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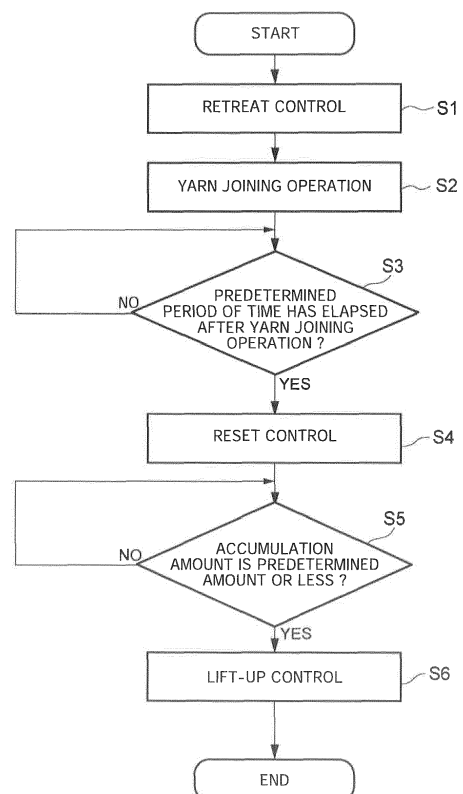
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(54) **Winding device and yarn winding machine including the same**

(57) As winding device 13 includes a package holding section 71 adapted to rotatably hold a package 45 around which a yarn 10 is wound, a switching mechanism 80 adapted to move the package holding section 71 from a winding position, which is a position where the package holding section 71 is located when the yarn 10 is wound around the package 45, to a receded position, which is a position located away from the winding position, and a control section 30 adapted to operate the switching mechanism 80 after the switching mechanism 80 has moved the package holding section 71 from the receded position to the winding position.

FIG. 9



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a winding device and a yarn winding machine including the same.

2. Description of the Related Art

[0002] As a conventional textile machine, for example, Japanese Patent Application Laid-open No. 2011-37608 discloses a textile machine including a winding device adapted to wind a yarn around a bobbin held by a package holding section to form a package. The winding device includes the package holding section adapted to rotatably support the bobbin or a package, a contact roller adapted to rotate the package while making contact with the package, and a switching mechanism (a drive mechanism) adapted to move a position of the package by swinging the package holding section with a swinging shaft as a center. When an accumulation amount of a yarn accumulating device arranged upstream of the winding device becomes less than a predetermined amount, the switching mechanism is controlled to move the package holding section to a receded position located away from the contact roller. Accordingly, since a winding speed of the package is decelerated, the accumulation amount in the yarn accumulating device can be increased.

SUMMARY OF THE INVENTION

[0003] In such a winding device, if the package holding section is not moved away from the contact roller at a predetermined timing, since an appropriate accumulation amount would not be secured in the yarn accumulating device, a defective package may be produced. If the package holding section is not moved away from the contact roller by a predetermined distance, a defect may be generated on a surface of the package, for example, a scrambled package may be formed. Therefore, a stable operation of the switching mechanism is demanded. The stable operation of the switching mechanism includes, for example, reliably operating the switching mechanism at the predetermined timing, and/or operating the switching mechanism such that the package holding section is reliably moved away from the contact roller by the predetermined distance.

[0004] An object of the present invention is to provide a winding device capable of stably operating the switching mechanism adapted to move the package holding section away from the contact roller, and a yarn winding machine including the same.

[0005] A winding device according to one aspect of the present invention includes a package holding section adapted to rotatably hold a package around which a yarn

is wound, a switching mechanism adapted to move the package holding section from a winding position, which is a position where the package holding section is located when the yarn is wound around the package, to a receded position, which is a position located away from the winding position, and a control section adapted to operate the switching mechanism after the switching mechanism has moved the package holding section from the receded position to the winding position.

[0006] In the winding device with the above configuration, if the switching mechanism is not returned to an initial state after the switching mechanism has moved the package holding section from the receded position to the winding position, a defect may occur during a next operation. That is, the switching mechanism may not be reliably operated at a predetermined timing or the switching mechanism may not be operated to reliably recede the package holding section by a predetermined amount. In the above-described winding device, after the switching mechanism has moved the package holding section, the control section returns the switching mechanism to the initial state by operating the switching mechanism. In such a manner, the switching mechanism can be reliably operated at the predetermined timing, and the package holding section can be reliably moved to the receded position. Consequently, the switching mechanism can be stably operated.

[0007] In one embodiment, the receded position may include a first position and a second position that is located further away from the winding position than the first position. In this case, the switching mechanism may include a first switching mechanism adapted to move the package holding section from the winding position to the first position and a second switching mechanism adapted to move the first switching mechanism to move the package holding section from the winding position to the second position.

[0008] In the winding device with such a configuration, after the second switching mechanism has moved the package holding section to the second position, for some reasons, the second switching mechanism may not be returned to the initial state, which is a state of the second switching mechanism before the package holding section is moved to the second position. In this case, even if the first switching mechanism is operated, the package holding section cannot be moved to an assumed first position. The reason is that a position of the first switching mechanism, which moves in conjunction with movement of the second switching mechanism, is displaced from an original position. In the winding device of the above-described one embodiment, the control section returns the first switching mechanism to the initial state by operating the first switching mechanism. That is, by operating the first switching mechanism, the position of the first switching mechanism is returned to an original position. Furthermore, since the second switching mechanism moves in conjunction with the movement of the first switching mechanism, by operating the first switching

mechanism, the second switching mechanism can be returned to the initial state. In such a manner, the position of the first switching mechanism can be reliably returned to the original position. By operating the first switching mechanism in this state, the package holding section can be moved to the first position that is assumed at the time of designing. Consequently, the first switching mechanism can be reliably operated at the predetermined timing, and the package holding section can be reliably moved to the first position.

[0009] In one embodiment, the control section may return the second switching mechanism to the initial state before the first switching mechanism moves the package holding section from the winding position to the first position.

[0010] According to the winding device with the above configuration, at a desired timing to move the package holding section to the first position, the package holding section can be reliably moved to the first position.

[0011] In one embodiment, the second switching mechanism may include a single-acting cylinder adapted to move the package holding section from the winding position to the second position and an elastic member adapted to move the package holding section from the second position to the winding position.

[0012] In the winding device with such a configuration, after the single-acting cylinder of the second switching mechanism has moved the package holding section to the second position, for some reasons, the elastic member of the second switching mechanism may not be returned to the initial state, which is a state of the elastic member before the package holding section is moved to the second position. In this case, even if the first switching mechanism is operated, the package holding section cannot be moved to the assumed first position. In the winding device of the above-described one embodiment, the control section returns the first switching mechanism to the initial state by operating the first switching mechanism. That is, by operating the first switching mechanism, the position of the first switching mechanism can be returned to the original position. Furthermore, since the second switching mechanism moves in conjunction with the movement of the first switching mechanism, by operating the first switching mechanism, the elastic member of the second switching mechanism is returned to the initial state. In such a manner, the position of the first switching mechanism can be reliably returned to the original position. By operating the first switching mechanism in this state, the package holding section can be moved to the assumed first position. Consequently, the first switching mechanism can be reliably operated at the predetermined timing, and the package holding section can be reliably moved to the first position.

[0013] According to the winding device with the above configuration, the second switching mechanism adapted to move the package holding section from the winding position to the second position can be configured at a low cost.

[0014] In one embodiment, the winding device may further include a contact roller adapted to rotate in contact with the package when the package holding section is located at the winding position.

[0015] In one embodiment, a yarn winding machine may include the above-described winding device, a yarn accumulating device arranged upstream of the winding device and adapted to accumulate the yarn supplied from a yarn supplying device, and a yarn joining device adapted to perform a yarn joining operation to join the yarn from the yarn accumulating device and the yarn from the winding device. In this case, the control section may move the package holding section to the first position when adjusting an accumulation amount of the yarn in the yarn accumulating device, and may move the package holding section to the second position when performing the yarn joining operation by the yarn joining device.

[0016] According to the yarn winding machine with the above configuration, even when the accumulation amount of the yarn in the yarn accumulating device decreases, by moving the package holding section to the first position and relatively reducing a speed in which the yarn is unwound from the yarn accumulating device, the accumulation amount of the yarn is increased. Furthermore, even when a yarn breakage or the like occurs, by moving the package holding section to the second position, a yarn end of the yarn is prevented from being entangled with a member in proximity to the package. In the yarn winding machine with such a configuration, the control section moves the package holding section from the winding position to the second position for the yarn joining operation by the yarn joining device. Then, regardless of the accumulation amount of the yarn in the yarn accumulating device, the control section operates the first switching mechanism (performs an ON/OFF control) to return the second switching mechanism to the initial state. In such a manner, when moving the package holding section from the winding position to the first position to adjust the accumulation amount of the yarn in the yarn accumulating device, the second switching mechanism is always in the initial state. Consequently, since the package holding section can be reliably moved to the first position at the predetermined timing, the accumulation amount of the yarn can be reliably adjusted. Furthermore, an occurrence of a defect such as damage, for example, on a surface of the package caused by the package holding section that has not moved an assumed distance can be reduced.

[0017] In one embodiment, the control section may return the second switching mechanism to the initial state after the yarn joining operation is performed by the yarn joining device and before the accumulation amount of the yarn in the yarn accumulating device is adjusted.

[0018] According to the yarn winding machine with the above configuration, the accumulation amount of the yarn can be reliably adjusted and the defect such as damage on the surface of the package can be reduced.

[0019] In one embodiment, the control section may re-

turn the second switching mechanism to the initial state after an elapse of a predetermined period of time after the yarn joining operation is performed by the yarn joining device.

[0020] According to the yarn winding machine with the above configuration, the first switching mechanism can be stably operated with a simple setting.

[0021] In one embodiment, the yarn accumulating device may include a yarn accumulating roller adapted to temporarily accumulate the yarn by rotating while the yarn is being wound around an outer peripheral surface thereof.

