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(54) Automatic winder

(57) The present invention provides an automatic winder that can increase the speed of a bobbin installation operation, and thus of doffing operations, and that can reduce the weight of the apparatus. An automatic winder includes a winding unit 4 having a drum 6 that contacts a bobbin 14 to rotate it and a supporting member 8 that supports the bobbin 14, allowing it to rotate contact, and leave the drum 6, said automatic wider also includes a bobbin installation means 15 for installing the bobbin 14 on the supporting member 8, the bobbin installation means 15 being controlled to install the bobbin 14 on the supporting member 8 at a position at which the bobbin 14 and drum 6 contact each other.

EP 0 881 186 A1

Description

Field of the Invention

The present invention relates to an automatic winder including a doffing apparatus for doffing a full package and then placing an empty bobbin on a drum.

Background of the Invention

In a conventional doffing apparatus provided in an automatic winder, when a package on a winding unit for winding yarn from a supplying package becomes full, the apparatus doffs the full package from a supporting member referred to as cradle arms and then installs the bobbin on the cradle arms. When yarn is wound around the bobbin installed between the cradle arms, a process is used that attaches yarn to the bobbin, followed by bunch winding around the bobbin and subsequent final winding.

In a series of operations starting with the winding around the bobbin and ending with the final winding, as shown in Figure 10, a bobbin 61 is rotatably gripped by cradle arms 62 at a bunch winding position left by a traverse drum 60 that traverses yarn Y, the end of yarn from a supplying package is gripped between the end of the large diameter side of the bobbin 61 and a bobbin holder of the cradle am 62, and a bunch guide 63 at the output side of the traverse drum 60 guides the yarn Y to the large diameter end 61A of the bobbin 61. A bunch roller 64 in the doffing apparatus rotates the bobbin 61 at a low speed to bunch-wind the yarn Y around the large diameter end 61A of the bobbin 61 (shown in Figures 10A and 10B). Once the bunch winding of the bobbin 61 has been completed, the bunch guide 63 releases the yarn Y, the bunch roller 64 leaves the bobbin 61, and then the cradle arms 62 swivel to bring the bobbin 61 onto the traverse drum 60, which then rotates at a high speed to rotate the bobbin 61 at a high speed in order to start the final winding of the yarn Y (shown in Figure 10C).

In a conventional automatic winder, however,

(a) the bobbin 61 is installed between the cradle arms 62 at the bunch winding position located above the traverse drum 60, so much time is required to transfer the bobbin 61 from a stock position to a bobbin installation position of the cradle arms 62;

(b) a separate drive mechanism such as a bunch roller for rotating the bobbin 61 at a low speed during bunch winding must be provided, preventing the weight of the doffing apparatus from being reduced;

(c) when, after bunch winding, the cradle arms 62 are swiveled to bring the bobbin 61 onto the traverse drum 60, snarling may occur such that the bunch-winded yarn Y is loosened from the bobbin 61;

(d) when the bobbin 61 is installed between the cradle arms 62 at a position distant from the traverse drum 60, the installation position of the bobbin 61 changes depending on its taper angle or amount of increase, thereby requiring the bobbin installation means of the doffing apparatus to be changed each time the taper angle or amount of increase changes.

This invention is provided to solve these problems, and its object is to provide the automatic winder that can increase the speed of the bobbin installation operation and thus of the doffing operation and that can reduce the weight of the apparatus for performing those operations.

Summary of the Invention

According to the present invention, an automatic winder includes a winding unit having a drum that contacts a bobbin to rotationally drive it and a supporting member that supports the bobbin, allowing it to rotate contact, and leave the drum, and that also includes a bobbin installation means for installing the bobbin on the supporting member, the bobbin installation means being controlled to install the bobbin on the supporting member at a position at which the bobbin and drum contact each other.

In the conventional method of installing the bobbin at a position distant from the drum, the installation position of the bobbin varies significantly depending on the taper angle of the bobbin or amount of increase of the package, forcing the bobbin installation means to be changed for each operation. By installing the bobbin at a position at which it contacts the drum, however, the bobbin can be installed without changing the bobbin installation means. Thus, even if a single automatic winder is used to wind yarn from packages of different angles or amounts of increase, a single common bobbin installation apparatus (a doffing apparatus) can perform a bobbin installation operation (a doffing operation).

In the prior art, after a full package has been formed, the supporting member must be moved to the bobbin installation position, and after installation, to the drum position. This invention enables the supporting member to be moved to the drum position immediately after the formation of the full package, thereby increasing the speed of the doffing operation.

According to the present invention, a plurality of winding units are provided, the bobbin installation means is provided in a doffing apparatus for removing the full package from the supporting member, and the doffing apparatus selectively acts on a requested winding unit. Thus, even when a plurality of winding units are used to wind yarn from packages of different angles or amounts of increase, the bobbin installation means provided in a single common doffing apparatus can he used to perform the bobbin installation operation (the

doffing operation).

According to the present invention, the bobbin installation means transfers the bobbin from a housing position to the bobbin installation position of the supporting member. Thus, the final stop position of the bobbin is determined by the drum, thereby increasing the speed of the transfer and thus of the doffing operation.

According to the present invention, bunch winding is carried out while the bobbin and drum contact each other. Thus, during bunch winding, the rotation of the drum can be used to rotate the bobbin, thereby eliminating the need for a separate means for rotating the bobbin. In addition, the bobbin does not approach the drum after the bunch winding has been finished, thereby preventing the yarn from being loosened. Furthermore, the final winding can be started as soon as the bunch winding has been finished, thereby reducing the time required for the operation of the doffing apparatus.

According to the present invention, the doffing apparatus has a position change means for moving the supporting member until the bobbin and drum contact each other, the position change means and supporting means are mutually opposed and free to rotate, and these means are provided in such a way that their rotational paths cross each other. Thus, even if the different diameters of full packages cause the supporting member to be placed at different positions each time the package becomes full, the position change means can move the supporting member to the drum contact position. In addition, the position change means has a simple configuration and can also be used as a means for removing a full package from the supporting member.

According to the present invention, a guide means for guiding yarn to one end of the bobbin supported by the supporting member in order to carry out bunch winding is provided on the yarn feeding side of the drum. This configuration enables bunch winding to be carried out while the bobbin is contacting the drum.

According to the present invention, the bobbin installation means has a gripping section for gripping a bobbin using air pressure. This configuration enables the bobbin to be stably and reliably gripped regardless of the shape of the bobbin.

Brief Description of the Drawings

Figure 1 is a front view of a winding unit and a doffing apparatus in an automatic winder.

Figure 2 is a side view of the winding unit and doffing apparatus in the automatic winder.

Figure 3 is a right side view showing the configuration of an opener, a yarn insertion lever, and a chucker in the doffing apparatus.

Figure 4 is taken along line IV-IV in Figure 3, showing the configuration of the opener.

Figure 5 is taken along line V-V in Figure 3, showing the relationship between the yarn insertion lever and a yarn clearer.

Figure 6 is taken along line VI-VI in Figure 1, showing the configuration of a thread handler.

Figure 7 is taken along line VII-VII in Figure 6, showing the configuration of a thread handler.

Figure 8 is a side view showing the configuration of the chucker.

Figure 9 is a top view showing the configuration of the chucker.

Figure 10 illustrates the operation of bunch and final winding according to the prior art.

Detailed Description of the Preferred Embodiments

An automatic winder according to an embodiment of the present invention is described below with reference to Figures 1 to 9.

The overall configuration of a doffing apparatus 1 provided in an automatic winder X and a plurality of winding units 4 installed in parallel in the automatic winder X is described with reference to Figures 1 and 2.

In Figures 1 and 2, the doffing apparatus 1 travels directly above each of the winding units 4 installed in parallel along a rail 3 located in a frame 2, and detects the lighting of a green lamp (full bobbindisplay means) that lights when a package of each winding unit 4 becomes full in order to stop at a predetermined position for doffing.

A yarn gripping apparatus 5 having a yarn cutting and gripping section 5A that can extend toward the winding unit 4 is provided in the doffing apparatus 1, and moves the yarn cutting and gripping section 5A forward and backward using an air cylinder while cutting and gripping a yarn Y using the yarn cutting and gripping means 5A. The yarn gripping apparatus 5 is provided in an upper frame 1A of the doffing apparatus 1 in such a way as to swivel in the radial direction of a traverse drum 6 in the winding unit 4, and pulls up the gripped yarn Y to above the traverse drum 6 for swivelling. A mechanism for moving the yarn cutting and gripping section 5A of the yarn gripping apparatus 5 forward and backward is not limited to an air cylinder but may be a device that mechanically slides the yarn. The yarn gripping apparatus 5 pulls up the yarn Y from a supplying package 20 to place it between the large diameter side 14A of a bobbin 14 and the bobbinholders 24 of the cradle arms 8. The guided yarn Y is sandwiched therebetween and installed on the bobbin 14.

