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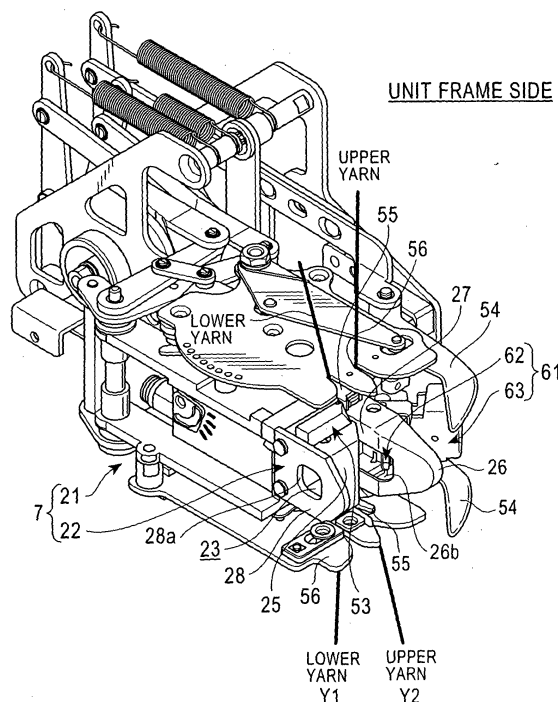
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(54) **Yarn splicing device**

(57) The present invention can prevent a liquid from scattering and enable yarn splicing to be reliably accomplished. A yarn splicing device has a twisting member 31 which twists yarn ends by injecting compressed air to which a liquid is added, against the yarn ends, and a shielding mechanism 61 which covers a periphery of the twisting member with no loads imposed on the yarns, the shielding mechanism being open to an exterior in its part corresponding to a yarn path, the shielding mechanism regulating a scattering direction in which the compressed air and liquid used for twisting. The shielding mechanism 61 has a twisting shielding member 62 which prevents the compressed air and liquid from scattering toward a front surface, and a base member wall shielding member 63 which prevents the compressed air and liquid from scattering toward a unit frame (Fig.1).

FIG. 1



Description

Field of the Invention

[0001] The present invention relates to a yarn splicing device that splices yarns or weaving yarns together using compressed air to which a liquid is added.

Background of the Invention

[0002] As is well known, if yarns or weaving yarns are spliced together using an automatic winder or the like, then depending on a yarn type, the quality, appearance, and tensile strength of the spliced yarns are improved by using compressed air with which a small amount of liquid such as water is mixed. However, if the liquid scatters around during yarn splicing, electronics or mechanical parts may become defective. Accordingly, the Examined Japanese Patent Application Publication (Tokkou-Hei) No. 5-41734 proposes a yarn splicing device in which a cover member can entirely cover the periphery of a twisting member that carries out yarn splicing. This configuration executes yarn splicing inside a closed space, thus preventing the liquid from scattering around.

[0003] However, with the configuration described in the Examined Japanese Patent Application Publication (Tokkou-Hei) No. 5-41734, when the cover member seals the periphery of the twisting member, it presses and fixes a cut or untwisted yarn end fed out of the twisting member in two directions and a fixed-side yarn also fed out of the twisting member in two directions. If the yarn end is left outside the sealing member, a mixed gas composed of a liquid and compressed air is ineffective on yarn splicing. Further, if the yarn end is pressed by the cover member, the twisting operation may be incorrectly performed because the yarn end is fixed and does not follow the movement of the mixed gas. In spite of the dependence on the accuracy in a cutting step, an untwisting step, and a step of moving two yarn ends closer by an appropriate amount so as to bring them close to each other, all the steps being preparatory to the twisting operation, how fibers are entangled with one another varies depending on the part of the yarn, so that it is difficult to set the yarn ends to have the same length. Further, it is impossible to place the yarn ends having different lengths at the same position without a mechanism that detects the length or a mechanism that controllably changes the length by which the yarns ends are moved to come closer to each other. As a result, the regular twisting step may not be achieved. Thus, disadvantageously, it is difficult to eliminate the possibility of creating an unsatisfactory joint having an unfavorable appearance.

[0004] It is thus an object of the present invention to prevent a liquid from scattering and enable yarn splicing to be reliably accomplished.

Summary of the Invention

[0005] The present invention provides a yarn splicing device comprising a twisting member which twists yarn ends each other by injecting compressed air to which a liquid is added, against the yarn ends, and a shielding mechanism which covers a periphery of the twisting member with no loads imposed on yarns, the shielding mechanism being open to an exterior in its part corresponding to a yarn path, the shielding mechanism regulating a scattering direction in which the compressed air and liquid used for twisting.

[0006] With this configuration, the shielding mechanism regulates the scattering direction of the compressed air and liquid used for twisting. It is thus possible to sufficiently reduce the degree at which the liquid scatters around and adheres to electronics or the like which are located around the twisting member. Further, in this case, the shielding mechanism and the yarn maintain a no-load state. This prevents the shielding mechanism from causing the yarn ends to deviate from the regular position. As a result, yarn splicing can be reliably accomplished.

[0007] Further, according to the present invention, the shielding mechanism has a twisting shielding member which prevents the compressed air and liquid from scattering toward a front surface side, and a base member wall shielding member which prevents the compressed air and liquid from scattering toward a unit frame side.

[0008] This configuration prevents the liquid from scattering toward the front surface side and toward the unit frame side. It is thus possible to regulate the scatter of the liquid toward areas in which a large number of electronics or the like susceptible to the liquid are located.

[0009] The present invention also provides a yarn splicing device comprising a twisting member which twists yarn ends each other by injecting compressed air to which a liquid is added, against the yarn ends, a twisting chamber which accommodates the twisting member and which is open in front side of the twisting member, the twisting chamber being open in a side wall of a unit frame side, and a shielding mechanism which covers a periphery of the twisting member with no loads imposed on yarns, the shielding mechanism being open to an exterior in its part corresponding to a yarn path, the shielding mechanism regulating a scattering direction of the compressed air and liquid used for twisting, wherein the shielding mechanism has a twisting shielding member which can pass through the opening in the side wall side of the twisting chamber and which prevents the compressed air and liquid injected into the twisting member from scattering toward a front surface side, a base member wall shielding member which shields the opening in the side wall side of the twisting chamber, and a shielding member rotative moving mechanism that moves each of the shielding members to simultaneously allow each shielding member to regulate a scattering direction

of the compressed air and liquid used for twisting. This makes it possible to use the relatively simple configuration to prevent the scatter of the liquid and to reliably accomplish yarn splicing.

[0010] According to the present invention, the shielding mechanism regulates the scattering direction of the compressed air and liquid used for twisting. It is thus possible to sufficiently reduce the degree at which the liquid scatters around and adheres to electronics or the like which are located around the twisting member. Further, in this case, the shielding mechanism and the yarn maintain a no-load state. This advantageously enables yarn splicing to be reliably accomplished.

Brief Description of the Drawings

[0011]

Figure 1 is a perspective view of a yarn splicing device.

Figure 2 is a timing chart showing an operative state of the yarn splicing device.

Figure 3 is a block diagram of an air path in the yarn splicing device.

Figure 4 is a front view illustrating how a base member is mounted in the yarn splicing device.

Figure 5 is a front view of the yarn splicing device.

Figure 6 is a perspective view of a yarn splicing unit.

Figure 7 is a sectional view of the yarn splicing unit.

Figure 8 is a front view of the yarn splicing unit.

Figure 9 is a side view of the yarn splicing unit.

Figure 10 is a perspective view of a twisting member.

Figure 11 is a diagram showing the general configuration of a winding unit.

Detailed Description of the Preferred Embodiments

[0012] An embodiment of the present invention will be described with reference to the accompanying drawings. As shown in Figure 11, a yarn splicing device according to the present embodiment is provided in a winding unit 1. Typically, a plurality of winding units 1 are arranged in line and constitute a yarn winder (automatic winder) together with a frame control device placed at one end in a direction in which the winding units 1 are arranged in line.

[0013] The winding unit 1 winds a spun yarn Y unwound from a yarn supplying package B around a bobbin Bf while traversing the spun yarn Y, to form a yarn winding package P with a predetermined length and a predetermined shape. Further, when the winding unit 1 is viewed from its front, a unit frame 13 is provided on either the right or left side of the winding unit 1, and a winding unit main body 14 provided on one side of the unit frame 13.

[0014] The winding unit main body 14 comprises a cradle 2 that grips the bobbin Bf and a traversing drum

(winding drum) 3 that traverses the spun yarn Y. The cradle 2 can be freely pivoted toward the traversing drum 3 so that the yarn winding package P, formed around the bobbin Bf, contacts with and separates from the traversing drum 3. Further, the following are attached to the cradle 2: a lift-up mechanism 2a that lifts up the cradle 2 to separate the yarn winding package P from the traversing drum 3 when yarn breakage occurs, and a package brake mechanism 2b that stops rotation of the yarn winding package P gripped by the cradle 2 at the same time when the cradle 2 is lifted up.

[0015] Spiral traversing grooves 3a are formed in a surface of the traversing drum 3 to traverse the spun yarn Y. Further, the winding unit 1 is provided with an unwinding assisting device 4, a tensioning device 5, a yarn splicing device 7, and a clearer (yarn thickness detector) 8 arranged in this order within the yarn running path between the yarn supplying package B and the traversing drum 3.

[0016] The unwinding assisting device 4 assist unwinding of the yarn from the yarn supplying package B by lowering a cylinder that covers a core tube simultaneously with the unwinding of the yarn from the yarn supplying package B. The tensioning device 5 applies a predetermined tension to the running spun yarn Y. In the illustrated example, the tensioning device 5 is of a gate type in which movable comb teeth 5b are arranged with respect to fixed comb teeth 5a. The tensioning device 5 can be freely swung so that the movable comb teeth 5b mesh with or are released from the movable comb teeth 5a. The tensioning device 5 is swung by a rotary solenoid.