[0022] In one embodiment, the yarn winding machine may further include a traverse guide provided independently from a contact roller adapted to rotate in contact with the package, and adapted to traverse the yarn to be wound around the package. In this case, when the package holding section is moved to the first position by the first switching mechanism, the yarn is located at a position where the yarn can be traversed by the traverse guide. When the package holding section is moved to the second position by the second switching mechanism, the yarn is located at a position where the yarn cannot be traversed by the traverse guide and a bunch-winding may be formed on the package.

[0023] According to the yarn winding machine, even when an amount of the yarn wound around the yarn accumulating roller decreases, by moving the package holding section from the winding position to the first position, the yarn is wound at a speed faster than a speed in which the yarn is unwound from the yarn accumulating roller, and thus the accumulation amount of the yarn in the yarn accumulating roller can be increased. Furthermore, even when the yarn breakage or the like occurs, since the bunch-winding is formed on the package by moving the package holding section from the winding position to the second position, the yarn end can be prevented from being entangled with the member in proximity to the package.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 is a front view illustrating a spinning machine according to one embodiment;

FIG. 2 is a side view illustrating a spinning unit included in the spinning machine of FIG. 1;

FIG. 3 is a block diagram illustrating main configurations of the spinning machine;

FIG. 4 is a perspective view illustrating a winding device included in the spinning machine of FIG. 1;

FIG. 5 is a side view illustrating a state of the winding device at the time of winding;

FIG. 6 is a side view illustrating a state of the winding device when adjusting an accumulation amount;

FIG. 7 is a side view illustrating a state of the winding device at the time of yarn joining operation;

FIG. 8 is a side view illustrating a state of the winding device that has not been returned to an original position; and

FIG. 9 is a flow chart illustrating control processing in a unit controller.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0025] One embodiment will be described with reference to the accompanying drawings. In description of the drawings, the same reference numerals are denoted for the same elements, and redundant description will be omitted. The dimensional ratios in the drawings do not necessarily match with the description. In the present specification, "upstream" and "downstream" respectively indicate upstream and downstream in a travelling direction of a spun yarn (yarn) 10 at the time of spinning.

[0026] As illustrated in FIG. 1, a spinning machine (yarn winding machine) 1 includes a plurality of spinning units 2, a yarn joining cart 3, a blower box 4, and a motor box 5. The plurality of spinning units 2 is arranged in a row, and each of the spinning units 2 is adapted to produce the spun yarn 10 and to wind the spun yarn 10 around a package 45. The yarn joining cart 3 is adapted to perform a yarn joining operation in a spinning unit 2 where the spun yarn 10 has been disconnected. The blower box 4 accommodates an air supply source adapted to generate suction flow and/or whirling flow in each section of the spinning unit 2, and the like. The motor box 5 accommodates a motor adapted to supply power to each section of the spinning unit 2, and the like.

[0027] As illustrated in FIGS. 1 and 2, each spinning unit 2 includes a draft device 7, a pneumatic spinning device (yarn supplying device) 9, a yarn accumulating device 12, and a winding device 13 as main components in this order from upstream towards downstream. The draft device 7 is provided in proximity to an upper end of a frame 6 provided with the spinning machine 1. A fiber bundle 8 fed from the draft device 7 is spun by the pneumatic spinning device 9. The spun yarn 10 produced by the pneumatic spinning device 9 is wound by the winding device 13 via a yarn accumulating roller 21, and thus the package 45 is formed. In the following description, a bobbin 48 with yarn layers of the spun yarn 10 wound therearound is referred to as the package 45.

[0028] The draft device 7 is adapted to produce the fiber bundle 8 by stretching a sliver 15. The draft device 7 includes four pairs of rollers, which are a pair of back rollers 16, a pair of third rollers 17, a pair of middle rollers 19 equipped with apron belts 18, and a pair of front rollers 20. Bottom rollers of each pair of rollers 16, 17, 19, 20 are driven by power from the motor box 5 or power of an electric motor (not illustrated) arranged in each spinning unit 2. Each pair of rollers 16, 17, 19, and 20 is respectively driven at rotational speeds that are different from one another. Accordingly, the sliver 15 supplied from upstream is stretched and formed into the fiber bundle 8,

and the fiber bundle 8 is fed to the pneumatic spinning device 9 located downstream.

[0029] The pneumatic spinning device 9 is adapted to twist the fiber bundle 8 by use of whirling airflow to produce the spun yarn 10. Although detailed description and drawings are omitted, the pneumatic spinning device 9 includes a fiber guiding section, a whirling airflow generating nozzle, and a hollow guide shaft body. The fiber guiding section is adapted to guide the fiber bundle 8 fed from the draft device 7 to a spinning chamber formed inside the pneumatic spinning device 9. The whirling airflow generating nozzle is arranged around a path of the fiber bundle 8 and is adapted to generate the whirling airflow in the spinning chamber. With the whirling airflow, a fiber end of the fiber bundle 8 inside the spinning chamber is inverted and whirled. The hollow guide shaft body is adapted to guide the spun yarn 10 from the spinning chamber to outside the pneumatic spinning device 9. The pneumatic spinning device 9 is controlled to be driven/stopped by a unit controller 30 (see FIG. 3).

[0030] The yarn accumulating device 12 is provided downstream of the pneumatic spinning device 9. The yarn accumulating device 12 includes the yarn accumulating roller 21, a yarn hooking member 22, an upstream guide 23, an electric motor 25, a downstream guide 26, and an accumulation amount sensor 27.

[0031] The yarn hooking member 22 is adapted to guide the spun yarn 10 to an outer peripheral surface of the yarn accumulating roller 21 by rotating together with the yarn accumulating roller 21 with the spun yarn 10 hooked thereon. The yarn hooking member 22 is supported in a relatively rotatable manner with respect to the yarn accumulating roller 21.

[0032] The yarn accumulating roller 21 is adapted to temporarily accumulate the spun yarn 10 by winding the spun yarn 10 around the outer peripheral surface thereof. The yarn accumulating roller 21 is rotationally driven at a constant rotational speed by the electric motor 25 controlled by the unit controller 30. With this configuration, the spun yarn 10 that has been guided to the outer peripheral surface of the yarn accumulating roller 21 by the yarn hooking member 22 is tightly wound around the yarn accumulating roller 21 by the rotation of the yarn accumulating roller 21 and pulls a spun yarn 10 located upstream of the yarn accumulating device 12. Accordingly, the spun yarn 10 can be continuously drawn from the pneumatic spinning device 9.

[0033] The accumulation amount sensor 27 is adapted to detect in a non-contacting manner, an accumulation amount of the spun yarn 10 wound around the yarn accumulating roller 21 and to transmit a detection signal to the unit controller 30.

[0034] The upstream guide 23 is arranged slightly upstream of the yarn accumulating roller 21. The upstream guide 23 is adapted to appropriately guide the spun yarn 10 to the outer peripheral surface of the yarn accumulating roller 21. The upstream guide 23 prevents twists of the spun yarn 10 that propagate from the pneumatic spin-

ning device 9 from propagating to downstream of the upstream guide 23.

[0035] A yarn clearer 52 is provided on a front surface side of the frame 6 of the spinning machine 1 (a side of a worker passage) and between the pneumatic spinning device 9 and the yarn accumulating device 12. The yarn clearer 52 is adapted to monitor a thickness of the travelling spun yarn 10 and/or a presence and an absence of a foreign substance in the spun yarn 10. The yarn clearer 52 transmits a yarn defect detection signal to the unit controller 30 when detecting a yarn defect of the spun yarn 10.

[0036] When receiving the yarn defect detection signal, the unit controller 30 immediately stops injection of compressed air from the whirling airflow generating nozzle of the pneumatic spinning device 9. Accordingly, the whirling airflow is stopped and thereby twisting the fiber bundle 8 is stopped, and introduction of the fiber bundle 8 into the pneumatic spinning device 9 is also stopped. Then, a continuous state of fibers is disconnected in the pneumatic spinning device 9, and the spun yarn 10 is disconnected. Subsequently, the unit controller 30 further stops the draft device 7 and the like.

[0037] The unit controller 30 transmits a control signal to the yarn joining cart 3 to cause the yarn joining cart 3 to travel to the relevant spinning unit 2. Then, the unit controller 30 drives the pneumatic spinning device 9 and the like again, causes the yarn joining cart 3 to perform the yarn joining operation, and restarts winding in the relevant spinning unit 2. At this time, after the pneumatic spinning device 9 has restarted spinning and before the winding is restarted, the yarn accumulating device 12 eliminates slackening of the spun yarn 10 by accumulating the spun yarn 10, which is continuously fed from the pneumatic spinning machine 9, around the yarn accumulating roller 21.

[0038] As illustrated in FIG. 2, the yarn joining cart 3 includes a splicer (a yarn joining device) 43, a suction pipe 44, and a suction mouth 46. When a yarn breakage or a yarn cut has occurred in a certain spinning unit 2, by a control signal from the unit controller 30, the yarn joining cart 3 drives wheels 42 and travels on a rail 41 (see FIG. 1) fixed to the frame 6 to such a spinning unit 2, and stops to perform the yarn joining operation.

[0039] The suction pipe 44 is capable of vertically swinging with an axis as a center. The suction pipe 44 is adapted to suck and catch a yarn end (an upper yarn) fed from the pneumatic spinning device 9 and to guide the caught yarn end to the splicer 43. The suction mouth 46 is capable of vertically swinging with an axis as a center. The suction mouth 46 is adapted to suck and catch a yarn end (a lower yarn) from the package 45 supported by the winding device 13 and to guide the caught yarn end to the splicer 43. Although detailed description on the splicer 43 is omitted, the upper yarn and the lower yarn can be joined by twisting the yarn ends together with the whirling airflow.

