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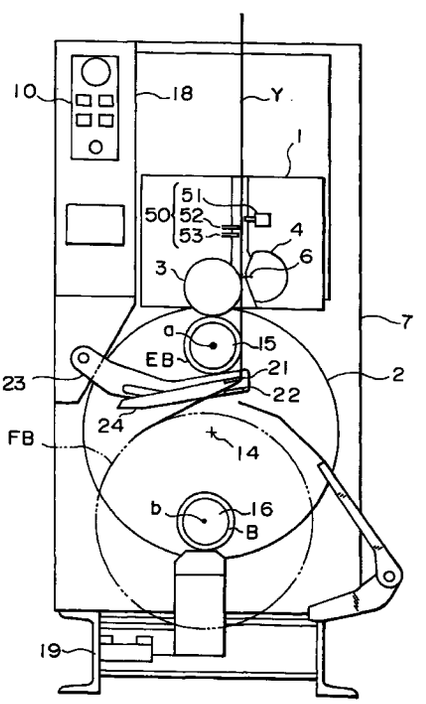
(54) Take-up winder and yarn-transferring method for the same

(57) To provide a take-up winder and related yarn-transferring method that can improve the success rate of yarn-transferring from a full bobbin to an empty bobbin without damaging the yarn during transferring. The present invention has a switching operation that switches two bobbin holders 15 and 16 between a winding position (a) and a standby position (b), and provides a yarn path restraining guide 21 that controls the angle at which a travelling yarn Y leading to a full bobbin FB contacts a empty bobbin EB when the travelling yarn Y is transferred to the empty bobbin EB in response to the swithcing operation.

The yarn path restraining guide 21 is controlled in such a way that the contact angle from the contact of the travelling yarn Y with the empty bobbin EB until the yarn-transferring operation is maintained smaller than the contact angle during yarn-transferring.

FIG. 1



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Description

Field of the Invention

The present invention relates to a take-up winder of a revolving type and a yarn-transferring method for the take-up winder in which a continuously supplied yarn is continuously wound by switching two protruding bobbin holders between a winding position and a standby position in order to transfer the yarn from a full bobbin to an empty bobbin.

Background of the Invention

In Figure 14, two bobbin holders 115 and 116 protrude rotatably from a rotatable turret plate 102, and several bobbins are installed on each of the bobbin holders 115 and 116. One of the two bobbin holders 115 and 116 is located at a winding position (a) while the other is located at a standby position (b). The yarn is wound around the bobbin located at the winding position (a), and each time the bobbin becomes full, the turret plate 102 is rotated by 180° to switch the position in order to start winding the yarn around an empty bobbin EB that newly arrives at the winding position (a). Revolving type take-up winders, which alternately winds the continuously supplied yarn around the two bobbin holders 115 and 116 in the above manner, are well known. 103 is a touch roller and 104 is a traverse device.

The operation of such a take-up winder for transferring the yarn from a full bobbin FB to the empty bobbin EB is briefly described below.

Once the bobbin at the winding position (a) becomes full, the turret plate 102 is rotated by 180 ° to switch the positions of the two bobbin holders 115 and 116 in such a way that the full bobbin FB is located at the standby position (b) while the empty bobbin EB is located at the winding position (a). When each bobbin is located at the new respective position, however, a supplied yarn Y is still connected to the full bobbin FB at the standby position (b), and the transferring of the yarn from the full bobbin FB to the empty bobbin EB is not completed until that yarn is caught in a slit (a yarn capturing groove) in the empty bobbin EB followed by the start of winding. In other words, when caught in the slit located outside the traverse range of the empty bobbin EB, the yarn, which is connected to the full bobbin FB, is cut by its tension, which in turn caused by the rotation of the empty bobbin EB, and then wound around the empty bobbin EB.

Since such a take-up winder transfers the yarn in response to the switching operation of the turret plate 102 and bobbin holders 115 and 116, it includes a first yarn guide device 150 on the upstream side and a second yarn guide device 120 on the downstream side. The first yarn guide device 150 is provided on the upstream side relative to the traverse device 104, and consists of a yarn displacement guide 151 and a yarn release guide 152. The second yarn guide device 120 comprises a slide guide 121 and a fixed guide 122 provided at the tip of an oscillating arm 123 that advances between the empty bobbin EB and the full bobbin FB.

When the turret plate 102 is rotated to place the empty bobbin EB at the winding position, the second yarn guide device 120 advances to a position between the empty bobbin EB and the full bobbin FB that is indicated by the continuous line. The yarn release guide 152 then advances to release the yarn from the traverse device 104, and at the same time, a yarn guide 159 of the yarn displacement guide 151 in Figure 15 moves leftward in Figure 15 to displace the travelling yarn to a position corresponding to a slit 117 in the empty bobbin EB. In this state, the fixed guide 122 of the second guide device 120 supports the travelling yarn on the full bobbin FB, and then the slide guide 121 of the second yarn guide device 120 moves leftward in Figure 15 to carry the travelling yarn to the slit 117 in the empty bobbin EB in order to transfer the yarn thereto.

According to the conventional yarn-transferring method described above in Figure 14, the empty bobbin EB starts contacting the travelling yarn at position ⑧ in response to the swithcing of the positions of the turret plate 102 and the bobbin holders 115 and 116. The contact angle α between the empty bobbin EB and the travelling yarn increases starting from position ⑧, and reaches its maximum value at winding position ⑨ in excess of 60° . At this point, the rotating direction of the empty bobbin EB is opposite to the travelling direction of the yarn Y, so the travelling yarn Y is rubbed by the surface of the empty bobbin EB. Once the empty bobbin EB has reached the specified winding position (a), the second yarn guide device 120 advances to reduce the contact angle β between the travelling yarn Y and the empty bobbin EB (the angle β required for yarn-transferring). Until the second yarn guide device 120 reaches its operating position, the travelling yarn Y is rubbed on the empty bobbin EB at the large contact angle. Thus, the yarn may be damaged and generate fluffs, and the damaged yarn may be wound around the full bobbin. In addition, if the yarn is thin and is not sufficiently elastic, it may be cut, causing the yarn-transferring operation to fail.

In addition, since the second yarn guide device 120 advances after the bobbin holders 115 and 116 have been rotated 180° to complete the switching operation in order to place the empty bobbin EB at the winding position (a), the travelling year Y is rubbed by the empty bobbin EB for an extended period of time, and thus the switching operation and the yarn-transferring operation are extremely time-consuming. The conventional winder forces the second yarn guide device 120 to advance after the empty bobbin EB has reached the winding position (a) because it is difficult to move the second yarn guide device 120 forward so as not to interfere with the empty bobbin EB travelling from the

standby position (b) to the winding position (a).

According to the conventional yarn-transferring method described above in Figure 14, the second yarn guide device 120 advances after the bobbin holders 115 and 116 have been rotated by 180° to complete the switching operation in order to place the empty bobbin EB at the winding position (a). When the fixed yarn guide 122 of the second yarn guide device 120 is placed at a specified position to prevent the travelling yarn leading to the full bobbin FB from falling, the yarn displacement guide 151 of the first yarn guide device 115 moves leftward to enable the yarn to be displaced to the position corresponding to the slit 117 in the empty bobbin EB. Thus, the yarn-transferring operation until yarn-transferring is completed is extremely time-consuming because it involves the completion of the switching operation provided by the rotation of the turret plate 102, the advancement of the second yarn guide device 120, and the activation of the yarn displacement guide 151 of the first yarn guide device 150 in this order.

These problems occur due to the conventional belief that the yarn cannot be displaced before the yarn guide has advanced because the yarn may fall from a yarn layer onto the full bobbin if the travelling yarn is displaced to the end of the empty bobbin before the yarn guide that prevents the yarn from falling from the yarn layer onto the full bobbin moves forward.

In addition, since the yarn-transferring operation until yarn-transferring is completed is extremely time-consuming, the travelling yarn Y is rubbed by the empty bobbin EB at the contact angle α or β for a long period of time. Consequently, the yarn may be damaged and become fluffy, and the damaged yarn may be wound around the full bobbin. In addition, if the yarn is thin and not sufficiently elastic, it may be cut, causing the yarn-transferring operation to fail. Furthermore, another conventional disadvantage is that the yarn is displaced while contacting the empty bobbin EB at an contact angle α that exceeds 60° . The yarn Y may be rubbed on the surface of the bobbin, and damaged or cut.

The present invention is provided in view of these problems of the conventional techniques, and its object is to provide a turret type take-up winder and a yarn-transferring method for the winder that can reduce the time required until yarn-transferring during the switching operation that switches two bobbin holders between a winding position and a standby position, that can increase the success rate of the transferring of the yarn-transferring from the full bobbin to the empty bobbin, and that does not damage the yarn during the switching operation.

Summary of the Invention

To achieve the above object, the present invention provides a take-up winder having a switching operation for switching two bobbin holders between a winding position and a standby position and in response to the switching operation, transferring to an empty bobbin a travelling yarn leading to a full bobbin, characterized in that a yarn path restraining guide is provided that controls during the switching operation the contact angle at which the travelling yarn contacts the empty bobbin and that is controlled so that the contact angle varying from the contacting of the travelling yarn with the empty bobbin until yarn-transferring is kept smaller than that during yarn-transferring.

According the present invention, the yarn path restraining guide also acts as a yarn guide located between the empty bobbin and the full bobbin to transfer the travelling yarn from the full bobbin to the empty bobbin.

According the present invention, the yarn guide can advance and retract an arm that moves outside an region in which the empty bobbin and the full bobbin rotate.

The present invention provides a take-up winder having a switching operation for switching two bobbin holders between a winding position and a standby position and in response to the switching operation, transferring to an empty bobbin a travelling yarn leading to a full bobbin, characterized in that a member that advances toward the empty bobbin during the switching operation is guided by a bobbin holder for the empty bobbin.

The present invention provides a take-up winder having a switching operation for switching two bobbin holders between a winding position and a standby position and that, in response to the switching operation, allows a yarn capturing means provided at the end of an empty bobbin to capture a travelling yarn leading to a full bobbin in order to transfer the travelling yarn to the empty bobbin, characterized in that a yarn-transferring guide is provided that moves the travelling yarn leading to the full bobbin to the yarn capturing means at the end of the empty bobbin, and in that a temporary stop means is provided that temporarily stops the yarn-transferring guide at a position at which the travelling yarn is located at the end of the yarn layer on the full bobbin.

The present invention provides a transferring method for a take-up winder having a switching operation for transferring two bobbin holders between a winding position and a standby position and in response to the switching operation, transferring to an empty bobbin a travelling yarn leading to a full bobbin, characterized in that the contact angle at which the travelling yarn contacts the empty bobbin during the switching operation is set smaller during the time from the contacting of the travelling yarn with the empty bobbin until yarn-transferring, than during yarn-transferring.

The present invention provides a switching method for a take-up winder having a switching operation for switching two bobbin holders between a winding position and a standby position, and in response to the switching operation, allowing a yarn capturing means provided at the end of an empty bobbin to capture a travelling yarn leading to a full bobbin in order to transfer

the travelling yarn to the empty bobbin, characterized in that when the travelling yarn leading to the full bobbin is moved to the yarn capturing means at the end of the empty bobbin, the travelling yarn is moved to the end of a yarn layer on the full bobbin before the swithcing operation has been completed.

According to the present invention, while the empty bobbin and the travelling yarn are not mutually contacted, the travelling yarn is displaced to the end of the yarn layer of the full bobbin.

According to the present invention, before the switching operation has been completed, said travelling yarn is moved to the end of the yarn layer on the full bobbin and said travelling yarn leading to said full bobbin is retained on the yarn layer, and then the yarn-transferring is done.