[0017] The yarn splicing device 7 splices a lower yarn Y1 from the yarn supplying package B and an upper yarn Y2 from the yarn winding package P together when the yarn has been cut owing to a detected yarn defect or when yarn breakage has occurred during unwinding. The details will be described later. The clearer 8 detects a defect in the spun yarn Y. An analyzer (not shown in the drawings) processes a signal from the clearer 8 corresponding to the thickness of the spun yarn Y, to detect a yarn defect such as slab. Further, the clearer 8 is provided with a cutter 8a used to cut the yarn when a yarn defect is detected.

[0018] Lower yarn catching and guiding means 11 and upper yarn catching and guiding means 12 are provided below and above the yarn splicing device 7, respectively. The lower yarn catching and guiding means 11 catches and guides the lower yarn Y1 from the yarn supplying package B, and the upper yarn catching and guiding means 12 catches and guides the upper yarn Y2 from the yarn winding package P. When the yarn is cut or yarn breakage occurs, a suction port 11a in the yarn catching and guiding means 11 catches the lower yarn Y1 at the illustrated position. The suction port 11a then swings upward around a shaft 11b to guide the lower yarn Y1 to the yarn splicing device 7. At the same time, a suction mouth 12a in the upper yarn catching

and guiding means 12 swings upward from the illustrated position around a shaft 12b. The suction mouth 12a then catches the upper yarn Y2 from the reversely rotated yarn winding package P and further swings downward around the shaft 12b to guide the upper yarn Y2 to the yarn splicing device 7.

[0019] As shown in Figure 1, the splicing device 7 has a splicing device main body 21 and a yarn splicing unit 22 removably provided on the yarn splicing device main body 21. As shown in Figure 6, the yarn splicing unit 22 has a base member 24, and a first yarn guiding member 25 and a second yarn guiding member 26 provided on a front surface side (yarn side) of the base member 24. The first yarn guiding member 25 and the second yarn guiding member 26 are removably provided in the left side (opposite the unit frame 13 side) and right side (closer to the unit frame 13 side) of the base member 24, respectively. The members 24 to 26 are formed of metal or resin, which is unlikely to be corroded by water. The members 24 to 26 form a twisting chamber 23 inside.

[0020] The yarn guiding members 25, 26 are formed so as to create, when attached to the base member 24, a gap extending in a vertical direction (the direction in which the winding unit 1 stands) and constituting a yarn path 27 through which the upper yarn Y2 and the lower yarn Y1 are passed. The yarn guiding members 25, 26 have inclined surfaces 25a, 26a, respectively, on inner side walls lying opposite each other across the yarn path 27. As also shown in Figures 7 and 8, the inclined surfaces 25a, 26a are formed to enlarge the gap of the yarn path 27 from the yarn path to a leading end. As a result, the upper yarn Y2 and the lower yarn Y1 are collected in the yarn path 27.

[0021] Further, an outer side wall of the first yarn guiding member 25 is formed to be entirely open. A cover member 28 is removably provided on the outer side wall so as to close the opening. As shown in Figure 9, an opening hole 28a is formed in a central portion of the cover member 28. The opening hole 28a allows the twisting chamber 23 to communicate with an exterior so that air flows smoothly between the twisting chamber 23 and the exterior. This facilitates the dispersion of water from the twisting chamber 23. The cover member 28 need not comprise the opening hole 28a but may be formed to close the entire outer side wall of the first yarn guiding member 25. On the other hand, a pass-through portion 26b is formed in an outer side wall of the second yarn guiding member 26 as shown in Figures 6 and 7. The pass-through portion 26b is shaped and sized so as to pass a shielding member 62 of a shielding mechanism 61 in Figure 1, described later.

[0022] The base member 24 to which the yarn guiding members 25, 26 are attached is formed to appear rectangular in a plan view, as shown in Figure 4. Figure 4 shows that the first yarn guiding member 25 and the second yarn guiding member 26 and the cover member 28 are removed. The base member 24 has a first standup

wall 24a and a second standup wall 24b at an upper and lower ends, respectively, of an area covered with the first yarn guiding member 25, and both first standup wall 24a and second standup wall 24b are planar. As shown in Figure 6, the first standup wall 24a and the second standup wall 24b are sandwiched between side portions 25b, 25b of the first yarn guide member 25 via a packing 29. The first yarn guiding member 25 is fixed to the base member 24 by tightening screw members (not shown in the drawings) to press the first yarn guiding member 25 against the standup walls 24a, 24b.

[0023] Further, as shown in Figure 4, a third standup wall 24c is formed in an area of the base member 24 which is covered with the second yarn guiding member 26. The third standup wall 24c is composed of its top wall portion, intermediate wall portion, and a bottom wall portion so as to appear like the letter U in a plan view. As shown in Figure 6, the top and bottom wall portions of the third standup wall 24c are sandwiched between side portions 26c, 26c of the second yarn guide member 26 via the packing 29. The second guiding member 26 is fixed to the base member 24 by tightening screw members (not shown in the drawings) to press the second yarn guiding member 26 against the top and bottom wall portions of the third standup wall 24c. The intermediate wall portion of the third standup wall 24c is exposed from the side portions 26c, 26c of the second yarn guiding member 26. The exposed surfaces are flush with an end surface of the packing 29 and with an end surface of the second yarn guiding member 26.

[0024] Further, as shown in Figures 4 and 5, a twisting member 31 is provided on a front surface of an inner side of the base member 24. As shown in Figure 10, the twisting member 31 is composed of a twisting base 32 and a twisting portion 33 formed on a front surface of the twisting base 32. The twisting base 32 is fixedly buried in the base member 24 in Figure 4. On the other hand, the twisting portion 33 has a groove portion 33a halfway between yarn splicing portions 34, 34.

[0025] Each yarn splicing portion 34 has a yarn splicing hole 34a in which the upper yarn Y2 and the lower yarn Y1 to be twisted are set and which extends in the vertical direction. The yarn splicing hole 34a has an almost circular transverse cross section and is opened by cutting its front side flatly. Further, an air injection port 34b is formed in each yarn splicing hole 34a. The air injection port 34b is adapted to inject air to which water is added. Furthermore, the air injection ports 34b in the respective yarn splicing portions 34 are formed to whirl air in the opposite directions. Thus, the twisting member 31 twists the upper yarn Y2 and lower yarn Y1 set in the yarn splicing holes 34a by using the air flow to entangle the upper yarn Y2 and the lower yarn Y1 with each other while dampening the yarns with water.

[0026] As shown in Figure 7, the twisting member 31 configured as described above is provided on the front surface side of the base member 24 so that the yarn splicing holes 34a align with the yarn path 27. On the

other hand, a twisting plug 35 is provided on a rear surface side of the base member 24. An outlet side of the twisting plug 35 is in communication with the air injection port 34b via the air path formed in the base member 24 and twisting member 31. An inlet side of the twisting plug 35 is in communication with a twisting valve 41 via a first air path 36a formed of such as piping and then with a compressed air supplying device 42, as shown in Figure 3. The first air path 36a has a branch 36b that is in communication with a water supply tank 44 via a water supply valve 43.

[0027] As shown in Figure 2, the twisting valve 41 is controllably switched so as to be open during a twisting operation and a preprocess water discharging operation. The twisting operation twists the upper yarn Y2 and the lower yarn Y1 using compressed air. The preprocess water discharging operation discharges water remaining in the air path such as piping as a result of the last twisting operation, to the exterior of the device. The preprocess water discharging operation has only to be performed before the next twisting operation and may be performed one or more times. Further, the water supply valve 43 is controllably switched so as to be opened immediately before the twisting operation (after yarn breakage has occurred or a drum has stopped rotating and before the twisting operation is started) to supply a predetermined amount of water to the first air path 36a.

[0028] Further, as shown in Figure 7, a plurality of suction ports 24d which are open to the twisting chamber 23 are formed in the base member 24. As shown in Figure 3, each suction port 24d is in communication with a suction device 46 via a suction valve 45. The suction device 46 may utilize a suction force resulting from an air flow generated while the twisting valve 41 is open provided that it can suck air. Thus, when the suction valve 45 is opened, the air and water used for twisting can be sucked from the twisting chamber 23 through the suction port 24d and then discharged to the exterior of the device.

[0029] As shown in Figure 2, the suction valve 45 is controllably switched so as to be open during the preprocess water discharging operation and a water discharging operation. The water discharging operation is performed during a twisting operation to discharge part of the water generated in the twisting chamber 23 as a result of the twisting operation. The water discharging operation must be performed simultaneously with or slightly later than the twisting operation. This is because if a sucking operation precedes the twisting operation, the yarn ends or parts of the pre-twisted upper yarn Y2 and lower yarn Y1 may be sucked and misaligned, resulting in unsatisfactory twisting. Further, the suction valve 45 during a preprocess water discharging operation is preferably set to remain open for a time longer than the time for which the twisting valve 41 remains open, that is, to be kept open for a predetermined time even after the twisting valve 41 has been closed. This is because once compressed air from the twisting valve

41 blows the water remaining in the air path away to the twisting chamber 23, part of the water moved to the twisting chamber 23 must be sufficiently sucked and discharged to the exterior of the device.

[0030] As shown in Figure 7, the yarn splicing unit 22 configured as described above is provided on the yarn splicing device main body 21 so as to be removable using a removing mechanism 71. The removing mechanism 71 has a mounting hole 24e that penetrates the base member 24 from its front surface to bottom surface, a set surface 21a formed on front surface side of the yarn splicing device main body 21 and against which a bottom surface of the yarn splicing unit 22 is abutted while being positioned, a screw hole 21b formed in the set surface 21a and having a positional correspondence with the mounting hole 24e, and a bolt 72 screwed into the screw hole 21b via the mounting hole 24e. Untwisting members 53, 53 are provided above and below the yarn splicing unit 22, respectively, as also shown in Figure 4. The untwisting members 53, 53 are arranged symmetrically with respect to the yarn splicing unit 22 in the vertical direction and also symmetrically with respect to the yarn path 27 in a lateral direction. Each untwisting member 53 comprises a cut yarn guide 53a placed on a front surface side to guide a yarn to be cut and a fixed yarn guide 53b placed on the front surface side to guide a yarn to be fixed.

