle arm 8 of the large diameter side of the cone bobbin 2, and the bunch guide 17 of the small diameter side can be omitted.

[0046] Due to the above construction, the present invention has the following effects.

[0047] The position of the bunch can be changed depending on whether the yarn has been twisted in the S or Z direction. Consequently, when the yarn is drawn out upward from the winding package formed by the automatic winder, the drawing-out can be carried out in the direction in which the yarn is untwisted. As a result, possible snarl or kink in the unwound yarn is restrained to enable the yarn to be unwound in the form of a well-defined balloon, thereby reducing the occurrence of yarn breakage.

[0048] Since the switching means is disposed for switching the yarn gripping device and yarn transferring device disposed in the doffing device between the operative state and the inoperative state, the single doffing device can form the winding-start bunches of all winding units as appropriate.

[0049] The doffing device running along the winding units has the switching means responding to the zone detecting instruction means disposed in the machine body, thereby improving the versatility and availability of the automatic winder.

Claims

1. A doffing device of an automatic winder characterized by comprising a pair of winding-start bunch formation devices disposed so as to change a position at which a winding-start bunch is formed depending on a direction in which a wound yarn has been twisted, that is, whether the yarn has been subjected to S or Z twisting.
2. A doffing device of an automatic winder as in Claim 1 characterized by having a switching means for switching a yarn gripping device and a yarn transferring device constituting the winding-start bunch formation device, between an operative state and an inoperative state.
3. A doffing device of an automatic winder as in Claim

1 or Claim 2 characterized in that a doffing device running along a winding unit has a switching means disposed therein for responding to a zone detecting instruction means disposed in a main body, and in that the zone detecting instruction means operates 5 the switching means to make one of the pair of winding-start bunch formation devices operative or inoperative.

