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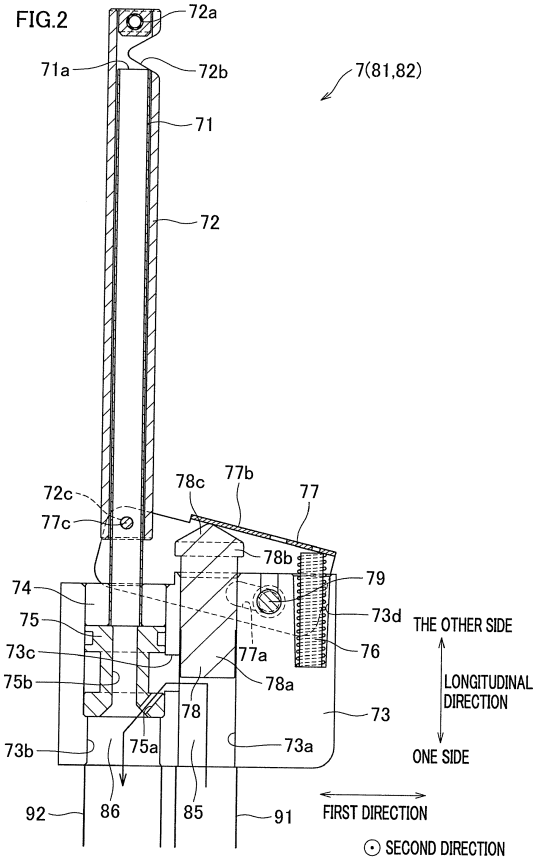
(54) YARN HANDLING DEVICE

(57) An object of the present invention is to provide a yarn handling device which is small in size and the state of which is switchable between a state in which a yarn is sucked and captured and a state in which the yarn is pinched and captured.

A yarn handling device 7 includes a fluid supply passage 85 to which compressed air is supplied, a first capturing mechanism 81 which is able to suck and capture a yarn Y by means of the negative pressure generated when the compressed air is supplied to the fluid supply passage 85, and a second capturing mechanism 82 which is able to pinch and capture the yarn Y. The second capturing mechanism 82 is in a capturing state in which the yarn Y can be pinched and captured when the compressed air is not supplied to the fluid supply passage 85, whereas the second capturing mechanism 82 is switched from the capturing state into an unlocked state in which the yarn Y is not pinched when the compressed air is supplied to the fluid supply passage 85.

FIG.2



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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a yarn handling device configured to handle a yarn.

[0002] Typically, a suction gun is used for handling a yarn when yarn threading and yarn cutting, etc., are performed in a textile machine. Patent Literature 1 (Japanese Laid-Open Patent Publication No. 2002-242034) recites that, for example, before operations are started in a draw texturing machine, a filament yarn is threaded to a series of paths as the yarn threading in a state in which the filament yarn is being sucked by the suction gun.

SUMMARY OF THE INVENTION

[0003] When the yarn is handled while being sucked and captured by the suction gun as described above, the yarn cutting may not be performable because the sucking force of the suction gun which sucks the yarn is low so that tension is not sufficiently applied to the yarn. In order to properly perform the yarn cutting, it is conceivable to use a chuck device configured to pinch and capture the yarn, instead of the suction gun. However, it is difficult to thread the yarn to members such as a guide because the yarn is relaxed in the yarn threading in a case in which the yarn is pinched and captured.

[0004] It is also conceivable to include a chuck mechanism configured to pinch the yarn in the suction gun, and to arrange the state of the suction gun to be switchable between a state in which the yarn is sucked and captured and a state in which the yarn is pinched and captured. The state of the suction gun is switched in accordance with content of operations. However, the structure of the suction gun is complicated so that the device is disadvantageously increased in size.

[0005] An object of the present invention is to provide a yarn handling device which is small in size and the state of which is switchable between a state in which a yarn is sucked and captured and a state in which the yarn is pinched and captured.

[0006] A first aspect of the present invention provides a yarn handling device comprising: a fluid supply passage to which a compressed fluid is supplied; a first capturing mechanism which is able to suck and capture a yarn by means of negative pressure generated when the compressed fluid is supplied to the fluid supply passage; and a second capturing mechanism which is able to pinch and capture the yarn, the second capturing mechanism being in a capturing state in which the yarn is able to be pinched and captured when the compressed fluid is not supplied to the fluid supply passage, whereas the second capturing mechanism being switched from the capturing state into an unlocked state in which the yarn is not pinched when the compressed fluid is supplied to the fluid supply passage.

[0007] In the present invention, the following states can be switched from each other: a state in which a yarn is sucked and captured by the first capturing mechanism; and a state in which the yarn is pinched and captured by the second capturing mechanism. With this, a yarn is capturable in a state suitable for content of operations. The state of the second capturing mechanism is also switchable between the capturing state and the unlocked state, by using the compressed fluid which causes the negative pressure used for sucking a yarn in the first capturing mechanism to be generated. As a result, the structure of the device is simple as compared to cases where a driving source for driving the second capturing mechanism is additionally provided. This enables downsizing of the device.