[0031] Further, each untwisting member 53 has an internal untwisting chamber 53c one end of which is open to the cut yarn guide 53a. An untwisting air port 53d is formed in a rear surface of the untwisting member 53 which is opposite the untwisting chamber 53c across the cut yarn guide 53a. The untwisting air port 53d is in communication with the untwisting chamber 53c that injects compressed air. Thus, the untwisting member 53 allows compressed air to flow from the untwisting air port 53d to the untwisting chamber 53c to draw the yarn from the cut yarn guide 53a into the untwisting chamber 53c for untwisting. Moreover, the untwisting member 53 has a vibration plate (not shown in the drawings) placed along an inner wall surface of the untwisting chamber 53c. The vibration plate is vibrated by the flow of air to vibrate the yarn, thus facilitating untwisting.

[0032] As shown in Figure 3, the untwisting air port 53d is in communication with the compressed air supplying device 42 via the untwisting valve 47 so as to inject compressed air from the compressed air supplying device 42. As shown in Figure 2, the untwisting valve 47 is controllably switched so as to be open during the preprocess water discharging operation, the untwisting operation, and a postprocess water discharging operation.

[0033] The untwisting operation uses the untwisting member 53 to untwist the yarn end as described above. Further, the untwisting valve 47 is open during the preprocess water discharging operation in order to blow the water remaining in the untwisting chamber 53c of the untwisting member 53 away to the exterior of the device

to dry the chamber 53c because water may enter the untwisting chamber 53c during the untwisting operation. The untwisting valve 47 during the preprocess water discharging operation is preferably set to remain open for a time longer than the time for which the twisting valve 41 remains open, that is, to be kept open for a predetermined time even after the twisting valve 41 has been closed.

[0034] The postprocess water discharging operation blows away water and contaminants such as fiber dusts away from the untwisting chamber 53c. This operation has only to be performed at least once before the next untwisting operation. Since water is discharged from the untwisting chamber 53c (the untwisting chamber 53c is cleaned) during the preprocess water discharging operation, the postprocess water discharging operation is unnecessary depending on operational conditions such as the type of the yarn. However, if water remains on the untwisting chamber 53c while the yarn is running after yarn splicing, contaminants such as fiber dusts become likely to adhere to the untwisting chamber 53c. The postprocess water discharging operation solves this problem. Accordingly, the postprocess water discharging operation is preferably performed immediately after the untwisting operation.

[0035] Further, as shown in Figures 1 and 5, the following components are provided in the following order above and below the untwisting members 53, 53, arranged across the yarn splicing unit 22: a yarn handling lever 54 that draws the upper yarn Y2 and the lower yarn Y1 to the yarn splicing unit 22, a cutter 55 that cuts the yarn guided by the cut yarn guide 53a, and a clamp mechanism 56 that fixes the yarn guided by the fixed yarn guide 53b.

[0036] The yarn handling lever 54 is rotatively movable around a position located on one side of the yarn splicing unit 22. The yarn handling lever 54 rotatively moves around one end and is arched so as to allow the area from the one end to the other end, that is, a leading end, to easily hold the yarn. Further, the yarn handling lever 54 is rotatively moved in two increments of a rotative movement angle. Specifically, the yarn handling lever 54 is assumed to be located at an origin angle when lying at a standby position where it does not contact with the yarn. Then, a first rotative movement angle is set so as to collect the upper yarn Y2 and lower yarn Y1 located in front side of the yarn splicing device 7, in the yarn path 27 of the yarn splicing unit 22. A second rotative movement angle is set so as to position the ends of the upper yarn Y2 and lower yarn Y1 cut by the cutter 55, in the yarn splicing holes 34a, 34a in the twisting member 31. The rotative movement angle of the yarn handling lever 54 is not limited to the two increments but may be three or more increments.

[0037] Further, a shielding mechanism 61 is disposed on one side of the yarn splicing unit 22. The shielding mechanism 61 has a twisting shielding member 62 that prevents water from scattering toward the front surface

side during a twisting operation and a preprocess water discharging operation, a base member wall shielding member 63 that prevents water from scattering toward the unit frame 13 side during a twisting operation and a preprocess water discharging operation, and a shielding member rotative moving mechanism 64 that swings and rotatively moves the shielding members 62, 63.

[0038] As shown in Figure 4, the twisting shielding member 62 has a shielding portion 65 having a leading end surface formed like a plane, and a shielding support member 66 that supports a trailing end of the shielding portion 65. The shielding portion 65 is sized and shaped to be able to entirely cover the openings of the yarn splicing holes 34a in the twisting member 31 and to be able to pass through the pass-through portion 26b in Figures 1 and 6. Further, a base member wall shielding member 63 is connected to the shielding support member 66. A surface of the base member wall shielding member 63 which is opposite an outer side wall of the second yarn guiding member 26 is formed to be planar and is sized and shaped to entirely cover the pass-through portion 26b.

[0039] As shown in Figure 5, the shielding member rotative moving mechanism 64 is connected to the base member wall shielding member 63. The shielding member rotative moving mechanism 64 is set to move the twisting shielding member 62 into and out of the twisting chamber 23 via the pass-through portion 26b in Figure 6 by swinging the twisting shielding member 62 while rotatively moving around one end of the base member wall shielding member 63. Further, the shielding member rotative moving mechanism 64 is set to use rotative movement and swinging to cause the shielding portion 65 to close the opening in the yarn splicing holes 34a while causing the base member wall shielding member 63 to close the pass-through portion 26b of the second yarn guiding member 26. Thus, the shielding mechanism 61 can prevent water from scattering toward the front surface side and the unit frame 13 side during a twisting operation and a preprocess water discharging operation.

[0040] As shown in Figure 11, the unit frame 13 supports components of the winding unit main body 14 such as the yarn splicing device 7 configured as described above. The unit frame 13 has a built-in unit control device (not shown in the drawings) that must be protected from water used for an untwisting operation. The unit control device has a storage section that stores rewritable programs created so as to operate the components using the timings shown in Figure 2, an arithmetic section that can execute the programs, an input/output section connected to the winding unit main body 14 so as to input signals from the winding unit main body 14 to the input/output section and to output signals to the winding unit main body 14, and a communication section connected to the frame control device so as to transmit and received data to and from the frame control device.

[0041] With reference to the timing chart in Figure 2, a description will be given of operations of the yarn splicing device 7 in the above configuration. While the spun yarn Y unwound from the yarn supplying package B is being wound around the bobbin Bf to form a yarn winding package P while being traversed, for example, yarn breakage may occur or a yarn defect detected by the clearer 8 may be removed. Then, the lower yarn Y1 from the yarn supplying package B is separated from the upper yarn Y2 from the yarn winding package P. Thus, the yarn splicing device 7 starts yarn splicing.

[0042] Specifically, when yarn breakage occurs or the yarn is cut, the rotation of the traversing drum 3 is stopped. Then, a preprocess water discharging operation is performed. First, as shown in Figure 5, the shielding mechanism 61 is activated which is in a standby position to maintain a space in front of the yarn path 27, and the twisting shielding member 62 is swung while the base member wall shielding member 63 rotatively moving by the shielding member rotative moving mechanism 64. As a result, the twisting shielding member 62 passes through the pass-through portion 26b in Figure 6 into the twisting chamber 23, and the twisting shielding member 62 then abuts against the planar top of the yarn splicing portion 34 to shield the openings of the yarn splicing holes 34a. Further, the base member wall shielding member 63 abuts flatly against an outer side of the second yarn guide member 26 in Figure 6 and against the third standup wall 24c of the base member 24 to shield the pass-through portion 26b.

[0043] Subsequently, the untwisting valve 47, the twisting valve 41, and the suction valve 45 are opened. As shown in Figure 3, when the untwisting valve 47 is opened, compressed air from the compressed air supplying device 42 advances into the untwisting members 53, 53, and the compressed air is then passes through the untwisting chambers 53c, 53c for discharge as shown in Figure 4. Thus, the compressed air blows away and discharges the water remaining in the untwisting chamber 53c as well as contaminants such as fiber dusts.

[0044] On the other hand, as shown in Figure 3, when the twisting valve 41 is opened, compressed air from the compressed air supplying device 42 passes through the first air path 36a and twisting plug 35 into the twisting member 31, and the compressed air is then injected into the yarn splicing holes 34a through the air injection port 34b as shown in Figure 10. Thus, the compressed air blows away and discharges the water remaining in the first air path 36a and air path and dries the wall surfaces of the first air path 36a and air path.

[0045] Since the openings of the yarn splicing holes 34a are shielded by the shielding portion 65, the compressed air and water injected into the yarn splicing holes 34a as described above are not injected to front of the yarn splicing holes 34a. The compressed air and water instead pass through the groove portions 33a arranged above and below the yarn splicing hole 34a and

halfway between the yarn splicing holes 34a, and flow into the twisting chamber 23. Then, as shown in Figure 1, since the pass-through portion 26b of the second yarn guiding member 26 is shielded by the shielding portion 65 in Figure 4, the compressed air and water flowing into the twisting chamber 23 are discharged from the opening hole 28a in the cover member 28, provided on the first yarn guiding member 25. Thus, the water discharged from the opening hole 28 in the cover member 28 together with the compressed air advances in a direction opposite the unit frame 13 side in Figure 11. Consequently, the water does not adhere to electronics or the like in the unit frame 13.

[0046] Moreover, since the suction valve 45 is open, parts of the compressed air and water flowing into the twisting chamber 23 are discharged from the suction port 24d. This further reduces the amount of water discharged from the opening hole 28a in the cover member 28, thus further reliably preventing water from scattering toward the unit frame 13.

[0047] Once a preprocess water discharging operation is started to sufficiently remove water from the air path as described above, the suction port 11a of the lower yarn catching and guiding means 11 catches the lower yarn Y1 at the illustrated position, and the lower yarn catching and guiding means 11 then swings upward around the shaft 11b to guide the lower yarn Y1 to front of the yarn splicing device 7. At the same time, the suction mouth 12a in the upper yarn catching and guiding means 12 swings upward from the illustrated position around the shaft 12b, and the suction mouth 12a then catches the upper yarn Y2 from the yarn winding package P and further swings downward around the shaft 12b to guide the upper yarn Y2 to front of the yarn splicing device 7.

