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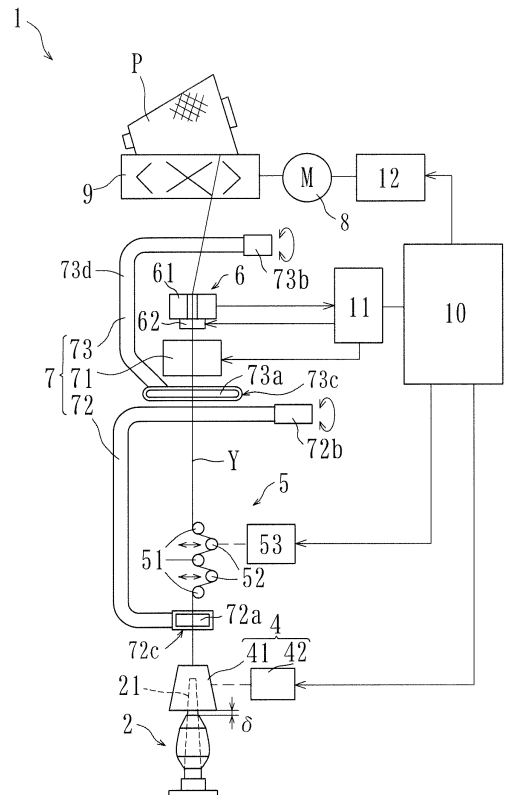
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(54) **Device for pulling out a yarn end from a winding package**

(57) The present invention provides a yarn end drawing device capable of reliably catching and drawing out a yarn end portion without cutting the yarn end portion. In the yarn end drawing device, a suctioning portion (73c), which includes a suction port (73a) and comb teeth (73h) projecting toward the interior of the suction port (73a), is positioned close to the circumferential surface of a wound yarn package, thereby suctioning a yarn end portion on the wound yarn package and hooking the yarn end portion on a comb tooth (73h) to catch and draw out the yarn end portion. The yarn end drawing device includes a yarn end regulating member (73f) for regulating the suctioned yarn end portion so as not to flutter while being bent at the tip of any comb tooth (73h), and the yarn end regulating member (73f) is arranged at the downstream side in the suction direction of the comb teeth (73h).

Fig. 1



Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a yarn end drawing device for drawing out a yarn end portion from a wound yarn package, which is formed by an automatic winder or suchlike, by suctioning and catching the yarn end portion, and specifically to a yarn end drawing device having a suction port with comb teeth for hooking a yarn end portion.

Description of the Background Art

[0002] Conventionally, there have been known automatic winders in which a yarn unwound from a yarn supply bobbin is wound as a package onto a winding tube, which is supported by a cradle, by traversing the yarn with a traverse drum or suchlike while eliminating a yarn defect.

[0003] In the automatic winders, the yarn is cut in order to eliminate the yarn defect, and thereafter a yarn end portion on the wound yarn package side is suctioned and caught by a suction mouth (a yarn end drawing device) including a suctioning portion that can be positioned close to the circumferential surface of the wound yarn package. On the other hand, a yarn end portion on the yarn supply bobbin side after the yarn cutting is suctioned and caught by a suction nozzle having a suctioning portion disposed between the yarn supply bobbin and a tension device. Thereafter, the suction mouth catching the yarn end portion pivotally moves for drawing out the yarn end portion on the wound yarn package side and introducing it into a yarn splicing device, and the suction nozzle catching the yarn end portion pivotally moves for introducing the yarn end portion on the yarn supply bobbin side into a yarn splicing device, thereby performing a yarn splicing.

[0004] For example, Japanese Utility Model Publication No. 61-45089 discloses an automatic winder in which a suction mouth has a suctioning portion 73c' with a suction port 73a extending substantially across the width of a wound yarn package as shown in FIG. 6. In order to increase the success rate of drawing out a yarn end portion on the wound yarn package side, the suctioning portion 73c' includes a comb teeth member 73e having comb teeth 73h projecting toward the interior of the suction port 73a. As shown in (A) of FIG. 7, the yarn end portion Y' on the wound yarn package P is suctioned into the suction port 73a and hooked by any comb teeth 73h, and thereby can be reliably caught and drawn out from the wound yarn package P.

[0005] In some cases, however, suction airflow might cause the yarn end portion Y' suctioned into the suction port 73a to flutter while being bent at the tip of a comb tooth 73h (see (B) of FIG. 7), so that the yarn end portion

Y' is cut (see (C) of FIG. 7). In such cases, winding is restarted with the yarn end portion Y' on the side of the terminal end Yt being left as a yarn snip Ys on the wound yarn package P, so that a defective package containing yarn waste is produced.

SUMMARY OF THE INVENTION

[0006] The present invention has been made in view of the above-described situation, and an objective thereof is to provide yarn end drawing devices capable of reliably catching and drawing out a yarn end portion without cutting the yarn end portion.