Brief Description of the Drawings

Figure 1 is a front view of a take-up winder according to the present invention.

Figure 2 is a top view of a second yarn guide device.

Figure 3 is a top view of a first yarn guide device.

Figure 4 shows a first operation of the second yarn guide device.

Figure 5 shows a second operation of the second yarn guide devices.

Figure 6 shows a third operation of the second yarn guide device.

Figure 7 shows a first operation of the first yarn guide device.

Figure 8 shows a second operation of the first yarn guide device.

Figure 9 shows a third operation of the first yarn guide device.

Figure 10 shows a fourth operation of the first yarn guide device.

Figure 11 shows a fifth operation of the first yarn guide device.

Figure 12 shows a sixth operation of the first yarn guide device.

Figure 13 shows a yarn-transferring operation performed by the first and second yarn guide devices.

Figure 14 is a front view showing a yarn-transferring method executed by a conventional take-up winder.

Figure 15 is a side view showing a yarn-transferring method executed by a conventional take-up winder.

Detailed Description of the Preferred Embodiments

One embodiment of the present invention is described below with reference to the drawings. Figure 1 is a front view schematically showing a take-up winder according to this invention, Figure 2 is a top view showing the structure of a second yarn guide device, and Figure 3 is a top view showing the structure of a first yarn guide device.

First, the basic structure of the take-up winder is described with reference to Figure 1.

A body frame 7 includes an elevating box 1 that can be elevated and lowered, a rotatable turret plate 2, ad a fixed frame 18 having an operation box 10 at its tip.

A touch roller 3, a traverse device 4, and a first yarn guide device 50 are each supported on the elevating box 1. The touch roller 3 is press-fitted to a yarn layer on a bobbin B at a winding position, which is described below, and rotationally drives the bobbin B counterclockwise in Figure 1. A traverse guide 6 is provided on the traverse device 4 and travels within a traverse range to traverse a yarn Y. Furthermore, the first yarn guide device 50 that disengages the yarn Y from the traverse guide 6 to move it out of the traverse range when the positions of a full bobbin FB and an empty bobbin EB are switched to allow the yarn to be transferred is provided on the upstream side relative to the traverse device 4. The first yarn guide device 50 consists of a yarn displacement guide 51, a yarn release guide 52, and a fixed yarn guide 53.

The turret plate 2 can be rotated around a rotating shaft 14 by a rotational driving device (not shown in the drawings), and two bobbin holders 15 and 16 are rotatably supported on the turret plate 2 in such a way as to protrude therefrom. Several bobbins B each including a slit 17 (a yarn capturing groove) at one end as a yarn capturing means are installed on each of the bobbin holders 15 and 16. During winding, the bobbin holder 15 is placed at a winding position (a), while the bobbin holder 16 is placed at a standby position (b). Once the bobbin B has become full of the yarn Y, the turret plate 2 is rotated 180 ° to switch the positions of the bobbin holders 15 and 16 in order to transfer the yarn from the full bobbin FB to the empty bobbin EB now located at the winding position (a), thereby continuing winding. Since Figure 1 shows a state in which the yarn Y is transferred, the full bobbin FB is supported on the bobbin holder 16 at the winding position (b).

The fixed frame 18 protrudes from the body frame 17 at a position at which it does not hinder the elevation or lowering of the elevating box 1, i.e., diagonally above the turret plate 2 and parallel with the elevating box 1. The operation box 10 is provided at the tip of the fixed frame 18, and the inside of the fixed frame 18 is hollow except for a portion through which wiring transfers. A second yarn guide device 20, which is described below, is provided below the fixed frame 18. In addition, the bottom of the body frame 7 constitutes a base frame 19 extending parallel with the bobbin holders 15 and 16. The second yarn guide device 20 comprises an oscillating arm 23, and a slide plate 24 provided on the oscillating arm 23 so that it can advance therefrom and having a slide yarn guide 21 and a fixed yarn guide 22 at its tip.

The slide plate 24 advances with a specified timing when the empty bobbin EB is switched to the winding position (a), and the slide yarn guide 21 also functions as a yarn path restraining guide for controlling the con-

tact angle between the travelling yarn Y and the empty bobbin EB travelling to the winding position (a). In addition, the first yarn guide device 50 and the second yarn guide device 20 cooperate in transferring the yarn to the empty bobbin EB, as described below.

The detailed structure of the second yarn guide device 20 that can advance between the empty bobbin at the winding position and the full bobbin at the standby position is now described with reference to Figure 2.

A shaft 26 is rotatably supported via a bearing 27 between the body frame 7 and a supporting plate 18a hanging from the fixed frame 8. A pair of oscillating arms 23, 23 are fixed at the respective ends of the shaft 26, and an air pressure cylinder 28 is coupled between the oscillating arm 23 on the body frame 7 side and the body frame 7. When the rod of the air pressure cylinder 28 is extended, the oscillating arms 23, 23 oscillate downward around the shaft 26 and are then located in their standby position (see the position indicated by the continuous line in Figure 4). When the rod of the air pressure cylinder 28 contracts, the oscillating arms 23, 23 oscillate upward around the shaft 26. The oscillating arms 23, 23 oscillate outside the region in which the full bobbin FB and the empty bobbin EB rotate. Shoes 29 and 30 are provided on the side surface of the oscillating arm 23 on the body frame 7 side.

When oscillating upward, the oscillating arms 23 contact a fixed shaft 11 located at the root of the bobbin holder 16 protruding from the turret plate 2 so that their upward operation is controlled by the bobbin holder 16. Since the turret 2 rotates during the switching operation, the upward position of the oscillating arms 23, 23 is determined in response to the movement of the bobbin holder 15 (see the position indicated by the continuous line in Figure 4).

A guide groove 31 (see Figure 4) is provided in the oscillating arms 23, 23, and the slide plate 24 the position of which is determined by two guide rollers 32, 32 that move along the guide groove 31 is provided between the oscillating arms 23, 23. The slide plate 24 has an advancement mechanism consisting of first links 33, 33 located on the right and left, second links 34, 34 located on the right and left, a connecting rod 35, an air pressure cylinder 36, and a speed control valve 37. One end of the first link 33 is supported and attached via a shaft to the slide plate 24 using a pin 33a, while the other end is connected to one end of the second link 34. The middle of the second link 34 is supported by the shaft 26 via a bracket 34b using a pin 34a, while the other end is coupled to the connecting rod 35 to allow the links on both sides to synchronize mutually. In addition, the air pressure cylinder 36 is coupled between the middle of the second link 34 on the body frame 7 side and the other end.

When the rod of the air pressure cylinder 36 stretches, the second links 34, 34 rotate clockwise to cause the first links 33, 33 to protrude, thereby moving the slide plate 24 forward. When the rod of the air pressure cylinder 36 contracts, the second links 34, 34 rotate counterclockwise to draw the first links 33, 33 and move the slide plate 24 backward. The forward and backward speeds of the slide plate 24 can be adjusted to predetermined values by regulating the amount of pressurized air supplied to the air pressure cylinder 36 using the speed control valve 37.

The slide yarn guide 21 that catches an upstream yarn and the fixed yarn guide 22 that catches a downstream yarn are mounted at the end of the slide plate 24 in parallel at a predetermined interval. The slide yarn guide 21 can slide in the axial direction of the bobbin holder 15 by means of an air cylinder 40 connected between the slide plate 24 and pins 39, 39 that are guided by long holes 38, 38 in the slide plate 24. The slide yarn guide 21 has catching sections 41 that each comprise the sides of a parallelogrammatic notch 43 and the number of which corresponds to the number of the bobbins B. The fixed yarn guide 22 has claws 42 that each protrude within the notch 43 in the slide yarn guide 21 and the number of which corresponds to the number of the bobbins B. The claw (a third yarn-transferring guide) 42 of the fixed yarn guide 22 regulates the travelling yarn displaced to the end of the bobbin B by a yarn guide bar 59 acting as a first yarn-transferring guide (described below) during yarn-transferring, to a position at which it will not fall from the yarn layer on the full bobbin FB.

The catching section (a second yarn-transferring guide) 41 of the slide yarn guide 21 transfers the yarn by transporting to the slit 17 the upstream side of the travelling yarn Y regulated by the claw (the third yarn-transferring guide) 42 . When the air pressure cylinder 40 stretches, the slide plate 24 transports the yarn caught on the catching section 41 until it crosses the slit 17, whereas when the air pressure cylinder 40 contracts, the slide plate 24 returns to the illustrated standby position.

The first yarn guide device 50 provided on the upstream side of the traverse device and consisting of the yarn displacement guide 51, the yarn release guide 52, and the fixed yarn guide 53 is described below with reference to Figure 3.

The yarn release guide 52 advances from a retracting position shown by the double-dashed line to an operating position shown by the continuous line, where it releases the yarn from the traverse guide of the traverse device (not shown in the drawing). The yarn displacement guide 51 is guided by a plurality of guide grooves 56 in a base 55 of the elevating box and comprises a bar body 57 that moves forward and backward by means of a first air pressure cylinder 58, and the yarn guide bars (the first yarn-transferring guide) 59 that protrude from the bar body 57 and displace the yarn, and the number of which corresponds to the number of the bobbins.

The guide groove 56 has a straight portion 56a and a backward portion 56b, and the bar body 57 and the

yarn guide bars 59 that are guided by a roller 57a advance to a position at which the guide bar 59 can catch the yarn and then displace the yarn to the left in Figure 3. A stopper 60 protruding to the side is mounted on the bar body 57 and halts when contacting the tip of the rod of a second air pressure cylinder (a halting means) 61 mounted on the base 55. At this halting position, the yarn guide bar 59 is located at a first position in which it sits within the notch 43 in the slide yarn guide 21 in front of the claw 42 of the fixed yarn guide 22. When the rod of the second air pressure cylinder 61 contracts, the bar body 57 moves further to the left in Figure 3 to transport the yarn Y to a second position, specifically a guide surface 53a of the fixed yarn guide 53. This second position is located beyond the slit 17 in the bobbin B.

Figures 4 to 6 show how the second yarn guide device 20 operates over time.

When a turret plate (not shown in the drawings) rotates 180 ° , the winding and standby positions are mutually switched. Figure 4 shows a switching operation from θ1 to θ2. At a switching position θ1, the empty bobbin EB is located at the position shown by the continuous line in Figure 4, while the bobbin holder 15 for the empty bobbin EB approaches the shoe 29 of the second yarn guide device 20 until it substantially contacts the shoe 29. At the switching position θ1, the oscillating arm 23 is oscillated counterclockwise by the air pressure cylinder, then the shoe 29 contacts the fixed shaft 11 of the bobbin holder 15, and the position of the oscillating arm 23 is regulated by the bobbin holder 15. When the bobbin holder 15 subsequently rotates with the turret plate, the position of the oscillating arm 23 is changed in such a way that it stands up, thereby gradually changing the position of the slide plate 24 in such a way that it approaches the intermediate position between the empty bobbin EB and the full bobbin FB.

A switching position θ2 is shown by the double-dashed line. At this point, the yarn leading to the full bobbin FB does not contact the surface of the empty bobbin EB. In this condition, the elevating box 1 lowers to allow the touch roller 3 to contact the empty bobbin EB moving toward the winding position (a). From a state of the above mentioned switching position θ2, the turret plate further rotates, and the turret plate is positioned at a switching position θ3 (not shown in the drawings), the travelling yarn Y leading to the full bobbin FB contacts the empty bobbin EB. Then the slide plate 24 of the second guide device 20 starts to advance to the travelling yarn Y.