[0008] According to a second aspect of the invention, the yarn handling device of the first aspect further comprises: a main body member which is hollow and cylindrical and which forms at least a part of a suction passage connected to the fluid supply passage; and a cover member which covers the outer circumferential surface of the main body member, the main body member and the cover member being movable relative to each other in a longitudinal direction of the main body member, and the state of the second capturing mechanism being switchable between the capturing state and the unlocked state in such a way that the main body member and the cover member move relative to each other in the longitudinal direction.

[0009] In the present invention, the cylindrical main body member and the cover member covering the outer circumferential surface of the main body member can move relative to each other in the longitudinal direction of the main body member so that the state of the second capturing mechanism is switched between the capturing state and the unlocked state. As a result, increase in size of the device can be suppressed in a direction orthogonal to the longitudinal direction of the main body member.

[0010] According to a third aspect of the invention, the yarn handling device of the second aspect is arranged such that one end portion of the main body member is connected to the fluid supply passage in the longitudinal direction, the main body member includes a suction port which is provided at the other end portion of the main body member which is opposite to the one end portion of the main body member, the cover member includes an opposed portion which opposes the other end portion of the main body member in the longitudinal direction, and the second capturing mechanism is in the capturing state in which the yarn is able to be pinched and captured between the other end portion of the main body member and the opposed portion of the cover member when the main body member and the cover member move relative to each other in the longitudinal direction so that the opposed portion of the cover member makes contact with the other end portion of the main body member.

[0011] In the present invention, by being arranged that a yarn is pinched between the other end portion at which the suction port of the main body member is provided

and the opposed portion of the cover member, the second capturing mechanism in which the yarn can be pinched and captured can be embodied with the simple structure.

[0012] According to a fourth aspect of the invention, the yarn handling device of the second or third aspect further comprises: a biasing member which biases the cover member toward the one end portion of the main body member; and a pressing member which is provided in the fluid supply passage and which is pressed by the compressed fluid supplied to the fluid supply passage so as to apply force to the cover member which is slidable along the longitudinal direction so that the cover member slides toward the other end portion of the main body member against the biasing force of the biasing member.

[0013] In the present invention, the cover member is slidable along the longitudinal direction of the main body member by means of the compressed fluid. Therefore, the state of the second capturing mechanism can be switched between the capturing state and the unlocked state with the simple structure.

[0014] According to a fifth aspect of the invention, the yarn handling device of any one of the first to fourth aspects is applied to handle the yarn in yarn joining in which a yarn provided on the inner layer side of one of two yarn supply packages held by a yarn supplying unit is joined to a yarn provided on the outer layer side of the other of the two yarn supply packages in a draw texturing machine including the yarn supplying unit configured to hold each yarn supply package, a processing unit provided for false-twisting the yarn supplied from the yarn supply package, and a winding unit provided for winding the yarn false-twisted by the processing unit.

[0015] The following operations are performed when the yarn joining is performed for two yarn supply packages held by the yarn supplying unit: the yarn threading to the guides; and the yarn cutting in which end portions of the joined yarns are cut. In the present invention, the yarns are preferably threaded without slackening in the yarn threading, in such a way that the yarns are sucked and captured by the first capturing mechanism. In addition to that, the yarns are appropriately cuttable in the yarn cutting, in such a way that the yarns are pinched and captured by the second capturing mechanism. It is appropriate to use the small yarn handling device of the present invention because the yarns are handled in a narrow space.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

FIG. 1 is a cross section of a yarn handling device in an embodiment of the present invention, and shows a state in which a yarn is capturable by a second capturing mechanism.

FIG. 2 is a cross section of the yarn handling device in the embodiment of the present invention, and shows a state in which the yarn is capturable by a first capturing mechanism.

FIG. 3 is a side view showing the outline of a draw texturing machine to which the yarn handling device of the present invention is applied.

FIG. 4 is a front view of a creel stand shown in FIG. 3.

FIG. 5 is a side view showing the outline of a yarn joining device configured to join yarns of two yarn supply packages supported by the creel stand shown in FIG. 4.

FIG. 6 is a top view of the yarn joining device shown in FIG. 5.

FIGs. 7(a) and 7(b) show steps of yarn joining in the yarn joining device, FIG. 7(a) shows a state in which a yarn of the yarn supply package provided on one side is set, and FIG. 7(b) shows a state in which a yarn of the yarn supply package provided on the other side is set.

FIGs. 8(a) and 8(b) show steps of the yarn joining in the yarn joining device, FIG. 8(a) shows a state in which the yarns are prepared to be cut, and FIG. 8(b) shows a state in which the yarn of the yarn supply package provided on the other side is cut whereas the yarn of the yarn supply package provided on the one side has not been cut.

FIG. 9 is a cross section of a yarn handling device in a first modification.