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FIG. 1

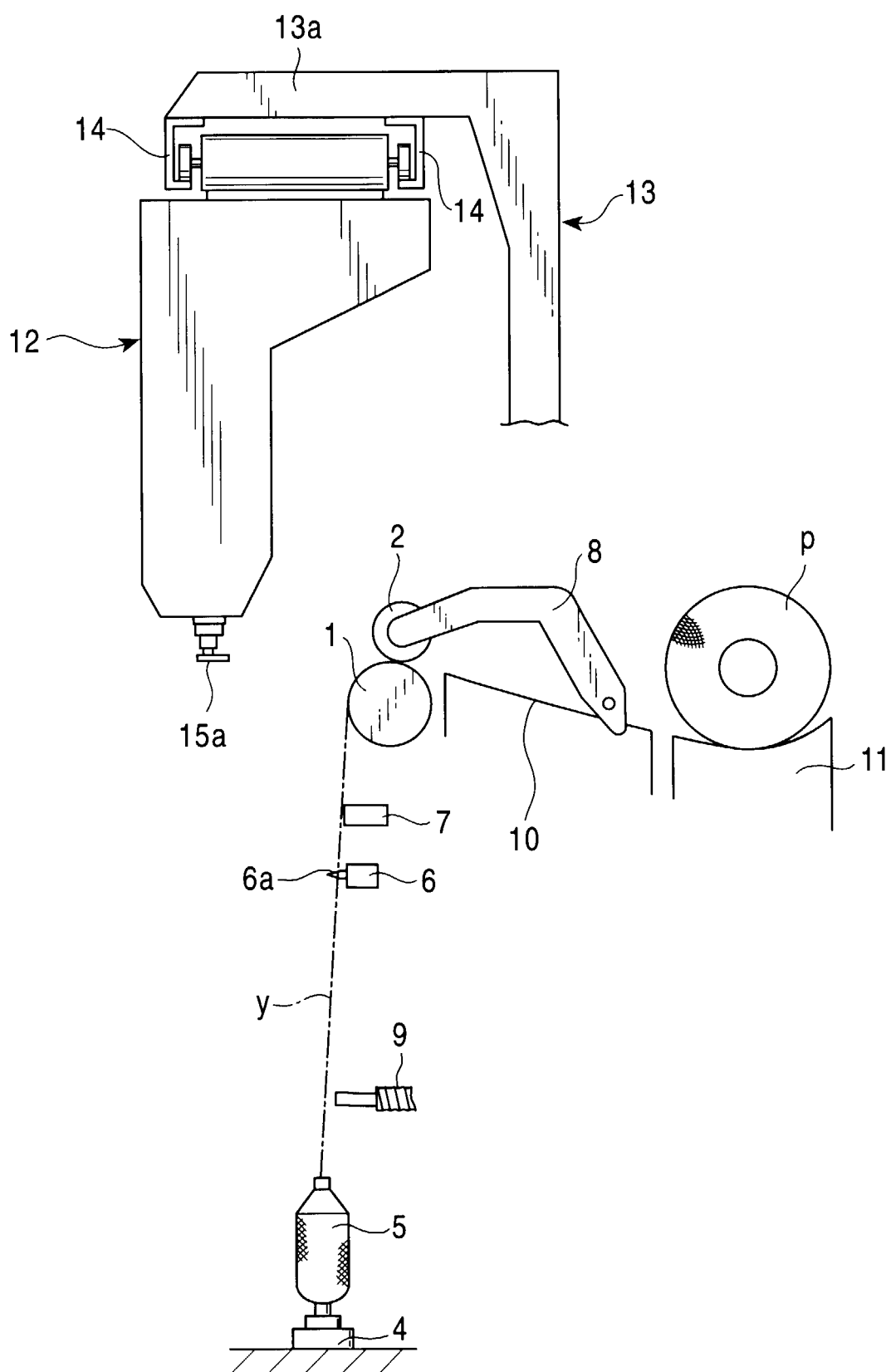