Figure 5 shows the switching operations θ4 to θ8 at a predetermined interval. At the switching position θ4, the travelling yarn Y contacts the empty bobbin EB slightly, and the yarn path restraining guide 21 located at the top of the end of the slide plate 24 and used as the slide yarn guide advances, but does not restrain the yarn path for the travelling yarn Y yet. At the switching position θ5, the angle at which the travelling yarn Y contacts the empty bobbin EB increases, but at the same time, the yarn path restraining guide 21 also serves as the slide yarn guide pushes out the travelling yarn Y to maintain the contact angle within 10° .

As the switching position shifts fromθ6 through θ7 to θ8, the empty bobbin EB further cuts in the travelling yarn Y. Since the position of the oscillating arm 23 changes in response to the movement of the bobbin holder, however, the yarn path restraining guide 21 also serves as the slide yarn guide advances in response to the movement of the empty bobbin EB in order to push out the travelling yarn Y further. Consequently, until immediately before the empty bobbin FB reaches the final specified switching position at 180° , the angle at which the travelling yarn Y contacts the empty bobbin EB, which rotates in the direction opposite to the travelling direction of the yarn Y, is maintained within 10 ° .

Figure 6 shows the specified winding position (a), or the switching position at 180° . Even when the yarn contacts the empty bobbin EB during the switching operation, the contact angle is kept smaller than the angle required to transfer the yarn to the empty bobbin EB (in order to allow the slit to capture the yarn) until a yarn-transferring position is reached (until yarn-transferring is started). At this specified position, the angle at which the travelling yarn Y contacts the empty bobbin EB increases to enable the yarn-transferring operation. The yarn-transferring time period, during which the contact angle increases, is extremely short. While the travelling yarn Y is restrained by the yarn path restraining guide 21 also serving as the slide yarn guide, it remains in contact with the bottom surface of the notch 43 in Figure 2 without causing the slide yarn guide 21 to slide. When the portion of the notch 43 that is contacted by the yarn is formed of ceramics, the likelihood that the travelling yarn Y is damaged is reduced significantly.

The operation of the first yarn guide device 50 that cooperates with the second yarn guide device 20 in transferring the yarn is described with reference to Figures 7 to 12.

First, when transferring needs to be executed, the bobbin holder 16 at the standby position on which the empty bobbin is installed starts accelerating. When a specified speed is reached, the turret plate starts rotating to initiate a switching operation. When the travelling yarn does not contact the empty bobbin EB until the switching position transfers θ4, a first phase of yarn displacement is carried out as shown in Figures 7 and 8.

The yarn release guide 52 advances in direction ① to release the yarn from the traverse device 4, then the tension causes the travelling yarn Y to be centered, and center winding is than started as shown in Figure 7. The bar body 57 and the yarn guide bar 59 move forward and then in the lateral direction as shown by arrow ③ in response to the extension of the air pressure cylinder 58. The stopper 60 of the bar body 57 contacts the tip of the rod of the second air cylinder 61 and halts. This condition is shown in Figure 8. At this point, a first end

straight winding, the yarn is wound around one section of the bobbin, is formed on the surface of the full bobbin FB. A first position of the first end straight winding is within the notch 43 in the slide yarn guide 21 and immediately before the claw 42 of the fixed guide 22. Therefore, the specified switching position at 180 ° is reached while the yarn path restraining guide 21 also serving as the slide yarn guide restrains the yarn path by holding the yarn within the notch 43. In other words, at the first position, the travelling yarn does not fall from that part of the yarn layer on the full bobbin that is located at the end of the yarn layer of the full bobbin, and this position is located closer to the center of the bobbin than to the third yarn-transferring guide, which enables the travelling yarn to be displaced to the end of the bobbin before the third yarn-transferring guide is advanced. Therefore, the travelling yarn can be displaced to the first position near the end of the bobbin while the turret plate is rotating, thereby reducing the time from the switching operation until yarn-transferring and thus the time during which the travelling yarn contacts the empty bobbin in order to increase the success rate of yarn-transferring. In addition, since yarn-transferring can be executed with little or no contact between the travelling yarn and the empty bobbin, the yarn is subjected to little damage, which further increases the success rate of yarn-transferring.

When the turret plate and the bobbin holder reach their specified positions, the rod of the second air pressure cylinder 61 in Figure 9 contracts to execute a second phase of yarn displacement in which the bar body 57 and the yarn guide bar 59 move further to the left as shown by arrow ③.

A second position achieved by the second phase of yarn displacement is determined by a stopper 61a, and this condition is detected by a sensor 61b. The second position for yarn displacement should be beyond the slit 17 in the empty bobbin EB but may be anywhere near the slit 17. The claw 42 of the fixed guide 22 of the second yarn guide device 20 precludes the yarn from falling from the full bobbin FB to form a second end straight winding that is much closer to the end of the bobbin than the first end straight winding. As shown in Figure 10, however, when the sensor 61b detects the contact of the bar body 57 with the stopper 61a, the slide yarn guide 21 of the second yarn guide device 20 simultaneously travels in the lateral direction as shown by arrow ④ to move the downstream side of the travelling yarn Y to a position at which the yarn traverses the slit 17 in the empty bobbin EB. Simultaneously with this movement of the slide yarn guide 21, the yarn release guide 52 moves backward as shown by arrow ⑤, causing the travelling yarn to be caught on a guide surface 53a of the fixed yarn guide 53.

Figure 11 shows a condition immediately after yarn-transferring carried out after the travelling yarn Y has been caught in the slit 17 in the empty bobbin EB. A bunch winding determined by the second position of the yarn guide bar 59 is then formed on the empty bobbin EB. After a predetermined time has transferred, as shown in Figure 12, the bar body 57 and yarn guide bar 59 leave, as shown by arrow ⑥ while moving backward. The travelling yarn Y, which naturally falls from the guide surface 53a of the fixed yarn guide 53 due to its tension, is then caught on the traverse guide 6 of the traverse device 4 to start traversing in order to start normal traverse winding.

Figure 13 shows the timings of the operations of the first yarn guide device 50 and the second yarn guide device 20.

Before the turret plate and the bobbin holder have switched the switching position θ4 to cause the yarn path restraining guide 21 also serving as the slide yarn guide to initialize restraining, the travelling yarn Y is released from the traverse device as indicated by reference numeral 71, and the first yarn guide device displaces the yarn to the first position that is close to the end of the traverse range as indicated by reference numeral 72, followed by the start of the first end straight winding as indicated by reference numeral 73. When the travelling yarn Y is located at the first position, the yarn enters the notch 43 in the yarn path restraining guide 21 also serving as the slide yarn guide and the yarn path restraining guide 21 advances while being guided by the bobbin holder for the empty bobbin EB, thereby restricting the contact angle γ between the travelling yarn and the empty bobbin EB to within 10 ° .

When the turret plate and the bobbin holder reach the specified switching position at 180 ° , the first yarn guide device displaces the yarn to the second position that is closer to the end of the traverse range as indicated by reference numeral 74, while the yarn on the empty bobbin EB is located at a position corresponding to bunch winding as indicated by reference numeral 75. The yarn on the full bobbin EB undergoes the second end straight winding determined by the claw 42 of the fixed yarn guide 22 as indicated by reference numeral 76. The yarn-transferring is executed by moving the yarn on the full bobbin FB in the lateral direction to allow it to traverse the slit while leaving it caught on the catching portion 41 of the slide yarn guide 21. The time during which the yarn-transferring remains in contact with the empty bobbin before the specified position is reached for yarn-transferring, and the contact angle is restricted to a small value such as γ or β by means of the advancement of the yarn path restraining guide 21 also serving as the slide yarn guide.

Furthermore, the second yarn guide device 20 (the third yarn-transferring guide 42) advances before the specified position is reached for yarn-transferring, so the yarn can be transferred as soon as the specified position is reached. This can reduce the probability of the failure to transfer the yarn caused by the contact between the yarn and the empty bobbin maintained until yarn-transferring.

In the conventional yarn-transferring shown in Fig-

ure 14, in order to advance the second yarn guide device after the turret plate and the bobbin holder have reached the specified position, the contact angle remains at a large value, or at least 60 ° within the contact section. Furthermore, since after the establishment of the specified position, the yarn-transferring is done by the advancement of the second yarn guide device, the activation of the first yarn guide device and the second yarn guide device, a large amount of time transfers before the yarn-transferring, thereby increasing the total time required to transfer the yarn. As a result, in the conventional yarn-transferring, the travelling yarn remains in contact with the empty bobbin for an extended period of time, thereby increasing the probability of yarn-transferring failure.

In addition, in the present invention, as shown in Figure 13, since the yarn is displaced to the first position within the non-contact section prior to the contact section, damage to the yarn can be reduced during displacement to increase the success rate of yarn-transferring.

Although the above embodiment implements both the restriction of the contact angle between the travelling yarn and the empty bobbin executed by the yarn path restraining guide 21 also serving as the slide yarn guide and the division into the first and second positions of the yarn displacement position established by the first guide device, the present invention effectively increases the success rate of yarn-transferring whether these operations are separately implemented or only the restriction of the contact angle is provided.

In addition, according to the above embodiment, when the bobbin holder for the empty bobbin EB approaches the oscillating arm 23, specifically, when the respective contact sites approach each other, the oscillating arm 23 (shoes 29, 30) is contacted with the bobbin holder. This is to reduce the impact (impact sound) upon contact.

Although the above embodiment uses the component member of the second yarn guide device 20 as the member that is moved forward toward the empty bobbin EB during the switching operation, this advancement member is not limited to the yarn guide but may be a partitioning member that advances between the empty and full bobbins during the yarn-transferring operation. Furthermore, the advancement member is not limited to the one that advances between the empty and full bobbins, but may be the member that advances upward from the empty bobbin.

In other words, this member need only advance to a neighborhood of the empty bobbin during the switching operation.

According to the above embodiment, the member that is moved forward toward the empty bobbin during the switching operation (the second yarn guide device 20) is moved forward while being guided by the bobbin holder for the empty bobbin. This configuration allows the position of the advancement member to be determined accurately relative to the empty bobbin, thereby preventing the interference between the empty bobbin and the advancement member without the needs for complicated control.

According to the above embodiment, the first switching guide acts on the travelling yarn on the upstream side of the touch roller, but may also act on the travelling yarn between the touch roller and the empty bobbin.

As described above, according to the present invention, the contact angle between the empty bobbin and the travelling yarn during the revolving of the bobbin holder, that is, the switching operation is reduced by the yarn path restraining guide, so the rubbing of the travelling yarn by the empty bobbin is mitigated to prevent the yarn from being damaged in order, thereby increasing the success rate of yarn-transferring. In particular, for thin, low-elongation yarns that are easy to cut, the present invention can significantly increase the success rate of yarn-transferring.

It is contemplated that the yarn is prevented from contacting the empty bobbin prior to yarn-transferring, but in this case, various constraints are imposed on the installation position of the yarn path restraining guide, the advancement timing for the yarn path restraining guide, and the switching timing for the full and empty bobbins. The present invention, however, can provide the above effect without creating these problems or complicating the device.

According to the present invention, the yarn guide for transferring the yarn also serves as the yarn path restraining guide that reduces the contact angle between the yarn and the empty bobbin, so the yarn guide can be moved forward during the yarn-transferring operation to provide for yarn-transferring, thereby reducing the time from the switching operation until yarn-transferring and the time during which the yarn contacts the empty bobbin. As a result, damage to the yarn is reduced, which in turn improves the success rate of yarn-transferring.

According to the present invention, the yarn guide can be moved forward while simultaneously preventing the interference between the empty and full bobbins.