[0007] In order to achieve the object mentioned above, the present invention provides (1) a yarn end drawing device for suctioning a yarn end portion of a wound yarn package and hooking the yarn end portion on comb teeth so as to catch and draw out the yarn end portion, the device including a yarn end regulating member for regulating the suctioned yarn end portion so as not to flutter while being bent at the tip of any comb tooth. The yarn end regulating member is arranged at a downstream side in a suction direction of the comb teeth. The device suctiones and hooks the yarn end portion by positioning a suctioning portion close to a circumferential surface of the wound yarn package. The suctioning portion includes a suction port and the comb teeth. The comb teeth project toward the interior of the suction port.

[0008] In addition, the present invention provides (2) a yarn end drawing device based on the above configuration, in which the yarn end regulating member has a yarn end regulating surface extending from the vicinity of the tips of the comb teeth toward the downstream side along the suction direction.

[0009] In addition, the present invention provides (3) a yarn end drawing device based on the above configuration (2), in which the yarn end regulating surface includes a resisting member for applying resistance to the suctioned yarn end portion in such a manner that the suctioned yarn end portion does not slip out of the suction port.

[0010] According to the device of the present invention as configured above, the yarn end regulating member does not allow a suctioned yarn end portion to flutter while being bent at the tip of any comb tooth, and thereby it is possible to prevent the yarn end portion from being cut at the time of suctioning and catching. Thus, it is possible to avoid any defective package from being produced due to a snip of yarn end portion on the side of the terminal end being left on a wound yarn package as yarn waste.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIG. 1 is a front view illustrating a winding unit to which a yarn end drawing device according to an embodiment of the present invention is applied.

FIG. 2 is a schematic view for explaining a yarn end drawing method for use in the winding unit of FIG. 1. FIG. 3 illustrates a suctioning portion of the yarn end drawing device according to the embodiment of the present invention, and consists of (A) a plan view of the suctioning portion, and (B) a cross-sectional side view taken along line Z-Z.

FIG. 4 is a view illustrating a yarn end portion drawn out by the yarn end drawing device of FIG. 3.

FIG. 5 is a cross-sectional side view illustrating a suctioning portion of a yarn end drawing device according to a variant of the embodiment.

FIG. 6 illustrates a suctioning portion of a conventional yarn end drawing device, and consists of (A) a plan view of the suctioning portion, and (B) a cross-sectional side view taken along line X-X.

FIG- 7 is a view illustrating a yarn end portion drawn out by the yarn end drawing device of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] Hereinafter, a preferred embodiment of the present invention will be described with reference to the drawings. FIG. 1 is a front view illustrating a winding unit to which a yarn end drawing device according to the present embodiment is applied; FIG. 2 is a schematic view for explaining a yarn end drawing method for use in the winding unit of FIG. 1; FIG. 3 illustrates a suctioning portion of the yarn end drawing device according to the present embodiment, and consists of (A) a plan view of the suctioning portion, and (B) a cross-sectional side view taken along line Z-Z; and FIG. 4 is a schematic view illustrating a yarn end portion drawn out by the yarn end drawing device of FIG. 3.

[0013] First, an overview is given for an automatic winder to which the yarn end drawing device according to the present embodiment is applied. The automatic winder forms a wound yarn package by unwinding yarn supply bobbins produced by a spinning machine or such-like. As shown in FIG. 1, a winding unit 1 included in the automatic winder has a yarn supply bobbin 2 disposed at the bottom and a wound yarn package P disposed at the top, which is a wound body of a yarn Y unwound from the yarn supply bobbin 2.

[0014] Provided between the yarn supply bobbin 2 and the wound yarn package P are, from the bottom along a yarn path: an unwinding-assist device 4 for controlling an unwound balloon; a variable tension device 5 for applying winding tension; a clearer 6 for detecting a yarn defect such as a slub; yarn splicing means 7 for splicing yarn ends when a yarn break occurs or when yarn cutting is performed by the clearer 6; and a traverse drum 9 driven by a drive motor 8 to traverse the yarn Y.

[0015] The unwinding-assist device 4 includes: an umbrella-like cylindrical member 41 covering a winding tube 21 of the yarn supply bobbin 2; and a drive mechanism 42 for lowering the cylindrical member 41 in such a manner as to substantially maintain a constant distance δ

from the upper end - chase portion- of the wound yarn body around the yarn supply bobbin 2. The cylindrical member 41 is controlled in such a manner as to maintain the balloon at a constant diameter at the time of unwinding, so that unwinding tension is not increased during the progress of unwinding.

[0016] The variable tension device 5 is of a gate type disposed in the yarn path of the yarn Y unwound from the yarn supply bobbin 2. The variable tension device 5 has movable teeth 52 alternating with fixed teeth 51, and includes a drive mechanism 53, such as a solenoid, which increases/decreases engagement of the movable teeth 52 with the fixed teeth 51. The variable tension device 5 is capable of controlling the engagement of the movable teeth 52 with the fixed teeth 51, i.e., the degree of zigzag bending of the yarn path, in accordance with a control signal from a control device 10, thereby successionaly controlling the winding tension that is to be applied to the yarn Y.