In a right frame 1B of the doffing apparatus 1 are provided a thread handler 7 (a guide means) that moves the yarn Y gripped by the yarn gripping apparatus 5, to one end of the traverse drum 6, an opener 9 (a position change means) that swivels the cradle arms 8 (a supporting member) in the winding unit 4 in such a way as to approach and leave the traverse drum 6, and that separates and contacts a pair of bobbinholders 24 that form part of the cradle arms 8 that support the bobbin 14, and a yarn insertion lever 11 (a yarn insertion member) that inserts into a yarn clearer 10 (a yarn monitor-

ing apparatus) in the winding unit 4 the yarn Y gripped by the yarn gripping apparatus 5. A chucker 15 (a bobbin installation means) that grips and carries the bobbin 14 from a bobbin housing section 12 provided in a frame 2 to the traverse drum 6 is provided in a left frame 1C of the doffing apparatus 1.

Each winding unit 4 winds, around the bobbin 14, yarn Y released from the supplying package 20 (in this case, a package produced by a spinning machine). Moreover, each winding unit 4 comprises the pair of cradle arms 8 that rotatably grip the bobbin 14 carried by the chucker 15 and the traverse drum 6 that rotates the bobbin 14 gripped by each cradle arm 8.

Each cradle arm 8 is swiveled toward the traverse drum 6 and borne by a journal to the upper part of the winding unit 4 body in such a way as to oscillate in the axial direction, and has the bobbin holder 24 support the bobbin 14 so as to enable the bobbin 14 to rotate. Each bobbin holder 24 supports a large diameter end 14A and a small diameter end 14B.

The traverse drum 6 is connected to a drive motor 22 driven by a controller 21 for the winding unit 4. The controller 21 for the winding unit 4 rotates the traverse drum 6 at a high or low speed based on the ON/OFF setting of a winding switch means 23. As shown in Figure 3, the winding switch means 23 consists of a rotatable electromagnet 23A provided around the right frame 1B of the doffing apparatus 1, and a lead switch 23B provided on the front surface of each winding unit 4 in such a way as to be opposed to the electromagnet 23A, which has been rotated. The winding switch means 23 uses the lead switch 23B to detect whether the electromagnet 23A has been excited by a signal input from the controller (not shown in the drawings) of the doffing apparatus 1. The controller 21 for the winding unit 4 rotates the traverse drum 6 at a low speed required to wind the cut yarn Y around a full package 28, a different low speed required to bunch-wind the yarn around the bobbin 14, and a high speed required to finally wind the yarn around the bobbin 14, in this order, depending on the number of excitations (one to three) detected by the lead switch 23B, thereby automatically starting the winding of the yarn Y around the bobbin 14 contacted by the traverse drum 6. The winding switch means 23 is not limited to a configuration consisting of the electromagnet 23A and the lead switch 23B.

A yarn piecing apparatus 25 that pieces the cut yarn Y, the yarn clearer 10 having a yarn cutting section 10A and detecting a defect such as a slab in the yarn Y, and a yarn trap 26 that sucks and traps the cut yarn Y on the supplying package 20 side are provided on a yarn Y supplying side extending from the traverse drum 6 in each winding unit 4 to the supplying package 20. 27 is a package guide that guides the full package 28 from above the traverse drum 6 to a transfer apparatus 29 such as a conveyor located behind the cradle arms 8. A presser plate 10C for preventing the yarn Y from jumping out from the yarn clearer 10 while the yarn Y is running is provided above and below the yarn clearer 10 (see Figure 5).

Specific configurations of the opener 9 (position change means), yarn insertion lever 11, thread handler 7 (guide means), and chucker 15 (bobbin installation means) provided on the right and left frames 1B and 1C of the doffing apparatus are described with reference to Figures 3 to 11.

As shown in Figures 3 and 4, the opener 9 provided in the right frame 1B of the doffing apparatus 1 swivels and separates, and then contacts the cradle arms 8 to open the full package 28 and install the bobbin 14 on the cradle arms 8. The opener 9 has an opener lever 31 fixed to a rotating shaft 30 protruding from the right frame 1B in parallel with the traverse drum 6. An opener hand 33 that abuts a cradle lever 32 provided on the cradle arms 8 is fixed to the tip of the opener lever 31.

The opener lever 31 can be oscillated in the axial direction of the traverse drum 9 by an oscillating mechanism 34 provided on the rotating shaft 30, and is swiveled by a cam (not shown in the drawing) in the direction in which it contacts or leaves the traverse drum 6. The cradle lever 32 is fixed to the rear surface of the cradle arm 8 in a cantilever manner and extends toward the opener 9. The cradle lever 32 is swiveled integrally with the cradle arm 8 end oscillated in the axial direction of the traverse drum 6. In addition, the opener lever 31 extends toward the cradle arm 8 and is fixed to the rotating shaft 30 so as to cross the rotational path (a) of the opener hand 33 and the rotational path (b) of the swiveled cradle lever 32 and to increase an overlapping area A (the shaded area A in Figure 3) formed on paths (a) and (b).

The opener 9 is rotated by a cam toward the traverse drum 6 from its standby position in which it is housed in the frame of the doffing apparatus 1 and which is distant from the traverse drum 6. During the rotation, the opener hand 33 engages the cradle lever 32 to swivel the cradle arms 8 to a position at which the bobbin 14 sufficiently contacts the traverse drum 6. In addition, when the opener 9 is oscillated in the axial direction of the traverse drum 6 with the opener hand 33 engaged with the cradle lever 32, the bobbinholders 24 provided on the cradle arms 8 are separated and contacted mutually to allow the full package 28 to be removed from the cradle arms 8 (doffing) and to allow the bobbin 14 to be installed on the cradle arms 8.

By crossing the rotational path (a) of the opener hand 33 and the rotational path (b) of the cradle lever 32 and increasing the overlapping area A formed of paths (a) and (b) in the above manner, the extent in which the opener hand 33 and cradle lever 32 abutted mutually can be rotated can be increased to enable the opener 9 to be oscillated to separate and contact the cradle arms 8 mutually even if the cradle arms 8 are swiveled through a larger angle when a package of a larger diameter becomes full. As a result, full packages 28 of all sizes ranging from small to large diameters can be

removed from the cradle arms 8 for doffing. In addition, since the opener 9 has the dual function of swivelling the cradle arms 8 and separating and contacting the cradle arms 8 mutually, a simple structure can be used to remove (doff) the full package 28 from the cradle arms 8 or to install the bobbin 14 on the cradle arms 8.

In Figure 3, the yarn insertion lever 11 provided in the right frame 1B of the doffing apparatus 1 inserts into the yarn clearer 10 the yarn Y from the supplying package 20 that has been pulled up above the traverse drum 6 by the yarn gripping apparatus 5. The yarn insertion lever 11 is supported by a journal to the right frame 1B in such a way as to rotate freely and extends above the yarn clearer 10 in such a way as to be opposed to it. The yarn insertion lever 11 has at its top a yarn insertion section 11A that can protrude to the yarn clearer 10 side to contact the yarn Y. The yarn insertion lever 11 is rotated to the yarn clearer 10 to cause the yarn insertion section 11A to contact the yarn Y gripped by the yarn gripping apparatus 5 in order to insert the yarn Y into a slit 10B in the yarn clearer 10 beyond a presser plate 10, as shown in Figure 5. By providing the yarn insertion means that is the yarn insertion lever 11 inserting the yarn Y into the slit 10B in the yarn clearer 10, however, the yarn Y can be reliably inserted into the yarn clearer 10 despite the presence of a pressure plate 10C for preventing the yarn from jumping out.

As shown in Figures 6 and 7, the thread handler 7 provided in the right frame 1B of the doffing apparatus 1 handles and guides the yarn Y for bunch winding and is located on the yarn Y feeding side (the input side of the traverse drum 6). The thread handler 7 has a thread handler lever 35 that moves the yarn Y pulled up above the traverse drum 6 by the yarn gripping apparatus 5, toward the large diameter end 14A of the bobbin 14 contacted by the traverse drum 6, and the thread handler lever 35 can be moved via a link mechanism 36 to approach or leave the intermediate portion between the traverse drum 6 and the bobbin 14. The thread handler lever 35 has a yarn hooking section 35A on which the yarn Y is hooked when it rotates towards the traverse drum 6.