According to the present invention, the advancement of the member that travels to the empty bobbin during the switching operation is guided by the bobbin holder. Therefore, the advancement position of the advancement member relative to the empty bobbin installed on the bobbin holder can be determined accurately to simplify the controls, thereby forcing the switching timing for the advancement member to synchronize accurately with the switching timing for the full and empty bobbins. This synchronism between these timings eliminates the need to provide the extra time that is required to switch between the full and empty bobbins at a low speed, thereby reducing the time required for switching. This feature is also preferable in implementing the present inventions.

According to the present inventions, during the yarn-transferring operation, the travelling yarn can be displaced to a neighborhood of the yarn capturing means at the end of the empty bobbin, that is, to the end of the yarn layer on the full bobbin. This configuration can reduce the time from the switching of the position of the bobbin holder until yarn-transferring to reduce the time during which the travelling yarn is rubbed by the empty bobbin, thereby improving the quality of the yarn wound the full bobbin and thus the success rate of yarn-transferring.

In particular, for thin yarns of a low elongation that are easy to cut when rubbed, the present invention can significantly improve the success rate of yarn-transferring.

Conventionally, since the travelling yarn is displaced to the yarn capturing means at the end of the empty bobbin by a single step, the yarn displacing cannot be executed unless the yarn guide advances between the empty and full bobbins to preclude the travelling yarn from falling from the yarn layer on the full bobbin. In addition, conventionally, the advancement timing for the yarn guide is constrained by the need to avoid interference with the bobbins during the switching operation, thereby increasing the time until yarn-transferring.

The present invention, however, can displace the yarn regardless of the advancement of the yarn guide.

According to the present invention, the travelling yarn is displaced to the end of the yarn layer on the full bobbin while the yarn and empty bobbin do not contact each other. Thereby, while the yarn is displaced to the end of the yarn layer on the full bobbin, the yarn is prevented from damage caused by its contact with the empty bobbin to further improve the quality of the yarn on the full bobbin and thus the success rate of yarn-transferring.

According to the present invention, the travelling yarn is displaced to the end of the yarn layer on the full bobbin and held thereon to provide for yarn-transferring before the switching of the position of the bobbin holder is completed, thereby minimizing the time required to transfer the yarn.

Claims

1. A take-up winder having a switching operation for switching two bobbin holders between a winding position and a standby position and transferring to an empty bobbin a travelling yarn lending to a full bobbin, in response to the switching operation, characterized in that a yarn path restraining guide is provided that controls, during said switching operation, the contact angle at which said travelling yarn contacts said empty bobbin, and that is controlled so that the contact angle from the contacting of the travelling yarn with said empty bobbin until yarn-transferring is kept smaller than that during the yarn-transferring.

2. A take-up winder as in claim 1 characterized in that said yarn path restraining guide also acts as a yarn guide located between said empty and full bobbins to transfer said travelling yarn from said full bobbin to said empty bobbin.

3. A take-up winder as in claim 2 characterized in that said yarn guide can move an arm forward and backward outside an region in which said empty and full bobbins rotate.

4. A take-up winder having a switching operation for switching two bobbin holders between a winding position and a standby position and in response to the switching operation, transferring to an empty bobbin a travelling yarn lending to a full bobbin, characterized in that a member that advances toward the empty bobbin during said switching operation is guided by a bobbin holder for the empty bobbin.

5. A take-up winder having a switching operation for switching two bobbin holders between a winding position and a standby position and in response to the swithcing operation, allowing a yarn capturing means provided at the end of an empty bobbin to capture a travelling yarn leading to a full bobbin in order to transfer said travelling yarn to the empty bobbin, characterized in that a yarn-transferring guide is provided that moves the travelling yarn leading to said full bobbin to the yarn capturing means at the and of said empty bobbin, and in that a temporary stop means is provided that temporarily stops the yarn-transferring guide at a position at which the travelling yarn is located at the end of a yarn layer on the full bobbin.

6. A yarn-transferring method for a take-up winder having a switching operation for switching two bobbin holders between a winding position and a standby position and in response to the switching operation, transferring to an empty bobbin a travelling yarn leading to a full bobbin, characterized in that the contact angle at which said travelling yarn contacts said empty bobbin during said switching operation is set smaller during the time from the contacting of the travelling yarn with said empty bobbin until yarn-transferring, than during the yarn-transferring.

7. A yarn-transferring method for a take-up winder having a switching operation for switching two bobbin holders between a winding position and a standby position and in response to the swithcing operation, allowing a yarn capturing means provided at the end of an empty bobbin to capture a

travelling yarn leading to a full bobbin in order to transfer said travelling yarn to the empty bobbin, characterized in that when the travelling yarn leading to said full bobbin is moved to the yarn capturing means at the end of said empty bobbin, said travelling yarn is moved to the end of the yarn layer on the full bobbin before said switching operation has been completed.

8. A yarn-transferring method for a take-up winder as in claim 7 characterized in that while said empty bobbin and travelling yarn are not mutually contacted, said travelling yarn is displaced to the end of the yarn layer of the full bobbin.

9. A yarn-transferring method for a take-up winder as in claim 7 or claim 8 characterized in that before the switching operation has been completed, said travelling yarn is moved to the end of the yarn layer on the full bobbin and said travelling yarn leading to said full bobbin is retained on the yarn layer, and then the yarn-transferring is done.

FIG. 1

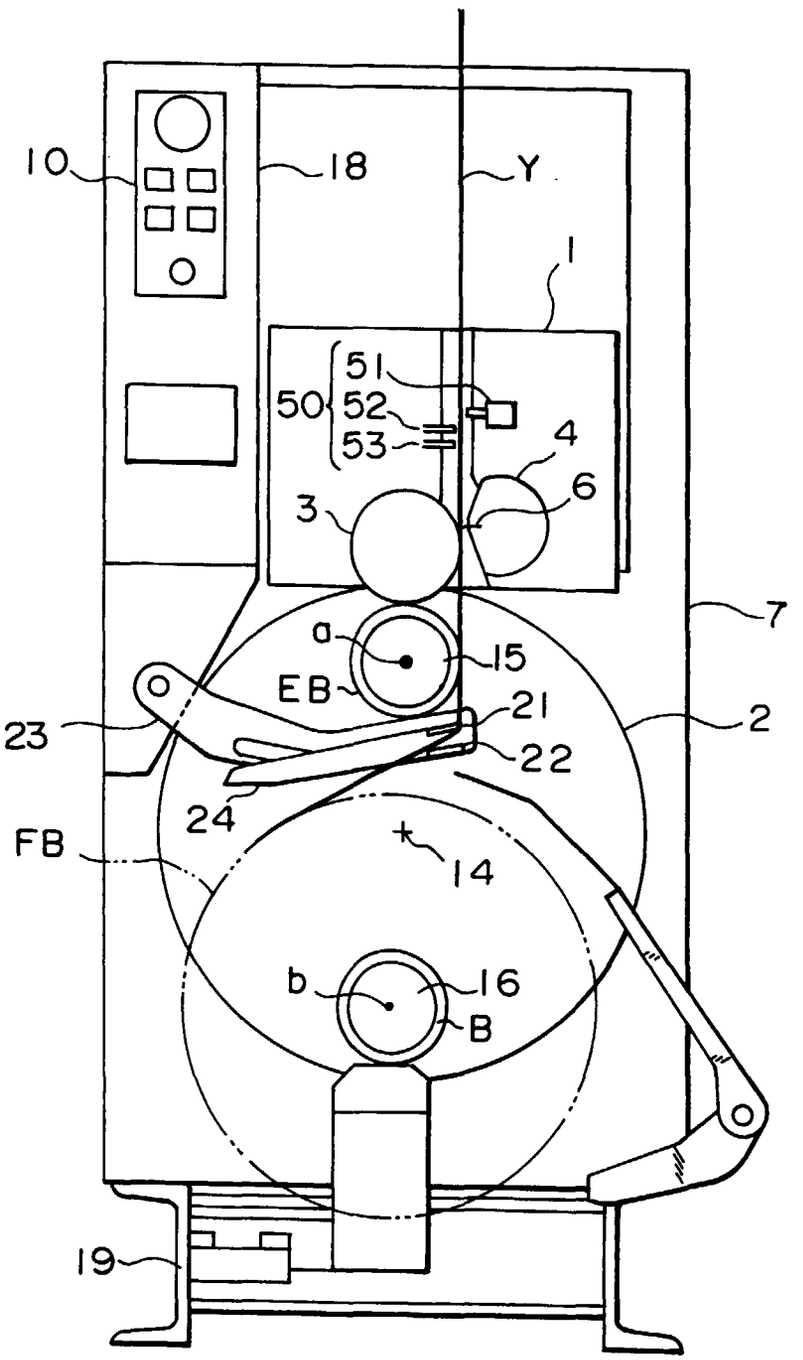
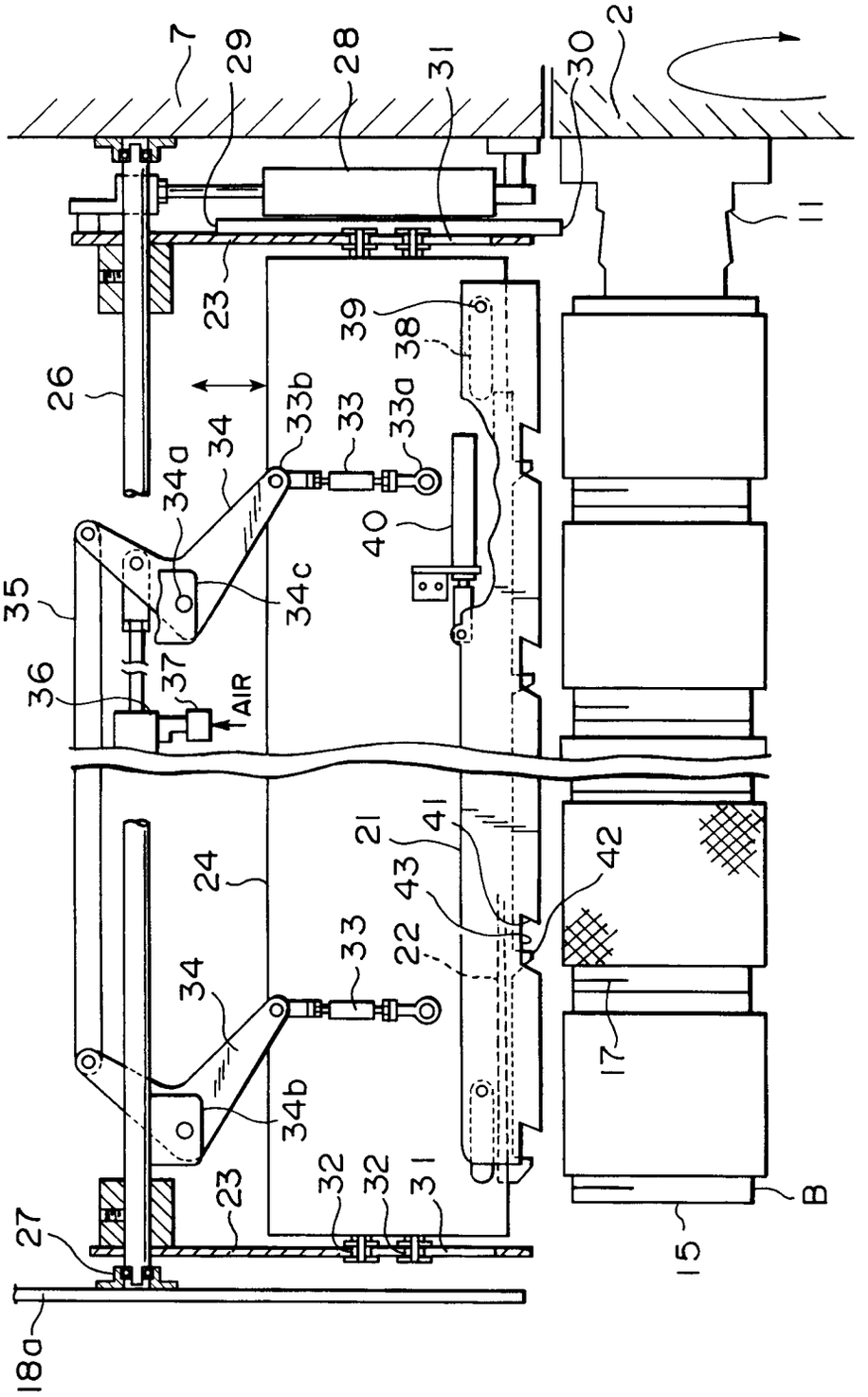