[0017] The clearer 6 includes a sensing unit 61 for sensing a thickness variation of the yarn Y passing therethrough, and a cutter 62 formed integrally with or separately from the sensing unit 61. During the winding, an electrical signal based on the thickness variation of the yarn Y passing through the clearer 6 is inputted to a clearer controller 11, and subjected to a comparison operation with a reference value. If the electrical signal is found to exceed a tolerance level as a result of the comparison operation, the clearer controller 11 determines that a yarn defect has passed, and immediately outputs an instruction signal to the cutter 62, thereby activating the cutter 62 to perform forced yarn cutting. At the same time as the yarn cutting, a yarn traveling signal from the clearer 6 is turned off, so that a yarn break is sensed, and the clearer controller 11 outputs a signal to stop the drive motor 8, thereby stopping the rotation of the traverse drum 9.

[0018] Subsequently, the clearer controller 11 outputs an instruction signal to cause the yarn splicing means 7 (a splicer) to start a yarn splicing operation. The yarn splicing means 7 includes a yarn splicing device 71, a suction nozzle 72 for guiding the yarn end portion on the yarn supply bobbin 2 side into the yarn splicing device 71, and a suction mouth (yarn end drawing device) 73 for guiding the yarn end portion on the wound yarn package P side into the yarn splicing device 71.

[0019] The suction nozzle 72 and the suction mouth (yarn end drawing device) 73 include at their one end suctioning portions 72c and 73c, respectively, which have their respective suction ports 72a and 73a formed therein. The suction nozzle 72 and the suction mouth 73 are capable of pivoting around their respective pivot shafts 72b and 73b at the other end. In addition, the suction nozzle 72 and the suction mouth 73 are connectable to a suction source (not shown) at their respective pivot shafts 72b and 73b, and thus can suction the yarn end portions from the suction ports 72a and 73a.

[0020] When the forced yarn cutting is performed upon

detection of a yarn defect, the yarn (upper yarn) on the wound yarn package P side is wound onto the wound yarn package P. The yarn (lower yarn) on the yarn supply bobbin 2 side, on the other hand, is caught by the suction port 72a of the suction nozzle 72 disposed between the yarn supply bobbin 2 and the variable tension device 5. Then, the suctioning portion 73c of the suction mouth 73 pivots upward around the pivot shaft 73b to approach the circumferential surface of the wound yarn package P (see (A) of FIG. 2), and in that state, the traverse drum 9 is counter-rotated so that the suctioning portion 73c catches the yarn end portion Y' on the circumferential surface of the wound yarn package P (see (B) of FIG. 2).

[0021] Thereafter, the suction mouth 73 pivots downward, thereby drawing out and guiding the upper yarn Yu into the yarn splicing device 71 (see (C) of FIG. 2). On the other hand, the suction nozzle 72 pivots upward around the pivot shaft 72b, thereby guiding the lower yarn into the yarn splicing device 71. Then, the upper and lower yarns guided into the yarn splicing device 71 are subjected to a yarn splicing process for a yarn splicing operation. After the yarn splicing operation, the traverse drum 9 is rotated by the drive motor 8, thereby restarting the winding.

[0022] As shown in FIG. 1, the traverse drum 9 has traverse grooves formed on its circumferential surface, and is connected to the drive motor 8 so as to frictionally drive the package P, while traversing and winding the yarn Y onto the wound yarn package P. The drive motor 8 is electrically connected to the control device 10 via an inverter 12. The drive motor 8 is controlled to rotate at an optimal speed for the state of winding in accordance with a control signal outputted from the control device 10.

[0023] Next, the suction mouth (yarn end drawing device) according to the embodiment of the present invention will now be described in detail. As shown in FIG. 1, the suction mouth 73 according to the present embodiment includes: the flat-shaped suctioning portion 73c having the suction port 73a at its tip; the pivot shaft 73b acting as a pivotal center; and a pipe 73d for connecting the suctioning portion 73c and the pivot shaft 73b.

[0024] When the suction mouth 73 starts pivoting upwardly toward the package P side, a shutter between the suction mouth 73 and a suction source (not shown) starts opening at the pivot shaft 73b, so that a suctioning action starts working at the suction port 73a via the pipe 73d and the suctioning portion 73c. The suction mouth 73 temporarily stops while returning from the position (working position), at which the suction mouth 73 suctions and catches the yarn end portion on the package P side after pivoting upward, to the original position (standby position) At this time, the yarn on the package P side is introduced into the yarn splicing device 71, and spliced with the yarn end on the bobbin 2 side. In the yarn splicing operation, extra yarn portions other than a portion required for splicing are cut. The resultant wasted yarn portions between the yarn splicing device 71 and the suction mouth 73 are suctioned and eliminated by the suction

mouth 73 maintaining its suctioning action. Thereafter, the suction mouth 73 returns to the original standby position, and is disconnected from the suction source to stop the suctioning action.