After the rotation towards the traverse drum 6, the thread handler 7 is moved in parallel with the axial direction of the traverse drum 6 to draw the yarn Y to the bunch guide 37, with the yarn hooking section 35A remaining opposed to the traverse drum 6 through the link mechanism 36. The bunch guide 37 is provided on the cradle arm 8 that grips the large diameter end 14A of the bobbin 14, and has a yarn guide section 37A that protrudes to the input side of the traverse drum 6 to guide the yarn Y at a predetermined position (a bunch winding or a bobbin installation position) so that it traverses from the large diameter end 14A of the bobbin 14 to its small diameter end 14B.

The thread handler 7 rotates the thread handler lever 35 to the traverse drum 6 to cause the yarn Y pulled up above the traverse drum 6 to be hooked on the yarn hooking section 35A, and coordinates with the yarn guide section 37A of the bunch guide 37 in guiding the yarn Y to the bunch winding position. When the yarn Y is guided by the thread handler 35 and the bunch guide 37, the yarn Y, which is now between the cradle arms 8 after extending above the bunch guide 37 due to the swiveling of the yarn gripping apparatus 5, is positioned in such a way as to traverse inside and near the bobbin holder 24 provided on the cradle arms 8 in the vertical direction. When the bobbin 14 is then gripped by the bobbinholders 24 provided on the cradle arms 8, the yarn Y traversing inside and near the bobbin holder 24 is gripped by the large diameter end 14A of the bobbin 14 and the bobbin holder 24 to cause the yarn Y from the supplying package 20 to he installed on the bobbin 14.

When the thread handler lever 35 of the thread handler 7 and the bunch guide 37 are positioned on the yarn Y feeding side (the input side of the traverse drum 6), the bobbin 14 can contact the traverse drum 6 for bunch winding. Thus, by rotating the traverse drum 6 at a low speed, the bobbin 14 is also rotated at a low speed to enable the yarn Y to be bunch-wound around the large diameter end 14A of the bobbin 14, thereby eliminating the need for a drive mechanism (a roller or a drive motor) for rotating the bobbin 14 for bunch winding.

In addition, since the bunch winding can be executed with the bobbin 14 remaining in contact with the traverse drum 6, the need for the cradle arms 8 to be brought down onto the traverse drum 6 after the bunch winding is finished. This prevents snarling caused by the loosening of the yarn Y and enables the final winding of the yarn Y to start immediately by simply spacing the thread handler lever 35 from the traverse drum 6 and then increasing the rotational speed of the traverse drum 6.

As shown in Figures 3, 8 and 9, the chucker 15 provided in the left frame 1C of the doffing apparatus 1 grips the bobbin 14 and carries it from the bobbin housing section 12 to between the cradle arms 8. The chucker 15 is composed of two air cylinders 40 (a gripping section) provided in the axial direction of the bobbin 14, a chuck claw 41 cooperating with each air cylinder 40 in gripping the bobbin 14, and a chuck lever 42 that holds each air cylinder 40 and chuck claw 41 at a certain interval. The chuck lever 42 of the chucker 15 is supported by a journal in such a way as to rotate freely to the left frame 1C of the doffing apparatus 1 and extends from the yarn Y feeding side to the traverse drum 6. The chuck claw 41 is provided at the tip of the chuck lever 42 in such a way as to extend along the circumferential shape of the bobbin 14. Air is supplied to each air cylinder 40 from a source located in the yarn gripping apparatus 5. The gripping section of the chucker 15 is not limited to the air cylinder 40 but may be any mechanism that supplies and ejects air pressure to provide a stroke to grip the bobbin 14.

The chucker 15 is rotated to the bobbin housing section 12 by the cam to set the bobbin 14 at the output port end of the bobbin housing section 12, between each air cylinder 40 and the chuck claw 41. When air is then supplied to each air cylinder 40, a rod 40A extends toward the chuck claw 41 to grip the bobbin 14. Further rotation cause the rod to extend until it contacts the traverse drum 6, and the bobbin 14 is positioned between the cradle arms 8 separated by the opener 9 (shown in Figure 3).

When the air cylinders 40 are used for the chucker 15 that grips the bobbin 14, the red 40A extends depending on the shape of the bobbin 14, despite the difference in the taper angle of the cone shaped bobbin 14. Consequently, various bobbins 14 can be reliably gripped and carried until they contact the traverse drum 6 without the need to adjust the angle of the chuck claw 41 so as to correspond to the taper angle of the bobbin 14.

In addition, since the gripping of the bobbin 14 by the chucker 15 is determined by the air pressure supplied by the air cylinder 40, the chuck force (holding force) required to grip the bobbin 14 can be adjusted freely to provide a strong and stable chuck force for the bobbin 14 and to enable the bobbin 14 to gripped or released quickly by supplying and ejecting air to and from each cylinder 40.

Next, a series of steps (a procedure) for doffing the full package 28 using the automatic winder according to the embodiment of this embodiment is described.

When the winding package rotated at a high speed by the traverse drum 6 in the winding unit 4 becomes full, the yarn cutting section 10A of the yarn clearer 10 is activated to cut the yarn Y, and its tip on the supplying package 20 side is sucked and trapped by the yarn trap 26, as shown in Figure 2. Simultaneously with the activation of the winding unit 4, the doffing apparatus 1 starts to travel and stops directly above the full package 28 on the unit 4 whose green lamp is ON.

The doffing apparatus 1, which is stopped directly above the full package 28, opposes the electromagnet 23A of the winding switch means 23 to the lead switch 23B, as shown in Figure 3 and uses its controller to excite the electromagnet 23A. When the electromagnet 23A of the winding switch means 23 is excited, the lead switch 23B detects the excitation to output a signal to the controller 21 for the winding unit 4. On receiving the output from the lead switch 23B, the controller 21 drives the drive motor 22 to rotate the traverse drum 6 at a low speed in order to cause the cut yarn Y on the full package 28 side to be wound around the full package 28. After a specified time has passed to wind the cut yarn Y around the full package 28, the controller 21 for the winding unit 4 stops driving the drive motor 22 to stop rotating the traverse drum 6.

Once the cut yarn Y has been wound around the full package 28, the opener 9 is swivelled to abut the opener hand 33 with the cradle lever 32 and is then oscillated to separate the cradle arms 8 mutually in order to allow the full package 28 to be removed (doffed). The full package 28 is then loaded on the transfer apparatus 29 via the package guide 27 as shown in Figure 2 and transferred to a predetermined place.

When the full package 28 is removed (doffed) from the cradle arm 8 and the oscillation of the opener 9 is then canceled, the opener 9 cooperates with the cradle arms 8 in swivelling the bobbin 14 to an appropriate position at which the bobbin 14 can be gripped while contacting the traverse drum 6, and is again oscillated to separate the cradle arms 8 from each other. After the cradle arms 8 have been swiveled to the traverse drum 6, the yarn gripping apparatus 5 of the doffing apparatus 1 is extended to the yarn trap 26, as shown in Figure 2, and the tip of the yarn Y from the supplying package 20 that is being sucked and trapped by the yarn trap 26 is cut, gripped, and drawn. The yarn gripping apparatus 5 is elevated to raise the yarn Y until it is located above and before the traverse drum 6. The yarn gripping apparatus 5 that has lifted the yarn Y to above the traverse drum 6 is swivelled to the cradle arms 8 to interpose the yarn Y between the cradle arms 8 while abutting it with the inlet side of the slit 10B in the yarn clearer 10, as shown in Figure 5. When the yarn insertion lever 11 of the doffing apparatus 1 is rotated to the yarn clearer 10, the yarn insertion section 11A contacts the yarn Y, which is then inserted into the slit 10B of the yarn clearer 10.

The thread handler lever 35 of the doffing apparatus 1 is rotated to the traverse drum 6 to cause the yarn Y on the input side of the traverse drum 6 to be hooked on the yarn hooking section 35A, and the yarn hooking section 35A and the yarn guide section 37A of the bunch guide 37 guide the yarn Y to the bunch winding position. In addition, when the thread handler lever 35 and the bunch guide 37 cooperate in guiding the yarn Y, the yarn Y interposed between the cradle arms 8 is positioned in such a way as to traverse inside and near the bobbin holder 24 of the cradle arms 8.