FIG. 2


7
29
28
31
30
2
11
23
39
38
26
33b
33
33a
34
34a
40
35
34c
36
37
AIR
21
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34
34b
17
32
32
31
23
27
18a
15
B

FIG. 3

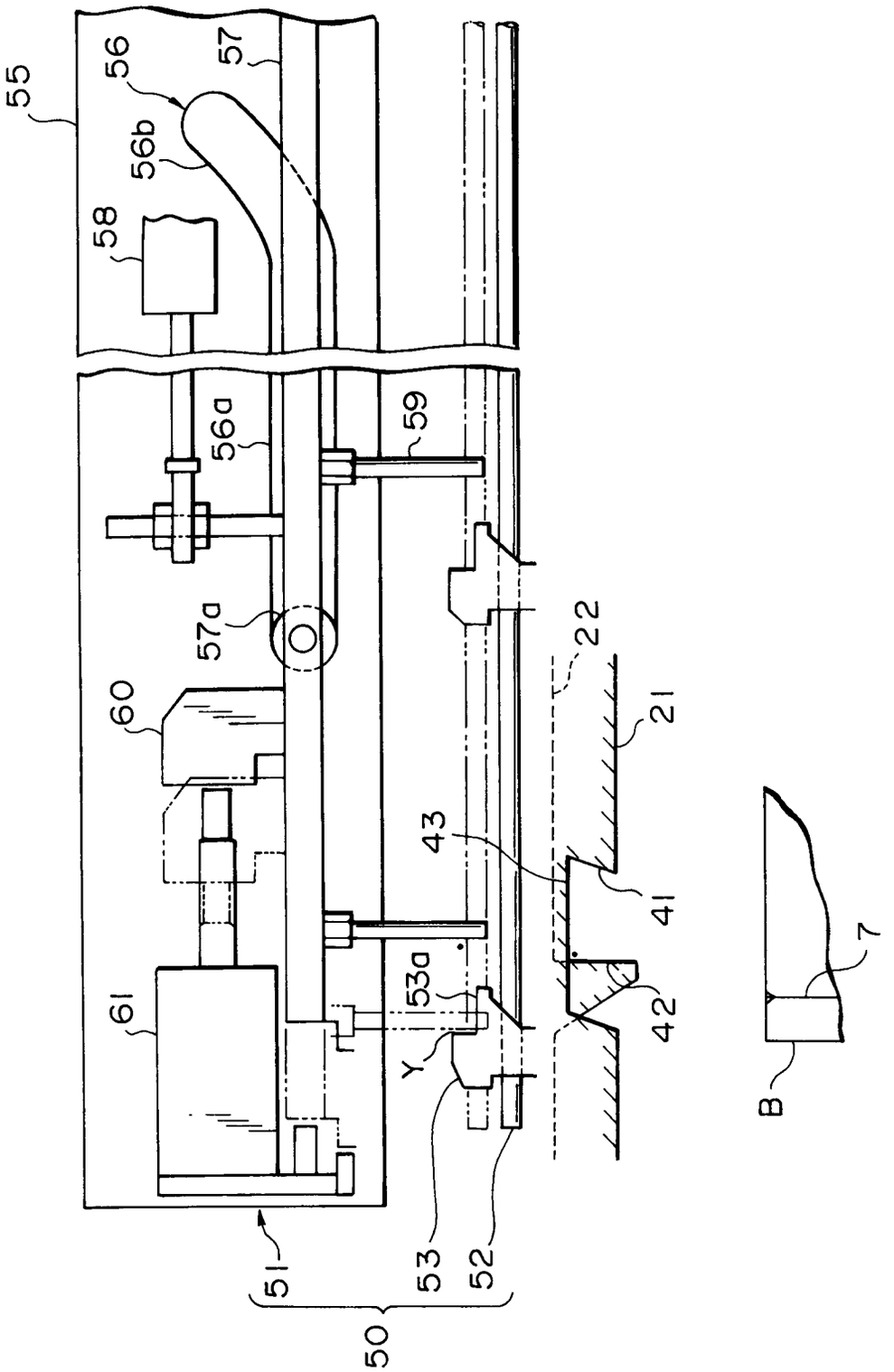


FIG. 4

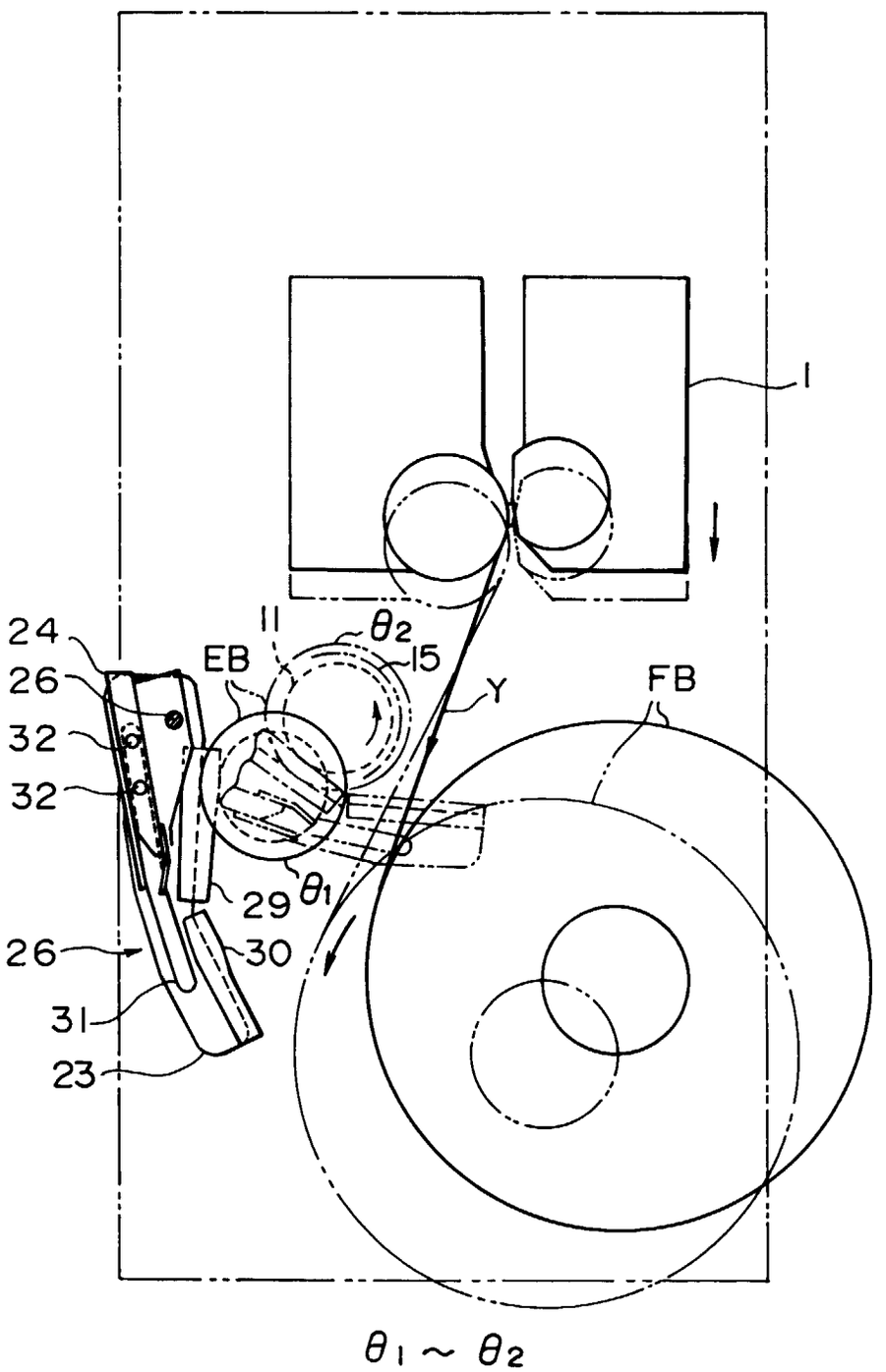
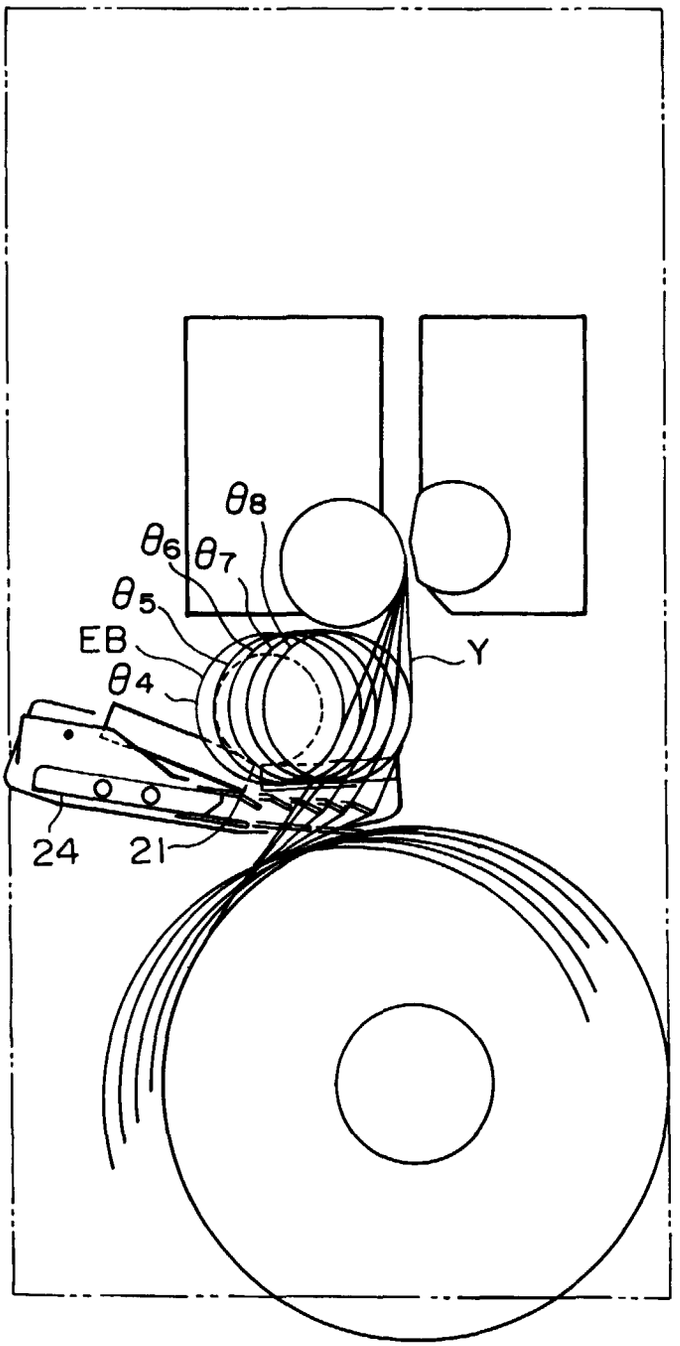