[0025] As shown in FIG. 3, the suctioning portion 73c has a comb teeth member 73e and a yarn end regulating member 73f to be located at the upper side thereof in the working position, both of which are made of metal and have substantially the same width as the suction port 73a. The comb teeth member 73e and the yarn end regulating member 73f are respectively L- and U-shaped in cross section. The comb teeth member 73e and the yarn end regulating member 73f are attached to the suctioning portion 73c by bolts 73g with the comb teeth member 73e being positioned on top of the yarn end regulating member 73f.

[0026] When viewed in cross section as shown in FIG. 3, the comb teeth member 73e has comb teeth 73h at the tip of the short-side portion for hooking the yarn end portion, which are disposed so as to project toward the interior of the suction port 73a. The comb teeth member 73e further has elongated holes 73i for the bolts 73g, which holes are formed in the long-side portion, so that the lengthwise position of the comb teeth 73h can be appropriately adjusted.

[0027] When viewed in cross section as shown in (B) of FIG. 3, the yarn end regulating member 73f is formed so that the short-side portion and one long-side portion fit the inner side of the comb teeth member 73e. In addition, the yarn end regulating member 73f is formed so that a bottom surface (yarn end regulating surface) 73j on the other long-side portion extends from the vicinity of the tips of the comb teeth 73h toward the downstream side in a direction substantially parallel to the suction direction S. Note that the tips of the comb teeth 73h slightly project from the level of the yarn end regulating surface 73j, so that the yarn end portion can be hooked. As in the comb teeth member 73e, the yarn end regulating member 73f further has, at one long-side portion, elongated holes (not shown) provided for the bolts 73g, so that the lengthwise position thereof can be adjusted along with that of the comb teeth member 73e.

[0028] Next, the suction mouth (yarn end drawing device) 73 according to the present embodiment will now be described in relation to the drawing-out of the yarn end portion. As described above, when the forced yarn cutting is performed upon detection of a yarn defect, the suction mouth 73 pivots upward around the pivot shaft 73b to approach the circumferential surface of the wound yarn package P (see (A) of FIG. 2), and in that state, the traverse drum 9 is counter-rotated to make it easier for the mouth 73 to catch the yarn end portion Y' on the circumferential surface of the wound yarn package P (see (B) of FIG. 2).

[0029] At this time, the yarn end portion Y' is suctioned into the suction port 73a, and reliably hooked by a comb tooth 73h as shown in FIG. 4. Thereafter, normal drawing-out of the yarn end portion is performed by linking the

counter rotation of the wound yarn package P to downward pivotal movement of the suction mouth 73 (see (C) of FIG. 2).

[0030] During this operation, suction airflow is constantly applied to the yarn end portion Y' suctioned into the suction port 73a. The yarn end portion Y', however, is regulated by the yarn end regulating surface 73j of the yarn end regulating member 73f, so as not to move upward above the yarn end regulating surface 73j as shown in FIG. 4. The yarn end portion Y' thus does not flutter while being bent at the tip of any comb tooth 73h. Accordingly, it is possible to prevent the yarn end portion Y' from being cut by the tip of any comb tooth 73h during the drawing-out of the yarn end portion. Thus, it is possible to avoid any defective package from being produced due to a snip of yarn end portion Y' on the side of the terminal end Yt - not connected to the package P - being left on the wound yarn package P as yarn waste.

[0031] Also, in the suction mouth 73, since the comb teeth member 73e and the yarn regulating member 73f are slidable lengthwise, the positions of the comb teeth member 73e and the yarn regulating member 73f can be adjusted to accord with the situation, so that the yarn end can be reliably suctioned.

[0032] In addition, the yarn regulating member 73f can be readily attached by the bolts 73g for attaching the comb teeth member 73e, without requiring any additional attachment structure.

[0033] While the foregoing description has been directed to a specific embodiment of the present invention, the present invention is not limited thereto.

[0034] In the above embodiment, the yarn end regulating member 73f is attached so as to sandwich the upper wall of the suctioning portion 73c, but the member 73f may be attached, for example, so that the top surface of the yarn end regulating member 73f is placed in contact with the inner surface of the upper wall of the suctioning portion 73c as shown in (A) of FIG. 5. In addition, the yarn end regulating member 73f has a U-shaped cross section, but the member 73f may have, for example, an L-shaped cross section as shown in (B) of FIG. 5, so that its long-side portion is used as a yarn end regulating surface 73j and its short-side portion is coupled to the short-side portion of the comb teeth member 73e. In such a case, elongated holes for attachment may be further provided in the short-side portion of the yarn end regulating member 73f, so that the positional relationship between the tips of the comb teeth 73h and the yarn end regulating surface 73j can be fine-tuned. The yarn end regulating member 73f may be integrally formed with the comb teeth member 73e. The material of the yarn end regulating member 73f is not limited to metal but may be plastic or suchlike.