FIG. 2

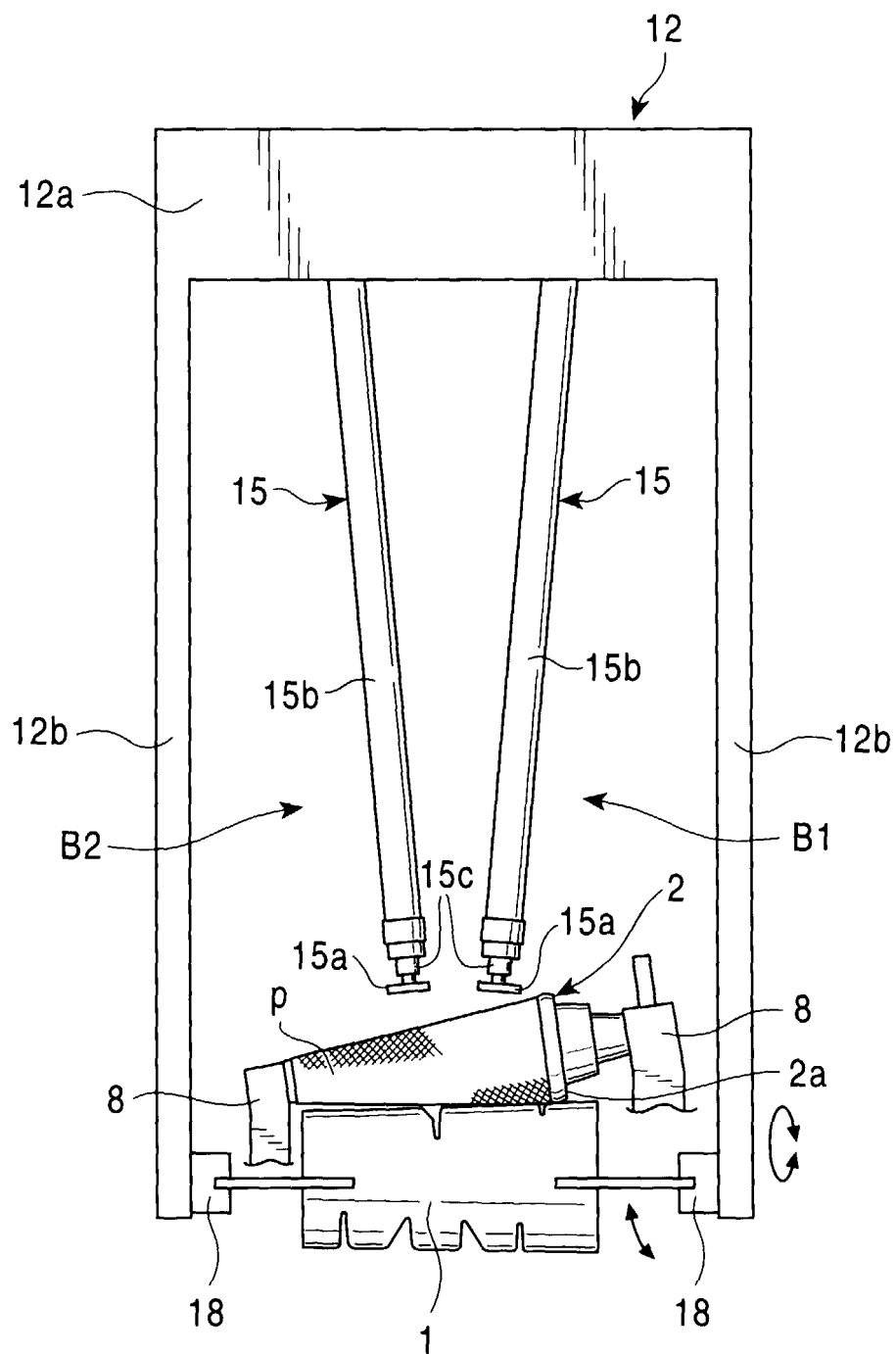


FIG. 3

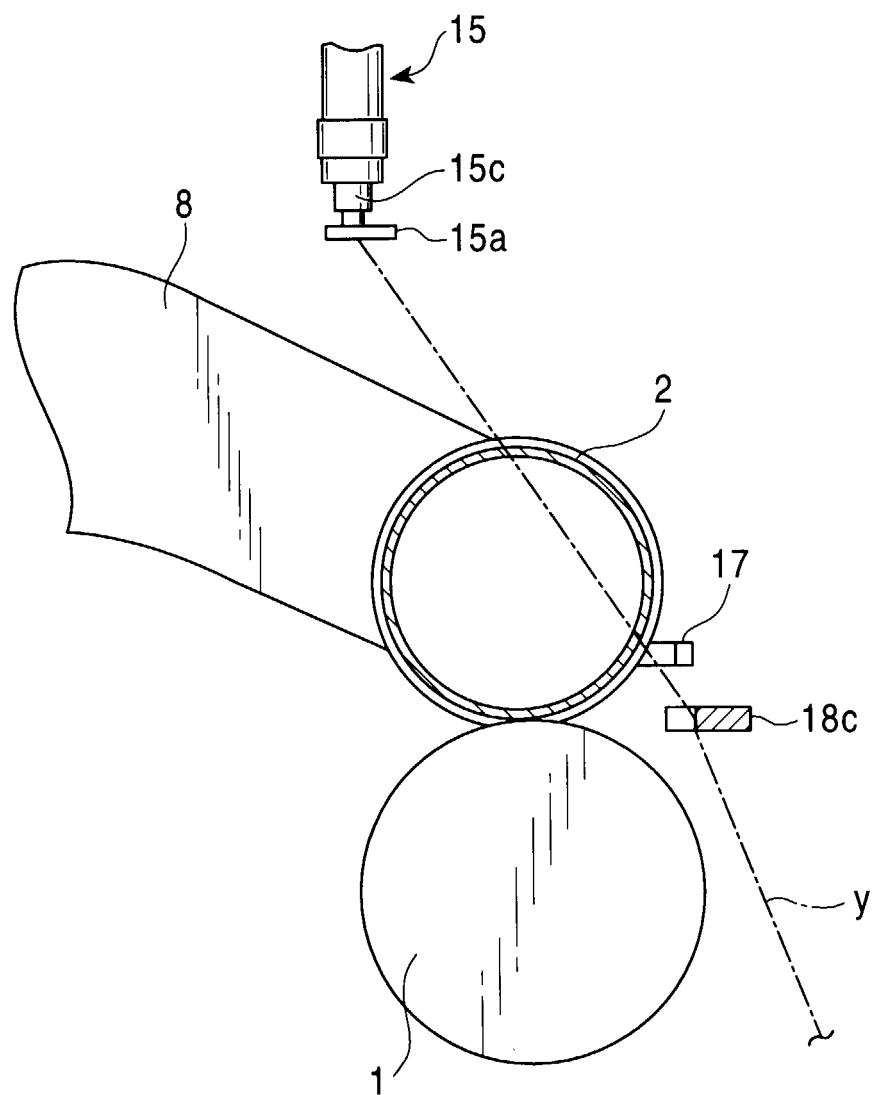