FIG. 5



θ4 ~ θ8

FIG. 6

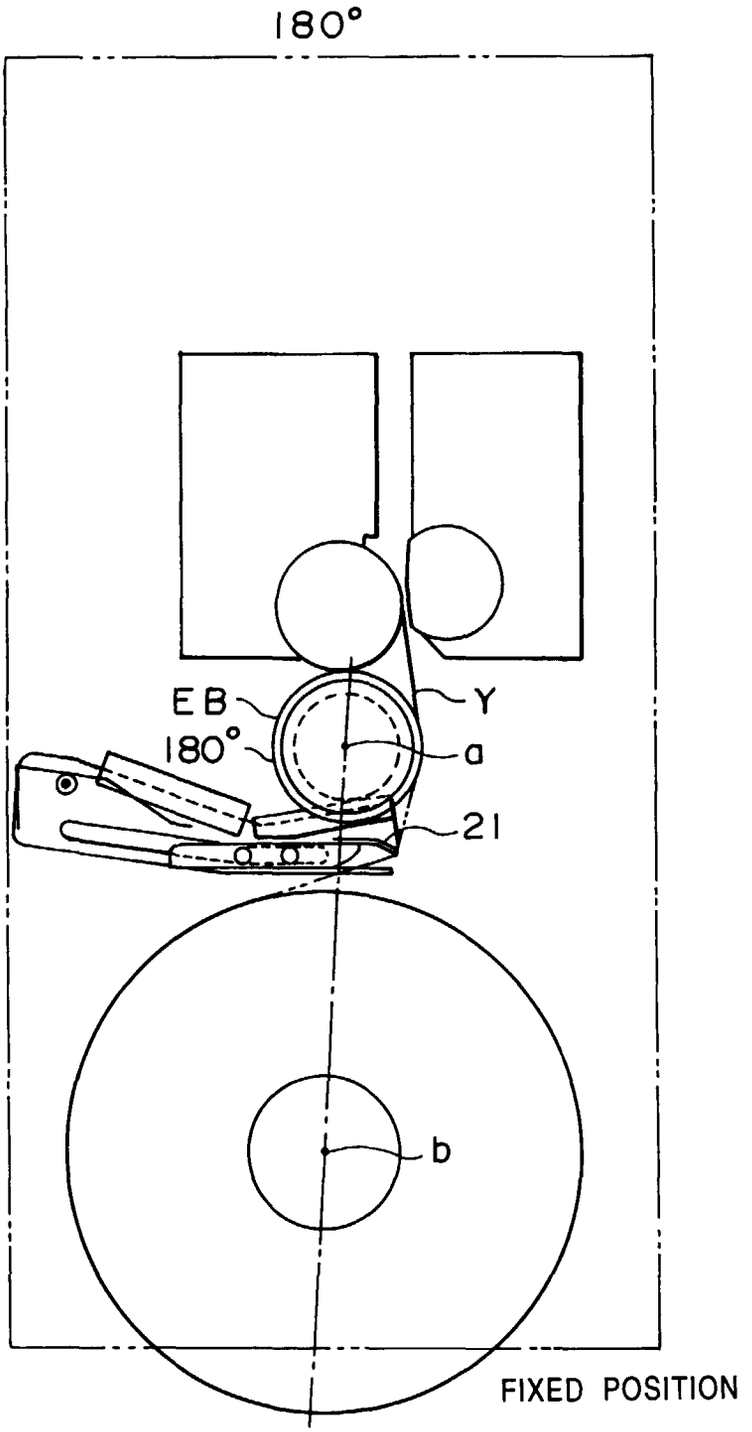


FIG. 7

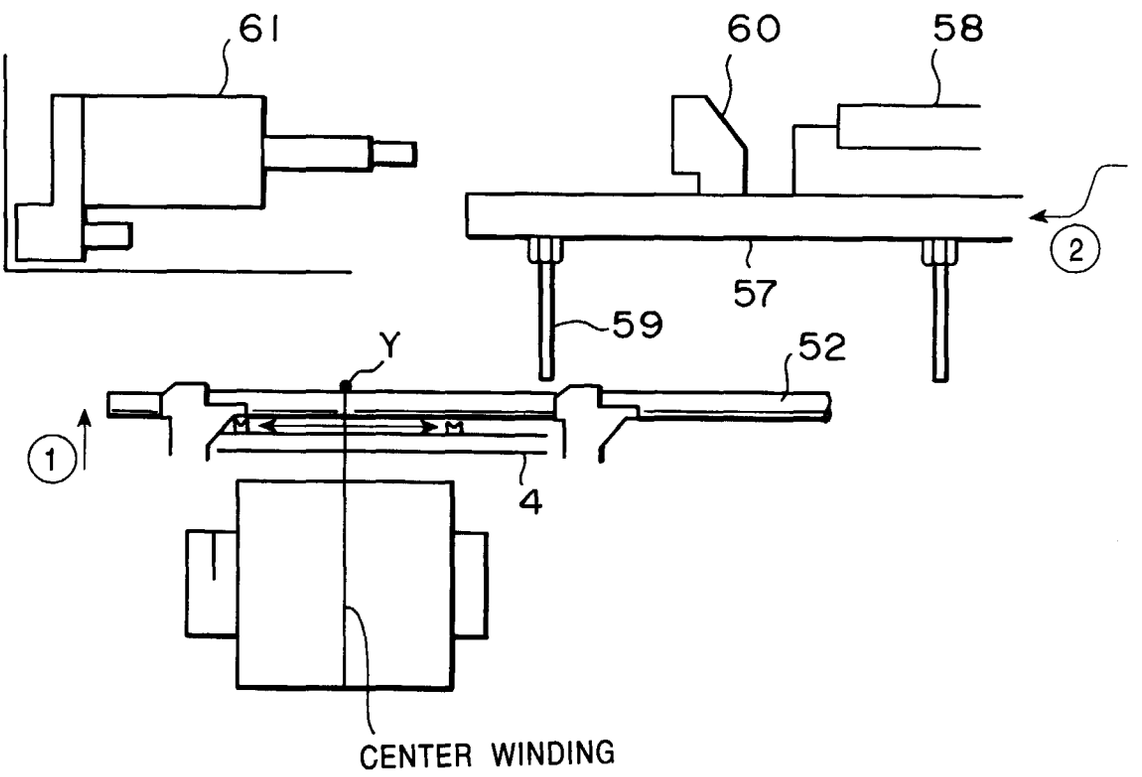


FIG. 8

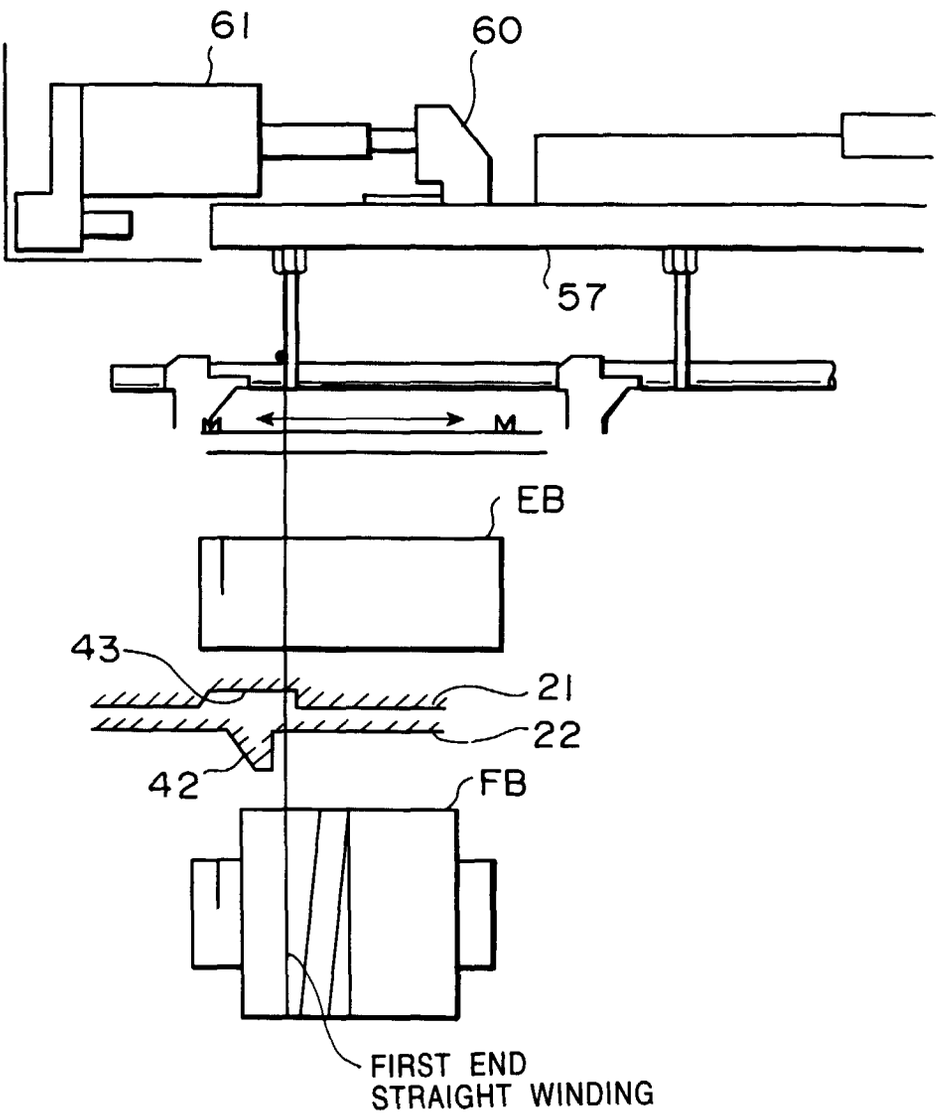


FIG. 9

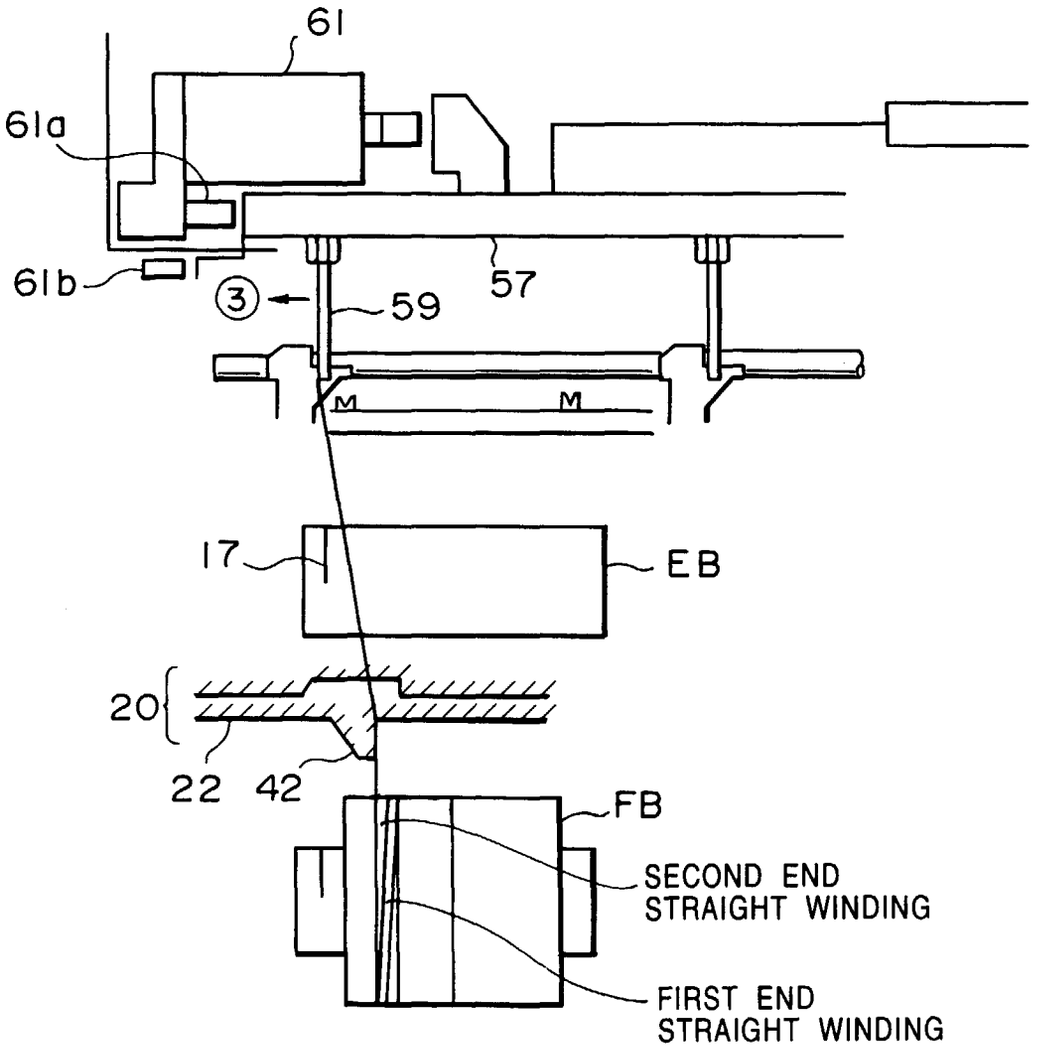

61
61a
61b
3
59
57
M
M
17
EB
20
22
42
FB
SECOND END
STRAIGHT WINDING
FIRST END
STRAIGHT WINDING

FIG. 10

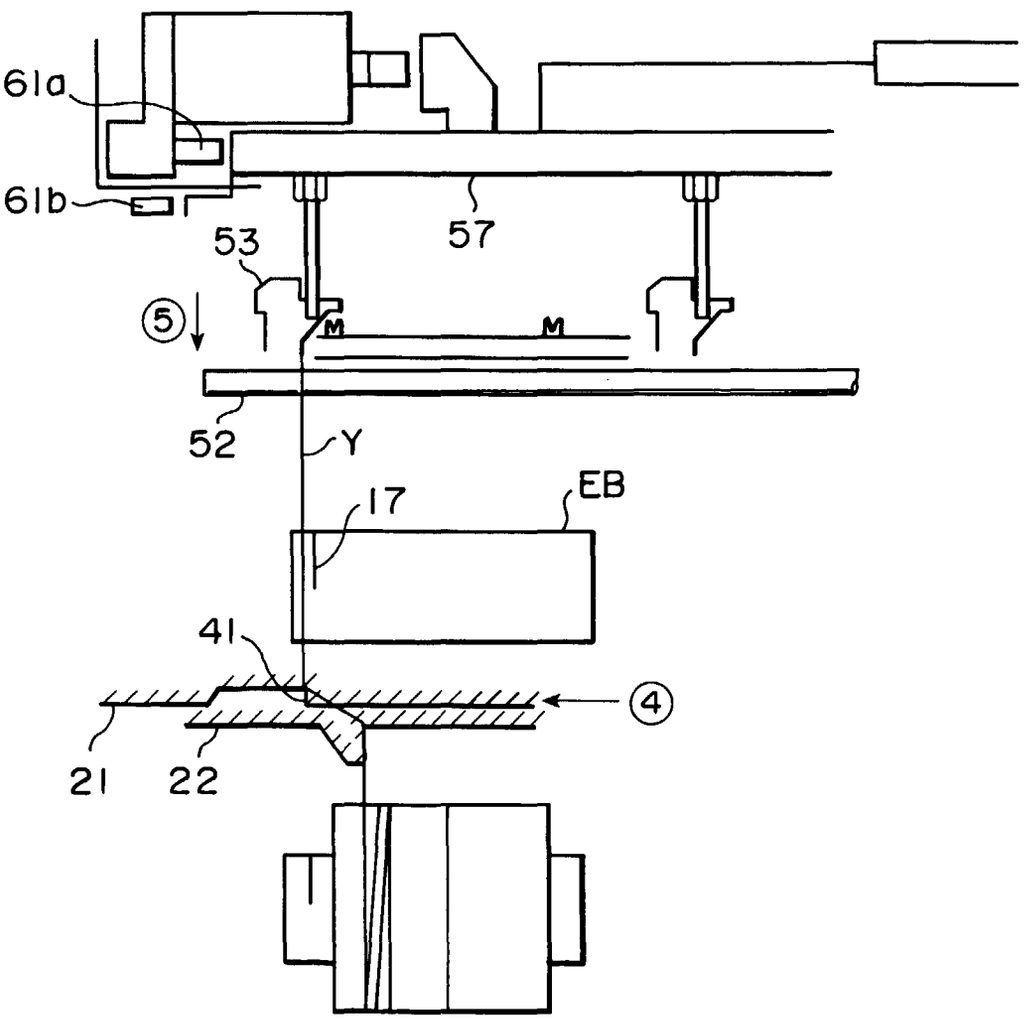


FIG. 11

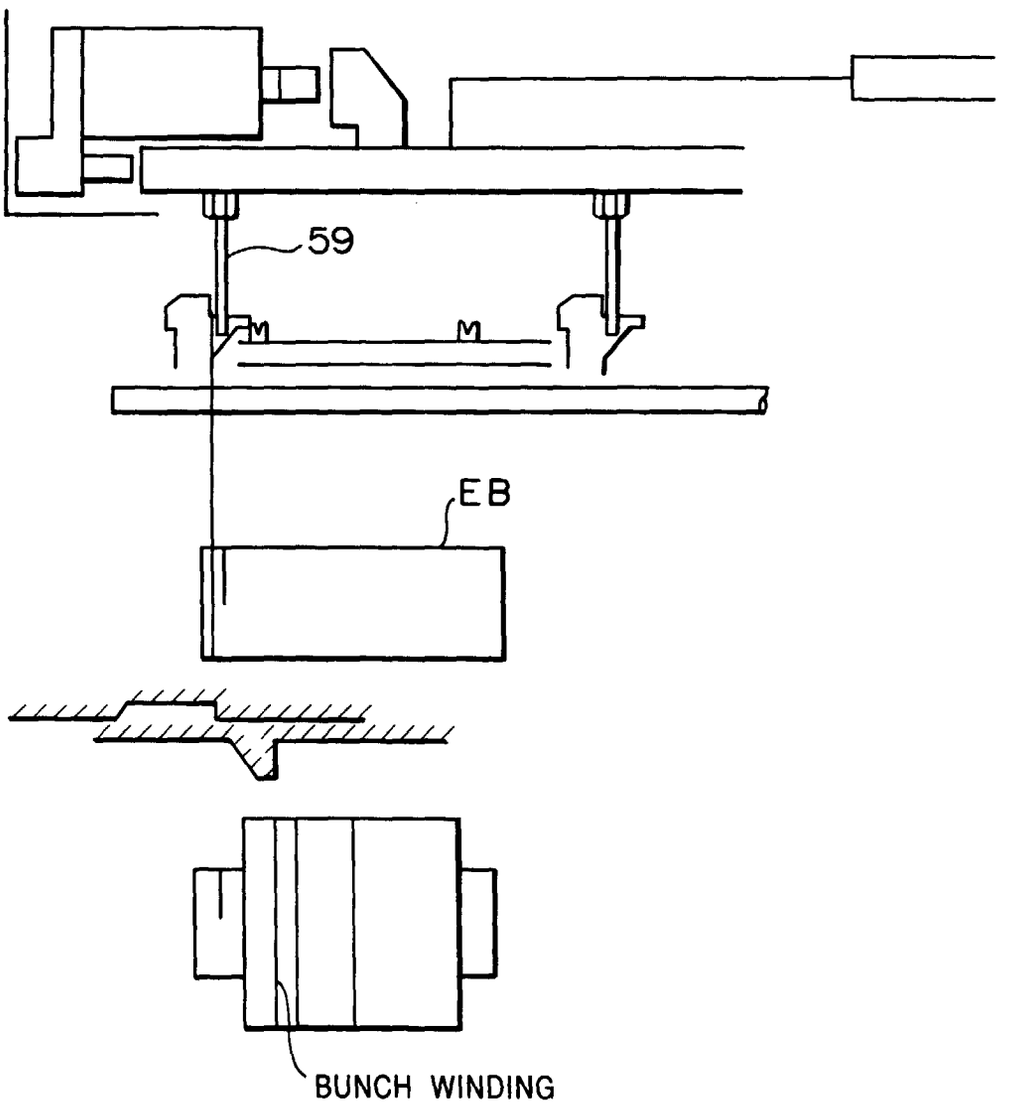


FIG. 12

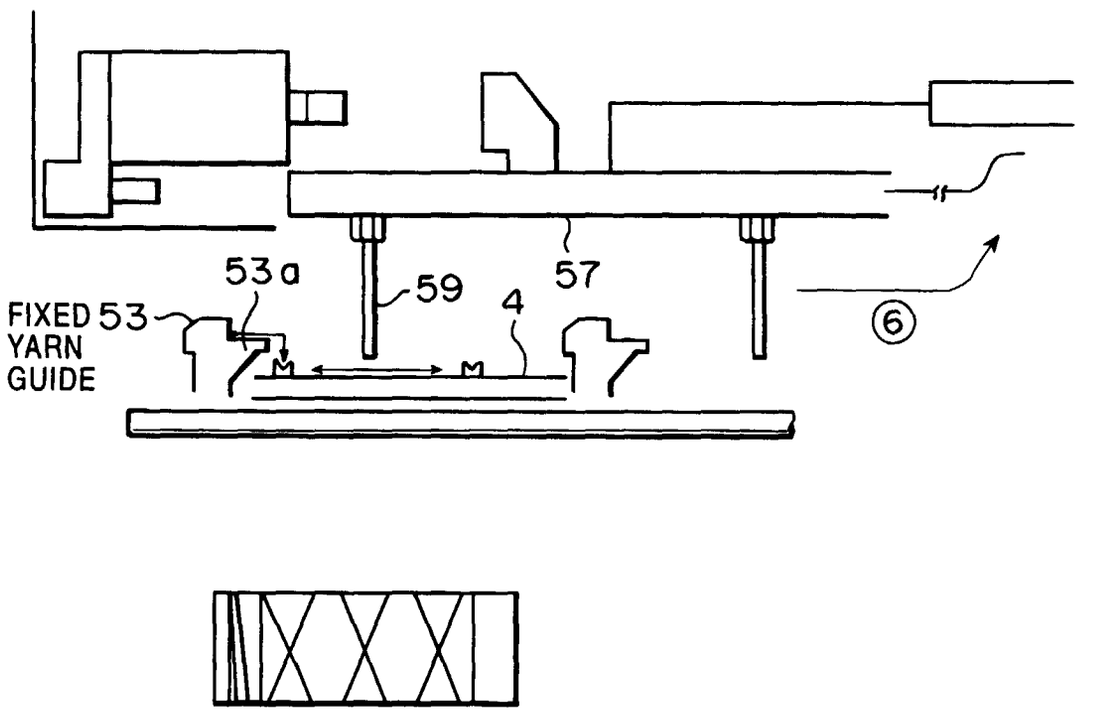


FIG. 13

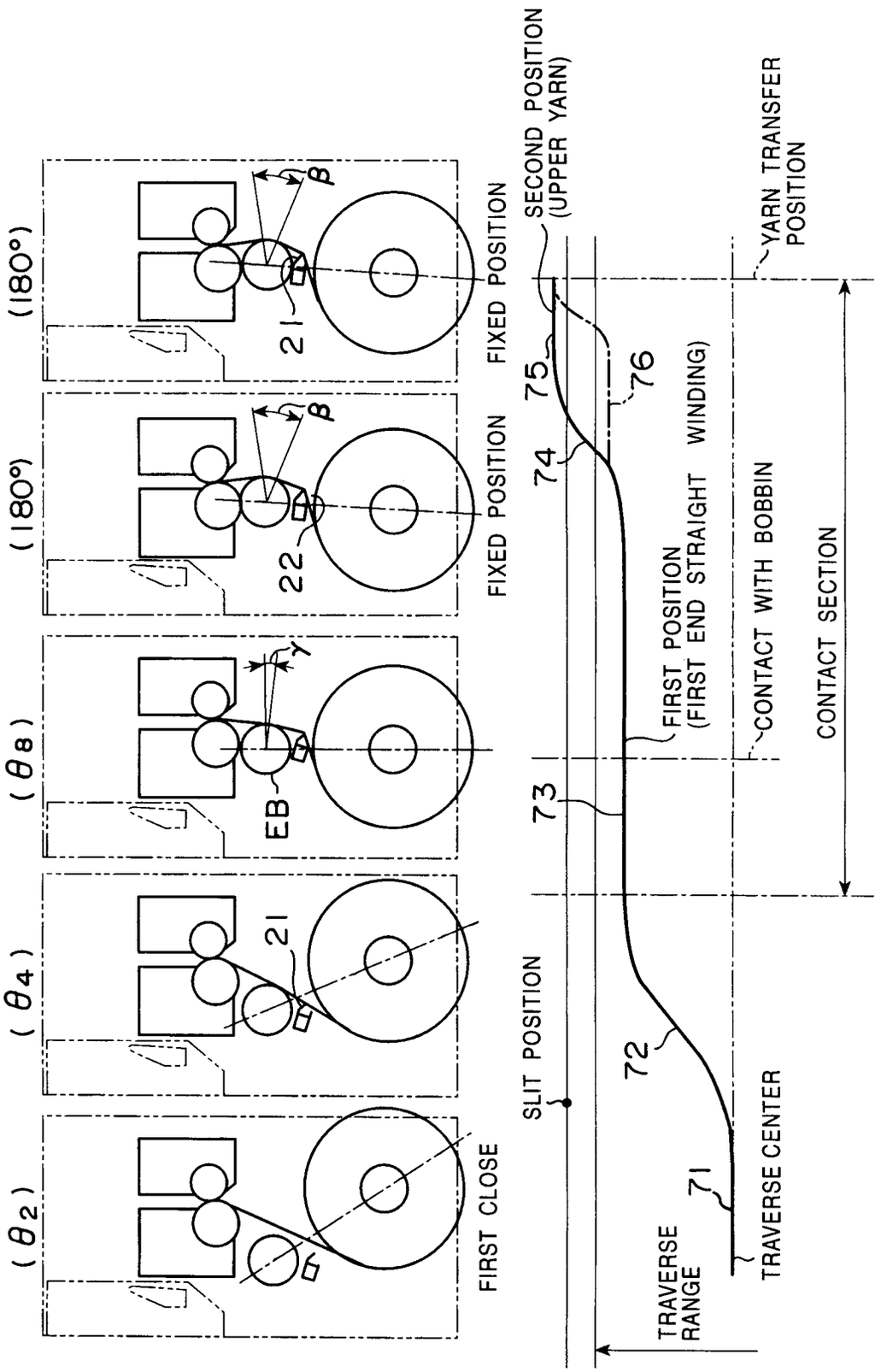