[0048] Subsequently, the twisting valve 41 is closed. Then, slightly later, the untwisting valve 47 and the suction valve 45 are closed. Thus, drainage from the untwisting member 53 based on compressed air and drainage from the twisting chamber 23 based on suction are continued until drainage by the twisting valve 41 is reliably stopped. This eliminates the possibility that water remains in the untwisting member 53 and twisting chamber 23. Subsequently, the shielding mechanism 61 is activated to return to its original position to maintain a space in front of the yarn path 27.

[0049] Once the preprocess water discharging operation is completed, a water supplying operation and a first yarn handling operation are performed. During a water supplying operation, the water supplying valve 43 remains open for a predetermined period. Then, as shown in Figure 3, a predetermined amount of water from the water supply tank 44 is supplied to the first air path 36a. Further, during a first yarn handling operation, as shown in Figure 1, the yarn handling lever 54 is rotatively moved through the first rotative movement angle from the illustrated standby position, and the upper yarn Y2 and lower yarn Y1 located in front side of the yarn

splicing device 7 are drawn toward the yarn splicing unit 22 and collected in the yarn path 27. Thus, as shown in Figure 5, the upper yarn Y2 passes through the yarn splicing holes 34a aligned with the yarn path 27. As a result, the upper yarn Y2 is guided between the side of the fixed yarn guide 53b of the untwisting member 53 located above and the cut yarn guide 53a of the untwisting member 53 located below. On the other hand, the lower yarn Y1 passes through the yarn splicing holes 34a aligned with the yarn path 27. As a result, the lower yarn Y1 is guided between the side of the fixed yarn guide 53b of the untwisting member 53 located below and the cut yarn guide 53a of the untwisting member 53 located above.

[0050] Subsequently, a clamping operation is performed, and the upper yarn Y2 and the lower yarn Y1 guided by the fixed yarn guide 53b are respectively fixed by the upper and lower clamp mechanisms 56. Then, a cutting operation is performed to cut the lower yarn Y1 and the upper yarn Y2 guided by the cut yarn guide 53a by the cutter 55. Once the clamping operation and the cutting operation are completed, an untwisting operation is performed. Specifically, the untwisting valve 47 is opened to allow compressed air to flow from the untwisting air port 53d to the untwisting chamber 53c. Then, the lower yarn Y1 and the upper yarn Y2 guided by the cut yarn guide 53a are drawn into the untwisting members 53c of the upper and lower untwisting members 53. The yarn ends are then untwisted.

[0051] Once the untwisting operation is completed, the shielding mechanism 61 is activated to shield the yarn splicing holes 43a and the pass-through portion 26b as in the case of the preprocess water discharging operation. Subsequently, the yarn handling lever 54 is rotatively moved to the second rotative movement angle. Thus, the ends of the upper yarn Y2 and lower yarn Y1 cut by the cutter 55 are positioned in the yarn splicing holes 34a, 34a in the twisting member 31. On this occasion, the shielding portion 65 does not contact with the yarn because the shielding portion 65 is abutted against the front surface of the yarn splicing portion 34 to open the yarn splicing holes 34a in the vertical direction. Consequently, the ends of the upper yarn Y2 and lower yarn Y1 do not deviate from the regular position.

[0052] Subsequently, a twisting operation is performed to open the twisting valve 41. Thus, as shown in Figure 3, compressed air flows through the first air path 36a to atomize a predetermined amount of water supplied to the first air path 36a during the water supplying operation. The water is then discharged to the yarn splicing holes 34a, 34a together with the compressed air. Then, as shown in Figure 10, the misty water dampens the ends of the upper yarn Y2 and lower yarn Y1, and compressed air is then injected into the yarn splicing holes 34a, 34a in the opposite directions and whirls inside the yarn splicing holes 34a, 34a to entangle the ends of the upper yarn Y2 and lower yarn Y1 with each other for sufficient twisting. During the twisting operation,

the yarn splicing holes 34a and the pass-through portion 26b are shielded as in the case of the preprocess water discharging operation. This prevents water from being injected toward the front side or the unit frame 13 side.

[0053] Further, a water discharging operation is started slightly later than the twisting operation. Thus, as shown in Figure 1, part of the water discharged into the twisting chamber 23 together with compressed air is discharged. This prevents the yarn ends or parts of the upper yarn Y2 and lower yarn Y1 from being misaligned by the suction associated with the water discharging operation.

[0054] Once the twisting operation is completed as described above, the shielding mechanism 61 is activated to return to its original standby position to maintain a space in front of the yarn path 27, and the yarn handling lever 54 is also returned to its illustrated standby position. Then, as shown in Figure 11, the traversing drum 3 is rotated to restart winding the yarn Y into the yarn winding package P. Further, once the twisting operation has completed and a predetermined period has elapsed, a postprocess water discharging operation is performed. Thus, the untwisting valve 47 is opened to clean the untwisting chamber 53c of the untwisting member 53 using compressed air.

[0055] As described above, as shown in Figures 1 and 4, the yarn splicing device 7 according to the present invention has the twisting member 31 which twists the yarn ends by injecting compressed air to which a liquid is added, against the yarn ends, and the shielding mechanism 61 which covers the periphery of the twisting member 31 with no loads imposed on the upper yarn Y2 and lower yarn Y1, the shielding mechanism 61 being open to an exterior in its part corresponding to a yarn path 27, the shielding mechanism 61 regulating the scattering direction in which the compressed air and liquid used for twisting.

[0056] With this configuration, the shielding mechanism 61 regulates the scattering direction in which the compressed air and liquid used for twisting. It is thus possible to sufficiently reduce the degree at which the liquid scatters around and adheres to electronics or the like which are located around the twisting member 31. Further, in this case, the shielding mechanism 61 and the yarn maintain a no-load state. This prevents the shielding mechanism 61 from causing the yarn ends to deviate from the regular position. As a result, yarn splicing can be reliably accomplished.

[0057] Further, the shielding mechanism 61 has the twisting shielding member 62 which prevents the compressed air and liquid from scattering toward the front surface side, and the base member wall shielding member 63 which prevents the compressed air and liquid from scattering toward the unit frame 13 side. This configuration prevents the liquid from scattering toward the front surface side and toward the unit frame 13 side. It is thus possible to regulate the scatter of the liquid to-

ward areas in which a large number of electronics or the like susceptible to the liquid are located. The twisting shielding member 62 and the base member wall shielding member 63 may be configured to operate integrally as in the present embodiment or may be connected to an independent driving mechanism so as to operate independently.

[0058] Further, the yarn splicing device 7 according to the present embodiment has the twisting member 31 which twists the yarn ends by injecting compressed air to which a liquid is added, against the yarn ends, the twisting chamber 23 which accommodates the twisting member 31 and which is open in front side of the twisting member 31 as the yarn path 27, the twisting chamber 23 being open in a side wall close to the unit frame 13 side as the pass-through portion 26b, and the shielding mechanism 61 which covers the periphery of the twisting member 31 with no loads imposed on the upper yarn Y2 and the lower yarn Y1, the shielding mechanism 61 being open to an exterior in its part corresponding to a yarn path 27, the shielding mechanism 61 regulating the scattering direction in which the compressed air and liquid used for twisting, wherein the shielding mechanism 61 has a twisting shielding member 62 which can pass through the opening in the side wall of the twisting chamber 23 and which prevents the compressed air and liquid injected into the twisting member 31 from scattering toward a front surface, the base member wall shielding member 63 which shields the opening in the side wall of the twisting chamber 23, and the shielding member rotative moving mechanism 64 that moves (swings and rotatively moves) each of the shielding members 62, 63 to simultaneously allow each shielding member 62, 63 to regulate the direction in which the compressed air and liquid scatter. This makes it possible to use the relatively simple configuration to prevent the scatter of the liquid and to reliably accomplish yarn splicing.

[0059] The present invention has been described in conjunction with the preferred embodiment. However, the present invention is not limited to the preferred embodiment. It should be appreciated that many other embodiments may be provided without departing from the spirit and scope of the present invention. Moreover, the operations and effects of the configuration of the present invention are described in the present embodiment. However, these operations and effects are examples only and do not limit the present invention.

Claims

1. A yarn splicing device **characterized by** comprising a twisting member which twists yarn ends by injecting compressed air to which a liquid is added, against the yarn ends, and a shielding mechanism which covers a periphery of said twisting member with no loads imposed on yarns, the shielding mechanism being open to an exterior in its part cor-

responding to a yarn path, the shielding mechanism regulating a scattering direction in which the compressed air and liquid used for twisting.

2. A yarn splicing device according to Claim 1, **characterized in that** said shielding mechanism has a twisting shielding member which prevents said compressed air and liquid from scattering toward a front surface side, and a base member wall shielding member which prevents said compressed air and liquid from scattering toward a unit frame side.

3. A yarn splicing device **characterized by** comprising a twisting member which twists yarn ends by injecting compressed air to which a liquid is added, against the yarn ends, a twisting chamber which accommodates said twisting member and which is open in front side of said twisting member, the twisting chamber being open in a side wall close to a unit frame side, and a shielding mechanism which covers a periphery of said twisting member with no loads imposed on yarns, the shielding mechanism being open to an exterior in its part corresponding to a yarn path, the shielding mechanism regulating a scattering direction in which the compressed air and liquid used for twisting, and in that said shielding mechanism has a twisting shielding member which can pass through the opening in the side wall side of said twisting chamber and which prevents the compressed air and liquid injected into said twisting member from scattering toward a front surface side, a base member wall shielding member which shields the opening in the side wall side of said twisting chamber, and a shielding member rotative moving mechanism that moves each of said shielding members to simultaneously allow each shielding member to regulate a direction in which the compressed air and liquid scatter.

4. A yarn splicing device according to Claim 1, **characterized by** comprising a twisting member which twists yarn ends by injecting compressed air to which a liquid is added, against the yarn ends, a twisting chamber which accommodates said twisting member, a shielding mechanism that regulates a scattering direction in which the compressed air and liquid used for twisting, and a suction mechanism which sucks and discharges the compressed air and liquid present in said twisting chamber to an exterior of the device.