FIG. 4

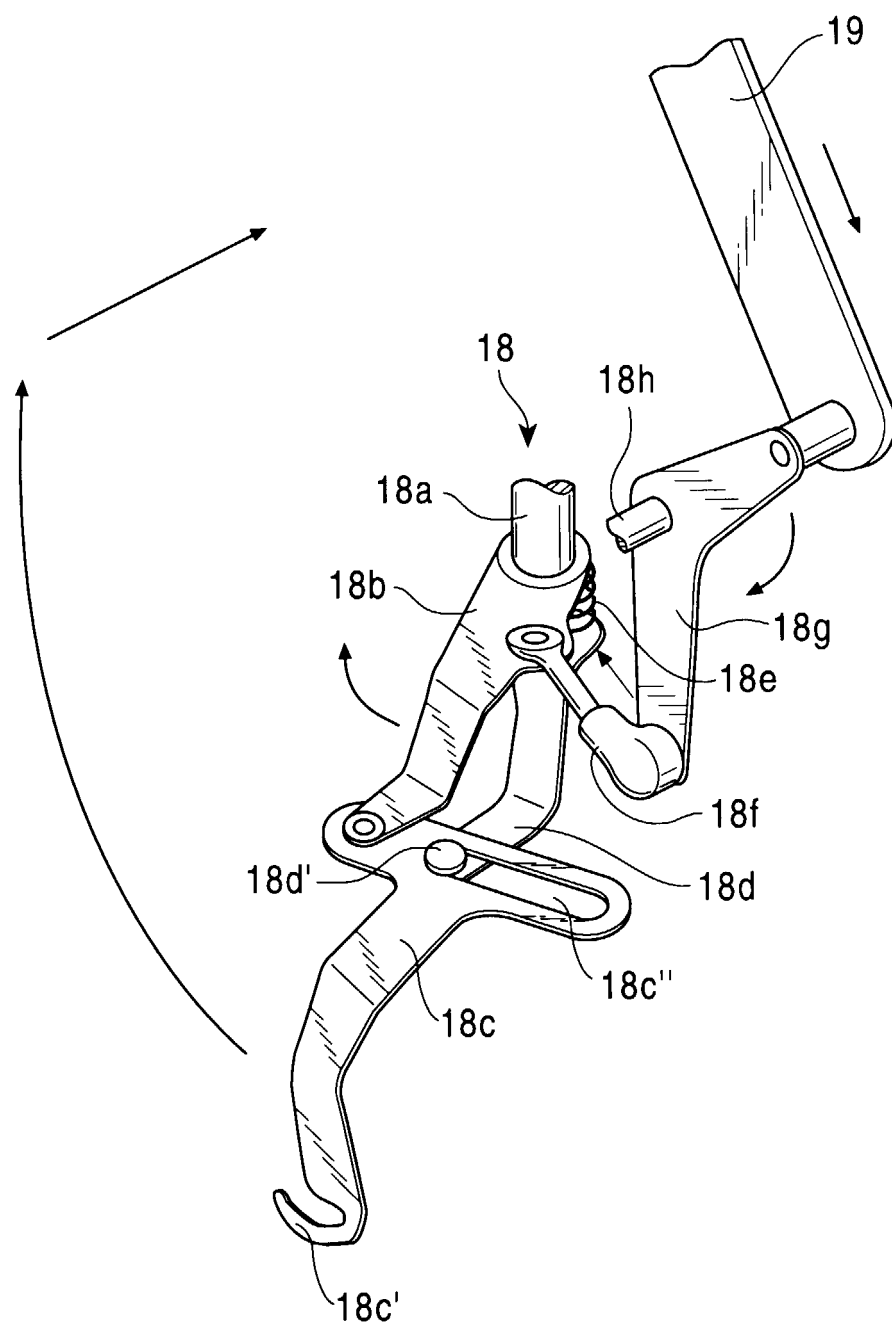


FIG. 5

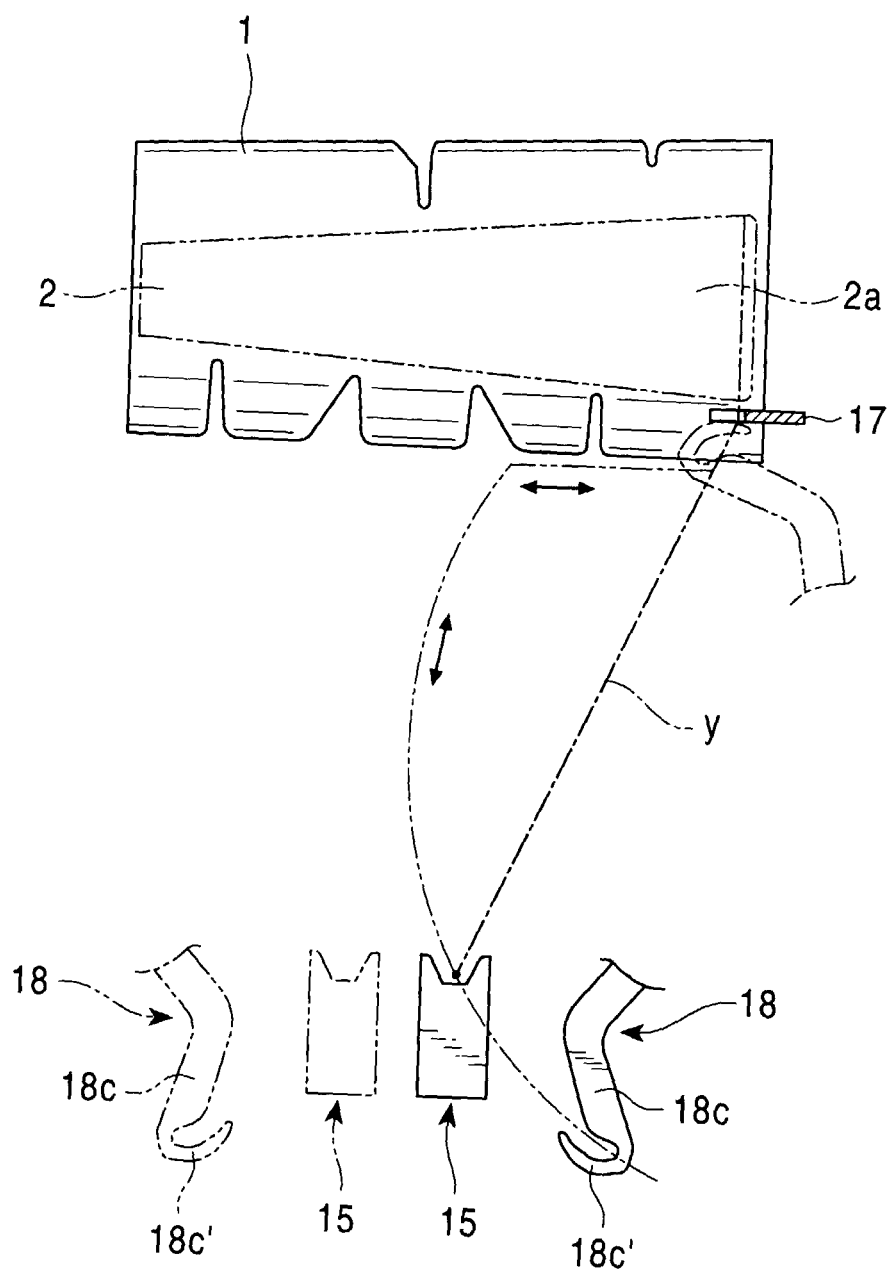


FIG. 6

