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(54) Winding method and device

(57) On a winding method that winds by traversing yarn, the present invention forcibly restricts the traverse width of the yarn when the yarn tension decreases. Specifically, traverse restriction is carried out before cutting of the yarn, immediately before the supply yarn runs out or at the start of winding.

Accordingly, end missing during winding and mis-traversing are prevented and the production of defective packages can be prevented.

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Description

Field of the Invention

The present invention relates to a winding method and that device of an autowinder or the like that winds yarn while traversing the yarn.

Background of the Invention

As shown in Figure 6, the winding unit 1 of the autowinder is arranged such that a package P of predetermined shape is formed by winding yarn Y on a take-up tube 3 from a spinning bobbin (not shown in the drawing) arranged on the lower part while traversing is being carried out by a traverse drum 2. The traverse drum 2 is arranged so as to be rotated while supported on one side only on a frame 4 of the winding unit 1. A cover 6 in order to prevent the yarn Y from flying from the groove 5 is arranged at the front side of the traverse drum 2 and a guide member 7 for restricting the running of the yarn Y corresponding to the traverse width is arranged in front of that.

Further, a slub catcher 8 that detects yarn defects (slub) in the yarn Y and cuts the yarn is arranged upstream in the yarn running direction from the guide member 7. Apart from these, a knotter for joining the yarn Y when a yarn breakage or yarn cutting by the slub catcher 8 occurs, a tension device for applying a suitable tension to the yarn Y and a suction mouth and suction pipe for transferring the upper yarn and lower yarn to the knotter by rotating during yarn piecing and the like are arranged on the winding unit 1.

However, when performing winding of the yarn Y by this kind of the autowinder, the yarn Y sometimes becomes separated from the package P (end missing) and yarn bundles on the outer layer of the package P sometimes slips to the small diameter side (scramble) resulting in a defective package. For example, in the case of end missing, one cause is the unrestricted flying of the yarn due to the sudden decrease in tension when the yarn breaks or when the supply yarn runs out due to the lastly wound part of the spinning bobbin. In the case of scramble, one cause is the instability of the yarn Y tension when winding starts after yarn piecing.

The generation of these kinds of defective packages could not be prevented by the conventional covers 6 and guide members 7. In short, the problem is the prevention of the generation of defective packages by tension decreases and an increase in the package quality.

Summary of the Invention

It is an aim of the present invention to propose a winding method that winds yarn while performing suitable traversing where traverse restrictions are carried out when the yarn tension is in a decreased state. It is preferable to perform traverse restrictions when the yarn tension is in a decreased state, in short, when the yarn

is cut, when the supply yarn has run out, when winding starts and the like.

It is a further aim of the present invention to propose a winding device that winds yarn while performing suitable traversing arranged with a yarn restriction member that restricts the yarn path (traverse width) by moving into the traverse range. It is preferable for there to be a drive system provided for projection of the yarn restriction member into the traverse range immediately before the yarn is cut. It is further preferable for there to be a drive system provided for projection of the yarn restriction member into the traverse range immediately before the supply yarn runs out.

It is yet further preferable for there to be a drive system for driving the yarn restriction member when the package starts rotating when winding starts. Due to this system, the generation of defective packages by tension decreases can be prevented. The yarn restriction member may be comprised of a pair of lever members or the like that move the yarn towards the center.

Brief Description of the Drawing

Figure 1 is front view showing a first embodiment of the present invention.

Figure 2 is a plan view of the main part of Figure 1.

Figure 3 is front view showing a second embodiment of the present invention.

Figure 4 is a plan view of the main part of Figure 3.

Figure 5 is a drawing showing the change in drum speed for describing the actions of Figure 4.

Figure 6 is a front view of the main part of an autowinder being a conventional winding device.

Detailed Description of the Preferred Embodiments

Hereafter, a first embodiment of the present invention will be described in accordance with the attached drawings.

Figures 1 and 2 show a autowinder utilizing the winding method and that device being a first embodiment of the present invention.

A winding unit 11 of this autowinder is provided with a traverse drum 2 for winding a yarn Y from a spinning bobbin (supply yarn bobbin) 12 while performing suitable traversing and is arranged such that a package P of predetermined shape (cone shape) is formed while removing yarn defects by a slub catcher 13. The traverse drum 2 is supported on one side on the frame 14 of the winding unit 11 and makes the package P rotate by friction contact by the rotation of a drum motor (not shown in the drawings).

A groove 5 for traversing the yarn Y at a predetermined width A is formed in the peripheral surface of the traverse drum 2 and a cover 6 is arranged in front of that for preventing the yarn Y from flying out of the groove 5. A yarn restriction member 15 is arranged below (upstream in the yarn running direction) the traverse drum 2.