FIG. 10 is a cross section of a yarn handling device in a second modification.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

(Structure of Yarn Handling Device)

[0017] The following will describe an embodiment of a yarn handling device of the present invention. A yarn handling device 7 of the present embodiment includes a first capturing mechanism 81 which is able to suck and capture a yarn Y by means of the negative pressure generated when compressed air is supplied to a fluid supply passage 85, and a second capturing mechanism 82 which is able to pinch and capture the yarn Y.

[0018] As shown in FIG. 1 and FIG. 2, the yarn handling device 7 of the present embodiment mainly includes a main body member 71, a cover member 72, a base portion 73, a fixing member 74, an introduction member 75, a spring 76, a pivoting member 77, and a pressing member 78. The first capturing mechanism 81 and the second capturing mechanism 82 are embodied by the main body member 71, the cover member 72, the base portion 73, the fixing member 74, the introduction member 75, the spring 76, the pivoting member 77, and the pressing member 78.

[0019] The main body member 71 is hollow and cylindrical in shape, and its one end portion is fixed to the base portion 73. Hereinafter, a longitudinal direction of the main body member 71 is simply referred to as a "longitudinal direction". In addition to that, regarding the longitudinal direction, the side of the one end portion of the

main body 71 is referred to as "one side", and the side opposite to the one side is referred to as "the other side". The one end portion of the main body member 71 is fixed to the base portion 73. As described later, the fluid supply passage 85 to which the compressed air is supplied is formed in the base portion 73. The end portion on the one side of the main body member 71 is connected to the fluid supply passage 85. The end portion on the other side of the main body member 71 has a suction port 71a. When the yarn Y is captured by the first capturing mechanism 81, the yarn Y is sucked from the suction port 71a.

[0020] The cover member 72 is a cap member, and covers the outer circumferential surface and an end face on the other side of the main body member 71. The cover member 72 is slidable along the longitudinal direction. The cover member 72 slides along the longitudinal direction so that the state of the second capturing mechanism 82 can be switched between a capturing state (as shown in FIG. 1) in which the yarn Y can be pinched and captured and an unlocked state (as shown in FIG. 2) in which the yarn Y is not pinched.

[0021] An end portion on the other side of the cover member 72 is an opposed portion 72a which opposes the end portion on the other side of the main body member 71 in the longitudinal direction. The position of the opposed portion 72a can be switched between a contact position (as shown in FIG. 1) where the opposed portion 72a makes contact with the end portion on the other side of the main body member 71 and a separated position (as shown in FIG. 2) where the opposed portion 72a does not make contact with the end portion on the other side of the main body member 71, in such a way that the cover member 72 slides in the longitudinal direction. When the opposed portion 72a is in the contact position, the second capturing mechanism 82 is in the capturing state in which the yarn Y can be pinched and captured by the opposed portion 72a and the end portion on the other side of the main body member 71.

[0022] The cover member 72 has a cutout 72b in the side wall of its end portion provided on the other side. The yarn Y is introduced into the suction port 71a via the cutout 72b when the first capturing mechanism 81 sucks and captures the yarn Y.

[0023] In the base portion 73, two through holes 73a and 73b are formed to extend in the longitudinal direction. An end portion on the one side of the through hole 73a in the longitudinal direction is connected with a compressed air hose 91 drawn from a compressed air supplier (not illustrated) supplying the compressed air. In other words, the internal space of the through hole 73a is the fluid supply passage 85 to which the compressed air is supplied. The internal space of the through hole 73b forms a part of a suction passage 86. An end portion on the one side of the through hole 73bin the longitudinal direction is connected with a waste yarn hose 92 drawn from a waste yarn box (not illustrated) in which yarns are wasted. In addition to that, a through hole 73c is formed in the base portion 73. The through hole 73c penetrates the wall separating the through hole 73a from the through hole 73b, in a direction (left-right direction in FIG. 1 and FIG. 2; hereinafter, it is referred to as a "first direction") orthogonal to the longitudinal direction.

[0024] The fixing member 74 is provided for fixing the main body member 71 to the base portion 73. The fixing member 74 is fitted into the end portion on the other side of the through hole 73b.

[0025] The introduction member 75 is fitted to the through hole 73b, and provided to be adjacent to the one side of the fixing member 74 in the longitudinal direction. A part of the introduction member 75 opposes the through hole 73c in the first direction. In the introduction member 75, a communication hole 75a is formed to allow the following spaces to communicate with each other: a space connected with the internal space of the through hole 73c; and the internal space of the through hole 73b, which is on the one side of the introduction member 75 in the longitudinal direction.

[0026] The communication hole 75a extends in the radial direction of the through hole 73b. In the communication hole 75a, its radially inner end is on the one side of its radially outer end in the longitudinal direction. The compressed air is supplied to the fluid supply passage 85, flows into the through hole 73b via the internal space of the through hole 73c, and then flows through the communication hole 75a toward the one side in the longitudinal direction.

[0027] In the introduction member 75, a through hole 75b is formed to extend in the longitudinal direction and to communicate with the internal space of the main body member 71. The suction passage 86 is formed of the internal space of the main body member 71, the internal space of the through hole 75b, and a part of the through hole 73b, which is on the one side of the introduction portion 75 in the longitudinal direction.