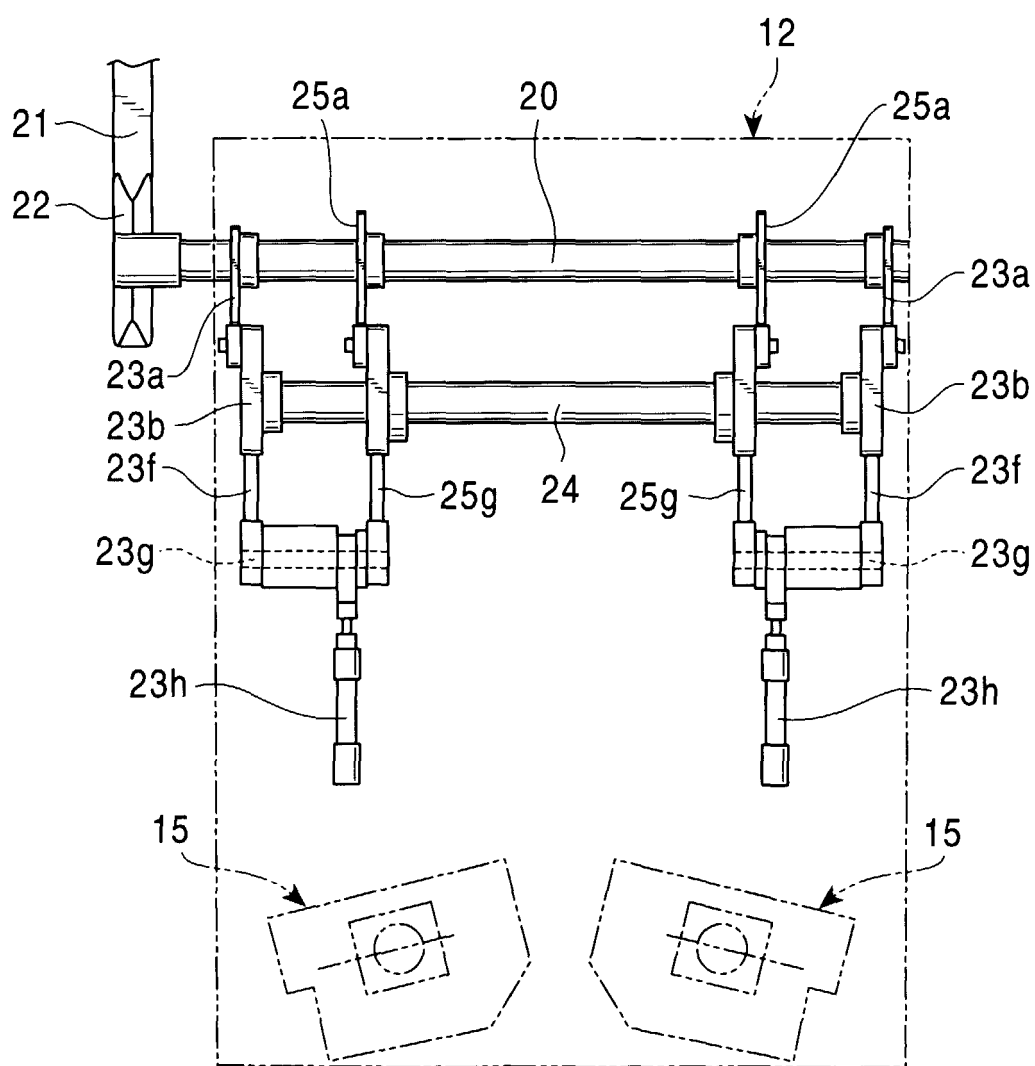


FIG. 7

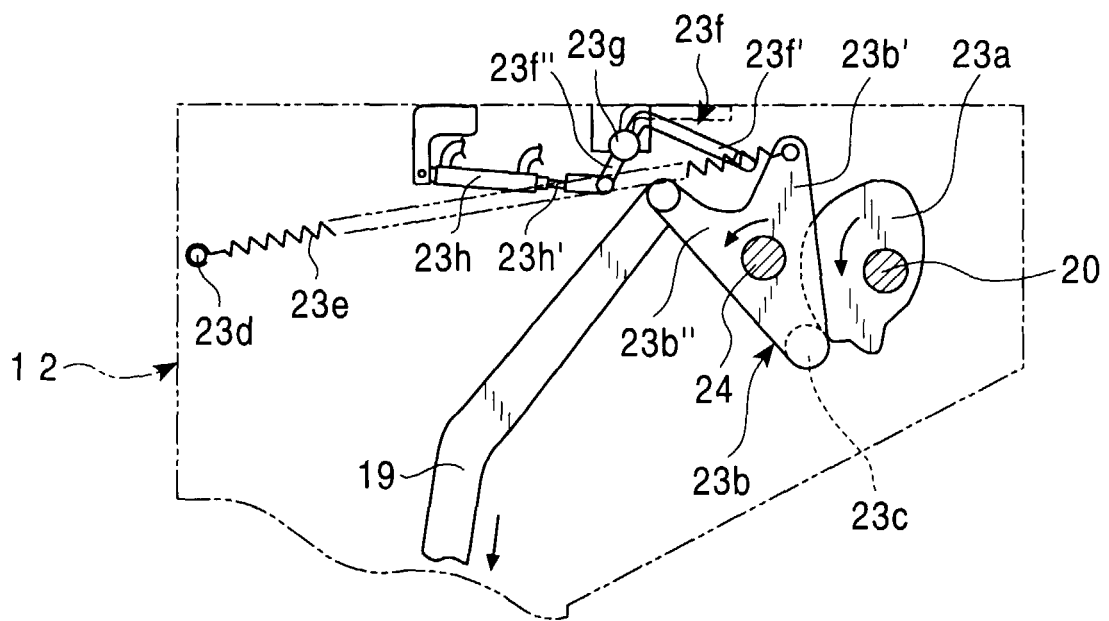


FIG. 8