The yarn restriction member 15 comprises a pair of lever plates 16, 17 which are able to swivel freely arranged along the axial direction of the traverse drum 2. A drive system 18 for driving these lever plates 16, 17 at predetermined timings is provided. The lever plates 16, 17 are supported via vertical shafts 19, 20 on a support bracket (not shown in the drawings) mounted on the frame 14 and the side where the tip swivels extends more forward than the traverse drum 2. Indented contact parts 21, 22 are formed on the inside edge of those extending parts in order to suitably contact with the yarn Y. The contact parts 21, 22 which contact with the yarn Y form the yarn restriction member 15 being essentially the present invention.

A link lever 23 spans from the near basal end of the vertical shaft 19 of one lever plate 16 positioned at the small diameter side of the package P to near the tip end of the vertical shaft 20 of the other lever plate 17 positioned at the large diameter side and is supported so as to be able to rotate on both ends by a pin 24. In short, the swivelling of one lever plate 16 is transmitted to the other lever plate 17 and the lever tips separate or close together. As shown in Figure 2, angled surfaces 32, 33 being a shape consisting of two converging lines separated at the top when viewed from above are arranged on the lever plates 16, 17 more toward the tip than the contact parts 21, 22 and are able to contact with the yarn (the end of the yarn which has begun to fly up) further in front of the yarn path during normal winding.

The drive system 18 comprises an air cylinder 25 connected to one lever plate 16, an electromagnetic valve 26 for supplying or expelling the air for operation of the air cylinder 25, and a controller 27 for suitably operating the electromagnetic valve 26. The air cylinder 25 is arranged in the axial direction of the traverse drum 2 and is coupled to the basal end of one lever plate 16 via a vertical pin 30 of a linking tool 29. In short, the air cylinder 25 extends when air is supplied and causes the pair of lever plates 16, 17 to swivel towards each other.

As shown in Figure 1, during normal winding, in short, when the yarn Y from the spinning bobbin 12 is being wound on the package P, the contact parts 21, 22 of the lever plates 16, 17 are maintained such that they do not interfere with the traverse actions of the traverse drum 2 by being positioned outside the predetermined traverse range A or in contact with the yarn Y_1 of the traverse end. Then, when traverse restriction is necessary, the air cylinder 25 extends, the contact parts 21, 22 are projected into the traverse range A as shown by the arrow S in Figure 1 and the yarn path Y_2 is moved closer to the center. In the present embodiment, the yarn is moved more towards the center than yarn path Y_3 where end missing easily occurs.

Further, the projection distance of the contact part 21 of one lever plate 16 is arranged to be greater than the projection distance of the contact part 22 of the other lever plate 17. For example, when the traverse restriction amount L_1 (the distance the contact part 21 projects into the traverse range A) of the small diameter

side is 35mm, the traverse restriction amount L_2 (the distance the contact part 22 projects into the traverse range A) of the large diameter side is 30mm. In short, the traverse restriction amount L_1 of the package small diameter side of the yarn restriction member 15 is larger than the traverse restriction amount L_2 of the package large diameter side of the yarn restriction member 15 ($L_1 > L_2$). This is a countermeasure as end missing tends to more easily occur on the small diameter side as the peripheral surface of the cone shaped package P is in a downwards slanting state toward the small diameter side.

This traverse restriction by the lever plates 16, 17 is carried out when the yarn Y is cut by the slub catcher 13 and when the supply yarn 12y from the spinning bobbin 12 runs out. In short, when (immediately before) the yarn Y flies up due to a sudden disappearance of the high tension (winding tension) of the yarn Y. In order to drive the lever plates 16, 17 by this timing, a yarn defect detection signal a is input from the slub catcher 13 into the controller 27 as shown in Figure 2 and before the cutter provided on the slub catcher 13 operates, input of the yarn defect signal a immediately switches the electromagnetic valve 26 and operates the air cylinder 25.

It should be noted that if the cutter ON signal of the slub catcher 13 is delayed so as to be preceded by the yarn defect detection signal a by for example 20msec, the operations of the electromagnetic valve 26 can be executed first and a position approximately 50cm from the slub detection place can be cut even at a yarn speed of 1,300m/min and accordingly, this does not present any hindrances to removal of the yarn defect.

It should be noted that the package P is separated from the drum 2 by a no-yarn detection signal from the slub catcher 13.

In order to perform operations when the supply yarn 12y runs out, operations of a balloon controller 28 shown in Figure 1 are used. The balloon controller 28 restricts the balloon whenever there is unwinding of the spinning bobbin 12 and if the supply yarn 12y of the spinning bobbin 12 becomes scarce, the balloon length is prevented from becoming too long by moving downwards.