[0040] As illustrated in FIGS. 4 and 5, the winding de-

vice 13 includes a package holding section 71, a first switching mechanism (switching mechanism) 60, a second switching mechanism (switching mechanism) 80, a contact roller 91, a traverse device 93, and the unit controller 30 (see FIG. 3) serving as a control section. The winding device 13 moves the package holding section 71 to a first position and a second position by operating the first switching mechanism 60 and the second switching mechanism 80. Each of the first position and the second position is set in advance.

[0041] In the following description, based on a vertical relation of the package holding section 71 in a state illustrated in FIGS. 4 and 5, wordings including concepts of "upper" and "lower" may be used in description of positional relation of each section. When using wordings including concepts of "front" and "back" in the description of the positional relation of each section, front side of the spinning machine 1 (a left side of FIG. 5) is referred to as "front" and back side of the spinning machine 1 (a right side of FIG. 6) is referred to as "back". In side views of the package holding section 71 illustrated in FIGS. 5 to 8, illustration of a sandwich arm 75a on the front side in the drawings is omitted.

[0042] The contact roller 91 is adapted to rotate in contact with an outer peripheral surface of the package 45. The traverse device 93 includes a traverse guide 76 capable of guiding the spun yarn 10. By driving the contact roller 91 with an electric motor (not illustrated) while reciprocating the traverse guide 76 with a drive means (not illustrated), the winding device 13 rotates the package 45 in contact with the contact roller 91 while traversing the spun yarn 10, and winds the spun yarn 10 around the package 45.

[0043] As illustrated in FIGS. 4 and 5, the package holding section 71 is adapted to rotatably hold the package 45 and includes a fixed portion 73 fixed to the frame 6 and a swinging portion 75 capable of swinging forward and backward with respect to the fixed portion 73.

[0044] The fixed portion 73 is fixed to the frame 6 located below the contact roller 91. Specifically, the fixed portion 73 is screwed to the frame 6 in a screwed portion 73a provided in the fixed portion 73.

[0045] In a lower end of a lower fixed portion 73b of the fixed portion 73, a pair of rotation links 73d and 73d is provided. The rotation links 73d and 73d are coupled to each other with a rotation shaft 73c that passes through in a thickness direction (a direction in which the spinning units 2 are arranged) with the lower fixed portion 73b therebetween. A lower end 60a of a case of the first switching mechanism 60, which is to be described later, is coupled to one rotation link 73d at a predetermined position located away from the rotation shaft 73c in a direction of rotation diameter of the rotation shaft 73c (a rotation diameter direction). A tip end 82a of a piston rod 82 of a single-acting cylinder 81 included in the second switching mechanism 80, which is to be described later, is coupled to the other rotation link 73d at a position located away from the rotation shaft 73c in the rotation

diameter direction. An upper end 81a of a case of the single-acting cylinder 81 is coupled to an upper end of the lower fixed portion 73b.

[0046] The swinging portion 75 is supported with respect to the fixed portion 73 and is capable of swinging about a support shaft (swinging shaft) 70. The swinging portion 75 includes a main body portion 75f and two sandwich arms (the sandwich arm 75a and the sandwich arm 75b).

[0047] The main body portion 75f is swingably provided with respect to the support shaft 70 fixed to the fixed portion 73. In other words, the main body portion 75f is swingably provided with respect to the frame 6. A tip end of a piston rod 61 of the first switching mechanism 60, which is to be described later, is coupled to a back end portion 75g of the main body portion 75f.

[0048] The sandwich arms 75a and 75b extend substantially parallel to each other and hold the package 45 in a sandwiching manner. The sandwich arms 75a and 75b are integrally formed with the main body portion 75f. That is, the sandwich arms 75a and 75b swing with respect to the support shaft 70 together with the main body portion 75f.

[0049] Bobbin holders 75c and 75c are respectively provided on the sandwich arm 75a and the sandwich arm 75b. The bobbin holders 75c and 75c are respectively provided at positions to face each other. One bobbin holder 75c is rotatably provided on the sandwich arm 75a via a bearing. The other bobbin holder 75c is rotatably provided on the sandwich arm 75b via a bearing. The package holding section 71 holds the package 45 by sandwiching the package 45 with the two bobbin holders 75c and 75c. The package 45 is rotated together with the two bobbin holders 75c and 75c with respect to the swinging portion 75 by drive power of the contact roller 91.

[0050] The sandwich arm 75a is supported by an opening/closing shaft 75d and is swingably provided about the opening/closing shaft 75d so as to move close to or away from the sandwich arm 75b. The sandwich arm 75a is urged by a built-in spring (not illustrated) in a direction of moving close to the sandwich arm 75b.

[0051] An operating lever 75e that extends further upward from a position of the bobbin holder 75c is mounted at an upper end portion of the sandwich arm 75a. The operating lever 75e is operated when the bobbin 48 or the package 45 is attached to or removed from the bobbin holders 75c and 75c.

[0052] The first switching mechanism 60 is adapted to appropriately bring the package 45 into contact with the contact roller 91. The first switching mechanism 60 is formed as a double-acting air pressure cylinder, and as illustrated in FIG. 4, includes the piston rod 61, a piston 62 fixed to the piston rod 61, a contact-pressure port 63, a reverse-pressure port 64, and a lifter port 68 as main components.

[0053] Air is supplied from the contact-pressure port 63 and the reverse-pressure port 64 into the case of the first switching mechanism 60. When there is a difference

in air pressure between air supplied to the contact-pressure port 63 and air supplied to the reverse-pressure port 64, the air pushes the piston 62 and drives the piston rod 61. When the piston rod 61 is pushed upward, the back end portion 75g of the main body portion 75f is lifted up, and the swinging portion 75 is swung to a front side of the spinning unit 2 (a left direction of FIG. 5) with the support shaft 70 as a center. As a result, the package 45 is moved in a direction in which the package 45 is located away from the contact roller 91. On the other hand, when the piston rod 61 is pushed downward, the back end portion 75g of the main body portion 75f is pulled downward, and the package holding section 71 is swung to a back side of the spinning unit 2 (a right direction of FIG. 5) with the support shaft 70 as a center. As a result, the package 45 is pressed against the contact roller 91. The contact-pressure port 63 is connected to a contact-pressure compressed air source 65 provided within the blower box 4. The reverse-pressure port 64 is connected to the contact-pressure compressed air source 65 via a depressurization valve 67.

[0054] The first switching mechanism 60 moves the package holding section 71 from a winding position (a position of the swinging portion 75 illustrated in FIG. 5), which is a position of the package holding section 71 when the spun yarn 10 is wound around the package 45, to the first position (a receded position: a position of the swinging portion 75 illustrated in FIG. 6), which is a position located away from the winding position. In other words, the first switching mechanism 60 moves the package 45 from the winding position to the first position.

[0055] Compressed air is supplied from the lifter port 68 into the case of the first switching mechanism 60. The lifter port 68 is connected to a first compressed air source 69. The lifter port 68 is provided separately from the reverse-pressure port 64 to move the piston rod 61 slightly upward. An electromagnetic valve (not illustrated) is arranged between the lifter port 68 and the first compressed air source 69, and the unit controller 30 controls whether to supply compressed air to the lifter port 68.

[0056] When compressed air is supplied to the lifter port 68, as illustrated in FIG. 6, the piston rod 61 is pushed slightly upward (by a distance L11 illustrated in FIG. 6), and the back end portion 75g of the main body portion 75f is slightly lifted up. The sandwich arms 75a and 75b are slightly swung to the front side of the spinning unit 2 (a left direction of FIG. 6) with the support shaft 70 as a center, and thus the package 45 is slightly moved away (by a distance L12 illustrated in FIG. 6) from the contact roller 91. Such a movement of the package holding section 71 (the package 45) is performed when making fine adjustments to a winding speed of the spun yarn 10 to adjust the accumulation amount of the spun yarn 10 in the yarn accumulating device 12. When the package holding section 71 is moved from the winding position to the first position by the first switching mechanism 60, the spun yarn 10 is maintained to be engaged with the traverse guide 76. That is, while being traversed by the

traverse guide 76, the spun yarn 10 is wound around the package 45.

[0057] The second switching mechanism 80 is adapted to move the package holding section 71 from the winding position (the position of the swinging portion 75 illustrated in FIG. 5) to the second position (a receded position: a position of the swinging portion 75 illustrated in FIG. 7). The second position is a position located further away from the winding position than the first position (the receded position: the position of the swinging portion 75 illustrated in FIG. 6). In other words, the second switching mechanism 80 moves the package 45 from the winding position to the second position. As illustrated in FIGS. 2 and 4, the second switching mechanism 80 includes the single-acting cylinder 81 adapted to move the package holding section 71 from the winding position to the second position, and a spring (an elastic member) 84 adapted to move the package holding section 71 from the second position to the winding position. The single-acting cylinder 81 includes the piston rod 82, a piston 83 fixed to the piston rod 82, and a port 86 as main components. An electromagnetic valve (not illustrated) is arranged between the port 86 and the second compressed air source 89, and the unit controller 30 controls whether to supply compressed air to the port 86.

[0058] Compressed air is supplied from the port 86 into the case of the single-acting cylinder 81. When the compressed air is supplied to the port 86 and the piston rod 82 is drawn into the case, as illustrated in FIG. 7, the rotation link 73d is rotated about the rotation shaft 73c (in a counterclockwise direction of FIG. 7). With this rotation, the lower end 60a of the case of the first switching mechanism 60 is pushed upward by the rotation link 73d. Accordingly, the entire first switching mechanism 60 is pushed upward with a relatively great stroke (by a distance L21 illustrated in FIG. 7). As a result, the back end portion 75g of the main body portion 75f is lifted with a relatively great stroke. The sandwich arms 75a and 75b are relatively greatly swung to the front side of the spinning unit 2 (a left direction of FIG. 7) with the support shaft 70 as a center, and thus the package 45 is moved away from the contact roller 91 relatively greatly (by a distance L22 illustrated in FIG. 7). The distance L22 is longer than the distance L12.