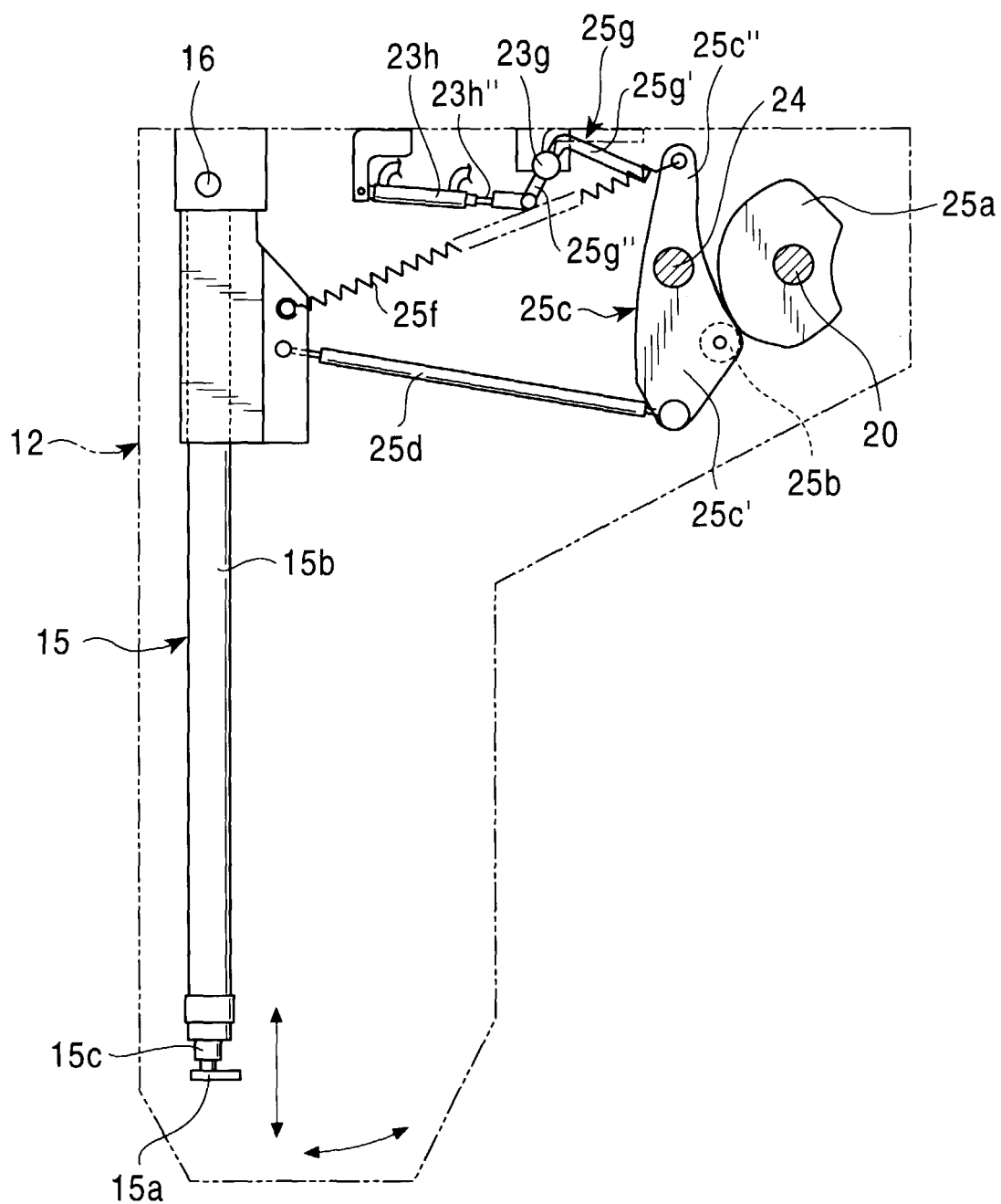


FIG. 9

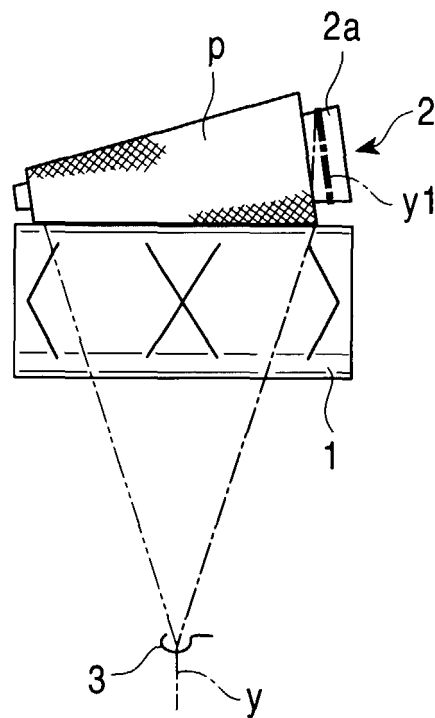


FIG. 10