Accordingly, when the balloon controller 28 has been moved to the lowest position (shown by the double dotted line B in the drawing) by the actuator 29, this is detected by a position sensor 30 or the like and when this detection signal b enters the controller 27 or after a predetermined time has elapsed after receiving this signal, traverse restriction can be performed immediately before the supply yarn 12y runs out by swivelling of the lever plates 16, 17.

A gate feeler 31 is also used for controlling. The gate feeler 31 determines whether to carry out a bobbin exchange by detection of whether there is a lower yarn (supply yarn) or not when there is a yarn breakage or when the yarn is cut. An absence of yarn is detected by the gate feeler 31 at almost the same time as when unwinding of the supply bobbin 12 is complete. Accord-

ingly, by inputting this no-yarn signal c in the controller 27, yarn restriction may be performed by swivelling of the lever plates 16, 17 immediately before flying of the yarn end.

In this way, as a movable yarn restriction member 15 that moves from outside of the traverse range A to inside of the traverse range A is provided, end missing can be prevented by moving the yarn path more towards the center when there is a sudden decrease in the yarn winding tension.

Furthermore, as the yarn path is restricted to the center by moving the yarn restriction member 15 inside the traverse range A due to the drive system 18 before the slub catcher 13 cuts the yarn Y, end missing due to the yarn Y flying when a yarn defect is detected and the yarn Y is cut can be prevented without the yarn restriction member 15 damaging the yarn Y during normal yarn winding. In short, even if the yarn Y flies, that yarn Y does not become a cause of a defective package by it being wound on the package P and moreover, the yarn restriction member 15 does not exert any detrimental effects on the yarn Y during normal winding thus the quality of the package P is improved.

As the lever plates 16, 17 are projected into the traverse range A immediately before unwinding of the spinning bobbin 12 is complete, end missing when the yarn Y flies up due to the no-tension state when the supply yarn has run out can be prevented. In this case also, as the traverse restriction is carried out immediately before the supply yarn runs out, there is no damage to the yarn Y.

Furthermore, as the lever plates 16, 17 are moved more towards the center than position Y_3 where end missing easily occurs, end missing can be reliably prevented.

Yet further still, as the yarn end is moved towards the center of the package P by the yarn restriction member 15, the upper yarn (package P yarn) is easily picked up by the yarn picking means (suction mouth) when yarn piecing occurs and the success rate of auto-yarn piecing can be improved.

Further, the lever plates 16, 17 and that drive system 18 shown in the present embodiment can be simply arranged as a pre-installed auto-winder due to their simple structure and show extremely high utility.

It should be noted that traverse restriction may be performed even when the yarn naturally breaks.

Furthermore, After the yarn Y has been cut and the yarn defect removed or after bobbin exchange, knotting is performed but maintaining the traverse restriction by the lever plates 16, 17 during this knotting and gradually opening while increasing the rotation of the traverse drum 2 and then removal of the restriction, is also possible. In this way, the tension can be increased during the period of tension instability when winding starts after knotting and mis-traversing where the yarn Y separates from the groove 5 of the traverse drum 2 can be prevented. Loose winding by a decrease in tension can also be prevented.

Furthermore, during this period of tension instability, as a phenomenon whereby the yarn of the package surface layer moves to the small diameter side in bundle shape (scramble) occurs, this scramble can be prevented if a traverse restriction is performed, for example, for 6-7 seconds from the start of rotation of the 10 second slow start period.

In summary, the present invention is able to improve package quality as traverse restriction is performed when the yarn tension decreases to a level which affects the quality of the package P.

Furthermore, in the present embodiment, a pair of lever plates 16, 17 are shown as a yarn restriction member 15 but if able to restrict the yarn path to the center, any construction is suitable. Also, the drive system 18 is not limited to the air cylinder 25 but may be any such construction that operates the yarn restriction member 15 by a predetermined timing.

Hereafter, a second embodiment of the present invention will be described in accordance with the attached drawings.

Figures 3 and 4 show an autowinder utilizing the winding method and that device being a second embodiment of the present invention.

A winding unit 111 of this autowinder is provided with a traverse drum 102 for winding a yarn Y from a spinning bobbin (supply yarn bobbin) 112 while performing suitable traversing and is arranged such that a package P of predetermined shape (cone shape) is formed while removing yarn defects by a slub catcher 113. The traverse drum 102 is supported on one side on the frame 114 of the winding unit 111 and makes the package P rotate by friction contact by the rotation of a drum motor 134. A groove 105 for traversing the yarn Y at a predetermined width A is formed in the peripheral surface of the traverse drum 102 and a cover 106 is arranged in front of that for preventing the yarn Y from flying out of the groove 105. A yarn restriction member 15 is arranged below (upstream in the yarn running direction) the traverse drum 102.