[0028] In the base portion 73, a hole 73d is formed to extend in the longitudinal direction and to be open to the other side. The hole 73d is positioned so as to oppose the through hole 73b over the through hole 73a when viewed in the direction (the direction orthogonal to the planes of FIG. 1 and FIG. 2; hereinafter, it is referred to as a "second direction") orthogonal to both the longitudinal direction and the first direction. The spring 76 is a coil spring. The spring 76 is provided in the hole 73d, and a part of the spring 76 protrudes outside the hole 73d. The base portion 73 supports a shaft 79 extending in the second direction. The shaft 79 is positioned between the hole 73d and the through hole 73a when viewed in the second direction.

[0029] In the pivoting member 77, an opening 77a which is elliptical in shape is formed to be open in the second direction. The shaft 79 is inserted into the opening 77a. The pivoting member 77 is supported to be pivotable by the shaft 79. The pivoting member 77 includes an opposed portion 77b which opposes the end portion on the other side of the through hole 73a. The pivoting member 77 is connected to the part of the spring 76, which

protrudes outside the hole 73d. The pivoting member 77 is biased in the one direction by the spring 76.

[0030] The pivoting member 77 supports a shaft 77c extending in the second direction. The shaft 77c is inserted into a hole 72c formed in the cover member 72. The cover member 72 is biased in the one direction by the spring 76 via the pivoting member 77.

[0031] The pressing member 78 is fitted into the through hole 73a forming the fluid supply passage 85. The pressing member 78 includes a first part 78a, a second part 78b, and a third part 78c. The first part 78a is cylindrical in shape and is slightly smaller in diameter than the through hole 73a. The second part 78b is provided on the other side of the first part 78a, and is cylindrical in shape and is slightly larger in diameter than the through hole 73a. The third part 78c is provided on the other side of the second part 78b, and is conical in shape and has an apex on the other side. The second part 78b and the third part 78c of the pressing member 78 protrude outside the through hole 73a.

[0032] In the pressing member 78, the entire first part 78a is positioned (as shown in FIG. 1) in the through hole 73a when the compressed air is not supplied to the fluid supply passage 85. At this time, the opposed portion 72a of the cover member 72 is in the contact position in which the opposed portion 72a makes contact with the end portion on the other side of the main body member 71. In other words, the second capturing mechanism 82 is in the capturing state in which the yarn Y can be pinched and captured.

[0033] The pressing member 78 moves toward the other side by being pressed by the compressed air which is supplied to the fluid supply passage 85, and a part of the first part 78a protrudes (as shown in FIG. 2) outside the through hole 73a. At this time, the pressing member 78 presses the opposed portion 77b of the pivoting member 77 toward the other side. The pivoting member 77 pivots by being pressed by the pressing member 78, so that the shaft 77c moves to the other side. As the shaft 77c moves to the other side, the cover member 72 slides toward the other side. In other words, the pressing member 78 applies the force to the cover member 72 so that the cover member 72 slides toward the other side against the biasing force of the spring 76.

[0034] The cover member 72 slides toward the other side by means of the pressing force of the pressing member 78 so that the opposed portion 72a of the cover member 72 is in the separated position where the opposed portion 72a does not make contact with the end portion on the other side of the main body member 71 as shown in FIG. 2. At this time, the second capturing mechanism 82 is in the unlocked state in which the yarn Y is not pinched.

[0035] The pressing member 78 moves toward the one side by means of the biasing force of the spring 76 when supply of the compressed air is stopped, with the result that the entire first part 78a is housed in the through hole 73a. At this time, the pivoting member 77 pivots so that the shaft 77c moves toward the one side. Because the shaft 77c moves toward the one side, the cover member 72 slides toward the one side. As a result, the opposed portion 72a is in the contact position. In addition to that, the state of the second capturing mechanism 82 is returned to the capturing state.

[0036] As shown in FIG. 1, the pressing member 78 opposes the entire through hole 73c in the first direction when the compressed air is not supplied to the fluid supply passage 85. As shown in FIG. 2, the pressing member 78 does not oppose a part of the through hole 73c in the first direction when the compressed air is supplied to the fluid supply passage 85. In this regard, the fluid supply passage 85 is connected to the suction passage 86 via the internal space of the through hole 73c and the internal space of the communication hole 75a. In addition to that, the compressed air supplied to the fluid supply passage 85 flows into the suction passage 86.

[0037] The compressed air having flowed into the suction passage 86 flows toward the one side from the other side in the longitudinal direction. This airflow generates the negative pressure at the suction port 71a, which makes it possible to suck and capture the yarn Y from the suction port 71a. In other words, the first capturing mechanism 81 can capture the yarn Y when the compressed air is supplied to the fluid supply passage 85. The yarn Y is sucked from the suction port 71a, and then discharged to the waste yarn hose 92 along the airflow in the suction passage 86.