[0059] Such a movement of the package holding section 71 (the package 45) by the second switching mechanism 80 is performed immediately after a yarn breakage has occurred and/or before a yarn joining operation is performed by the splicer 43. When the package holding section 71 is moved from the winding position to the second position by the second switching mechanism 80, the spun yarn 10 is disengaged from the traverse guide 76. That is, since the spun yarn 10 is not traversed by the traverse guide 76, a bunch-winding is formed on the package 45.

[0060] The unit controller 30 illustrated in FIG. 3 is a portion in which various types of control processing in the winding device 13 are performed, and is formed of a

Central Processing Unit (CPU), a Read Only Memory (ROM), a Random Access Memory (RAM), a hard disk, and the like. The various types of control processing in the unit controller 30 are, for example, formed as software in which a program stored in the ROM is loaded onto the RAM and is performed in the CPU. A portion in which the various types of control processing are performed in the unit controller 30 may be formed as hardware.

[0061] The unit controller 30 controls the first switching mechanism 60 and the second switching mechanism 80 to move the package holding section 71 (the package 45) to any one of the winding position, the first position, and the second position at a predetermined timing. In other words, the unit controller 30 controls the first switching mechanism 60 or the second switching mechanism 80 to move the package holding section 71 away from the winding position at the predetermined timing. In the following description, a control performed to move the package holding section 71 away from the winding position by operating the first switching mechanism 60 or the second switching mechanism 80 will be referred to as a "move-away control". As described later, the move-away control in the present embodiment includes a "lift-up control" to move the package holding section 71 from the winding position to the first position, and a "retreat control" to move the package holding section 71 from the winding position to the second position.

[0062] When winding the spun yarn 10 around the package 45 by rotating the package 45 in contact with the contact roller 91 while traversing the spun yarn 10, the unit controller 30 positions the package holding section 71 at the winding position.

[0063] When adjusting the winding speed of the spun yarn 10 and thereby adjusting the accumulation amount of the spun yarn 10 in the yarn accumulating device 12, the unit controller 30 moves the package holding section 71 from the winding position to the first position by operating the first switching mechanism 60 (the lift-up control).

[0064] Immediately after a yarn breakage has occurred and/or before the splicer 43 performs the yarn joining operation, the unit controller 30 moves the package holding section 71 from the winding position to the second position by operating the second switching mechanism 80 (the retreat control).

[0065] In the winding device 13 of the present embodiment, after the second switching mechanism 80 has moved the package holding section 71 from the second position to the winding position, the unit controller 30 returns the second switching mechanism 80 to an initial state by operating the first switching mechanism 60. The initial state indicates a state of the second switching mechanism 80 before the second switching mechanism 80 moves the package holding section 71 from the winding position to the second position (a state of the second switching mechanism 80 illustrated in FIG. 5). This control by the unit controller 30 will hereinafter be referred to as a "reset control". The unit controller 30 of the present embodiment operates the first switching mechanism 60

and returns the first switching mechanism 60 to an original position (a position of the first switching mechanism 60 illustrated in FIG. 5) to return the second switching mechanism 80 to the initial state.

[0066] Specifically, as illustrated in FIG. 8, in a state in which the spring 84 of the second switching mechanism 80 is contracted, in other words, in a state in which the second switching mechanism 80 is not in the initial state, the unit controller 30 operates the first switching mechanism 60. At this time, since the rotation link 73d is rotatable in a clockwise direction, the rotation link 73d is rotated in the clockwise direction by operation of the first switching mechanism 60. By the rotation of the rotation link 73d, the lower end 60a of the case of the first switching mechanism 60 is moved downward. That is, a position of the first switching mechanism 60 is moved to the original position (the position of the first switching mechanism 60 illustrated in FIG. 5). Simultaneously with this movement, the tip end 82a of the piston rod 82 in the second switching mechanism 80 is moved in a right direction of FIG. 8, and the spring 84 is pulled in the right direction. Accordingly, the second switching mechanism 80 is returned to the initial state as illustrated in FIG. 5.

[0067] The reset control by the unit controller 30 described above is performed before the first switching mechanism 60 moves the package holding section 71 to the first position. To describe in further details, the above-described reset control is performed after the yarn joining operation is performed by the splicer 43 and before a next adjustment of the accumulation amount of the spun yarn 10 in the yarn accumulating device 12 is performed. In other words, the reset control is performed after the retreat control has been performed and before a next lift-up control is performed.

[0068] The reset control will be described with reference to FIG. 9. In a case in which the yarn joining operation is required to be performed, for example, when the spun yarn 10 is disconnected, the unit controller 30 moves the package holding section 71 to the second position by operating the second switching mechanism 80 (step S1). When confirming that the package holding section 71 has moved to the second position, the unit controller 30 moves the yarn joining cart 3 to a predetermined position and causes the splicer 43 to perform the yarn joining operation (step S2).

[0069] Then, the unit controller 30 determines whether or not a predetermined period of time (for example, 30 seconds) has elapsed after the yarn joining operation (may be after performing the retreat control) (step S3). When determining that the predetermined period of time has elapsed (step S3: YES), the unit controller 30 performs the reset control (step S4). The operation of the first switching mechanism 60 in the reset control may be one time or a plurality of times. Furthermore, the operation of the first switching mechanism 60 in the reset control may be continuous or intermittent.

[0070] Subsequently, the unit controller 30 monitors a detection signal transmitted from the accumulation

amount sensor 27 and determines whether or not the accumulation amount of the spun yarn 10 in the yarn accumulating device 12 is a predetermined amount or less (step S5). When determining that the accumulation amount of the spun yarn 10 in the yarn accumulating device 12 is the predetermined amount or less (step S5: YES), the unit controller 30 performs the lift-up control (step S6).

[0071] Next, effects of the above-described winding device 13 and the spinning machine 1 including the same will be described.

[0072] In the winding device 13 of the above-described embodiment, after the second switching mechanism 80 has moved the package holding section 71, the unit controller 30 returns the second switching mechanism 80 to the initial state. Specifically, in the winding device 13 of the above-described embodiment, after performing the retreat control by the unit controller 30, the reset control is always performed. Further specifically, after performing the retreat control, the unit controller 30 performs the reset control to operate the first switching mechanism 60 (to perform an ON/OFF control) regardless of the accumulation amount of the spun yarn 10 in the yarn accumulating device 12. In such a manner, the second switching mechanism 80 is reliably returned to the initial state. Consequently, the package holding section 71 can be reliably moved (lifted up) from the winding position to the first position at a predetermined timing. That is, the first switching mechanism 60 can be stably operated and the lift-up by the first switching mechanism 60 can be reliably performed.

[0073] As illustrated in FIG. 5, the second switching mechanism 80 in the winding device 13 of the above-described embodiment uses the spring 84 as a member for moving the package holding section 71 from the second position to the winding position. When the package holding section 71 is moved from the winding position to the second position, the spring 84 is switched to a contracted state (see FIG. 7). By using elastic force of the spring 84 which tries to return to an original state (see FIG. 5) from the contracted state (see FIG. 7), the second switching mechanism 80 can return the package holding section 71 from the second position to the winding position.

[0074] However, as illustrated in FIG. 8, there may be a case in which the spring 84 in the second switching mechanism 80 remains contracted even after the package holding section 71 has been returned to the winding position, in other words, there may be a case in which the second switching mechanism 80 has not been completely returned to the initial state. When the lift-up control is performed by the unit controller 30 under such a state, operation of the first switching mechanism 60 may be absorbed by the second switching mechanism 80. That is, since the lower end 60a of the case of the first switching mechanism 60 is in a movable state (the rotation link 73d is in a movable state in the clockwise direction), even when the first switching mechanism 60 is operated, the

main body portion 75f of the swinging portion 75 may not be moved by an assumed amount.

[0075] In the winding device 13 of the above-described embodiment, the first switching mechanism 60 is returned to the original position by operating the first switching mechanism 60 by the unit controller 30, and thus the second switching mechanism 80 is returned to the initial state. That is, when operating the first switching mechanism 60 in a state in which the second switching mechanism 80 is not in the initial state as illustrated in FIG. 8 (in the state in which the spring 84 is contracted), since the rotation link 73d is in the movable state in the clockwise direction, the rotation link 73d is rotated in the clockwise direction. With the rotation of the rotation link 73d, the lower end 60a of the case of the first switching mechanism 60 is moved downward. In other words, the first switching mechanism 60 is moved to the original position (the position of the first switching mechanism 60 illustrated in FIG. 5). Simultaneously with the movement, the tip end 82a of the piston rod 82 in the second switching mechanism 80 is moved in the right direction illustrated in FIG. 8, and the spring 84 is pulled in the right direction. Accordingly, the second switching mechanism 80 can be returned to the initial state as illustrated in FIG. 5. Consequently, the package holding section 71 can be reliably moved (lifted up) from the winding position to the first position at the predetermined timing. That is, the first switching mechanism 60 can be stably operated.

[0076] One embodiment of the present invention has been described above, but the present invention is not limited to the above-described embodiment, and various changes may be made without departing from the scope of this invention.

[0077] Description has been made with an example that in the winding device 13 of the above-described embodiment, a switching mechanism adapted to move the package holding section 71 from the winding position to the retracted position (the first position and the second position) is formed of the first switching mechanism 60 and the second switching mechanism 80, but the present invention is not limited to such an example. For example, the switching mechanism adapted to move the package holding section 71 from the winding position to the retracted position may be formed of one or more than three switching mechanisms. Even in this case, if a reset control to return all the switching mechanisms to the initial state is performed by operating at least one switching mechanism, the switching mechanism adapted to move a package away from a contact roller can be stably operated.