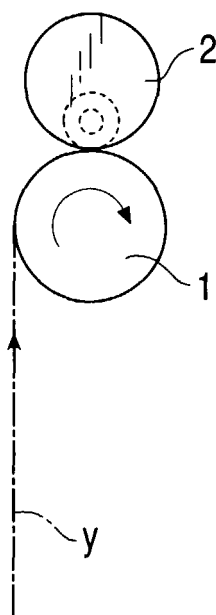


FIG. 11

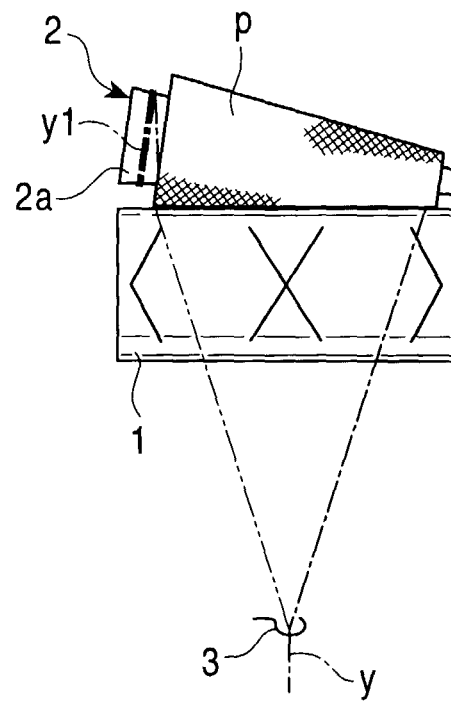


FIG. 12

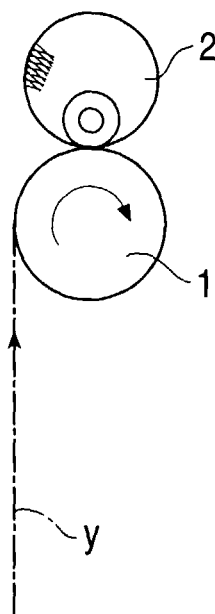


FIG. 13

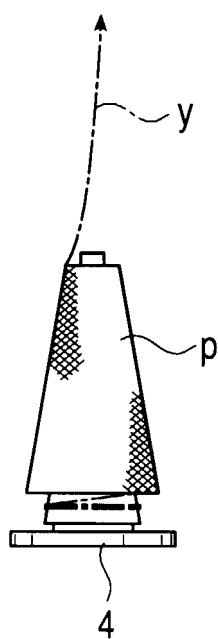


FIG. 14