[0035] Also, in the above embodiment, the yarn end regulating surface 73j is configured to extend from the vicinity of the tips of the comb teeth 73h toward the downstream side in a direction substantially parallel to the suction direction S, but the surface 73j may be configured

to extend from the vicinity of the tips of the comb teeth 73h toward the downstream side, while slanting upward or downward. In addition, the yarn end regulating surface 73j may include a resisting member composed of, for example, a plurality of protrusions or hairy pieces standing erect toward the downstream side in the suction direction. The resisting member allows the suctioned yarn end portion Y' to move in the suction direction, but applies resistance to movement of the yarn end portion Y' in the opposite direction so as to prevent the yarn end portion Y' from slipping out of the suction port 73a.

[0036] In addition, the suction mouth (yarn end drawing device) 73 according to the present invention is preferably applied to automatic winders that frequently perform a yarn splicing operation. However, the yarn end drawing device according to the present invention is applicable to any spinning machine, so long as the machine includes a winding device, which forms a wound yarn package and has a function of automatically splicing yarns when a yarn break occurs.

Claims

1. A yarn end drawing device (73) for suctioning a yarn end portion (Y') of a wound yarn package (P) by positioning a suctioning portion (73c) close to a circumferential surface of the wound yarn package (P), and hooking the yarn end portion (Y') on comb teeth (73h) so as to catch and draw out the yarn end portion (Y'), the suctioning portion (73c) including a suction port (73a) and the comb teeth (73h), the comb teeth (73h) projecting toward the interior of the suction port (73a), the device (73) being **characterized by** comprising a yarn end regulating member (73f) for regulating the suctioned yarn end portion (Y') so as not to flutter while being bent at the tip of any comb tooth, the yarn end regulating member (73f) being arranged at a downstream side in a suction direction of the comb teeth (73h).
2. The yarn end drawing device (73) according to claim 1, **characterized in that** the yarn end regulating member (73f) has a yarn end regulating surface (73j) extending from the vicinity of the tips of the comb teeth (73h) toward the downstream side along the suction direction.
3. The yarn end drawing device (73) according to claim 2, **characterized in that** the yarn end regulating surface (73j) includes a resisting member for applying resistance to the suctioned yarn end portion (Y') in such a manner that the suctioned yarn end portion (Y') does not slip out of the suction port (73a).