(Draw Texturing Machine)

[0038] The following will describe an outline of a draw texturing machine to which the yarn handling device 7 of the present invention is applied, with reference to FIG. 3.

[0039] A draw texturing machine 1 is configured to be able to false-twist yarns Y each of which is made of synthetic fibers such as nylon (polyamide fibers). The draw texturing machine 1 includes a yarn supplying unit 2 for supplying the yarns Y, a processing unit 3 configured to false-twist the yarns Y supplied from the yarn supplying unit 2, and a winding unit 4 configured to wind the yarns Y processed by the processing unit 3 onto winding bobbins Bw. The yarn supplying unit 2, the processing unit 3, and the winding unit 4 include structural elements, and the structural elements are provided to form plural lines in a base longitudinal direction orthogonal to a yarn running surface (surface orthogonal to the direction in which FIG. 3 is viewed) in which yarn paths are provided to extend to the winding unit 4 from the yarn supplying unit 2 via the processing unit 3.

[0040] The yarn supplying unit 2 includes a creel stand 5 retaining yarn supply packages Ps, and supplies the yarns Y to the processing unit 3. In the processing unit 3, the following members are provided in this order from the upstream in a yarn running direction: first feed rollers 11; a twist-stopping guide 12; a first heater 13; a cooler 14; a twisting unit 15; second feed rollers 16; an interlac-

ing device 17; third feed rollers 18; a second heater 19; and fourth feed rollers 20. The winding unit 4 winds the yarns Y false-twisted by the processing unit 3 onto the winding bobbins Bw at winding devices 21, so as to form wound packages Pw.

[0041] Each yarn Y supplied to the processing unit 3 from the yarn supplying unit 2 is drawn between the first feed rollers 11 and the second feed rollers 16, and twisted by the twisting unit 15. The twist formed by the twisting unit 15 is propagated to the twist-stopping guide 12, but is not propagated to the upstream in the yarn running direction of the twist-stopping guide 12. The yarn Y drawn and twisted in this way is heated by the first heater 13, and is then cooled by the cooler 14 and thermally set. The yarn Y having passed the twisting unit 15 is unwound before the yarn Y reaches the second feed rollers 16. The twist of the yarn Y, however, is thermally fixed as described above. Each of the filaments therefore maintains a wavy false-twisted state. Thereafter, interlacing is performed by the interlacing device 17, and the yarn Y thermally set by the second heater 19 is wound by each winding device 21.

[0042] The draw texturing machine 1 includes a main base 8 and a winding base 9 which are provided to be spaced apart from each other in a base width direction (left-right direction of FIG. 3). The main base 8 and the winding base 9 have the substantially same lengths, and are provided to extend in a base longitudinal direction (direction orthogonal to the direction in which FIG. 3 is viewed) so as to oppose each other. An upper part of the main base 8 is connected to an upper part of the winding base 9 by a supporting frame 10. The apparatuses constituting the processing unit 3 are mainly attached to the main base 8 and the supporting frame 10. The winding devices 21 constituting the winding unit 4 are mainly attached to the winding base 9.

[0043] The creel stand 5 is provided to oppose the main base 8 over the winding base 9 in the base width direction. A pair of creel stands 5 are provided back to back in the base width direction, each of the pair of the creel stands 5 is identical to the creel stand 5. The creel stands 5 are aligned along the base longitudinal direction. The length of the creel stands 5 aligned along the base longitudinal direction is substantially identical with the length in the base longitudinal direction of the main base 8 and winding base 9.

[0044] Rails R are respectively provided to extend in the base longitudinal direction on a floor so as to pinch the pair of the creel stands 5 provided back to back, in the base width direction. A running wagon (not illustrated) supporting a yarn joining device 6 (as shown in FIG. 5 and FIG. 6) described later runs along one of the rails R.

[0045] The draw texturing machine 1 is arranged to be symmetrical in the base width direction with the main base 8 being at the center. In other wards, the winding base 9 and the creel stands 5 are provided on each side of the main base 8 in the base width direction. In FIG. 3, the winding base 9 and creel stands 5 provided on the left side of the main base 8 are not shown.

(Creel Stand)

[0046] The following will describe the structure of each creel stand 5 with reference to FIG. 4. As shown in FIG. 4, the creel stand 5 mainly includes a creel base portion 51, columns 52a and 52b, partition plates 53, and pegs 54. The creel base portion 51 is structured as a frame-shaped frame. The columns 52a and 52b are provided to vertically extend on the creel base portion 51. The columns 52a and 52b extend along an up-down direction. The columns 52a and 52b are provided in the base longitudinal direction at a predetermined interval. The partition plates 53 are provided at the columns 52a and 52b. The partition plates 53 are provided in the up-down direction of the columns 52a and 52b, at predetermined intervals.

[0047] The pegs 54 support the yarn supply packages Ps, respectively. The pegs 54 are provided at both columns 52a and 52b. Hereinafter, a yarn supply package Ps supported by a peg 54 provided at the column 52a may be referred to as a "yarn supply package Ps1", and a yarn supply package Ps supported by a peg 54 provided at the column 52b may be referred to as a "yarn supply package Ps2".