After the yarn Y has been moved to the bunch winding position, the chucker 15 is rotated to the traverse drum 6 to interpose, between each air cylinder 40 and the chuck claw 41, the bobbin 14 at the output port end of the bobbin housing section 12, as shown in Figures 3 and 8. Air is then supplied to each air cylinder 40 to extend the rod 40A in order to cause the tip of the rod 40A of each air cylinder 40 and the chuck claw 41 to grip the bobbin 14. After the chucker 15 has gripped the bobbin 14, the bobbin 14 is further rotated toward the traverse drum 6, made to contact with it, and positioned between the bobbinholders 24 of the cradle arms 8 separated by the opener 9. With the bobbin 14 remaining in contact with the traverse drum 6, the oscillation of the opener 9 is canceled to cause the bobbinholders 24 of the cradle arms 8 to rotatably grip the large diameter end 14A and small diameter end 14B of the bobbin 14.

This configuration allows the yarn Y traversing inside and near the bobbin holder 24 of the cradle arms 8 to be gripped between the large diameter end 14A of the bobbin 14 and the bobbin holder 24 so that the yarn can be bunch-wound. When the bobbin 14 is gripped by the bobbinholders 24 of the cradle arms 8, air is exhausted from each air cylinder 40 of the chucker 15 to release the bobbin 14, and the chucker 15 and the yarn insertion lever 11 are rotated toward the doffing apparatus 1 to leave the bobbin 14 in order to release the yarn Y from the yarn gripping apparatus 5.

Once the series of operations starting with the doffing of the full package 28 and ending with the installation of the bobbin 14 has been completed in this manner, the controller for the doffing apparatus 1 again excites the electromagnet 23A of the winding switch means 23. When the electromagnet 23A of the winding switch means 23 is excited, the lead switch 23B detects the excitation to output a signal to the controller 21 for the winding unit 4, which then drives the drive motor 22 to rotate the traverse drum 6 at a low speed. When the traverse drum 6 is rotated at a low speed, the bobbin 14 contacting the traverse drum 6 is rotated at a low speed to cause the yarn Y from the supplying package 20 to be bunch-wound around the large diameter end 14A of the bobbin 14 while being guided by the thread handler lever 35 and the bunch guide 37. The yarn Y from the supplying package 20 is guided by the thread handler lever 35 and the bunch guide 37 to the bunch winding position at the large diameter end 14A of the bobbin 14, and is lap-wound within this range.

After the traverse drum 6 has been rotated at a low speed to carry out bunch winding, the thread handler lever 35 of the thread handler 7 is rotated in such a way as to leave the traverse drum 6 to release the yarn Y from the yarn hooking section 35A to the traverse drum 6, as shown in Figure 6. To automatically start the final winding of the yarn Y, the controller for the doffing apparatus 1 excites the electromagnet 23A of the winding switch means 23. When the electromagnet 23A of the winding switch means 23 is excited, the lead switch 23B detects the excitation and outputs a signal to the controller 21 for the winding unit 4. On receiving the output from the lead switch 23B, the controller 21 controls the drive motor 22 to continuously change the rotation of the traverse drum 6 from a low speed to a high speed. Thus, the traverse drum 6 rotates the bobbin 14 at a high speed while traversing the yarn Y in the axial direction of the bobbin 14 in order to automatically start final winding.

In this final winding, the swivelling angle of the cradle arms 8 is detected and the package around which the yarn is wound is assumed to have a specified diameter when the swivelling angle has reached a predetermined value. Alternatively, the number of rotations of the traverse drum 6 is counted and the package around which the yarn is wound is assumed to have a specified length when the number of revolutions has reached a predetermined value. In both cases, the green lamp is turned ON to cause the doffing apparatus 1 to execute the doffing of the full package 28.

By contacting the bobbin 14 with the traverse drum 6 and continuously changing the rotation of the traverse drum 6 from a low speed to a high speed in this manner, the bunch and final windings of the bobbin 14 can be continuously carried out to reduce the time required to change from bunch winding to final winding. In particular, when the thread handler 7 for bunch winding is located on the input side of the traverse drum 6, the rotation of the traverse drum 6 contacting the bobbin 14 can be used to rotate the bobbin 14 at a low speed during bunch winding, thereby eliminating the need for a drive mechanism (such as a roller or a drive motor) for bunch winding, and thus reducing the weight of the doffing apparatus 1.

According to the present invention, the position at which the bobbin is installed is the same as the position at which it contacts the drum, so the bobbin can be installed without the need to change the bobbin installation means, despite changes in the amount of increase of the package or the taper angle of the bobbin. Thus, even if a single automatic winder is used to wind yarn from packages of different angles or amounts of increase, a single common bobbin installation apparatus (doffing apparatus) can be used to perform the bobbin installation operation (the doffing operation).

In the prior art, after a full package has been formed, the supporting member must be moved to the bobbin installation position, and after installation, to the drum position. This invention enables the supporting member to be moved to the drum position immediately after the formation of the full package, thereby increasing the speed of the doffing operation.

According to the present invention, the bobbin installation means provided in the doffing apparatus cooperates with the doffing apparatus in selectively acting on a requested winding unit. Thus, even when a plurality of winding units are used to wind yarn from packages of different angles or amounts of increase, the bobbin installation means provided in a single common doffing apparatus can he used to perform the bobbin installation operation (the doffing operation).

According to the present invention, the bobbin installation means transfers the bobbin to the bobbin installation position of the supporting member. Thus, the final stop position of the bobbin is determined by the drum, thereby increasing the speed of the transfer and thus of the doffing operation.

According to the present invention, bunch winding is carried out while the bobbin and drum are contacting each other. Thus, during bunch winding, the rotation of the drum can be used to rotate the bobbin, thereby eliminating the need for a separate means for rotating the bobbin. In addition, the bobbin does not approach the drum after the bunch winding has been finished, thereby preventing the yarn from being loosened. Fur-

thermore, the final winding can be started as soon as the bunch winding has been finished, thereby reducing the time required for the operation of the doffing apparatus.

According to the present invention, the doffing apparatus has a position change means that makes it possible to move the supporting member until the bobbin and drum contact each other; the position change means and supporting member are mutually opposed and free to rotate; and these means are provided in such a way that their rotational paths cross each other. Thus, even if the different diameters of full packages cause the supporting member to be placed at different positions each time the package becomes full, the position change means can move the supporting member to the drum contact position. In addition, the position change means has a simple configuration and can also be used as a means for removing the full package from the supporting member.

According to the present invention, a guide means for guiding yarn to one end of the bobbin supported by the supporting member in order to carry out bunch winding is provided on the yarn feeding side of the drum, thereby enabling bunch winding to be carried out while the bobbin is contacting the drum.

According to the present invention, the bobbin installation means has a gripping section for gripping the bobbin using air pressure, thereby enabling the bobbin to be stably and reliably gripped regardless of the shape of the bobbin.

Claims

1. An automatic winder characterized in that it includes a winding unit having a drum that contacts a bobbin to rotationally drive it and a supporting member that supports the bobbin, allowing it to rotate, to contact, and leave the drum, and characterized in that it also includes a bobbin installation means for installing the bobbin on the supporting member, the bobbin installation means being controlled to install the bobbin on the supporting member at a position at which the bobbin and drum contact each other.

2. An automatic winder as in claim 1 characterized in that a plurality of winding units are provided, in that the bobbin installation means is provided in a doffing apparatus for removing a package from the supporting member, and in that the doffing apparatus selectively acts on a requested winding unit.

3. An automatic winder as in claim 1 or claim 2 characterized in that the bobbin installation means transfers the bobbin from a housing position to a bobbin installation position of the supporting member.

4. An automatic winder as in any one of claims 1 to 3 characterized in that bunch winding is carried out while the bobbin and drum contact each other.

5. An automatic winder as in claim 2 characterized in that the doffing apparatus has a position change means that makes it possible to move the supporting member until the bobbin and drum contact each other, in that the position change means and supporting means are opposed, each free to rotate, and in that these means are provided in such a way that their rotational paths cross each other.

6. An automatic winder as in claim 2 or claim 5 characterized in that a guide means for guiding yarn to one end of the bobbin supported by the supporting member in order to carry out bunch winding is provided on the yarn feeding side of said drum.

7. An automatic winder as in any one of claims 2, 5 and 6 characterized in that the bobbin installation means has a gripping section for gripping the bobbin using air pressure.