The yarn restriction member 115 comprises a pair of lever members being lever plates 116, 117 which are able to swivel freely arranged along the axial direction of the traverse drum 102. A drive system 118 for driving these lever plates 116, 117 at predetermined timings is provided. The lever plates 116, 117 are supported via vertical shafts 119, 120 on a support bracket (not shown in the drawings) mounted on the frame 114 and the side where the tip swivels extends more forward than the traverse drum 102. Indented contact parts 121, 122 are formed on the inside edge of those extending parts in order to suitable contact with the yarn Y. The contact parts 121, 122 which contact the yarn Y form the yarn restriction member 115 being essentially the present invention.

A link lever 123 spans from near the basal end of the vertical shaft 119 of one lever plate 116 positioned at the small diameter side of the package P to near the tip end of the vertical shaft 120 of the other lever plate

117 positioned at the large diameter side and is supported so as to be freely rotatable on both ends by a pin 124. In short, the swivelling of one lever plate 116 is transmitted to the other lever plate 117 and the lever tips separate or close together.

As shown in Figure 4, angled surfaces 132, 133 being a shape consisting of converging line with the ends top end separated when viewed from above are arranged on the lever plates 116, 117 more toward the tip than the contact part 121, 122 and are able to contact with the yarn (the end of the yarn which has begun to fly up) further in front of the yarn path during normal winding.

The drive system 118 comprises an air cylinder 125 connected to one lever plate 116, an electromagnetic valve 126 for supplying and expelling the air for operation of the air cylinder 125, and a controller 127 for suitably operating the electromagnetic valve 126. The air cylinder 125 is arranged in the axial direction of the traverse drum 102 and is coupled to the basal end of one lever plate 116 via a vertical pin 130 of a linking tool 129. In short, the air cylinder 125 extends when air is supplied and causes the pair of lever plates 116, 117 to swivel towards each other.

As shown in Figure 3, during normal winding, in short, when yarn Y from the spinning bobbin 112 is being wound on the package P, the contact parts 121, 122 of the lever plates 116, 117 are maintained such that they do not interfere with the traverse actions of the traverse drum 102 by being positioned outside the predetermined traverse range A or in contact with the yarn Y_1 of the traverse end. Then, when traverse restriction is necessary, the air cylinder 125 extends, the contact parts 121, 122 are projected into the traverse range A as shown by the arrow S in the drawing and the yarn path Y_2 is changed closer to the center.

This traverse restriction by the lever plates 116, 117 is performed during the drum rotation start period at the start of winding. In short, as shown in Figure 5, when winding of yarn Y on a new take-up tube 103 occurs or when winding restarts after knotting has finished, in order to prevent slippage between the traverse drum 102 and take-up tube 103, slow starting is performed in a time period t_0 of the first, for example, 10 seconds of the start until the drum speed reaches normal rotation speed r_0 . However, it is believed that the winding tension of the yarn at this first stage is low and unstable. Consequently, in the time period of, for example, around 6-7 seconds being t_1 from the drum start time, the tension is increased by moving the yarn Y towards the center by operation of the yarn restriction member 115 by the controller 127 entered with a start signal of the drum motor 134 sending an operation signal to the electromagnetic valve 126, thus suitable winding at a predetermined tension is possible. After this predetermined start-up time t_1 has elapsed, the lever plates 116, 117 are slowly opened, they return to outside the traverse range A and restrictions are removed.

In this way, as a movable yarn restriction member

115 which is able to freely move into the traverse range A from outside of the traverse range A is provided and it is projected into the traverse range A by that drive system 118 at the start of winding, the tension can be increased to a suitable degree by moving the yarn Y in the lateral direction (towards the center) and mistraversing, loose winding and scramble can be prevented. In short, the generation of defective packages can be prevented and the package P quality is improved.

Furthermore, as the yarn restriction member 115 is driven during the rotation start-up period at the start of winding, the production of defective packages due to the tension being low and unstable during a slow start can be prevented. It should be noted that traverse restriction may be performed continuously from knotting up to and after when the drum starts by swivelling of the lever plates 116, 117 during knotting (being when the spinning bobbin yarn and packs yarn are joined including yarn piecing by air). In this way, as the position of the cut yarn end is restricted to the center, the yarn picking means (suction mouth) easily picks the upper yarn (package P yarn) during yarn piecing and the auto-yarn piecing success rate improves.