5. A yarn splicing device according to Claim 4, **characterized in that** the suction of said suction mechanism is started simultaneously with or slightly later than the start of injection of said compressed air.

6. A yarn splicing device according to Claim 1, **characterized by** comprising a twisting member which

twists yarn ends by injecting compressed air to which a liquid is added, against the yarn ends, an air path through which said compressed is supplied to said twisting member together with said liquid, and liquid discharging means for using said compressed air to remove the liquid remaining in said air path after the twisting by said twisting member has been completed and before next twisting is started.

7. A yarn splicing device according to Claim 6, **characterized by** further comprising a shielding mechanism which can regulate the scattering direction in which the compressed air and liquid injected by said twisting member, and in that said liquid discharging means uses said shielding mechanism to regulate the scattering direction of the liquid while the liquid is being removed. 10
8. A yarn splicing device according to Claim 6 or Claim 7, **characterized by** comprising untwisting member which untwists said yarn ends using the compressed air, and in that while removing said liquid, said liquid discharging means uses said compressed air to remove the liquid entering said untwisting member. 15 20 25
9. A yarn splicing device according to any one of Claims 6 to 8, **characterized by** further comprising a suction mechanism which can suck and discharge the compressed air and liquid injected by said twisting member, and in that while removing said liquid, said liquid discharging means uses said suction mechanism to suck said compressed air and liquid. 30 35
10. A yarn splicing device according to Claim 1, **characterized by** comprising a twisting member which twists yarn ends by injecting compressed air to which a liquid is added, against the yarn ends, a base member on which said twisting member is provided, a yarn splicing unit provided on said base member and in which a twisting chamber accommodating said twisting member is formed, the yarn splicing unit having a yarn guiding member which guides said yarn to the twisting member, and a yarn splicing main body on which said yarn splicing unit is removably provided to set ends of said yarn for said twisting member. 40 45
11. A yarn splicing device according to Claim 10, **characterized by** comprising a removing mechanism having a mounting hole penetrating said base member from its front surface to rear surface, a set surface against which a bottom surface of said yarn splicing unit is abutted while being positioned, a screw hole formed in said set surface and having a positional correspondence with said mounting hole, and a mounting bolt which is screwed into said 50 55

screw hole via said mounting hole.

12. A yarn splicing device according to Claim 10 or Claim 11, **characterized by** comprising a shielding mechanism which regulates the scattering direction in which the compressed air and liquid used for twisting.