Fig. 1

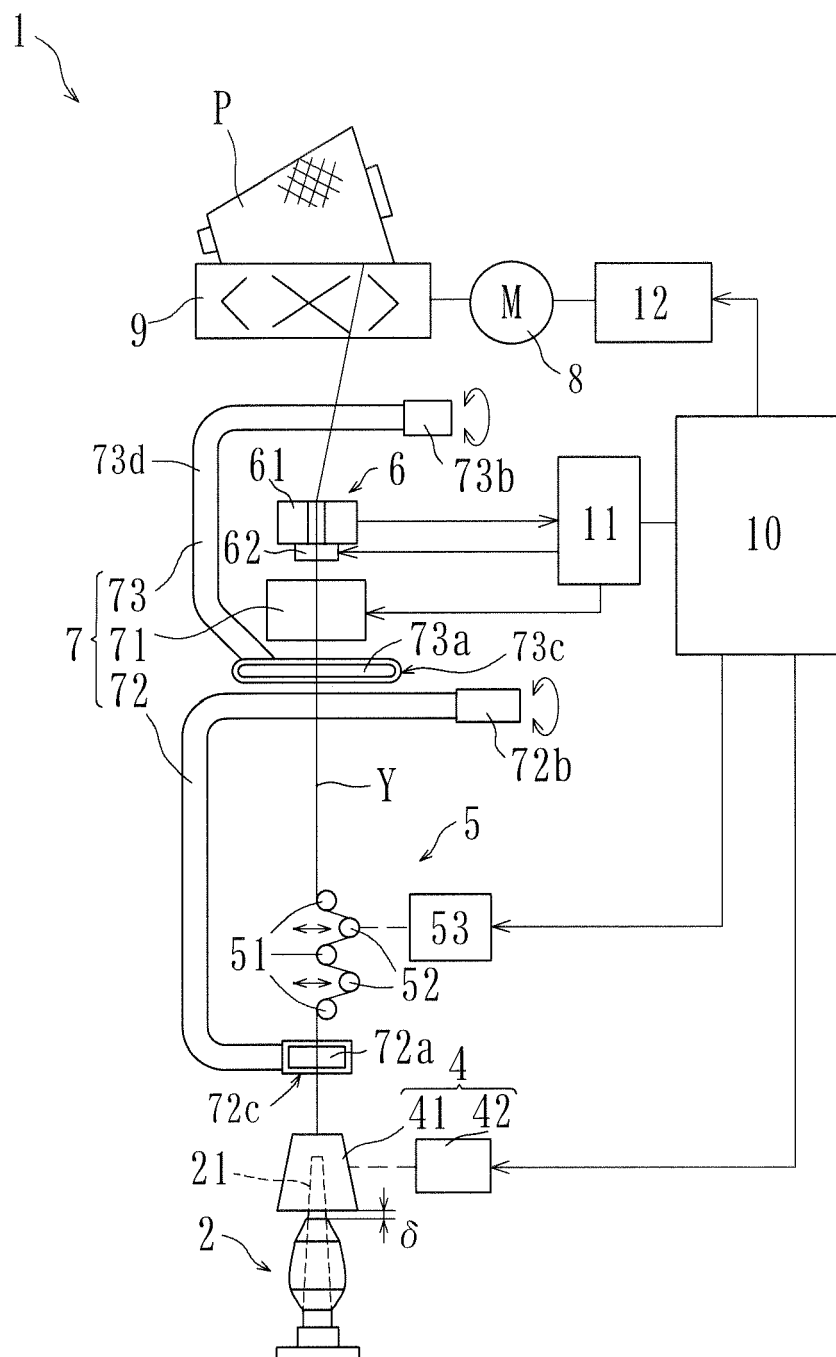


Fig. 2

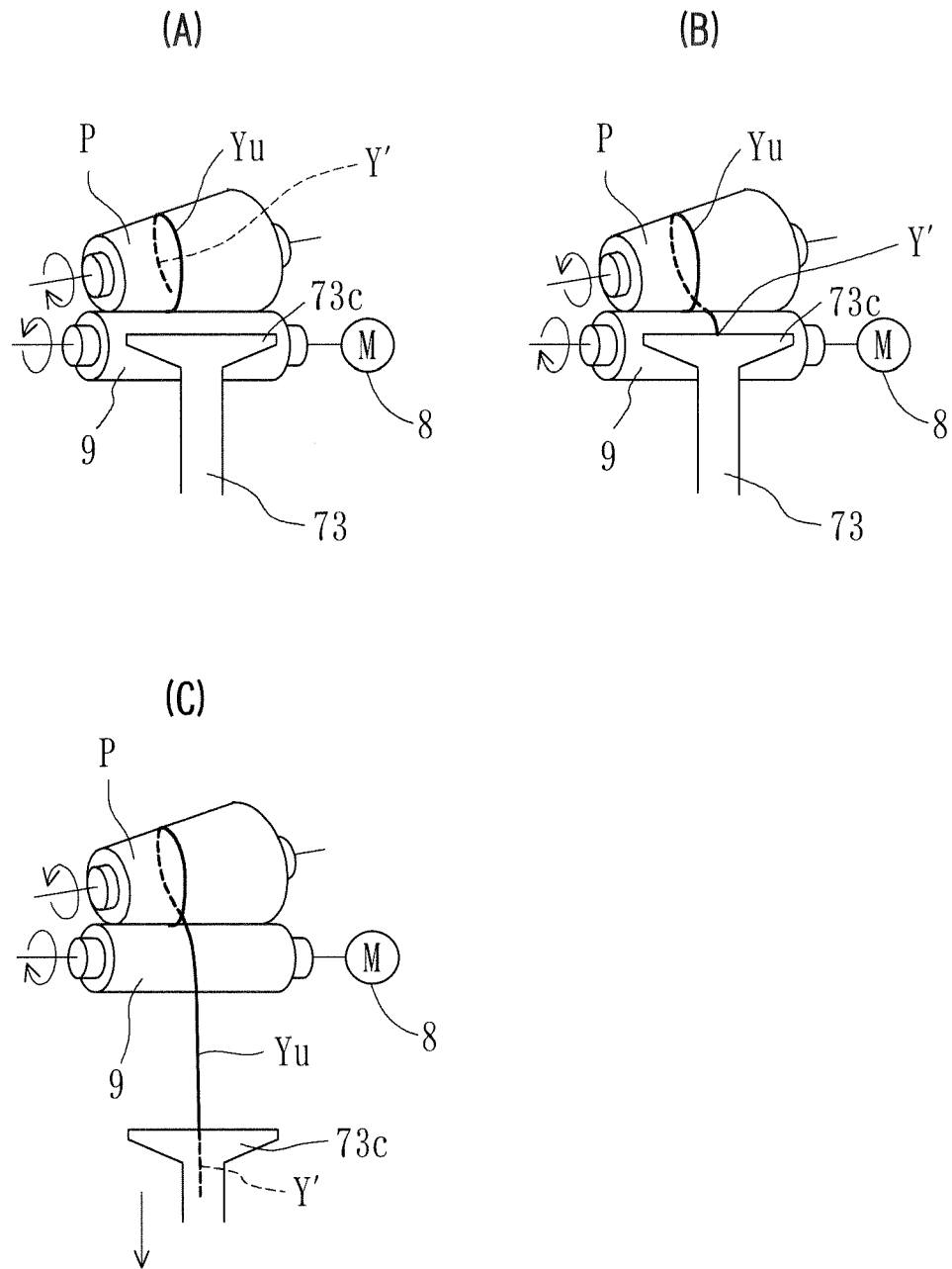
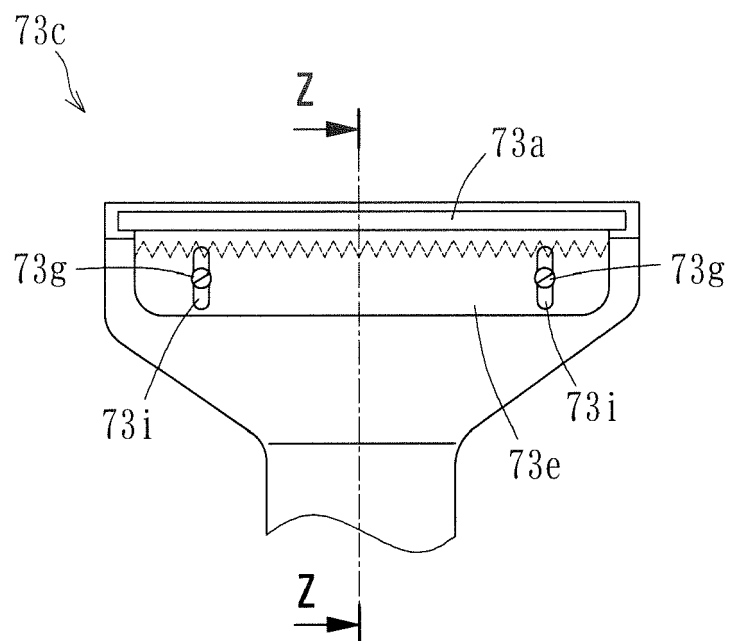