[0078] Description has been made with an example that in the winding device 13 of the above-described embodiment, the first switching mechanism 60 is configured as a double-acting air pressure cylinder. However, the present invention is not limited to such an example, and for example, similar to the second switching mechanism 80 in the above-described embodiment, a first switching mechanism may include a single-acting cylinder adapted

to move a package holding section from the winding position to the first position and a spring (an elastic member) adapted to move the package holding section from the first position to the winding position. Even with such a configuration, by operating the single-acting cylinder of the first switching mechanism, the first switching mechanism can be returned to an initial state. Consequently, the package holding section can be reliably moved (lifted up) from the winding position to the first position at a predetermined timing. That is, the first switching mechanism can be stably operated, and the lift-up by the first switching mechanism can be reliably performed.

[0079] Description has been made with an example in which the unit controller 30 of the above-described embodiment performs the reset control after an elapse of a predetermined period of time after performing the retreat control, but the present invention is not limited to such an example. For example, the accumulation amount sensor 27 may detect that the accumulation amount of the spun yarn 10 in the yarn accumulating roller 21 has reached a predetermined amount, which is different from the accumulation amount to perform the lift-up control, and the unit controller 30 may perform the reset control based on a signal from the accumulation amount sensor 27.

[0080] In the spinning machine 1 and the spinning unit 2 in the above-described embodiment, the spun yarn 10 is fed from the pneumatic spinning device 9 by the yarn accumulating roller 21 adapted to accumulate the spun yarn 10 by winding a certain amount of the spun yarn 10 therearound. A spun yarn may be fed from a pneumatic spinning device by a delivery roller and a nip roller.

[0081] In the spinning machine 1 and the spinning unit 2 in the above-described embodiment, the spun yarn 10 is disconnected by stopping whirling airflow of the pneumatic spinning device 9 at the time of detecting a yarn defect. However, a spun yarn may be disconnected by a cutter.

[0082] In the spinning machine 1 and the spinning unit 2 in the above-described embodiment, a yarn path is arranged such that the spun yarn 10 travels downward from the draft device 7 located in an upper part towards the winding device 13 located in a lower part. However, the yarn path may be arranged such that a spun yarn travels from the lower part towards the upper part.

[0083] In the spinning machine 1 and the spinning unit 2 in the above-described embodiment, the traverse guide 76 of the traverse device 93 is commonly driven among the plurality of spinning units 2. Each section of a spinning unit (for example, a draft device, a pneumatic spinning device, a yarn winding device, etc.) may be independently driven in each spinning unit 2.

[0084] In the above-described embodiment, description has been made with an example in which the unit controller 30 adapted to perform control of the entire spinning machine 1 performs various types of control processing in the winding device 13. However, for example, a controller dedicated to the various types of control

processing in the winding device 13 may be provided in the winding device 13.

5 Claims

1. A winding device (13) comprising:

a package holding section (71) adapted to rotatably hold a package (45) around which a yarn (10) is wound;
a switching mechanism (60, 80) adapted to move the package holding section (71) from a winding position to a receded position, the winding position being a position where the package holding section (71) is located when the yarn (10) is wound around the package (45), and the receded position being a position located away from the winding position; and
a control section (30) adapted to operate the switching mechanism (60, 80) after the switching mechanism (60, 80) has moved the package holding section (71) from the receded position to the winding position.

2. The winding device (13) according to claim 1, wherein the control section (30) is adapted to operate the switching mechanism (60, 80) to return the switching mechanism (60, 80) to an initial state after the switching mechanism (60, 80) has moved the package holding section (71) from the receded position to the winding position, the initial state being a state of the switching mechanism (60, 80) before the package holding section (71) is moved from the winding position to the receded position.

3. The winding device (13) according to claim 1 or claim 2, wherein the receded position includes a first position and a second position, the second position being located further away from the winding position than the first position, and the switching mechanism (60, 80) includes:

a first switching mechanism (60) adapted to move the package holding section (71) from the winding position to the first position; and
a second switching mechanism (80) adapted to move the first switching mechanism (60) to move the package holding section (71) from the winding position to the second position.

4. The winding device (13) according to claim 3, wherein the control section (30) is adapted to return the second switching mechanism (80) to the initial state before the first switching mechanism (60) moves the package holding section (71) from the winding position to the first position.

5. The winding device (13) according to claim 4, wherein the second switching mechanism (80) includes:

a single-acting cylinder (81) adapted to move the package holding section (71) from the winding position to the second position; and
an elastic member (84) adapted to move the package holding section (71) from the second position to the winding position.

6. The winding device (13) according to any one of claim 1 through claim 5, further comprising a contact roller (91) adapted to rotate in contact with the package (45) when the package holding section (71) is located at the winding position.

7. A yarn winding machine (1) comprising:

the winding device (13) according to any one of claim 1 through claim 6;

a yarn accumulating device (12) arranged upstream of the winding device (13) and adapted to accumulate the yarn (10) supplied from a yarn supplying device (9); and

a yarn joining device (43) adapted to perform a yarn joining operation to join the yarn (10) from the yarn accumulating device (12) and the yarn (10) from the winding device (13),

wherein the control section (30) is adapted to move the package holding section (71) to the first position when adjusting an accumulation amount of the yarn (10) in the yarn accumulating device (12), and to move the package holding section (71) to the second position when performing the yarn joining operation by the yarn joining device (43).

8. The yarn winding machine (1) according to claim 7, wherein the control section (30) is adapted to return the second switching mechanism (80) to the initial state after the yarn joining operation is performed by the yarn joining device (43) and before the accumulation amount of the yarn (10) in the yarn accumulating device (12) is adjusted.

9. The yarn winding machine (1) according to claim 7 or claim 8, wherein the control section (30) is adapted to return the second switching mechanism (80) to the initial state after an elapse of a predetermined period of time after the yarn joining operation is performed by the yarn joining device (43).

10. The yarn winding machine (1) according to any one of claim 7 through claim 9, wherein the yarn accumulating device (12) includes a yarn accumulating roller (21) adapted to temporarily accumulate the yarn (10) by rotating while the yarn (10) is being wound around an outer peripheral surface thereof.

11. The yarn winding machine (1) according to any one of claim 7 through claim 10, further comprising a traverse guide (76) provided independently from a contact roller (91), and adapted to traverse the yarn (10) to be wound around the package (45), the contact roller (91) being adapted to rotate in contact with the package (45),

wherein when the package holding section (71) is moved to the first position by the first switching mechanism (60), the yarn (10) is located at a position where the yarn (10) can be traversed by the traverse guide (76), and

when the package holding section (71) is moved to the second position by the second switching mechanism (80), the yarn (10) is located at a position where the yarn (10) cannot be traversed by the traverse guide (76) and a bunch-winding is formed on the package (45) .