FIG. 1

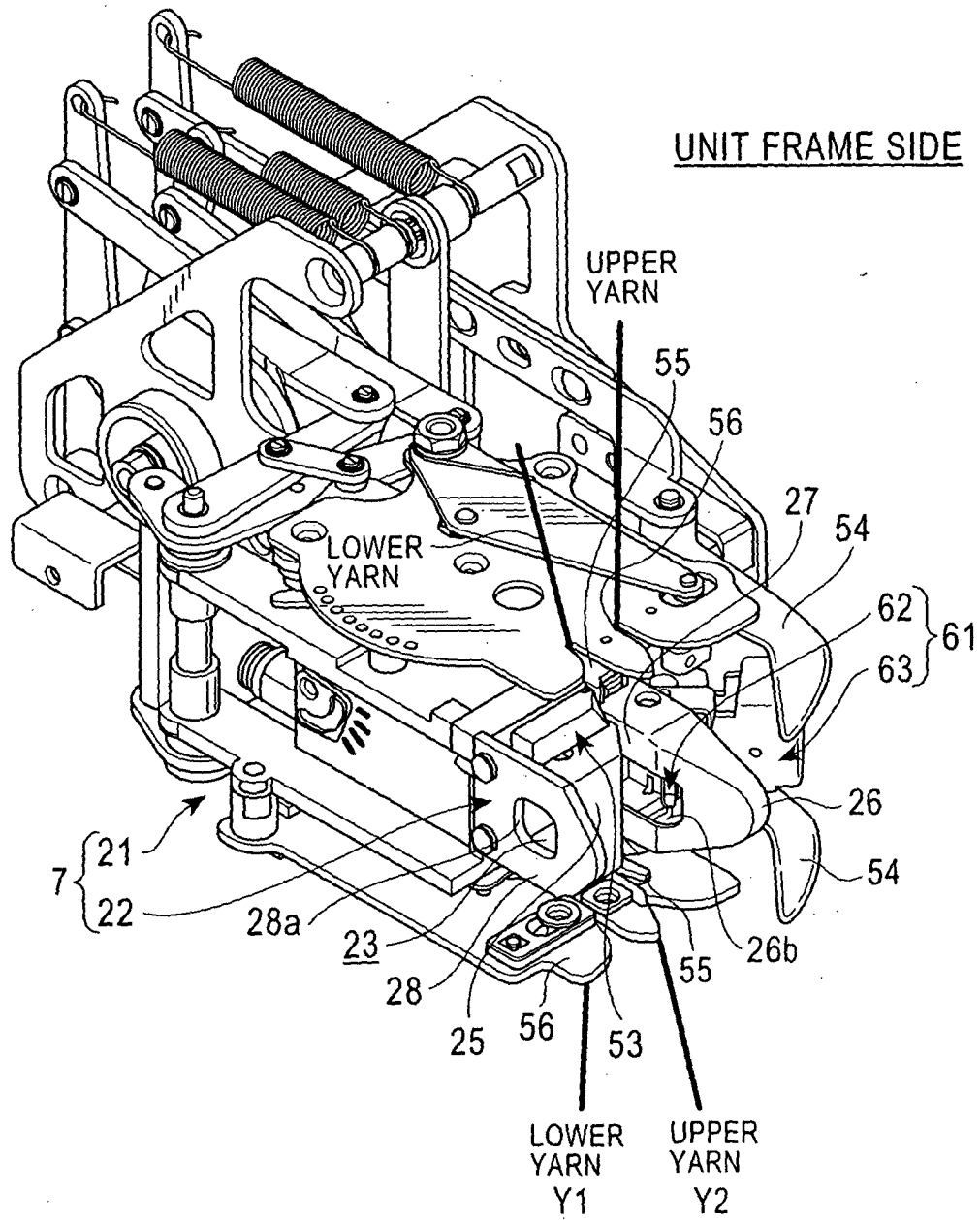


FIG. 2

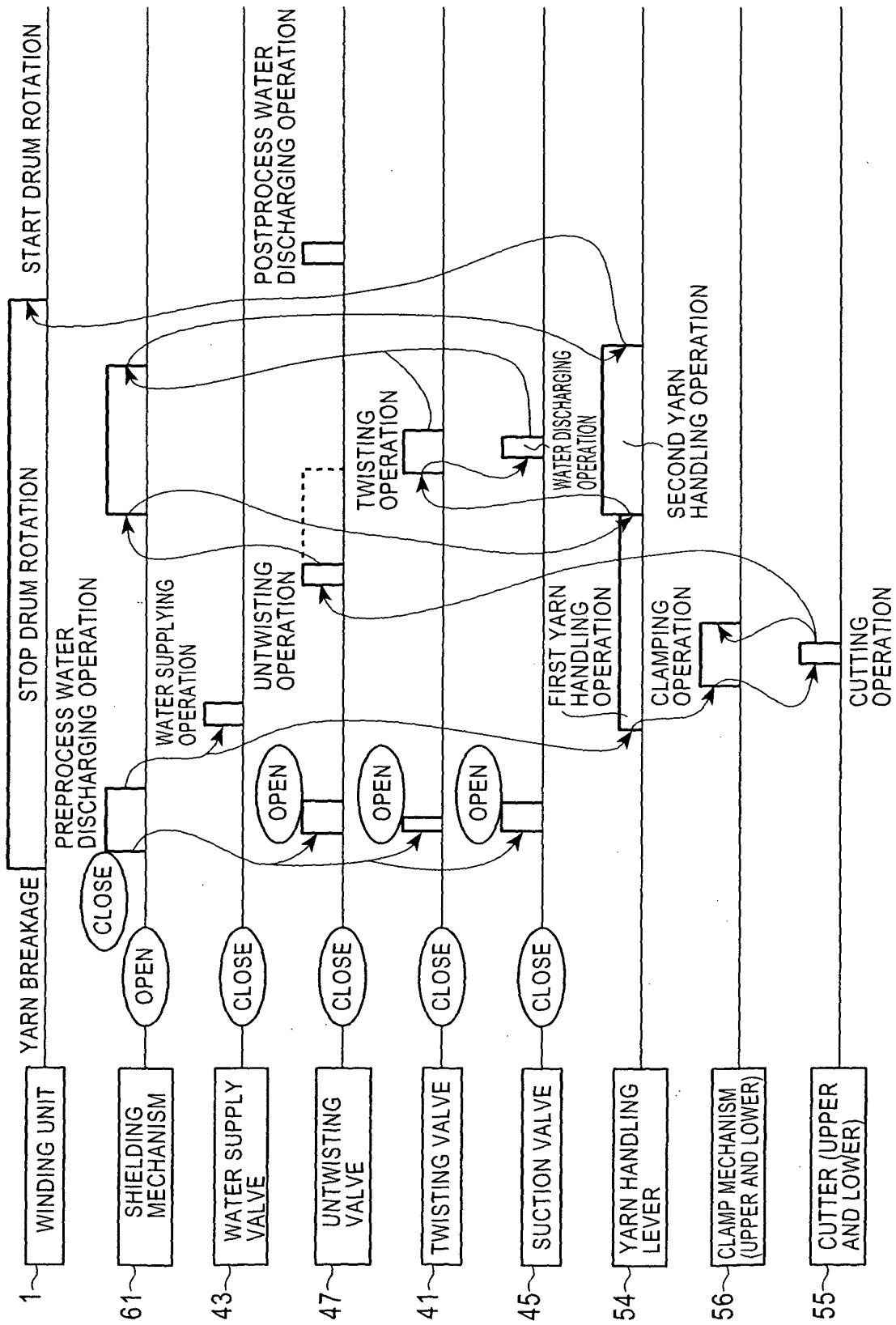


FIG. 3

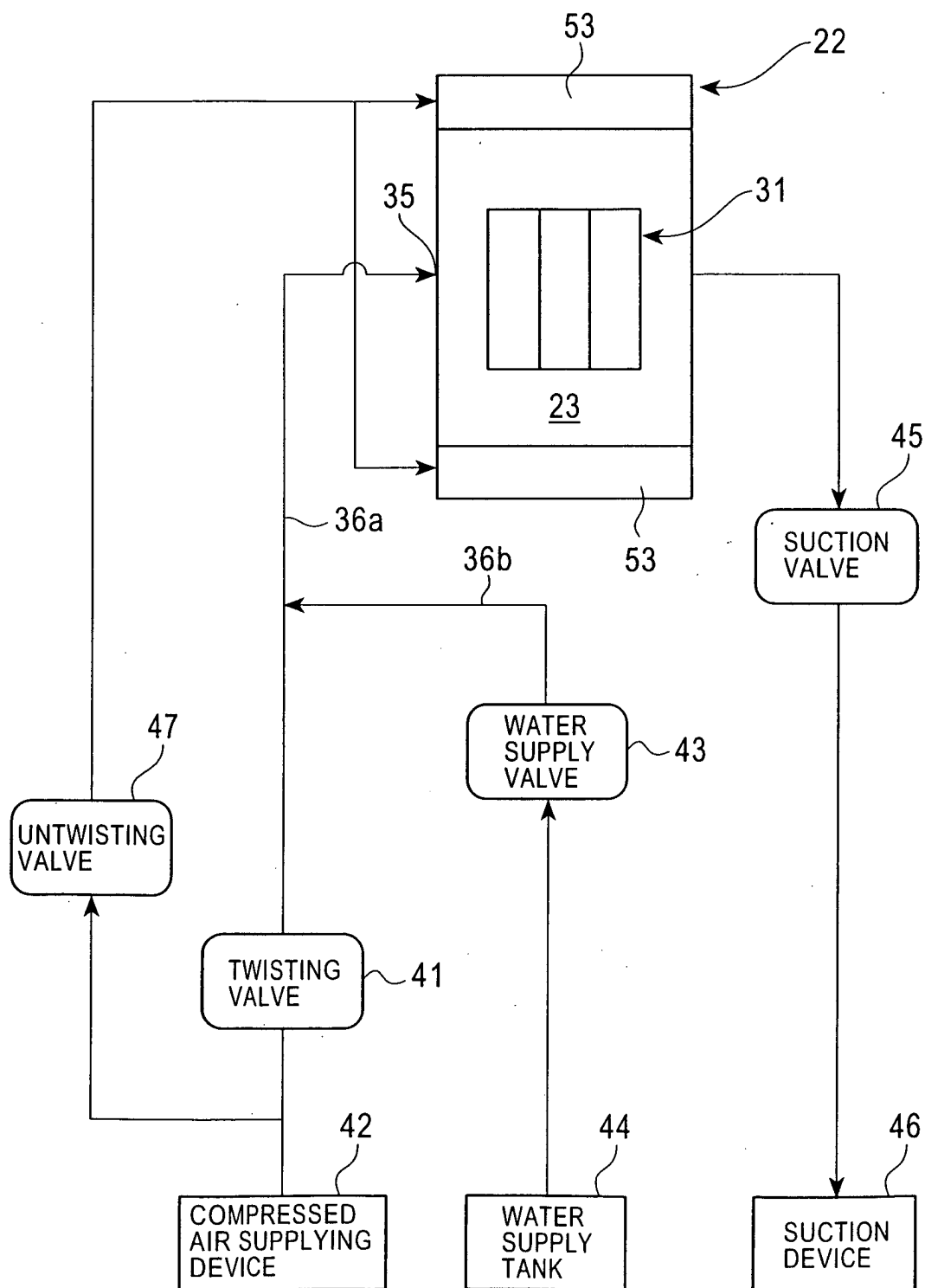


FIG. 4

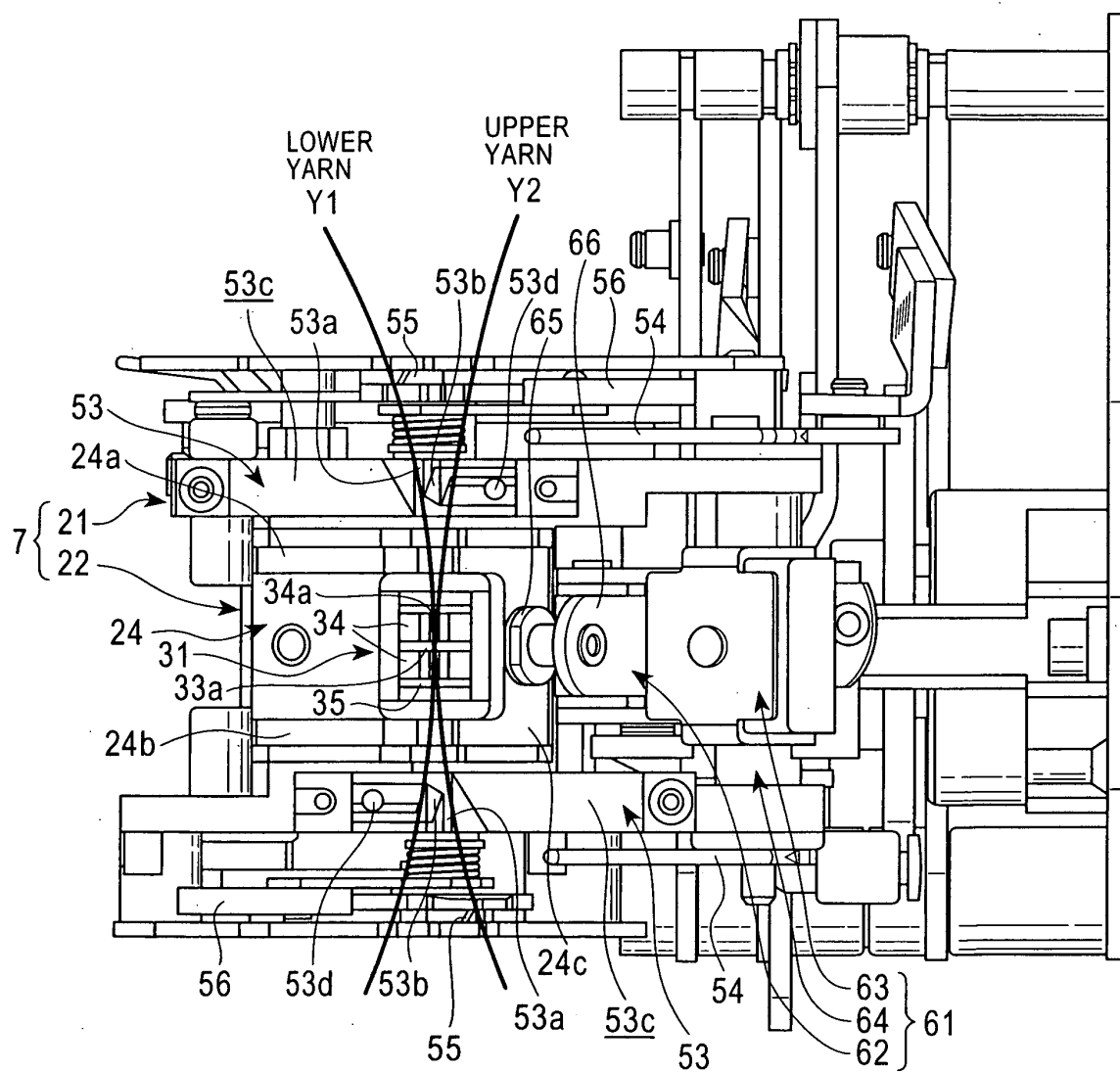


FIG. 5

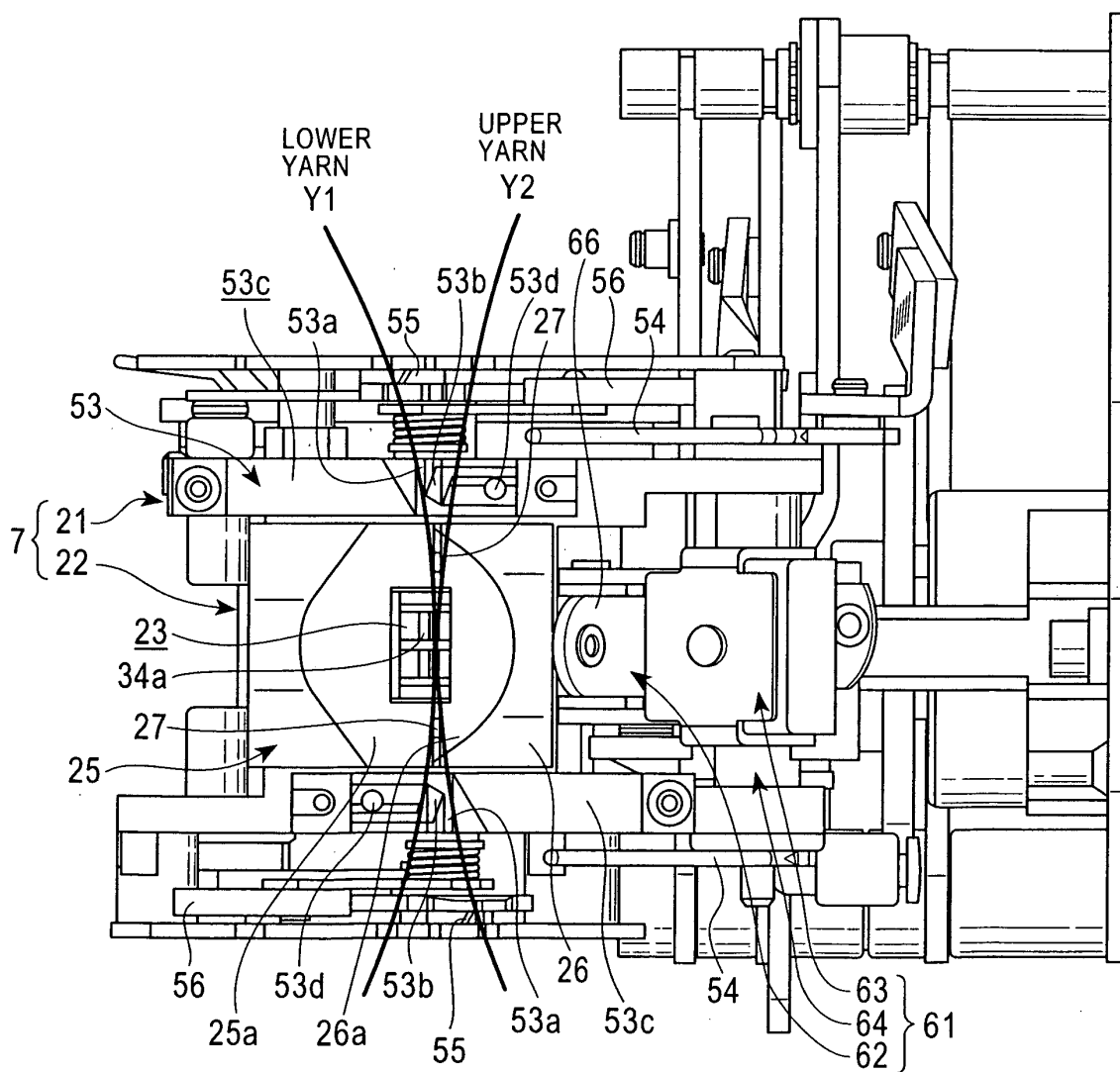


FIG. 6

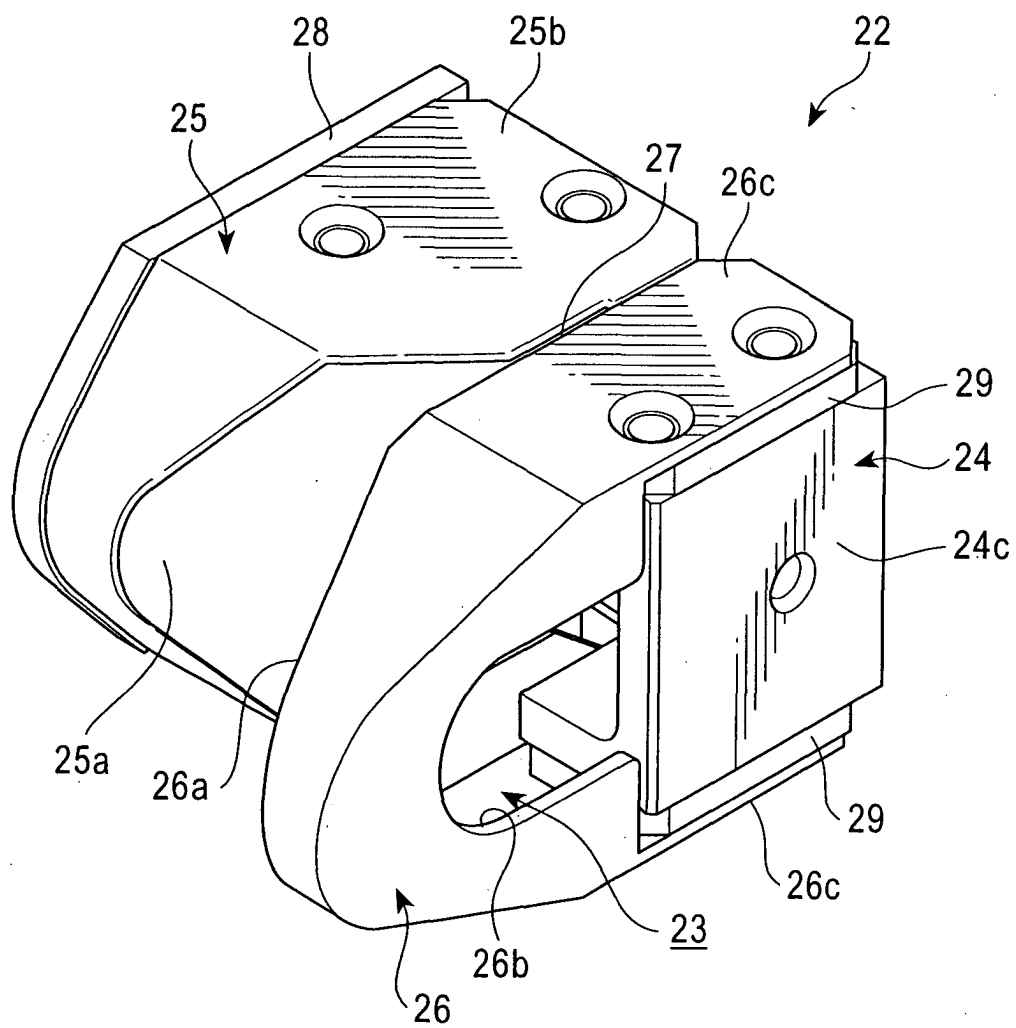


FIG. 7

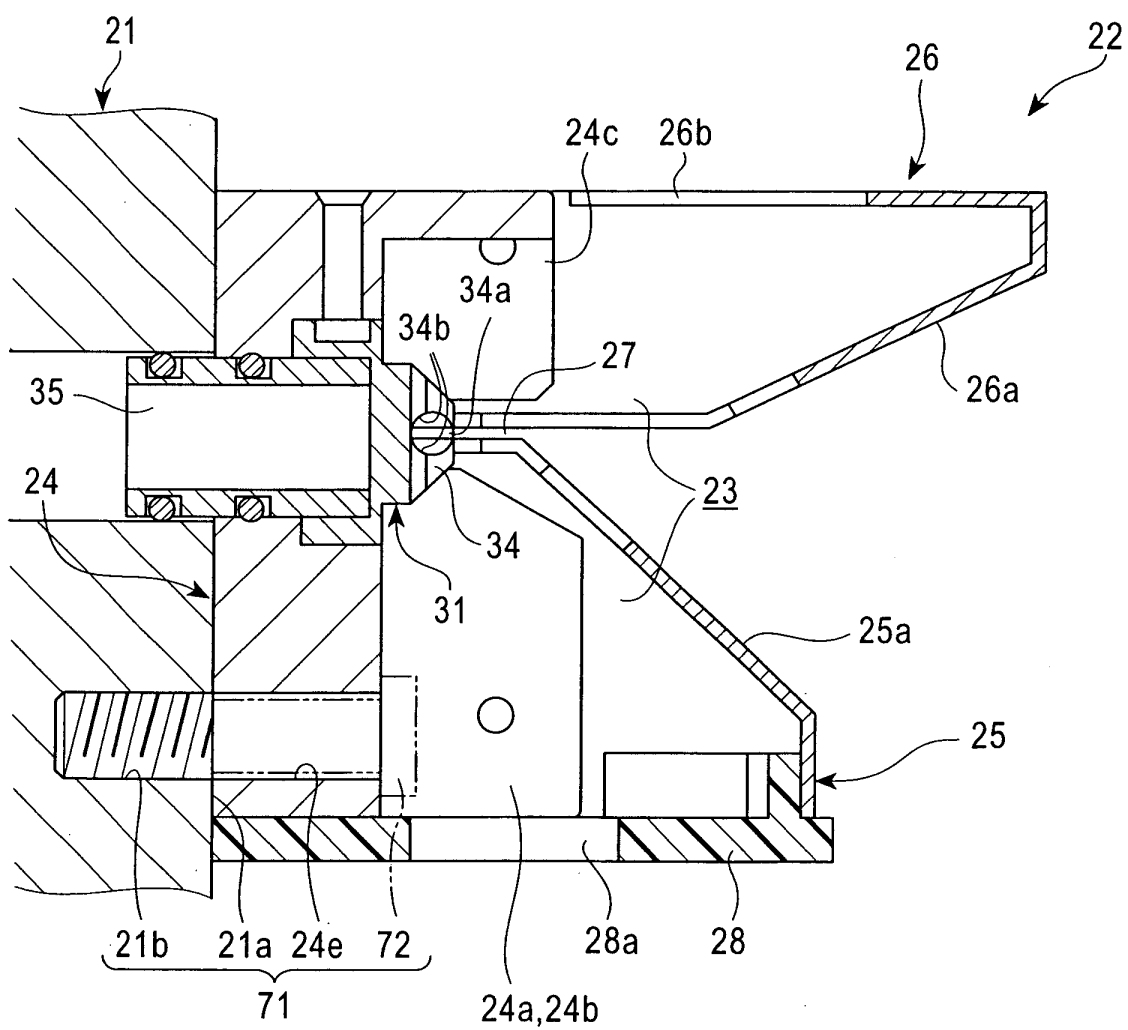