[0048] The plural (e.g., eight in this embodiment) pegs 54 are provided in the up-down direction of the columns 52a and 52b at the predetermined intervals. The pegs 54 are provided between each pair of the partition plates 53. Each peg 54 on the column 52a is provided to be at the same vertical position as each peg 54 provided on the column 52b. In other words, the plural yarn supply packages Ps are supported by the respective pegs 54 while being provided in a matrix manner in the up-down direction and the base longitudinal direction in the creel stand 5.

[0049] In two yarn supply packages Ps supported by two pegs 54 provided at the same vertical position in the creel stand 5, the following yarns Y are joined by the yarn joining device 6 described later: a yarn Y1 provided on the inner layer side of the yarn supply package Ps1 which is one of the two yarn supply packages Ps; and a yarn Y2 provided on the outer layer side of the yarn supply package Ps2 which is the other of the two yarn supply packages Ps. Because of this, a yarn Y is supplied from the other yarn supply package Ps even when a yarn Y of one yarn supply package Ps is run out in the creel stand 5. As a result, yarns Y can be continuously supplied.

(Yarn Joining Device)

[0050] The following will describe an outline of the yarn joining device 6 with reference to FIG. 5 and FIG. 6. The yarn joining device 6 is supported by the base 22. The base 22 is provided to be able to move up and down along a column 23 which vertically extends and which is

provided with the running wagon (not illustrated) running along one of the rails R (as shown in FIG. 3).

[0051] The yarn joining device 6 is movable to a position opposite to each of the creel stands 5 which are provided along the base longitudinal direction, as the running wagon runs along one of the rails R. In addition to that, the yarn joining device 6 can move to a position opposite to each of the yarn supply packages Ps supported by the creel stand 5, as the base 22 moves up and down along the column 23.

[0052] In this regard, the yarn handling device 7 of the present invention is supported while being attached to a robotic arm 25, in the base 22. The robotic arm 25 includes a rotating base 25a, three arms 25b, 25c, and 25d, and two joints 25e and 25f. The rotating base 25a is provided on the upper surface of the base 22. The rotating base 25a is rotatable in a horizontal plane by driving force of a motor (not illustrated). The arm 25b is provided to vertically extend on the rotating base 25a. The arm 25c is attached to the leading end portion of the arm 25b via the joint 25e. The arm 25c is swingable about the joint 25e by driving force of a motor (not illustrated). The arm 25d is attached to an end portion of the arm 25c via the joint 25f. This end portion is one far from the joint 25e, among the end portions of the arm 25c. The arm 25d is swingable about the joint 25f by driving force of a motor (not illustrated). The yarn handling device 7 is attached to an end portion of the arm 25d. This end portion is one far from the joint 25f, among the end portions of the arm 25d.

[0053] The yarn joining device 6 includes a splicer 61, guides 67a, 67b, 68a, and 68b, and a tension applying mechanism 69. The splicer 61 is provided on a central portion of the base 22. The guides 67a, 67b, 68a, and 68b are configured to guide yarns Y, and are hook members on which the yarns Y are hung. The guides 67a and 67b are provided on one side (left side shown in FIG. 6) of the splicer 61 in the base longitudinal direction. The guides 68a and 68b are provided on the other side (right side shown in FIG. 6) opposite to the one side of the splicer 61 in the base longitudinal direction. The tension applying mechanism 69 is configured to temporarily hold the yarns Y. The tension applying mechanism 69 is provided on the one side (left side shown in FIG. 6) of the splicer 61 in the base longitudinal direction.

[0054] The splicer 61 includes a yarn joining nozzle 62, a pair of pinching mechanisms 63 and 64, and a pair of cutters 65 and 66. In the yarn joining nozzle 62, there is a chamber 62a passing through the yarn joining nozzle 62 in the base longitudinal direction. Into the chamber 62a, air can be injected through an injection hole (not illustrated). In the yarn joining nozzle 62, there is a slit 62b connecting the upper surface of the yarn joining nozzle 62 to the chamber 62a. The splicer 61 joins two yarns Y inserted into the chamber 62a from the slit 62b, by injecting air to the two yarns Y.

[0055] The pinching mechanisms 63 and 64 are provided on both sides of the yarn joining nozzle 62 in the base longitudinal direction. The pinching mechanism 63 includes a fixed portion 63a and a movable portion 63b. The fixed portion 63a and the movable portion 63b are provided on a linear line along the base width direction. The movable portion 63b is movable along the base width direction by a driving mechanism (not illustrated). The position of the movable portion 63b can be switched between a pinching position (as shown in FIGs. 8(a) and 8(b)) where the yarns Y can be pinched with the fixed portion 63a and a cancellation position (as shown in FIG. 5, FIG. 6, and FIGs. 7(a) and 7(b)) which is far from the fixed portion 63a as compared to the pinching position. Hereinafter, a space which is formed between the fixed portion 63a and the movable portion 63b in a state in which the movable portion 63b is in the pinching position is referred to as a "pinching space". The pinching mechanism 64 includes a fixed portion 64a and a movable portion 64b. The structure of the pinching mechanism 64 is identical with the structure of the pinching mechanism 63, and descriptions are thus omitted.