Fig. 3

(A)



(B)

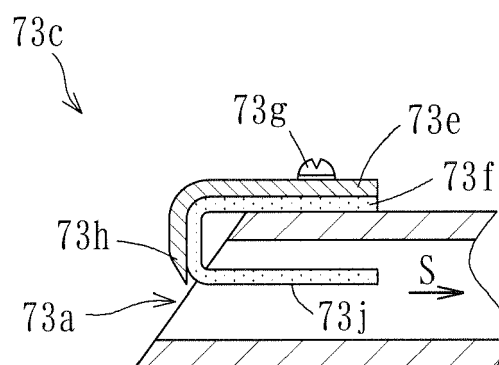


Fig. 4

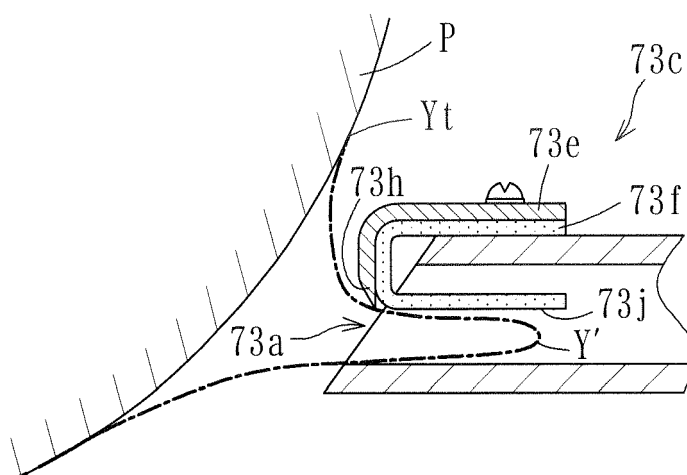
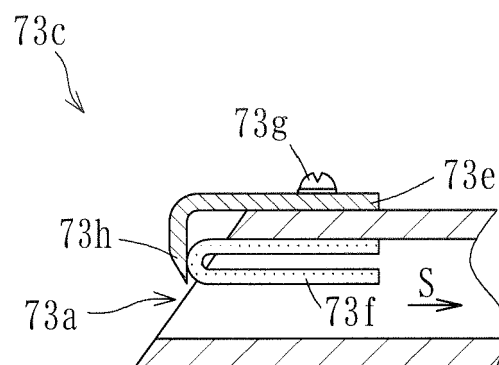


Fig. 5

(A)



(B)