FIG. 1

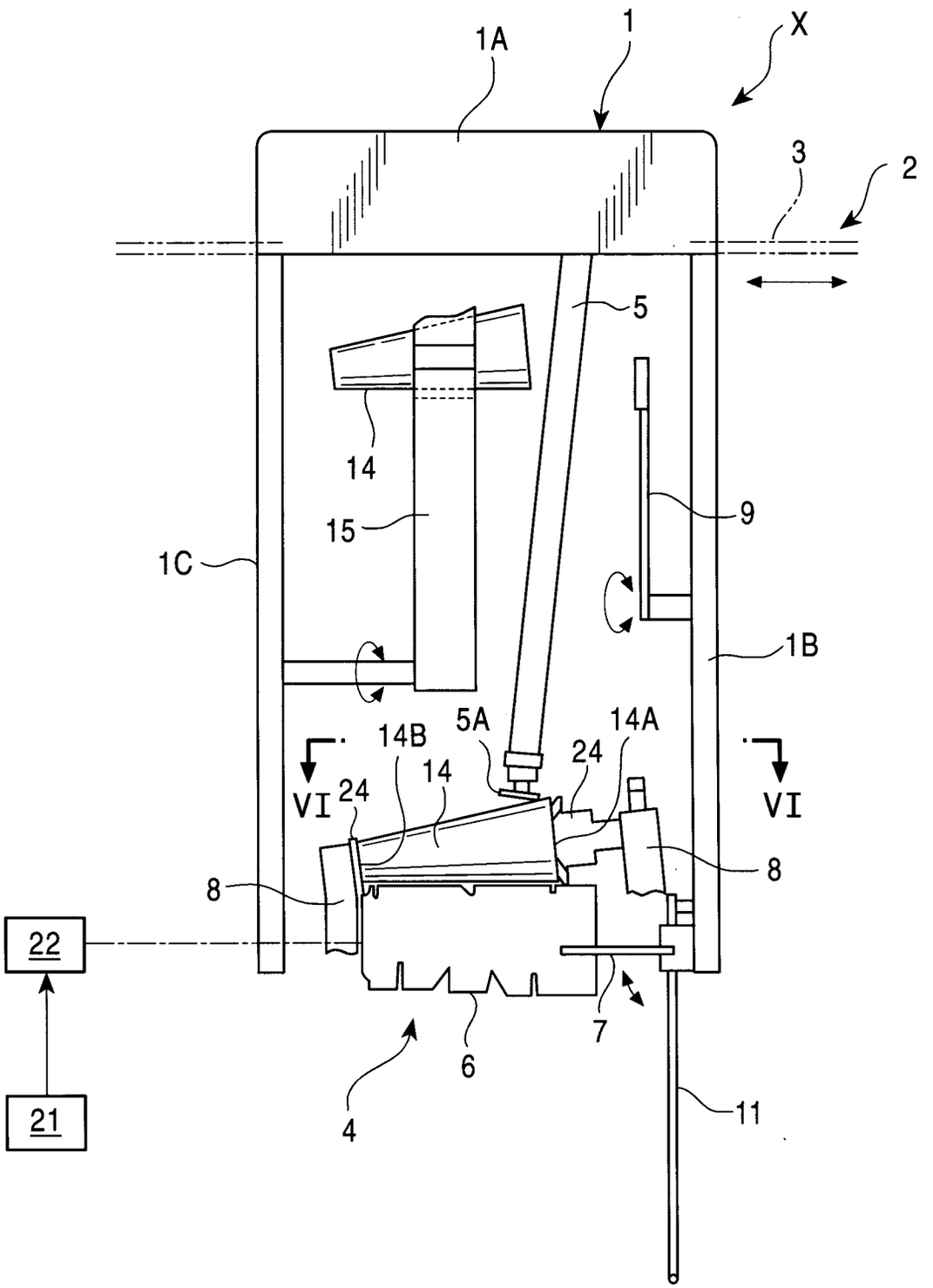


FIG. 2

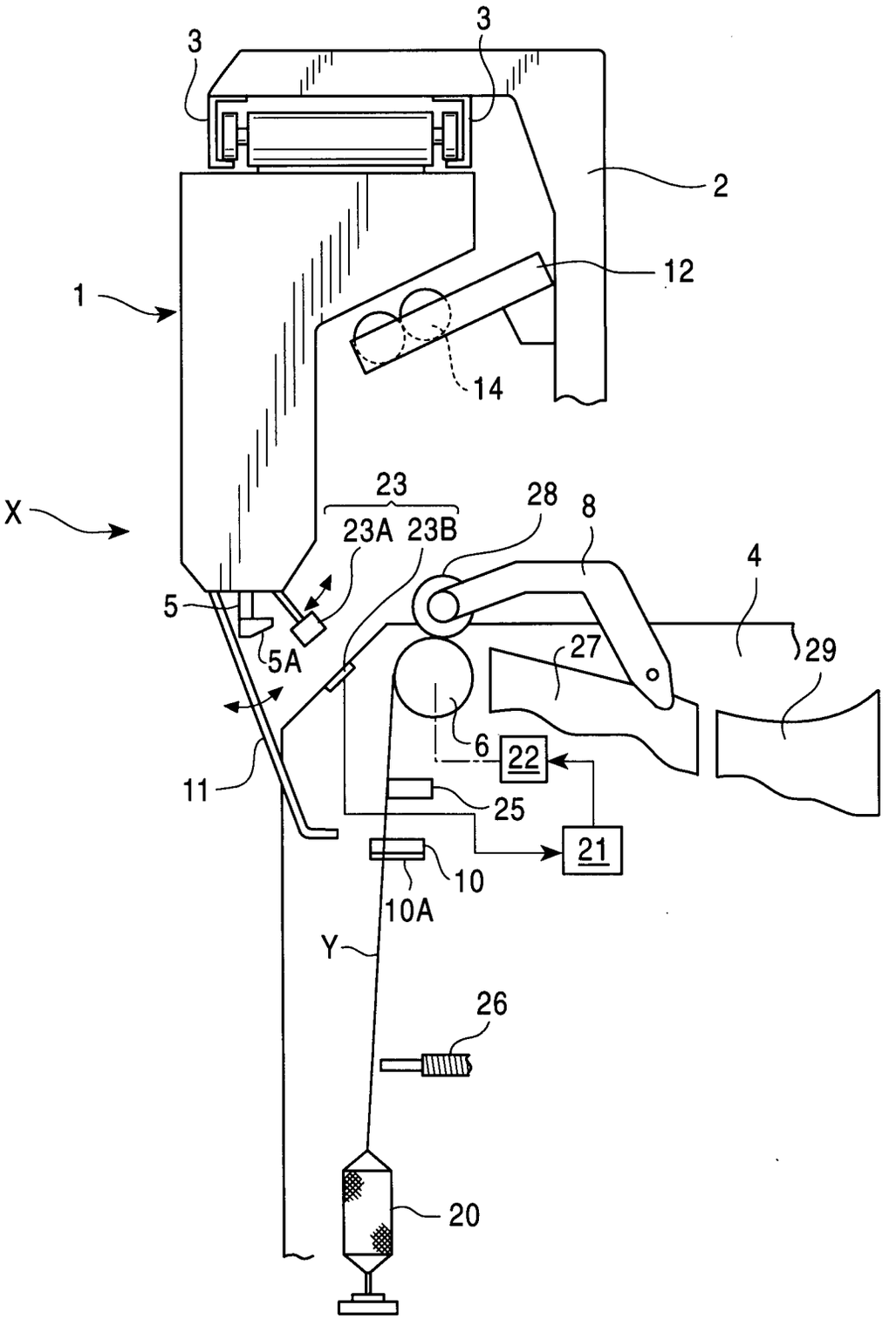


FIG. 3

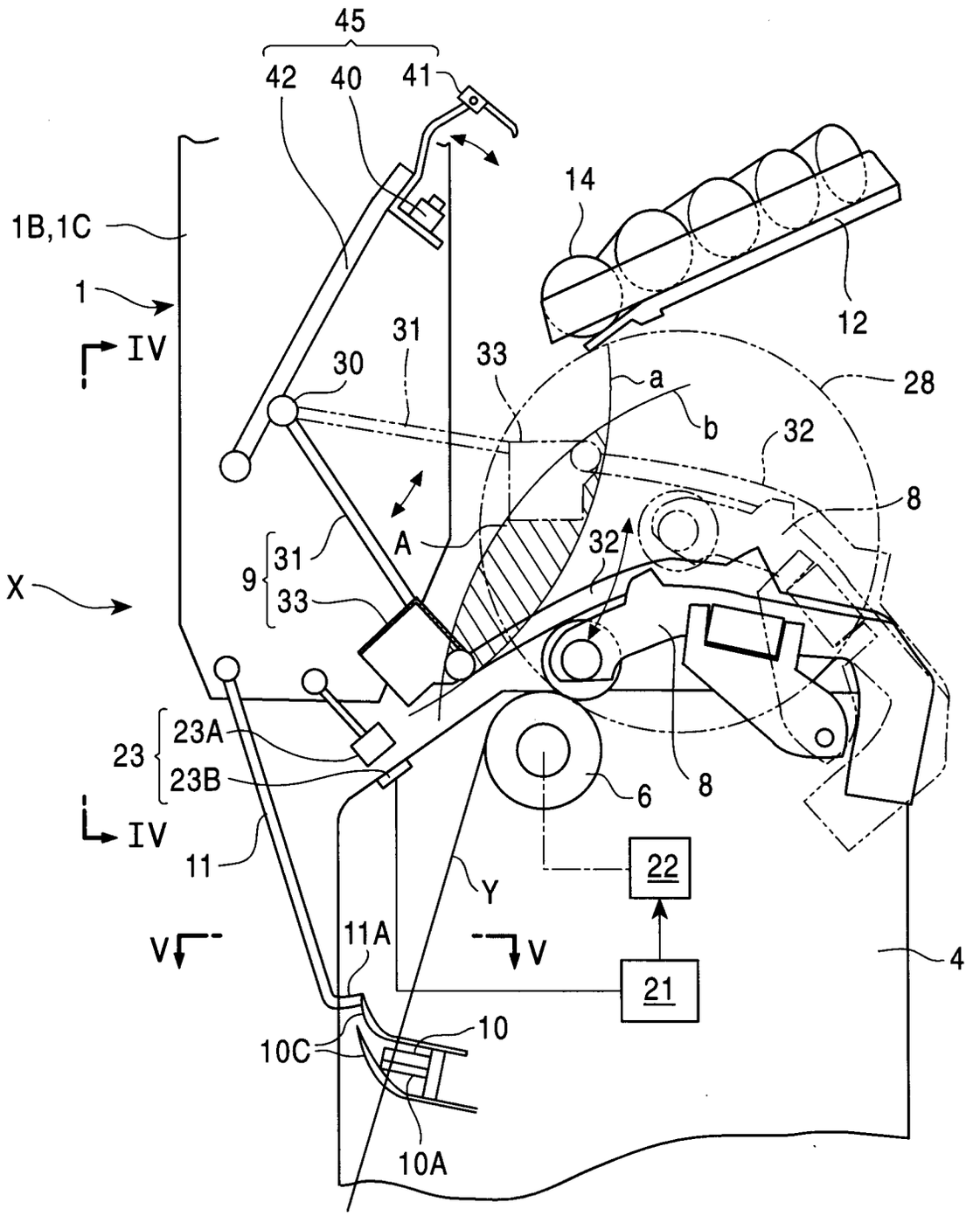

45
42
40
41
14
1B,1C
1
IV
12
31
30
33
a
28
b
32
8
A
31
9
33
X
32
23
23A
23B
6
8
IV
11
22
Y
V
V
11A
4
21
10
10C
10A

FIG. 4

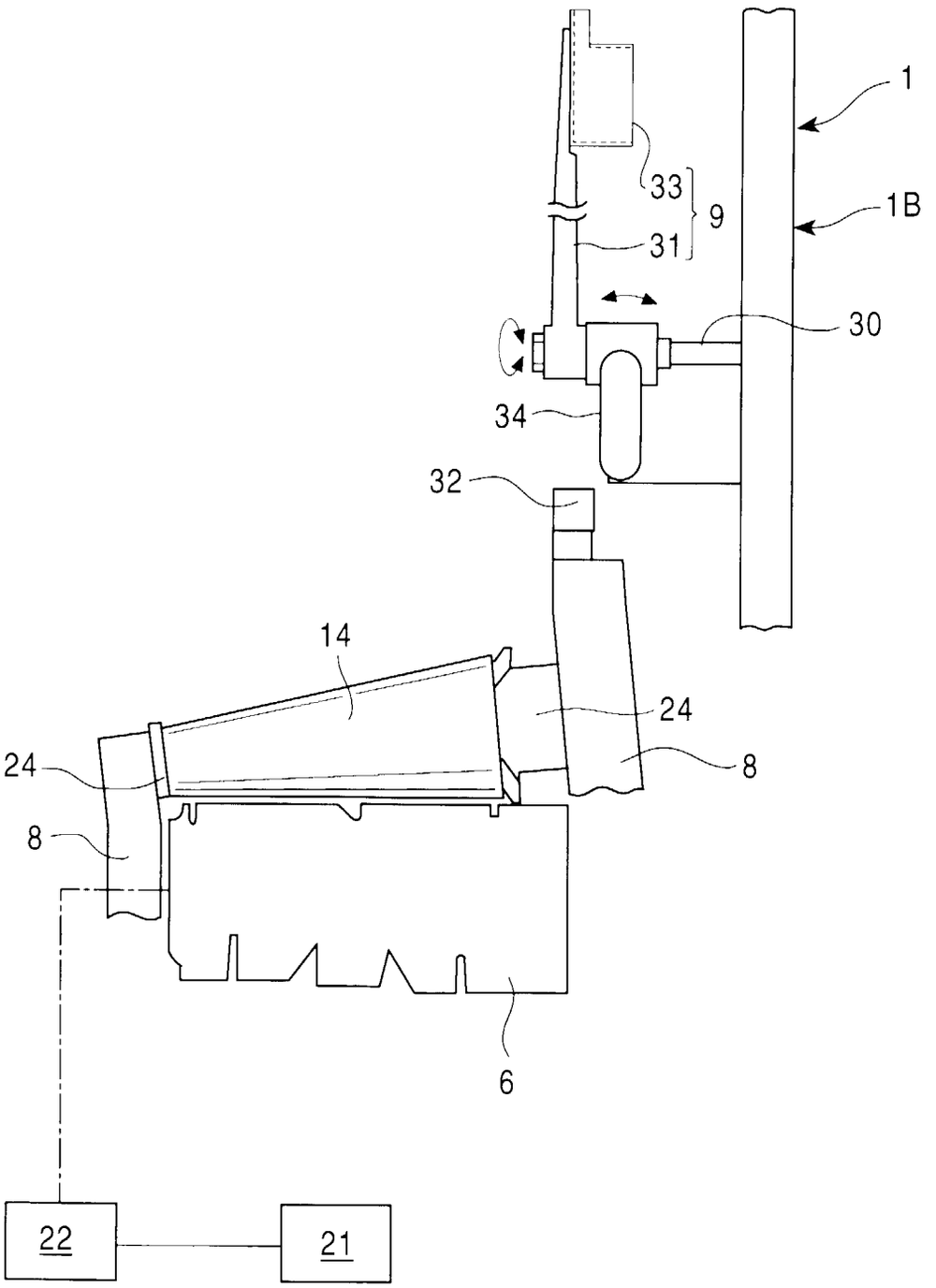


FIG. 5

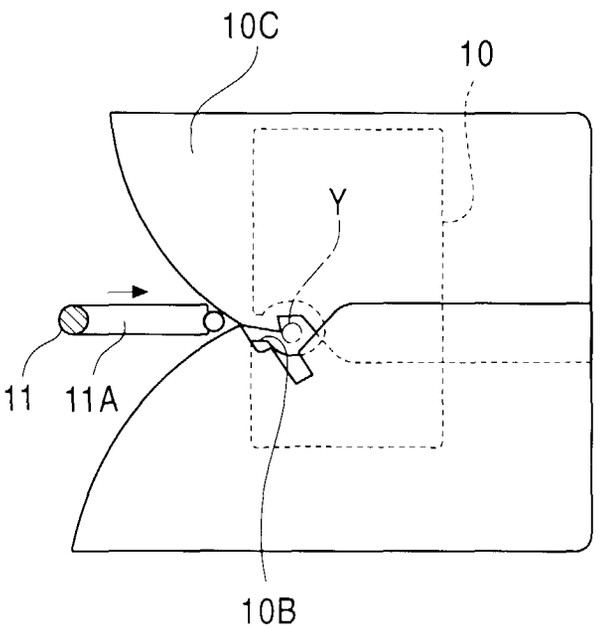


FIG. 6