Further, the lever plates 116, 117 and that drive system 118 shown in the present embodiment can be simply arranged on a pre-installed auto-winder due to their simple structure and show extremely high utility.

Furthermore, this yarn restriction member 115 may also be used to prevent end missing. It is believed that the flying of the yarn Y due to a sudden loss of high tension due to a cut yarn Y is one cause of end missing. Accordingly, not only when winding starts, but also when the yarn is cut by the slub catcher 113 and when supply yarn 112y of the spinning bobbin 112 runs out, traverse restriction is performed. In order to drive the lever plates 116, 117 by this timing, a yarn defect detection signal is input from the slub catcher 113 shown in Figure 4 into the controller 127 and before the cutter provided on the slub catcher 113 operates, the air cylinder 125 operates by switching of the electromagnetic valve 126.

It should be noted that if the cutter ON signal of the slub catcher 113 is delayed so as to be preceded by the yarn defect detection signal by for example 20msec, the operations of the electromagnetic valve 126 can be executed first and a position approximately 50cm from the slub detection place can be cut even at a yarn speed of 1,300m/min and accordingly, this does not present any hindrances to removal of the yarn defect.

In order to perform operations when the supply yarn 112y runs out, operations of a balloon controller 128 shown in Figure 3 are used. The balloon controller 128 restricts the balloon whenever there is unwinding of the spinning bobbin 112 and if the supply yarn 112y of the spinning bobbin 112 becomes scarce, the balloon length is prevented from becoming too long by moving downwards. Accordingly, when the balloon controller 128 has been moved to the lowest position, this is detected by a sensor or the like and when this detection

signal enters the controller 127 or after a predetermined time has elapsed after receiving this signal, traverse restriction can be performed immediately before the supply yarn 112y runs out if the lever plates 116, 117 are swivelled.

A gate feeler 131 may also be used for controlling the prevention of end missing. The gate feeler 131 determines whether to carry out a bobbin exchange by detection of whether there is a lower yarn (supply yarn) or not when there is a yarn breakage or when the yarn is cut. An absence of yarn is detected by the gate feeler 131 at almost the same time as when unwinding of the supply bobbin 112 is complete. Accordingly, by inputting this no-yarn signal in the controller 127, yarn restriction may be performed by swivelling of the lever plates 116, 117 before flying of the yarn end.

It should be noted that, in order to prevent this kind of end missing, projection further towards the center than the yarn path Y_3 set as the position where end missing easily occurs is preferable.

Furthermore, it is preferable for the projection distance of the contact part 121 of one lever plate 116 to be larger than the other lever plate 117. This is a counter-measure as end missing tends to easily occur on the small diameter side as the peripheral surface of the cone shaped package P is in a downwards slanting state toward the small diameter side.

In the present embodiment, a pair of lever plates 116, 117 are shown as a yarn restriction member 115 but if able to restrict the yarn and change the tension, any construction is suitable. Also, the drive system 118 is not limited to the air cylinder 125 but may be any such construction that operates the yarn restriction member 115 by a predetermined timing.

Accordingly, by the above described embodiment, as traverse restriction is performed when the yarn tension decreases as for example, when the yarn breaks, when the supply yarn runs out or when winding starts, the production of defective packages due to a decrease in the yarn winding tension can be prevented and the package quality can be improved.

Furthermore, there are no detrimental effects on the yarn during normal winding. If the yarn is cut after performing yarn restriction, the traversing of the cut yarn can be reliably performed. When winding a cone shaped package, if the traverse restriction amount of the small diameter side is greater than the traverse restriction amount of the large diameter side, end missing may be reliably prevented. If traverse restriction is performed by driving the yarn restriction member during the rotation start-up at the start of winding, production of defective packages when the tension is low and unstable during the slow start period may be prevented. If the yarn restriction member is arranged of a pair of lever members pushing the yarn towards the center, the device construction may be simplified and application on a pre-existing auto-winder is possible providing high utility.

Claims

1. A winding method that winds yarn while traversing, where

traverse restriction is performed when the yarn tension is in a decreased state.

2. A winding method as in claim 1, wherein traverse restriction is performed immediately before the winding yarn is cut.

3. A winding method as in claim 2, wherein, when a defect in the winding yarn is detected, the winding yarn is cut after traverse restriction is performed.

4. A winding method as in claim 1, wherein traverse restriction is performed immediately before the supply yarn runs out.

5. A winding method as in claim 1, wherein traverse restriction is performed at the start of winding.

6. A winding method as in claim 5, wherein traverse restriction is performed when yarn piecing where the yarn of the supply yarn side and yarn of the package side are joined.