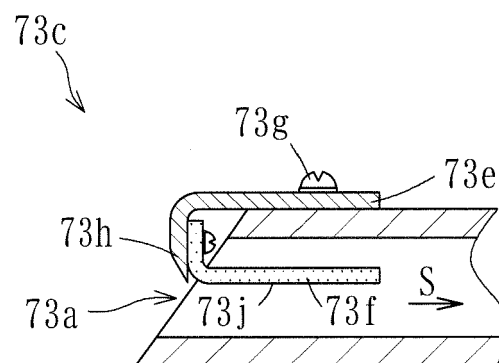
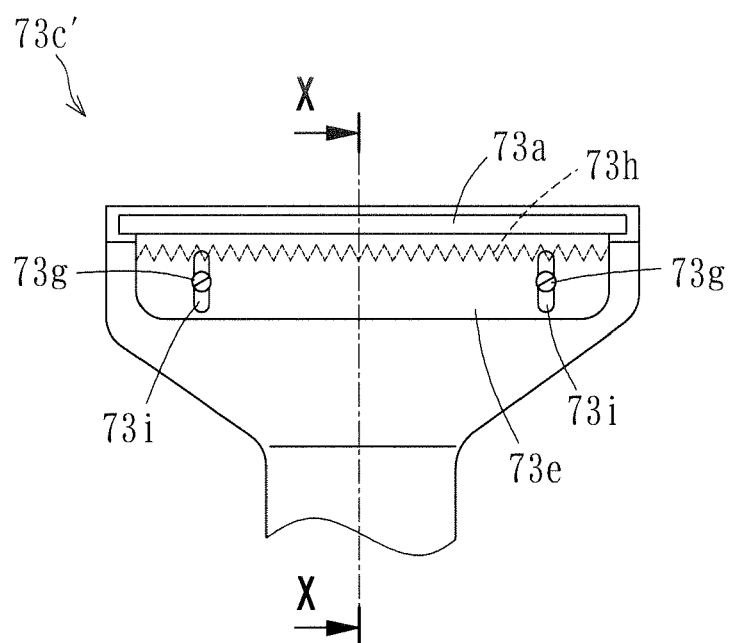


Fig. 6

(A)



(B)

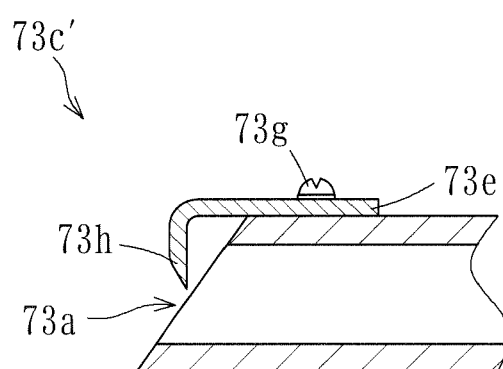
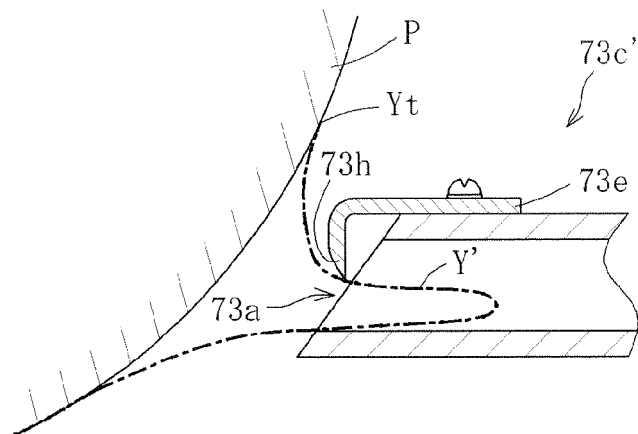
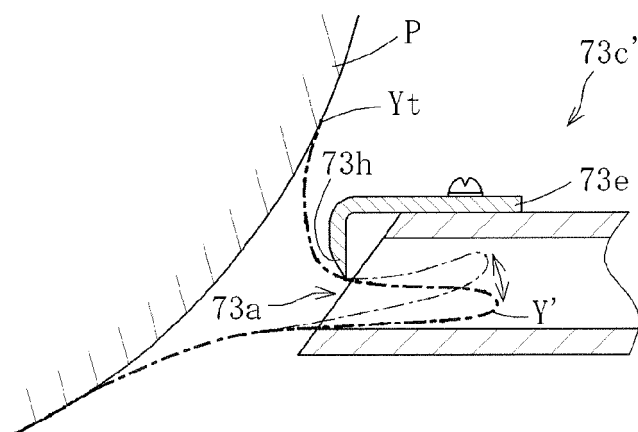


Fig. 7

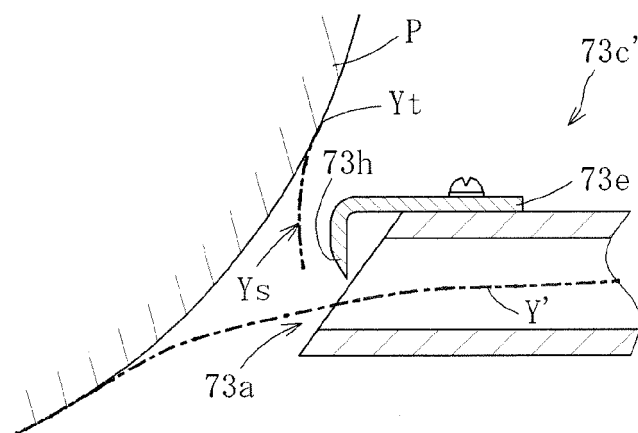
(A)



(B)



(C)



REFERENCES CITED IN THE DESCRIPTION

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