FIG. 1

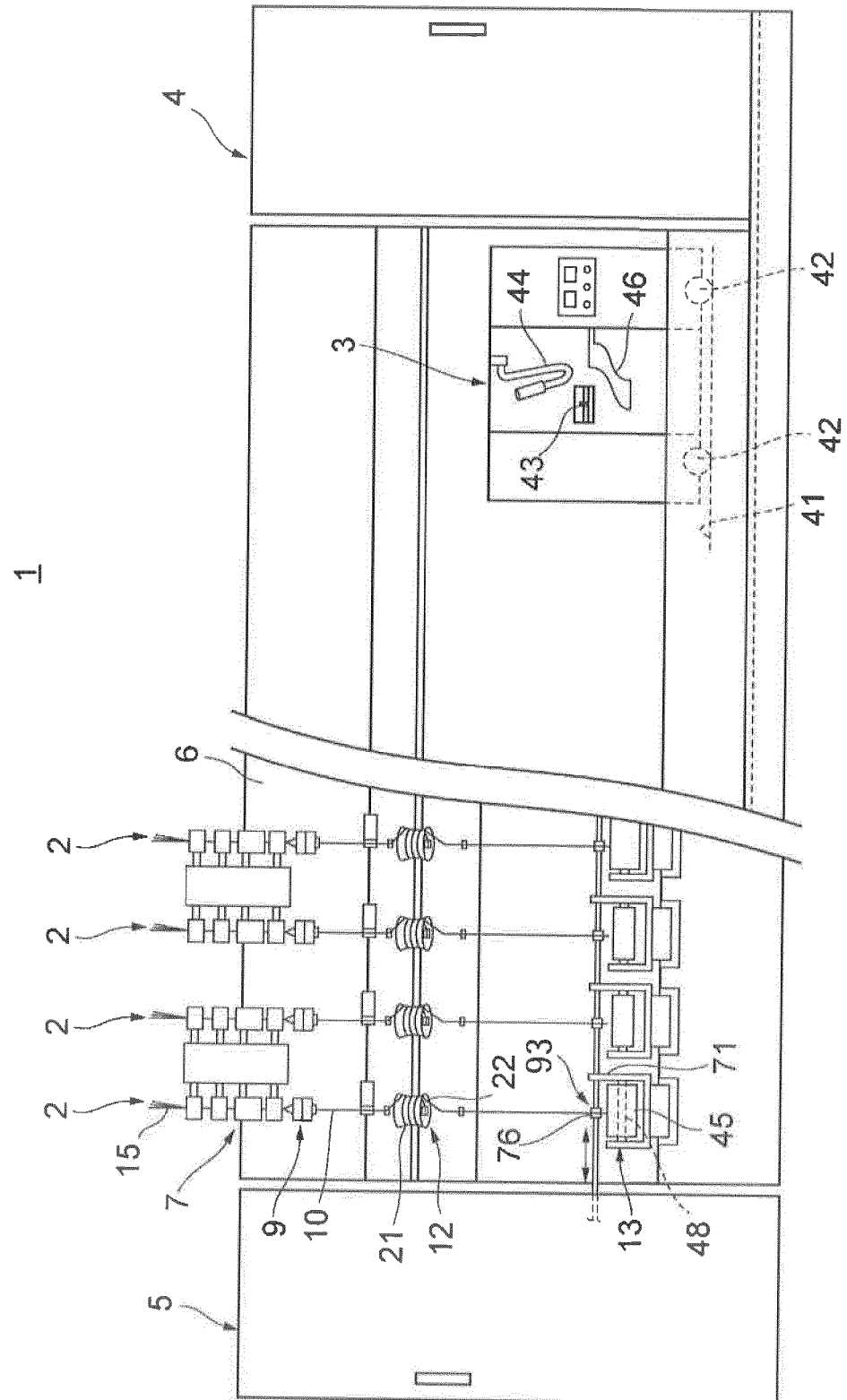


FIG. 2

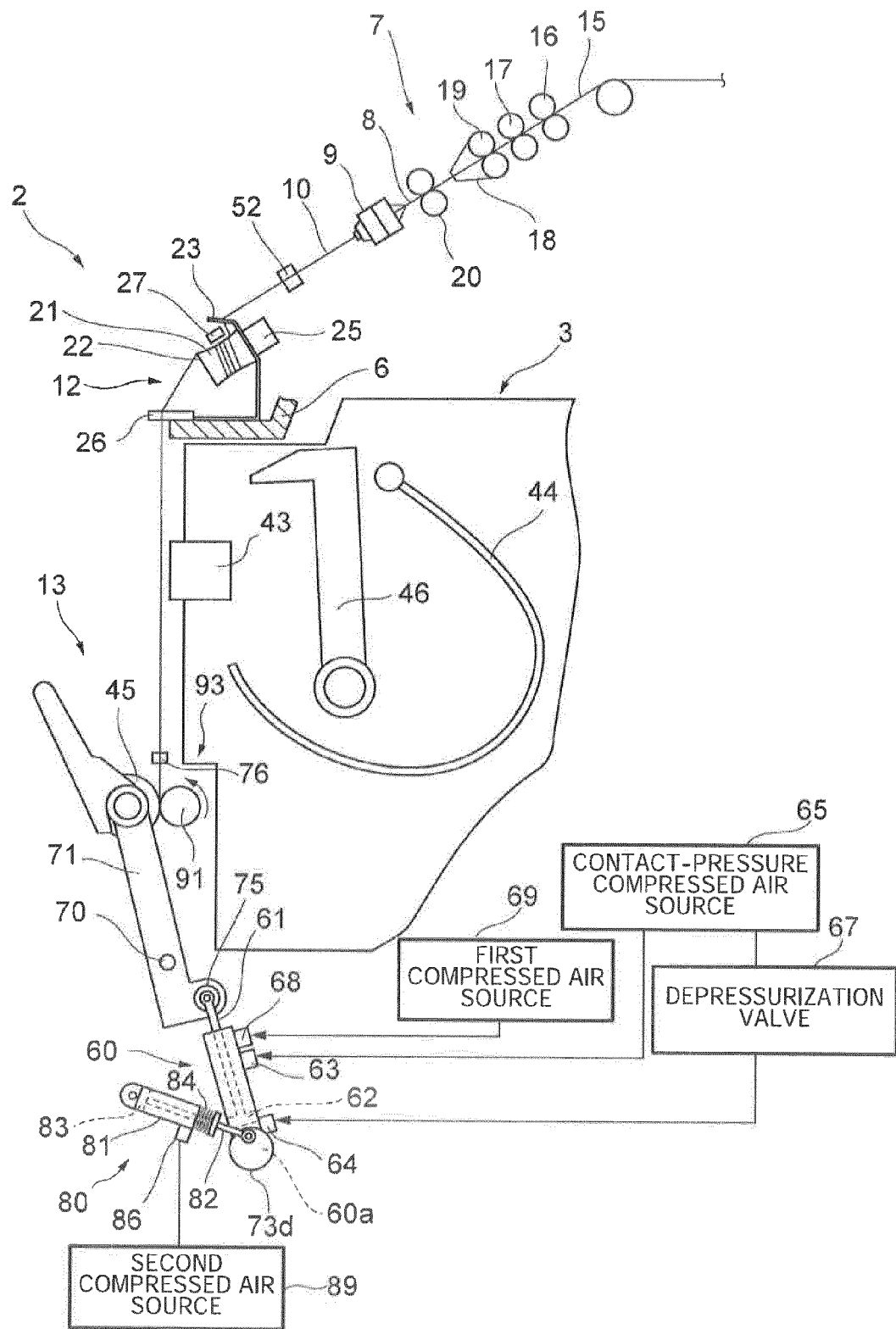


FIG. 3

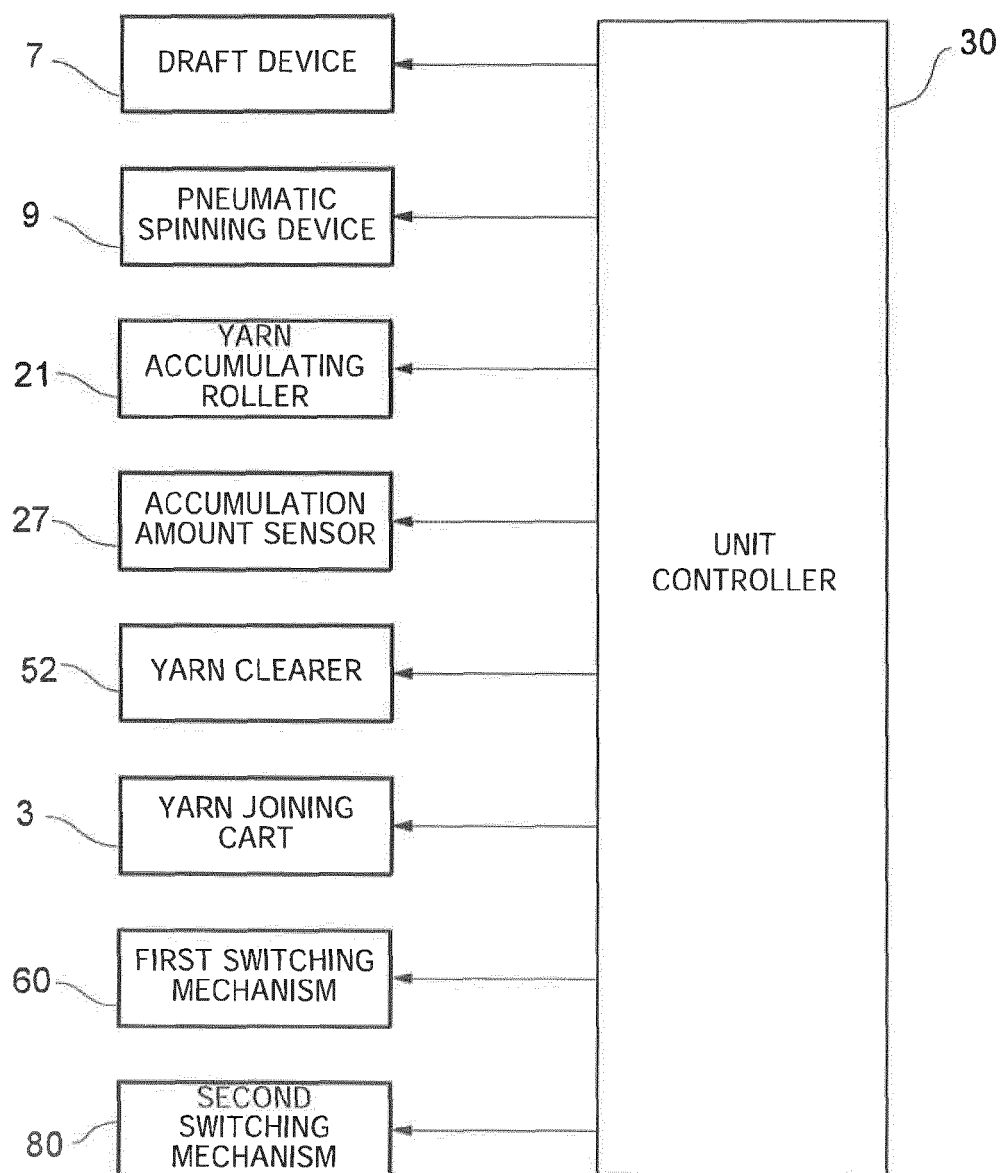


FIG. 4

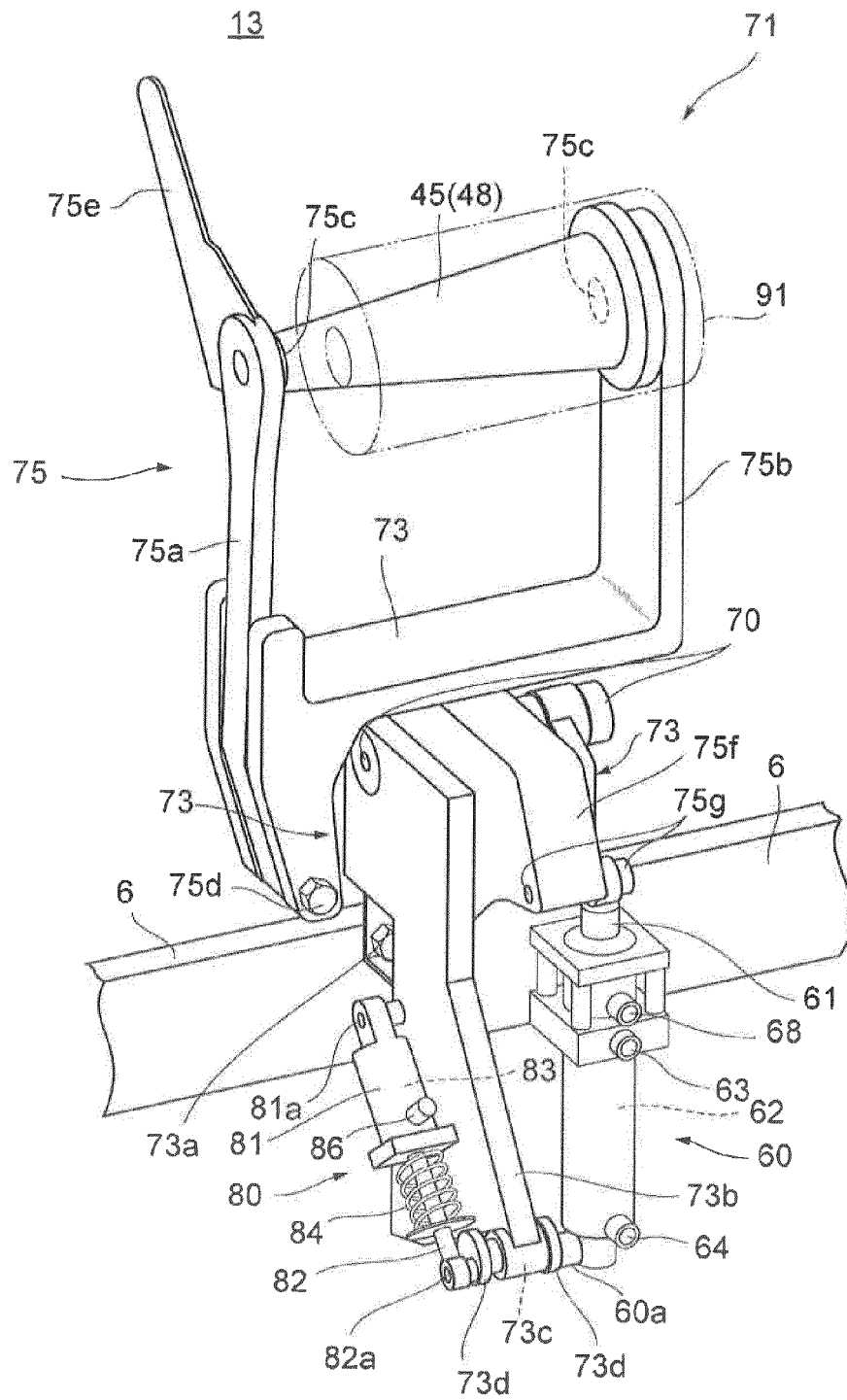


FIG. 5

13

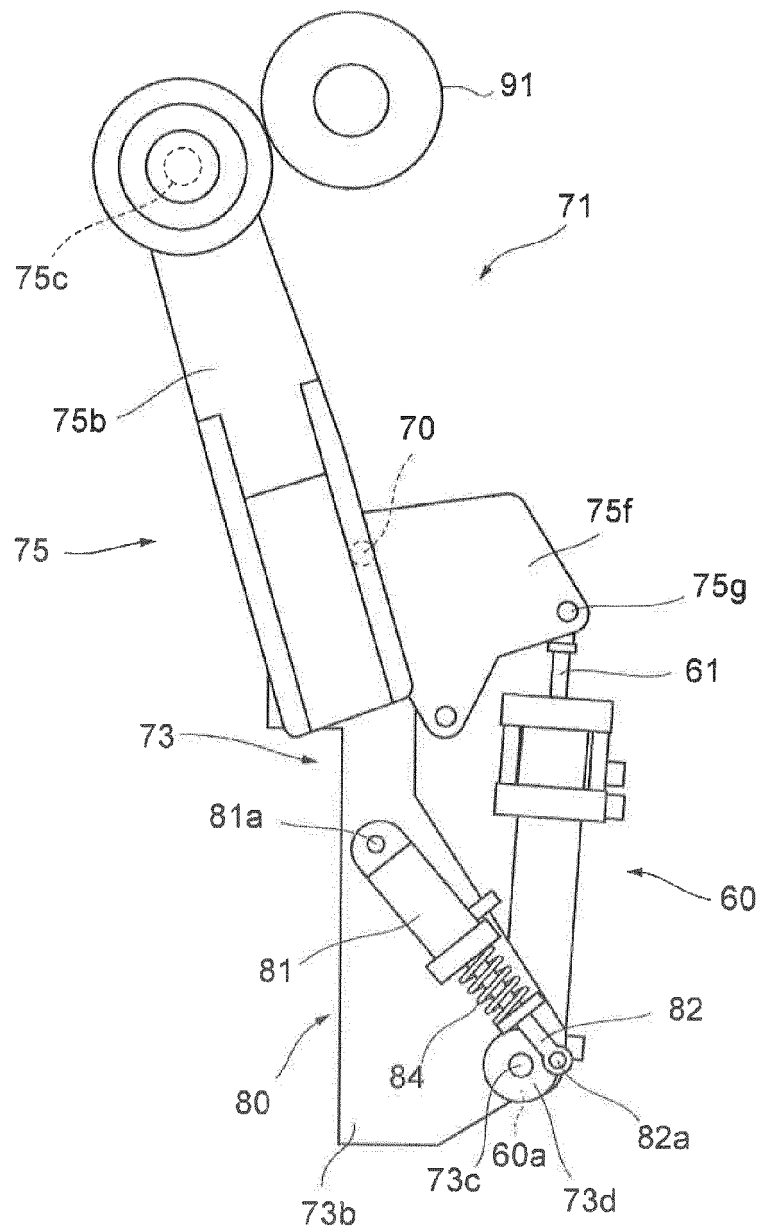


FIG. 6