7. A winding method as in any of claims 1-5, wherein, when winding a cone shaped package, the traverse restriction amount of the small diameter side of the package is larger than the traverse restriction amount of the large diameter side of the package.

8. A winding device that winds yarn while traversing, provided with

a yarn restriction member that restricts a yarn path by moving from outside of the traverse range to inside the traverse range.

9. A winding device as in claim 8, provided with a drive system for projecting the yarn restriction member into the traverse range immediately before the winding yarn is cut.

10. A winding device as in claim 8, provided with a drive system for projecting the yarn restriction member into the traverse range immediately before the supply yarn runs out.

11. A winding device as in claim 8, provided with a drive system for projecting the yarn restriction member into the traverse range at the start of winding.

12. A winding device as in claim 11, wherein the drive system drives the yarn restriction member during the rotation start-up period at the start of winding.

13. A winding device as in any of claims 8-12, wherein the yarn restriction member is a pair of lever members that move the yarn towards the center.

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FIG. 1

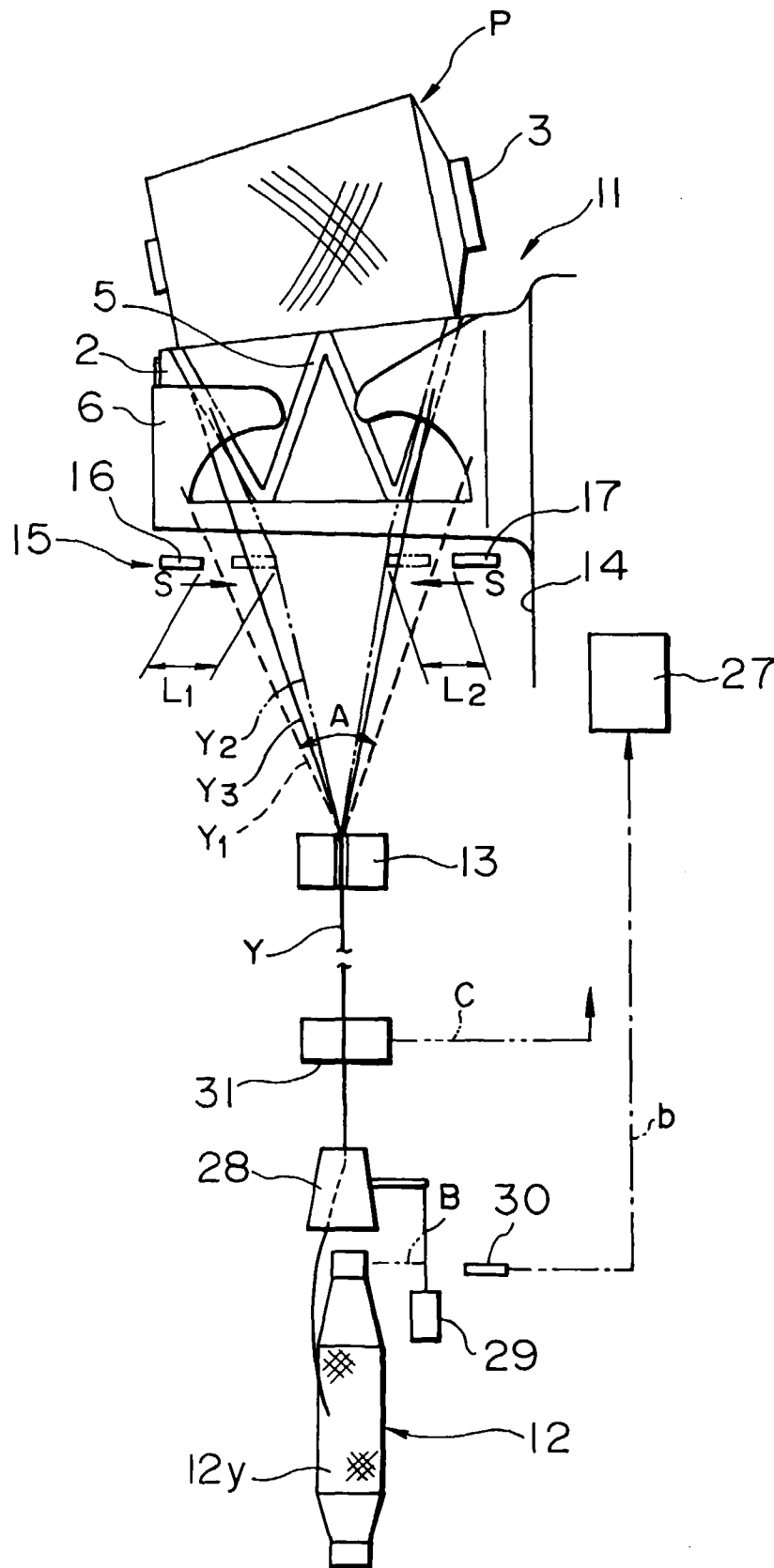


FIG. 2

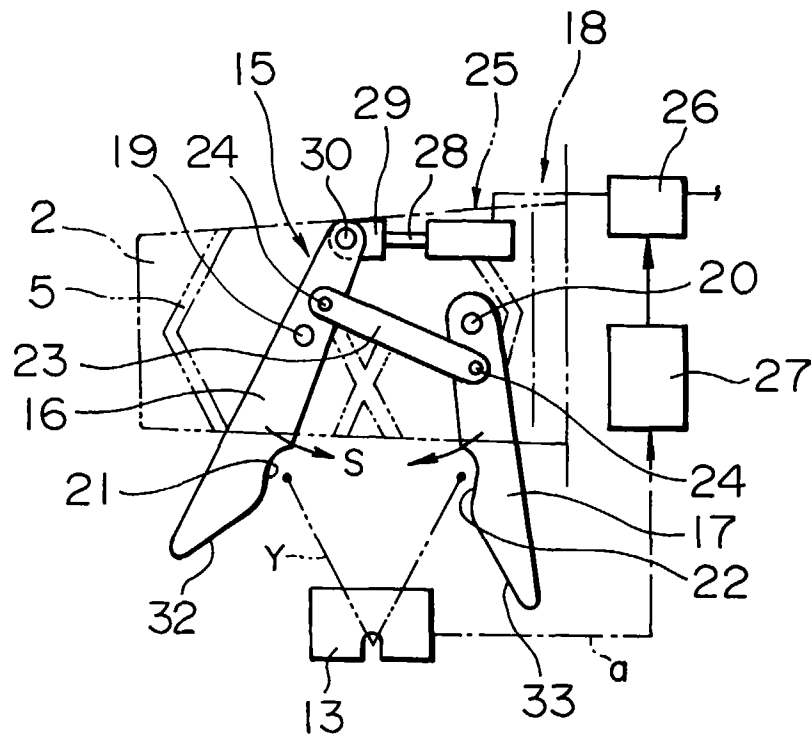


FIG. 3

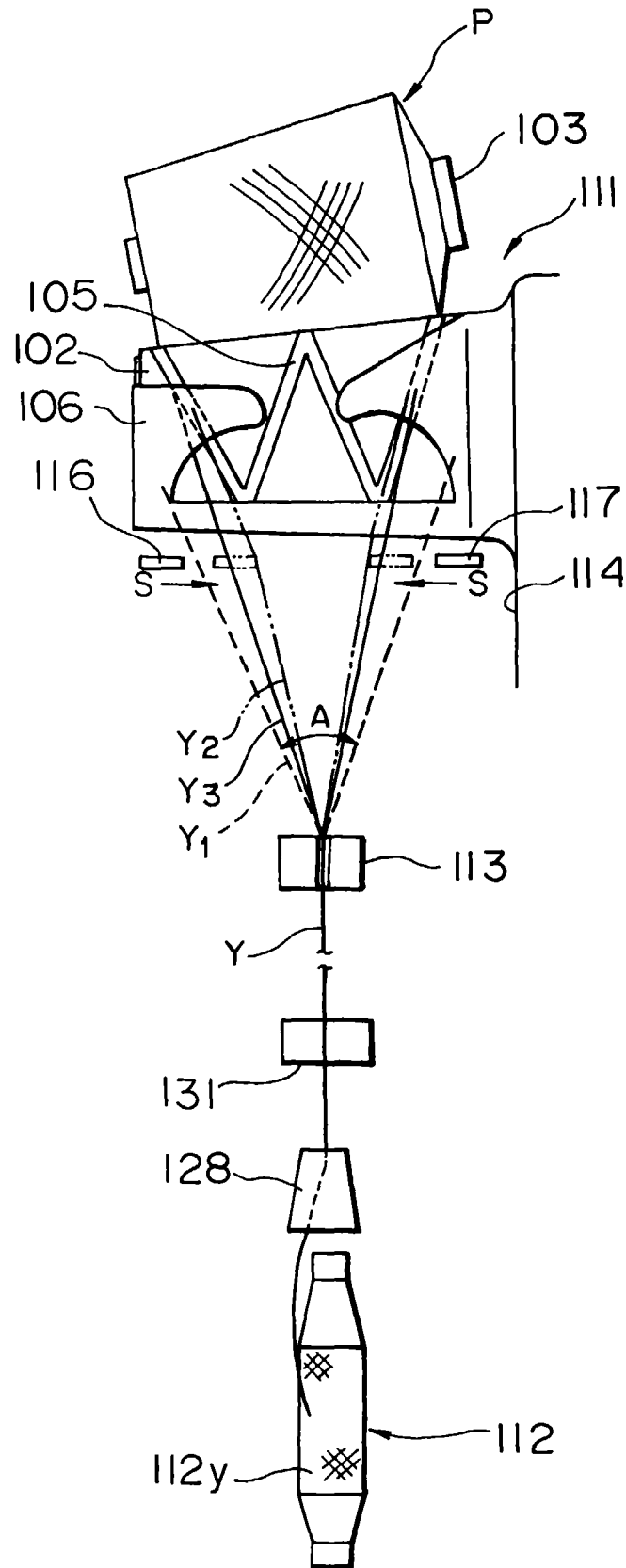


FIG. 4

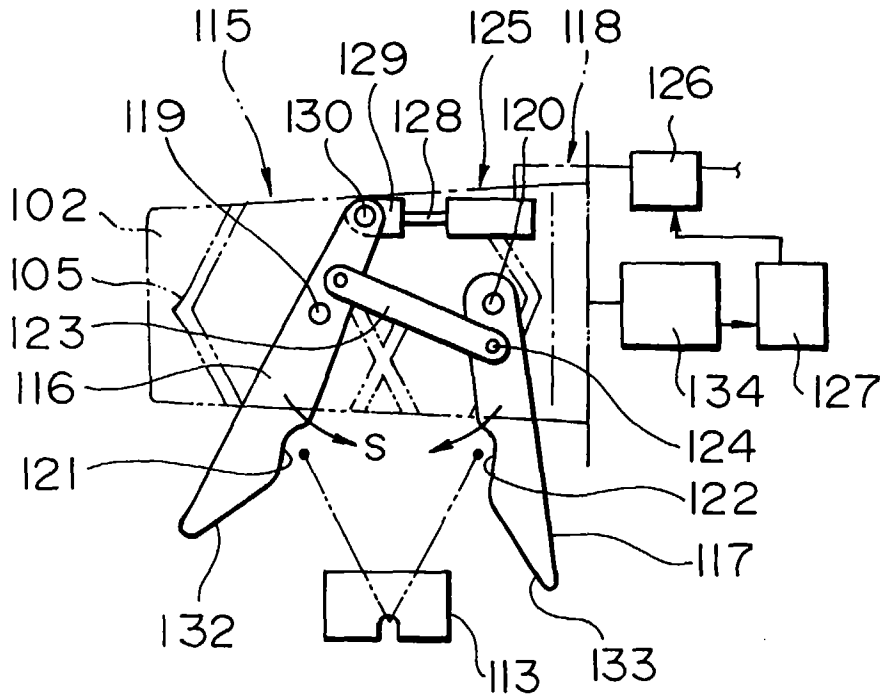


FIG. 5

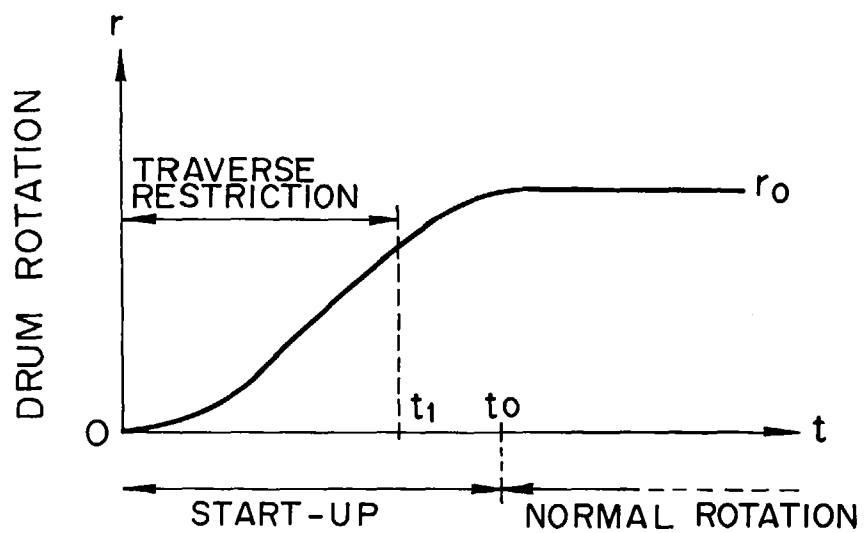


FIG. 6