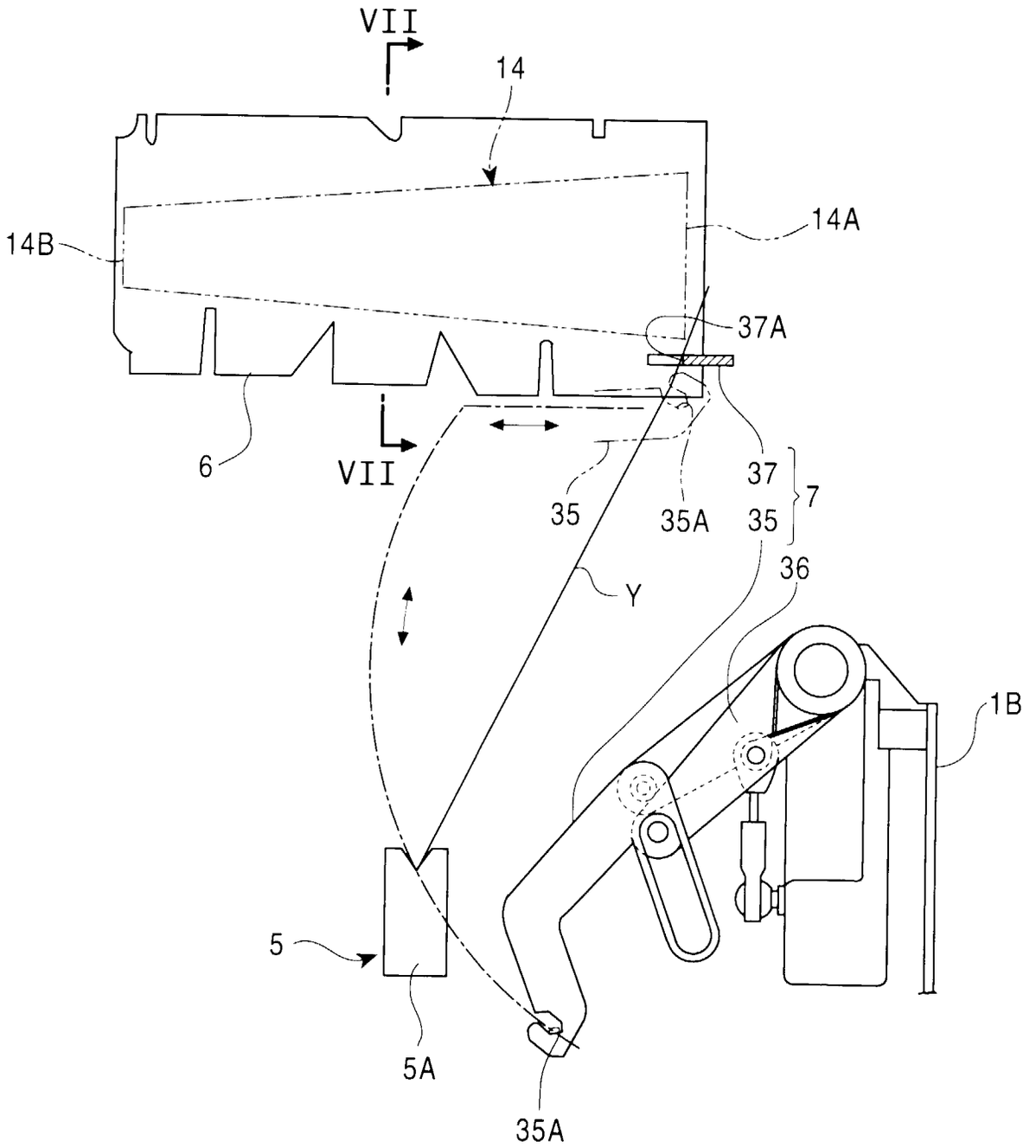


FIG.7

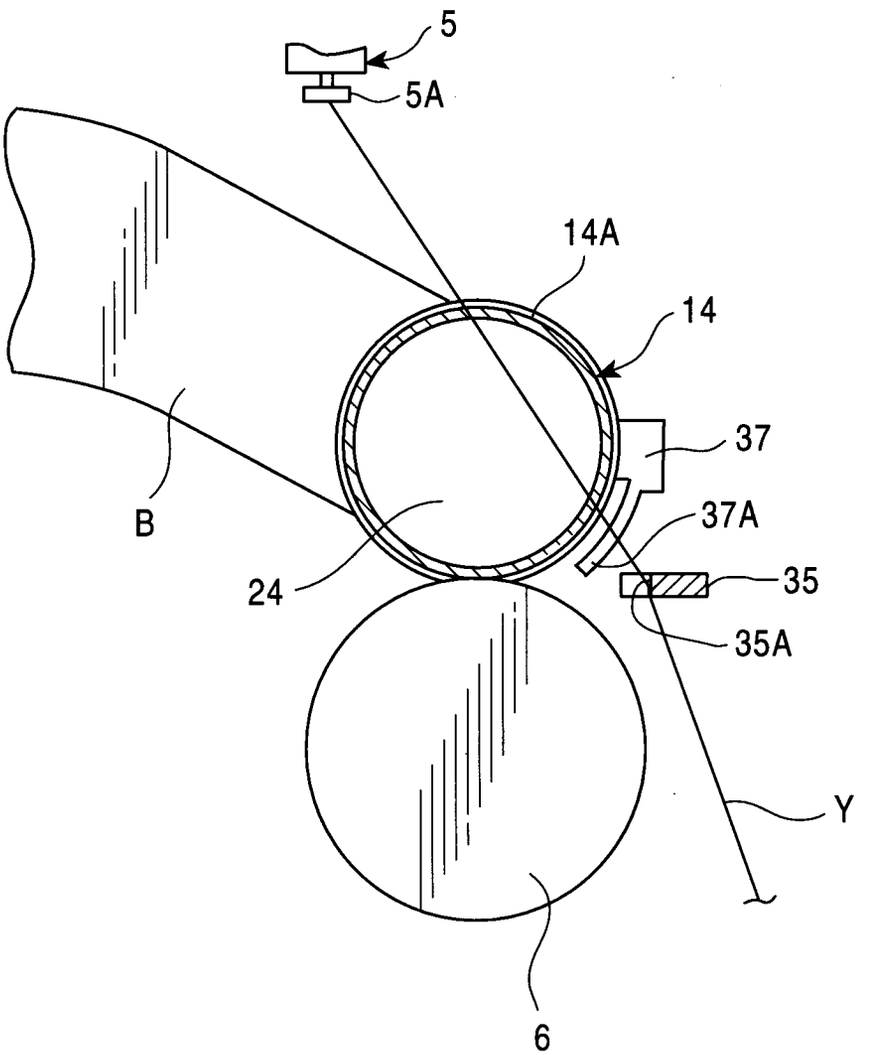


FIG. 8

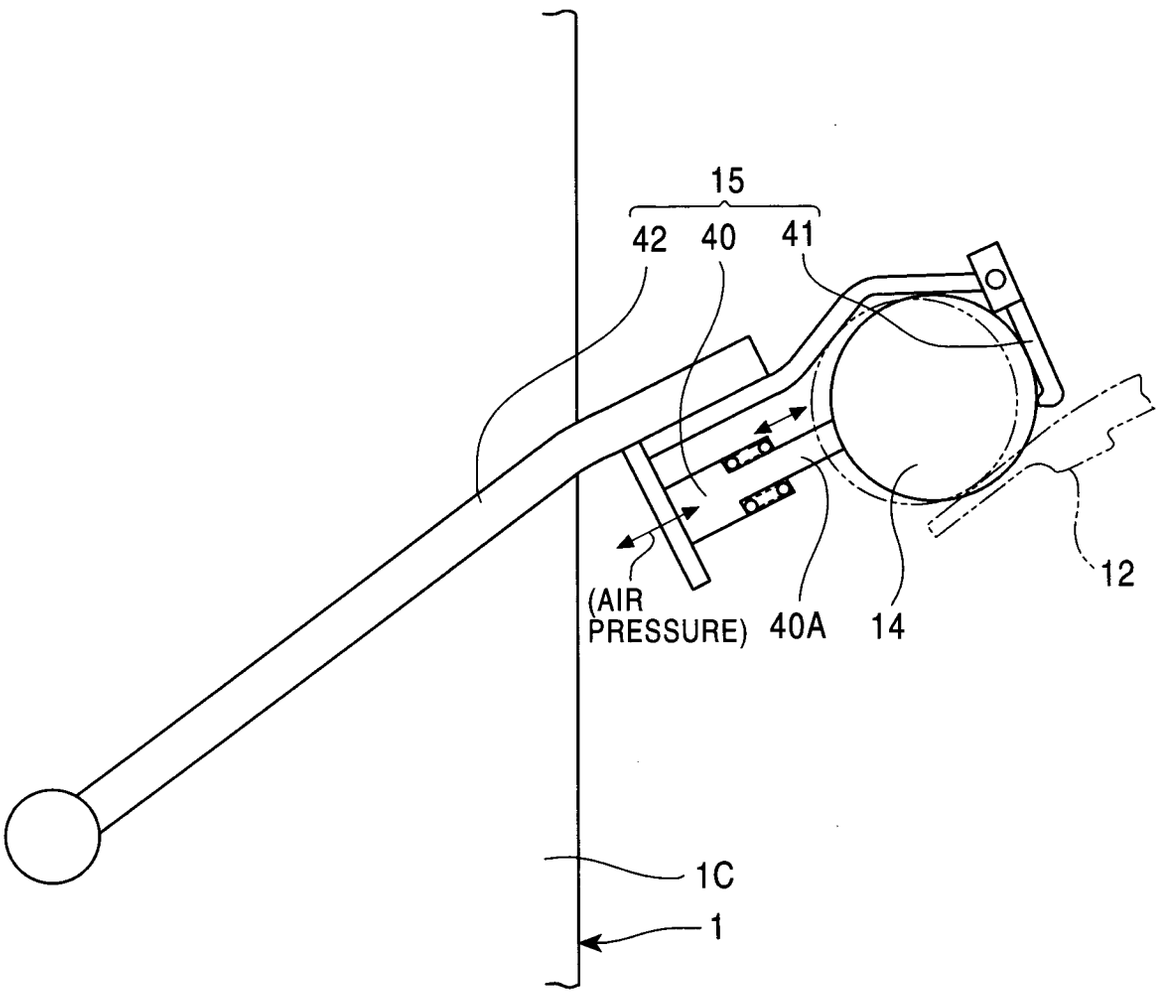


FIG. 9

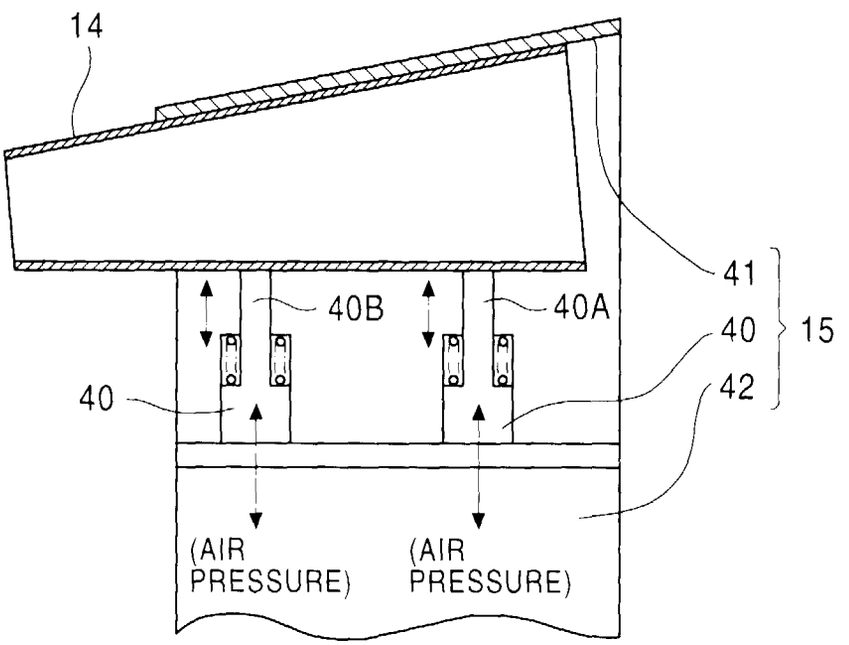


FIG. 10A

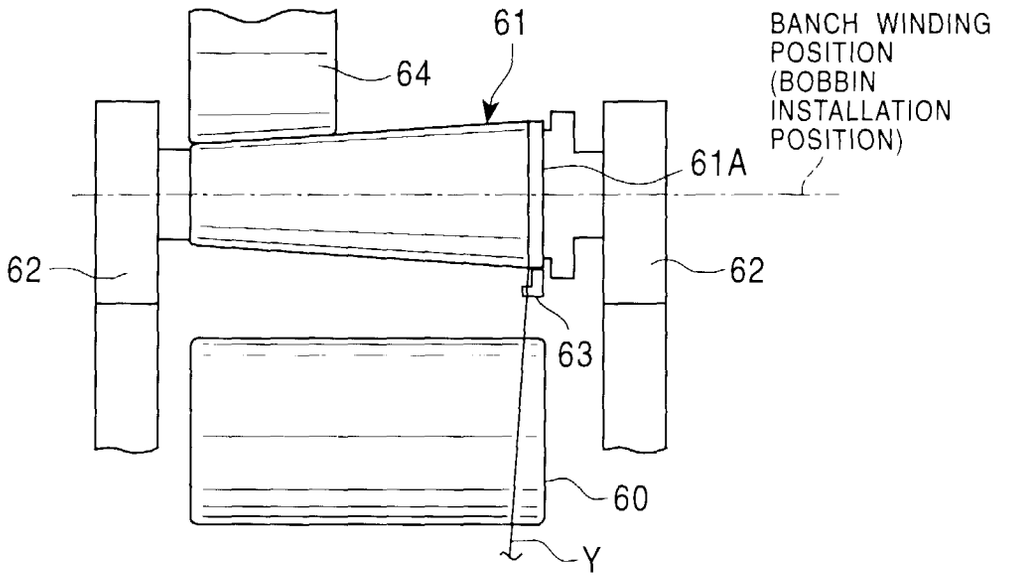


FIG. 10B

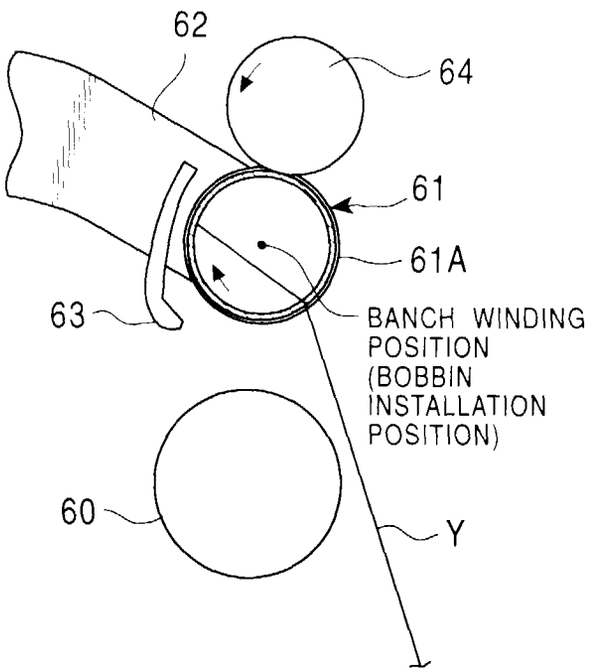
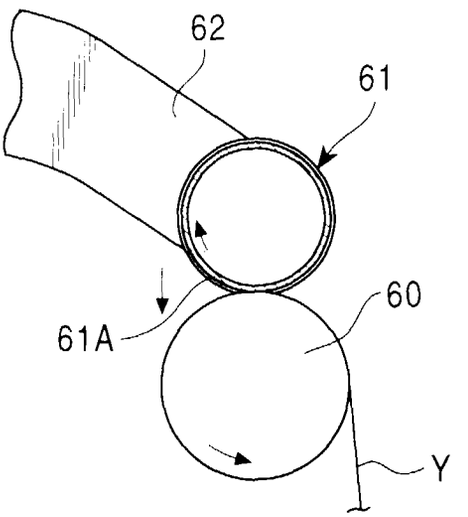


FIG. 10C



European Patent Office

EUROPEAN SEARCH REPORT

Application Number EP 98105121.2

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)
A	US 5083716 A (COLLI, L. et al.) 28 January 1992 (28.01.92), fig. 1,4,5, claims 1,2. --	1,2,3	B 65 H 67/04
A	US 5092532 A (MERONI, R. et al.) 03 March 1992 (03.03.92), fig. 1, claims 1-4. --	1,2	
A	US 4399951 A (PREUHS, H.J.) 23 August 1983 (23.08.83), fig. 1,2, claims 1-3. --	1,2	
A	US 3971520 A (SHIMAI, J.) 27 July 1976 (27.07.76), fig. 2,4,5,14, claims 1-5. ----	1,2	

TECHNICAL FIELDS SEARCHED (Int. Cl. 6)

B 65 H 67/00
B 65 H 54/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	19-06-1998	JASICEK

CATEGORY OF CITED DOCUMENTS

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D : document cited in the application
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