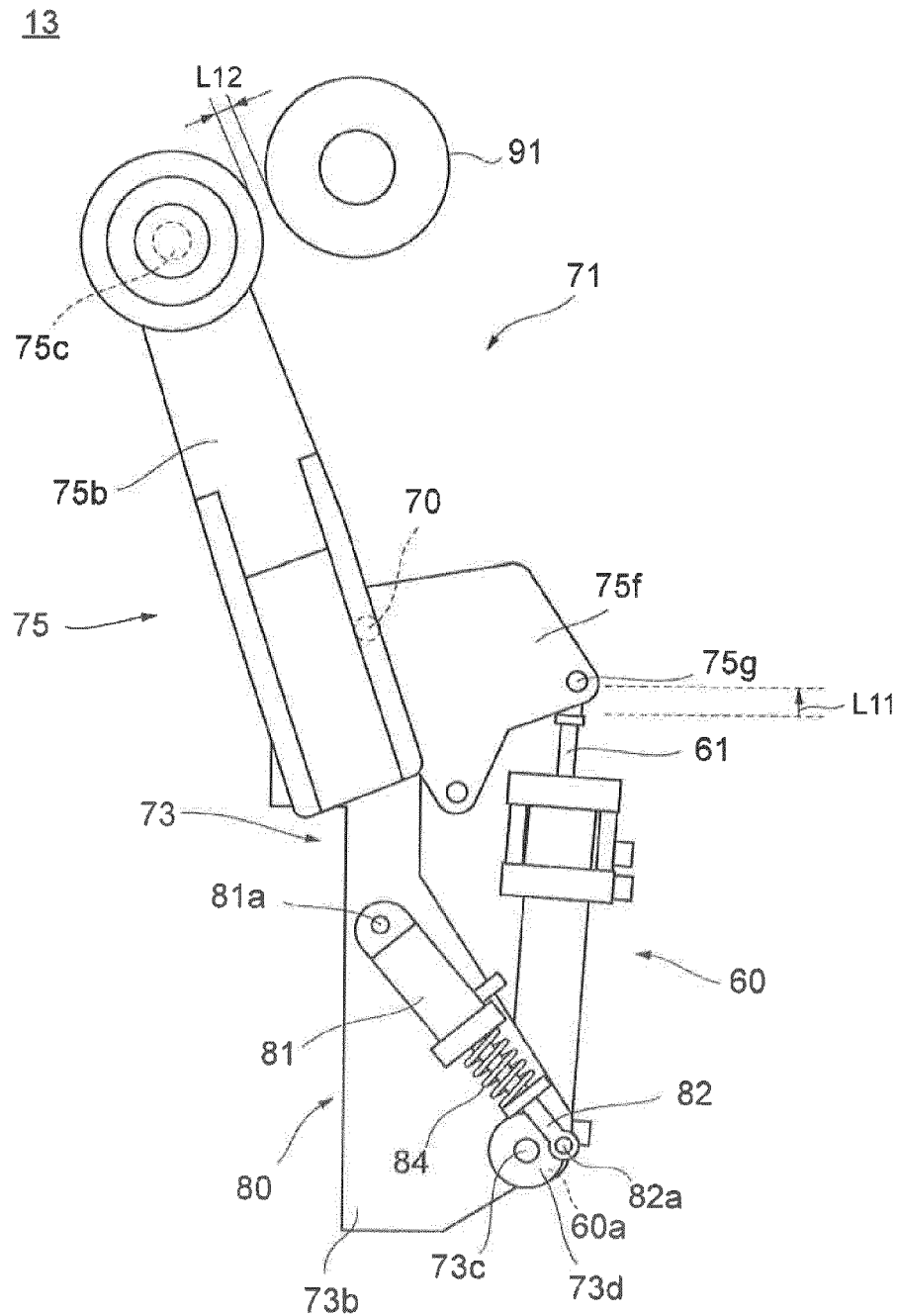


FIG. 7

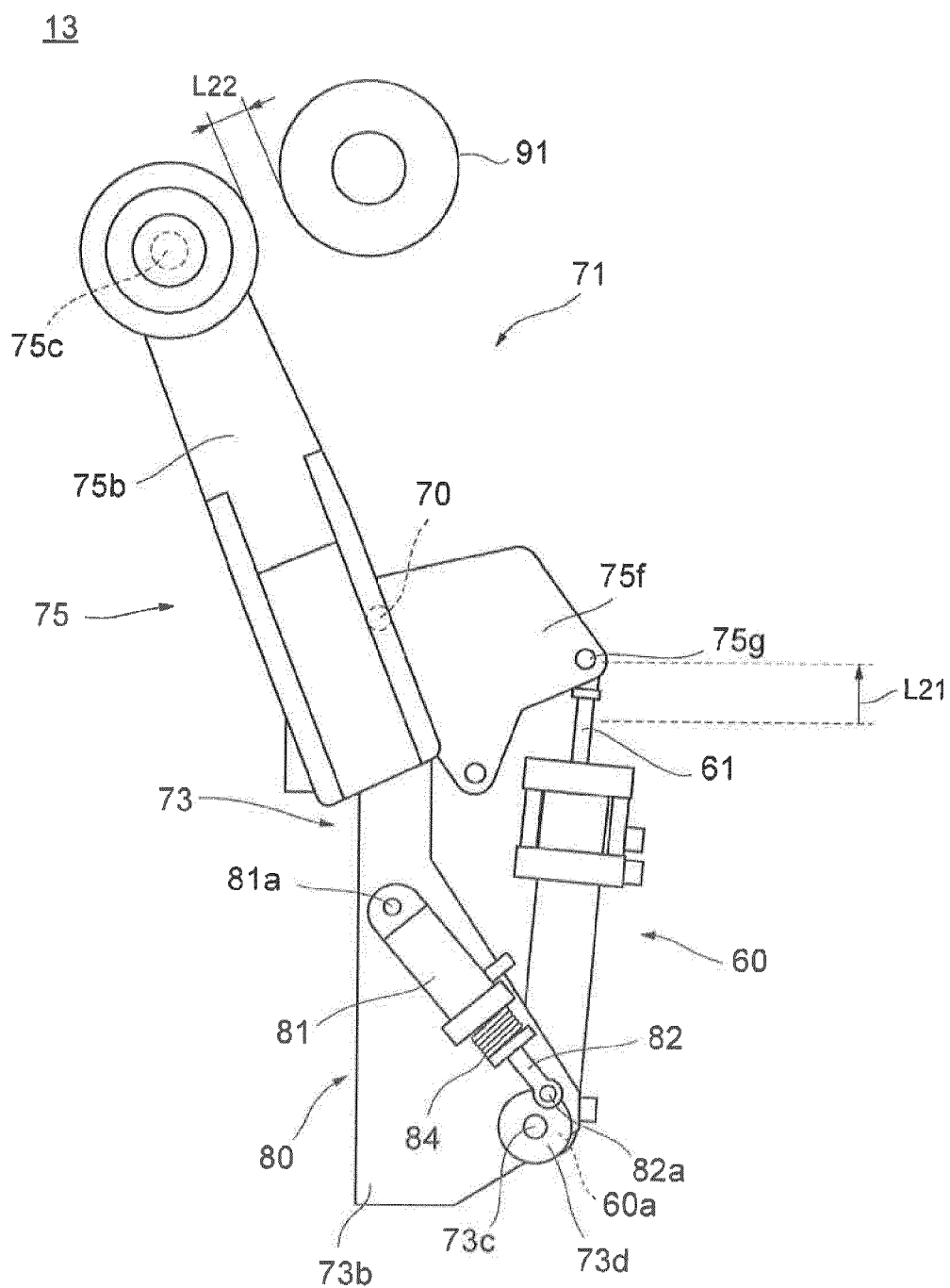


FIG. 8

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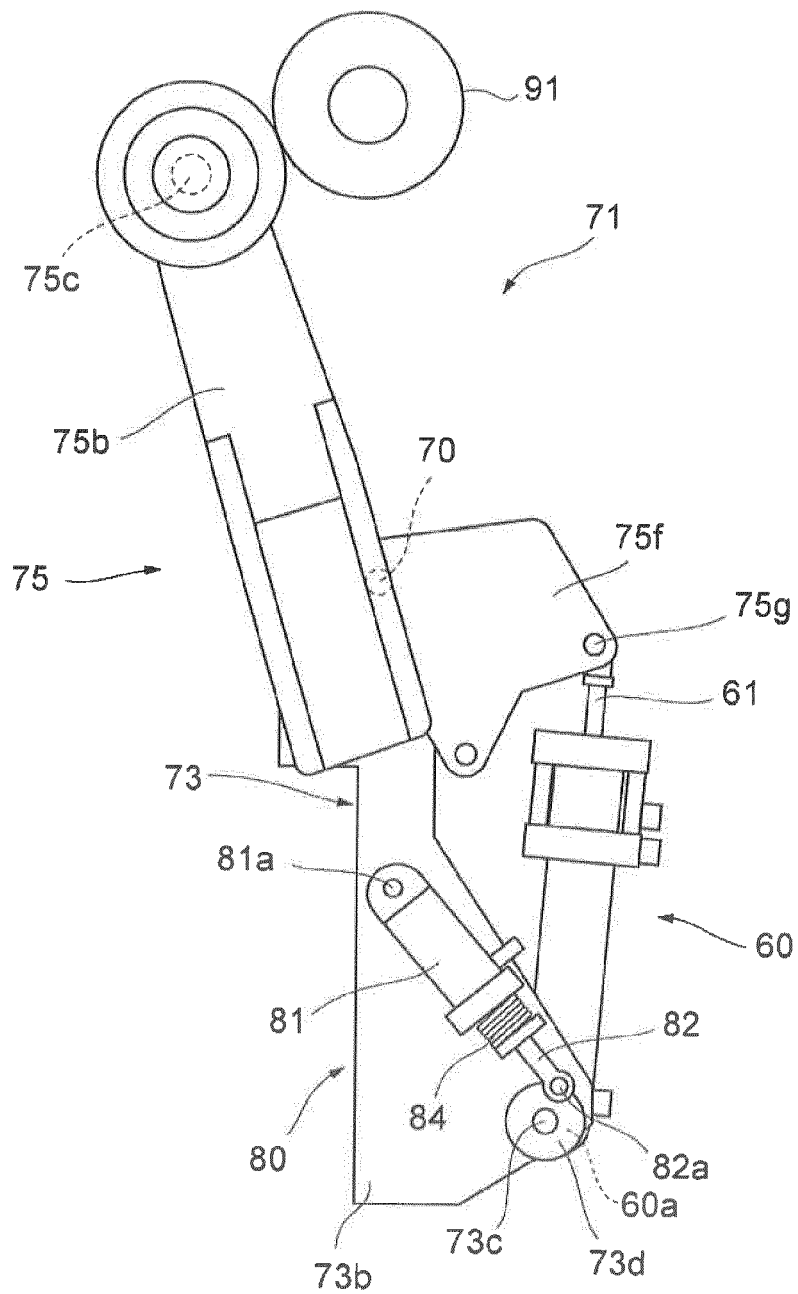
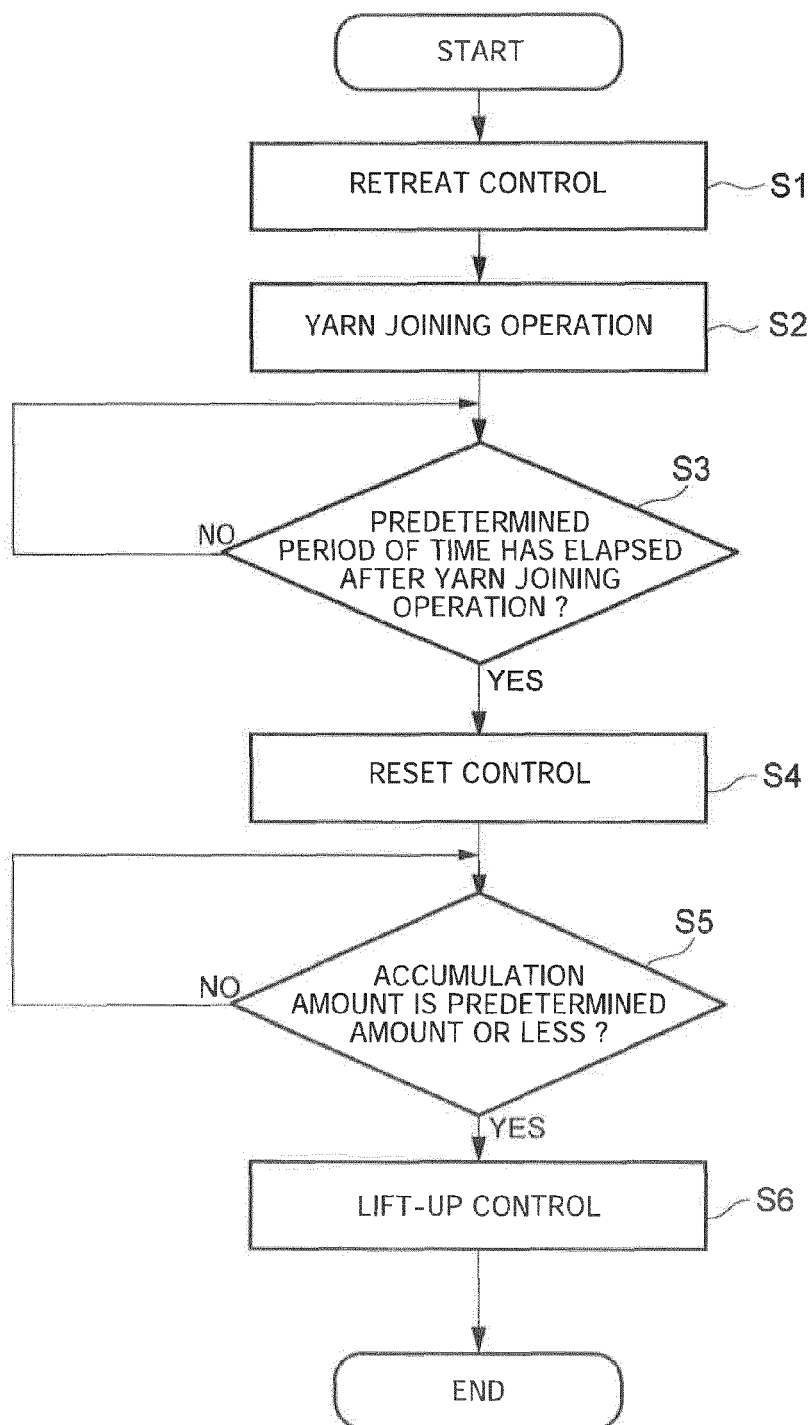


FIG. 9





EUROPEAN SEARCH REPORT

Application Number
EP 14 18 5545

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			B65H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 20 February 2015	Examiner Lemmen, René
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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