(θ2)
(θ4)
(θ8)
(180°)
(180°)
21
EB
γ
22
β
21
β
FIRST CLOSE
FIXED POSITION
FIXED POSITION
SECOND POSITION
(UPPER YARN)
YARN TRANSFER
POSITION
SLIT POSITION
73
74
75
76
72
71
FIRST POSITION
(FIRST END STRAIGHT WINDING)
CONTACT WITH BOBBIN
CONTACT SECTION
TRAVERSE
RANGE
TRAVERSE CENTER

FIG. 14

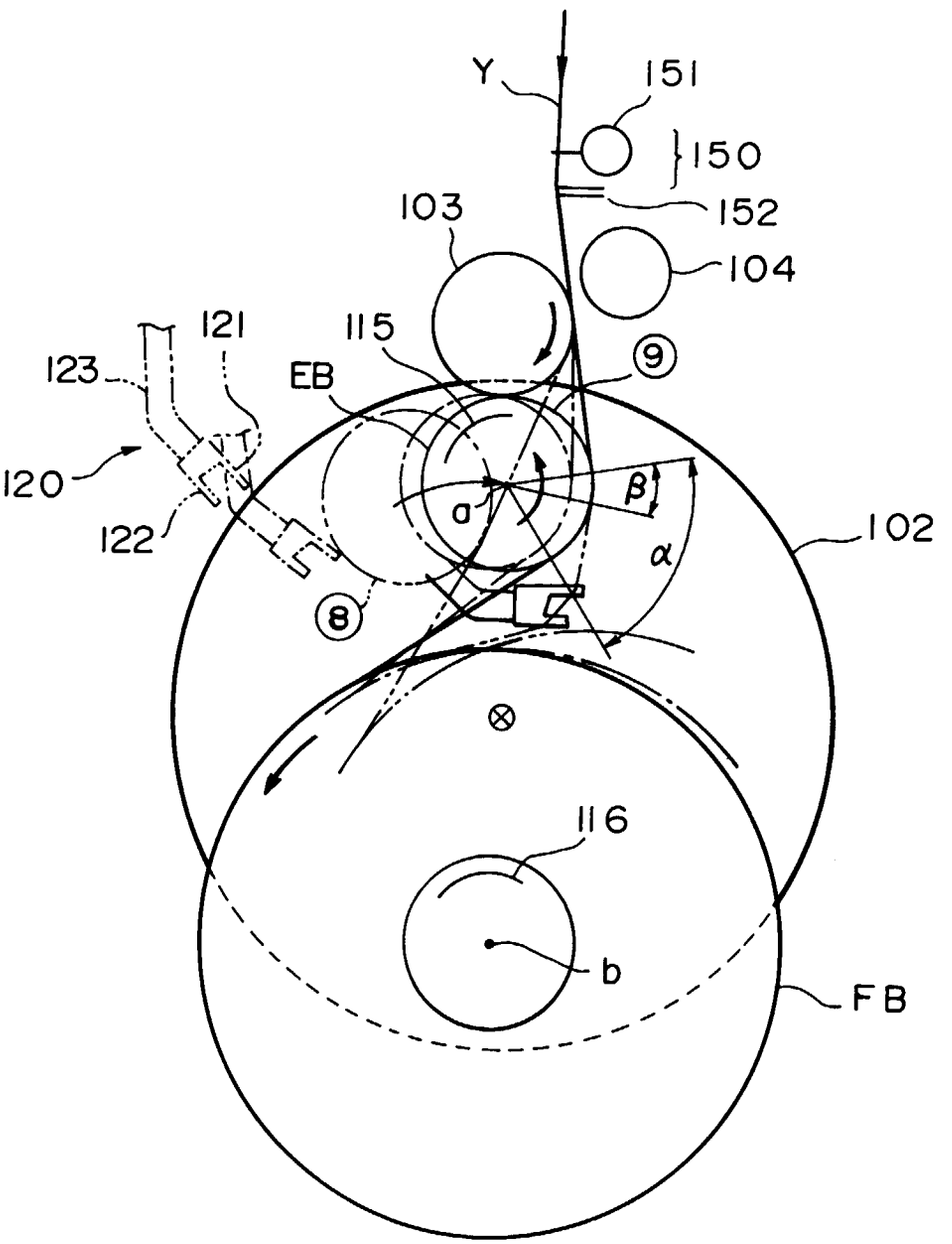
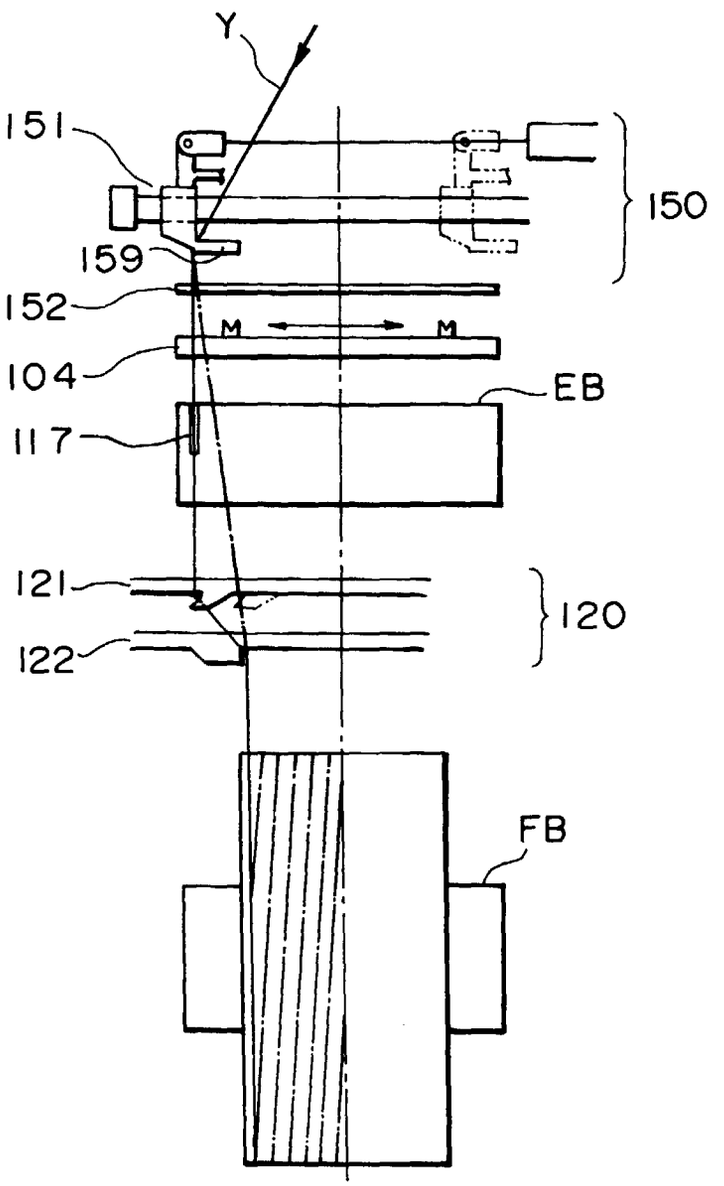


FIG. 15



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 10 7729

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	EP 0 367 253 A (RIETER AG MASCHF) 9 May 1990	1-3,5-9	B65H67/048
A	* column 2, line 19 - column 4, line 47; figures *	4	

X	GB 2 015 046 A (TORAY INDUSTRIES) 5 September 1979	1-3,5-9	
A	* page 4, line 125 - page 7, line 19; figures 9-11 *	4	

X	EP 0 521 816 A (RIETER AG MASCHF) 7 January 1993	5,7-9	
A	* column 3, line 5 - column 6, line 9; figures *	1,4-6	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	8 July 1998	David, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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