FIG. 8

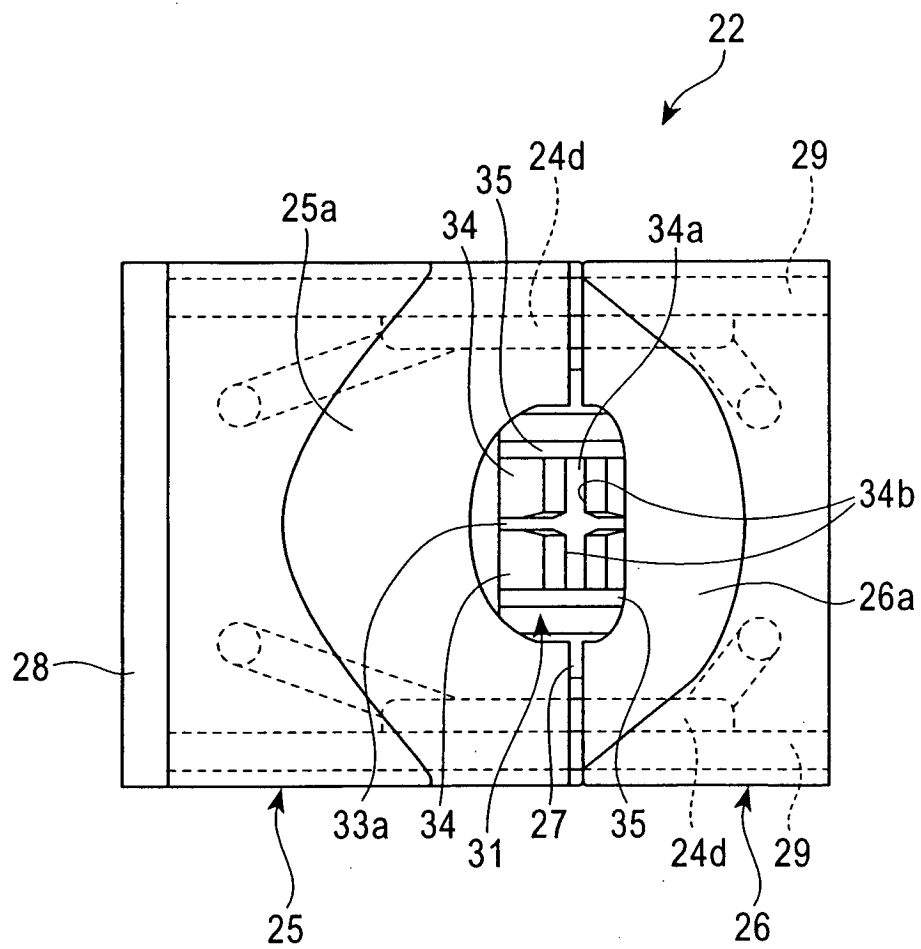


FIG. 9

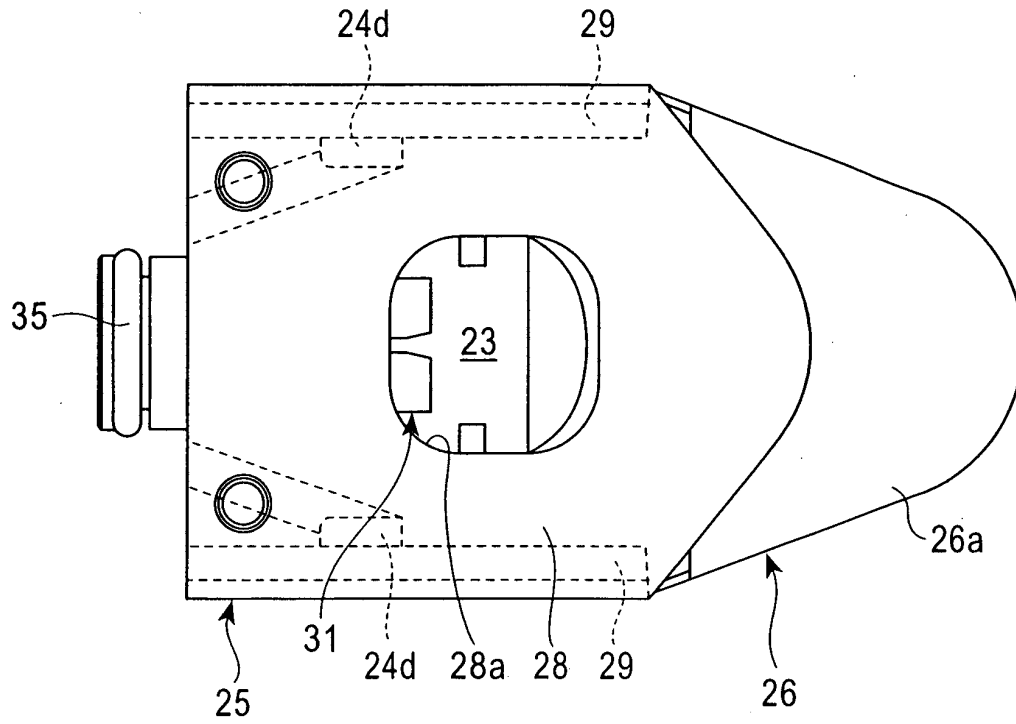


FIG. 10

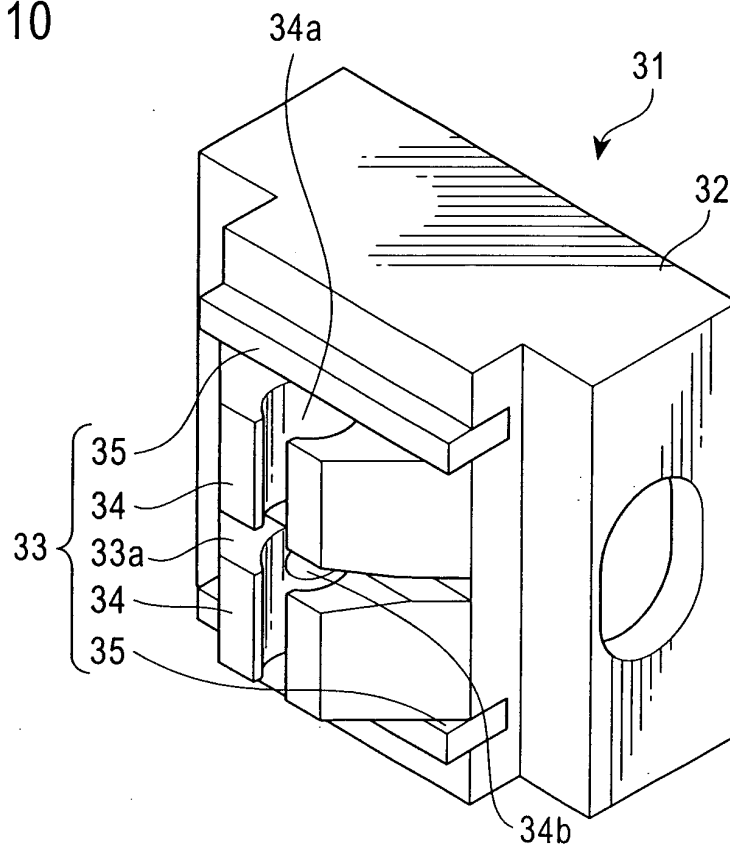
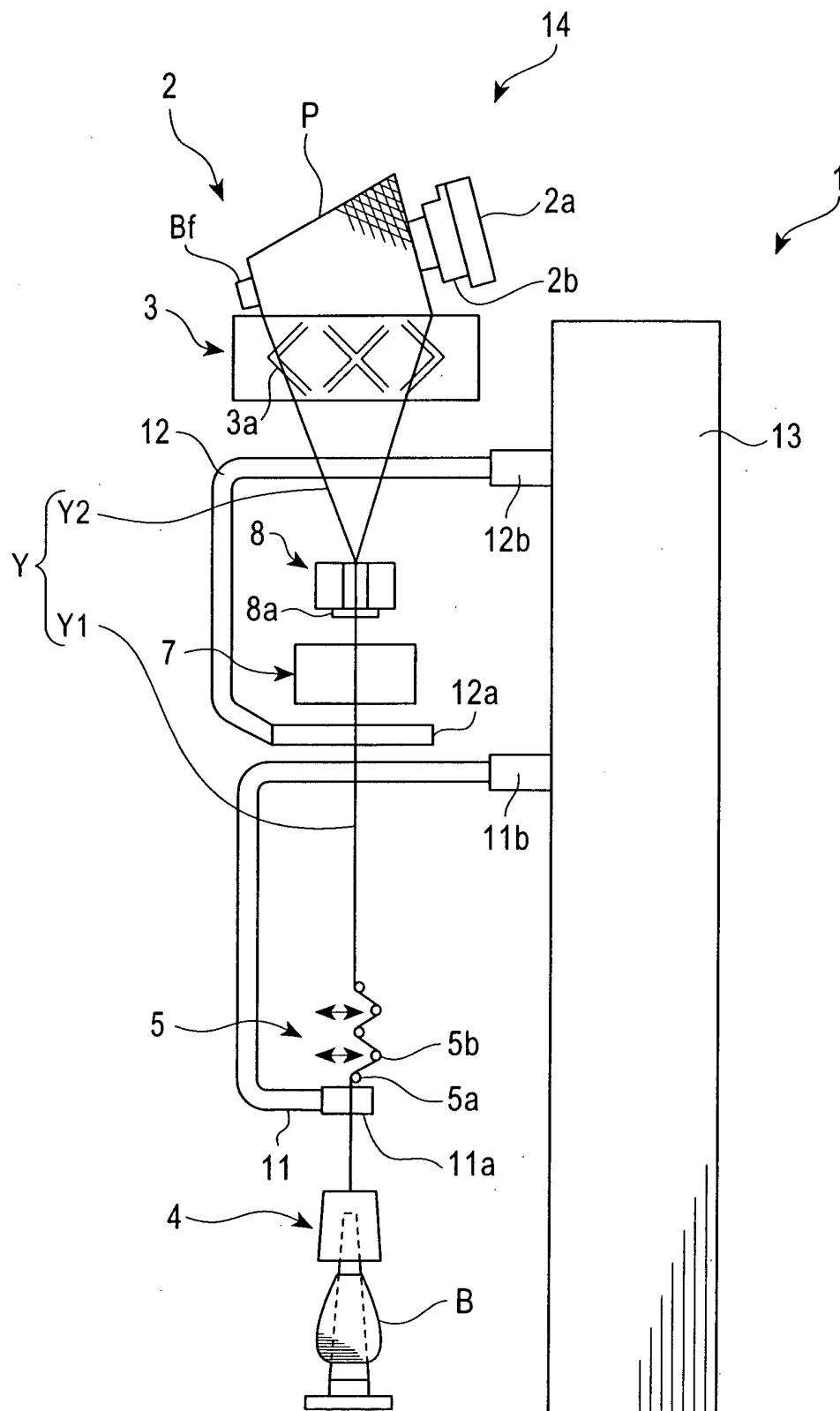


FIG. 11





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 02 2697

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			B65H
Place of search		Date of completion of the search	Examiner
Munich		28 January 2005	Kising, A
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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The members are as contained in the European Patent Office EDP file on
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