[0056] The cutters 65 and 66 are provided on both sides of the yarn joining nozzle 62 in the base longitudinal direction. To be more specific, the cutter 65 is positioned to oppose the yarn joining nozzle 62 over the pinching mechanism 63 in the base longitudinal direction. The cutter 66 is positioned to oppose the yarn joining nozzle 62 over the pinching mechanism 64 in the base longitudinal direction. As shown in FIG. 5, the cutter 65 has a blade part 65a which opposes the upper surface of the base 22 in the cutter 65.

[0057] The cutter 65 is movable along the base width direction by a driving mechanism (not illustrated). The position of the cutter 65 can be switched between a cutting position (as shown in FIGs. 8(a) and 8(b)) and a standby position (as shown in FIG. 5, FIG. 6, and FIGs. 7(a) and 7(b)). When the cutter 65 is in the cutting position, the blade part 65a opposes the pinching space of the pinching mechanism 63 in the base longitudinal direction. When the cutter 65 is in the standby position, the blade part 65a does not oppose the pinching space of the pinching mechanism 63 in the base longitudinal direction. The structure of the cutter 66 is identical with the structure of the cutter 65, and descriptions are thus omitted.

(Yarn Joining)

[0058] The following will describe an example of steps of yarn joining in which the yarn handling device 7 is used at the yarn joining device, with reference to FIGs. 7(a) and 7(b) and FIGs. 8(a) and 8(b). In the yarn joining, the following yarns Y are joined: a yarn Y1 provided on the inner layer side of one of two yarn supply packages Ps1 and Ps2 which are placed at the same vertical position in the creel stand 5; and a yarn Y2 provided on the outer layer side of the other of the two yarn supply packages Ps1 and Ps2.

[0059] When a yarn joining is started, the movable por-

tion 63b of the pinching mechanism 63 and the movable portion 64b of the pinching mechanism 64 are in the cancellation positions as shown in FIG. 7(a). In addition to that, the cutters 65 and 66 are in the standby positions. Furthermore, compressed air is supplied to the fluid supply passage 85 of the yarn handling device 7 by a compressed air supplier (not illustrated). In other words, the yarn handling device 7 is in a state (as shown in FIG. 2) in which a yarn Y can be sucked and captured by the first capturing mechanism 81.

[0060] In the yarn joining, to begin with, the yarn Y1 provided on the inner layer side of the one yarn supply package Ps1 is captured by the yarn handling device 7. Subsequently, the yarn Y1 is pulled out by a predetermined length from the yarn supply package Ps1 by a pulling out mechanism (not illustrated).

[0061] In a state in which the yarn Y1 is captured by the first capturing mechanism 81 of the yarn handling device 7, yarn threading is performed to the guides 68a and 68b. In addition to that, the yarn Y1 is inserted into the chamber 62a via the slit 62b, and threaded between the fixed potion 63a and movable portion 63b of the pinching mechanism 63 and between the fixed portion 64a and movable portion 64b of the pinching mechanism 64. At this step, the tension of the yarn Y1 captured by the first capturing mechanism 81 of the yarn handling device 7 is maintained to be substantially constant. Therefore, the yarn Y1 which is pulled out by a predetermined length from the yarn supply package Ps1 does not slacken. After that, the yarn Y1 is held by the tension applying mechanism 69, and then taken out from the inside of the main body member 71 of the yarn handling device 7 so that the yarn Y1 is released. As a result, the placement of the yarn Y1 of the yarn supply package Ps1 is completed in the yarn joining device 6.

[0062] Then, as shown in FIG. 7(b), the yarn Y2 provided on the outer layer side of the other yarn supply package Ps2 is captured by the yarn handling device 7. At this step, the yarn handling device 7 is still in the state in which the yarn Y can be sucked and captured by the first capturing mechanism 81. Subsequently, the yarn Y2 is pulled out by a predetermined length from the yarn supply package Ps2 by a pulling out mechanism (not illustrated).

[0063] In a state in which the yarn Y2 is captured by the first capturing mechanism 81 of the yarn handling device 7, the yarn threading is performed to the guides 67a and 67b. In addition to that, the yarn Y2 is inserted into the chamber 62a via the slit 62b, and threaded between the fixed potion 63a and movable portion 63b of the pinching mechanism 63 and between the fixed portion 64a and movable portion 64b of the pinching mechanism 64. At this step, the tension of the yarn Y2 captured by the first capturing mechanism 81 of the yarn handling device 7 is maintained to be substantially constant. Therefore, the yarn Y2 which is pulled out by a predetermined length from the yarn supply package Ps2 does not slacken. As a result, the placement of the yarn Y2 of the yarn supply package Ps2 is completed in the yarn joining device 6.

[0064] Subsequently, the supply of compressed air from the compressed air supplier (not illustrated) is stopped so that compressed air is not supplied to the fluid supply passage 85 of the yarn handling device 7. In other words, the yarn handling device 7 is in a state (as shown in FIG. 1) in which a yarn Y can be pinched and captured by the second capturing mechanism 82. At this step, the yarn Y2 having been sucked and captured by the first capturing mechanism 81 is pinched and captured by the second capturing mechanism 82.

[0065] Subsequently, preparation for cutting the yarns Y1 and Y2 is performed. As shown in FIG. 8(a), the movable portion 63b of the pinching mechanism 63 and the movable portion 64b of the pinching mechanism 64 are in the pinching positions. In addition to that, the cutters 65 and 66 are in the cutting positions. The yarn Y2 is raised by the yarn handling device 7, and is cut by the cutter 66. At this step, because the yarn Y2 is pinched and captured by the second capturing mechanism 82, tension is sufficiently applied to the yarn Y2 when the yarn Y2 is raised by the yarn handling device 7 and pressed onto a blade part (not illustrated) of the cutter 66. As a result, the cutting of the yarn Y2 is properly performable.

[0066] Subsequently, compressed air is supplied to the fluid supply passage 85 of the yarn handling device 7 by the compressed air supplier (not illustrated). In other words, the yarn handling device 7 is in the state (as shown in FIG. 2) in which a yarn Y can be sucked and captured by the first capturing mechanism 81. Then, as shown in FIG. 8(b), the yarn Y1 having been held by the tension applying mechanism 69 is sucked and captured, so that the holding by the tension applying mechanism 69 is canceled.

[0067] Subsequently, the supply of compressed air from the compressed air supplier (not illustrated) is stopped so that compressed air is not supplied to the fluid supply passage 85 of the yarn handling device 7. In other words, the yarn handling device 7 is in the state (as shown in FIG. 1) in which a yarn Y can be pinched and captured by the second capturing mechanism 82. At this step, the yarn Y1 having been sucked and captured by the first capturing mechanism 81 is pinched and captured by the second capturing mechanism 82.

[0068] Then, the yarn Y1 is raised by the yarn handling device 7, and is cut by the cutter 65. At this step, because the yarn Y1 is pinched and captured by the second capturing mechanism 82, tension is sufficiently applied to the yarn Y1 when the yarn Y1 is raised by the yarn handling device 7 and pressed onto the blade part 65a of the cutter 65. As a result, the cutting of the yarn Y1 is properly performable. Finally, the yarn joining is performed by injecting air to the two yarns Y1 and Y2 which are inserted into the chamber 62a.

(Advantageous Effects of Embodiment)

[0069] As described above, the yarn handling device 7 of the present embodiment includes the fluid supply passage 85 to which compressed air is supplied, the first capturing mechanism 81 which is able to suck and capture a yarn Y by means of the negative pressure generated when compressed air is supplied to the fluid supply passage 85, and the second capturing mechanism 82 which is able to pinch and capture the yarn Y. The second capturing mechanism 82 is in the capturing state in which a yarn Y can be pinched and captured when compressed air is not supplied to the fluid supply passage 85, and is switched from the capturing state into the unlocked state in which the yarn Y is not pinched when compressed air is supplied to the fluid supply passage 85. Therefore, the state of the yarn handling device 7 can be switched between the state in which a yarn Y is sucked and captured by the first capturing mechanism 81 and the state in which the yarn Y is pinched and captured by the second capturing mechanism 82. With this, a yarn Y is capturable in a state suitable for content of operations. The state of the second capturing mechanism 82 is also switchable between the capturing state and the unlocked state, by using compressed air which causes the negative pressure to be generated for sucking a yarn Y in the first capturing mechanism 81. As a result, the structure of the device is simple as compared to cases where a driving source for driving the second capturing mechanism 82 is additionally provided. This enables downsizing of the device.

[0070] In the present embodiment, the yarn handling device 7 includes the pipe-shaped main body member 71 forming at least a part of the suction passage 86 connected to the fluid supply passage 85, and the cover member 72 covering the outer circumferential surface of the main body member 71. The cover member 72 is slidable along the longitudinal direction of the main body member 71. The cover member 72 slides along the longitudinal direction so that the state of the second capturing mechanism 82 can be switched between the capturing state and the unlocked state. As such, the cover member 72 covering the outer circumferential surface of the pipe-shaped main body member 71 is slidable along the longitudinal direction of the main body member 71 so that the state of the second capturing mechanism 82 is switched between the capturing state and the unlocked state. As a result, increase in size of the device can be suppressed in a direction orthogonal to the longitudinal direction of the main body member 71.

[0071] In the present embodiment, the main body member 71 includes the suction port 71a at the end portion on the other side of the main body member 71 opposite to the end portion, connecting to the fluid supply passage 85 in the longitudinal direction, on the one side of the main body member 71. The cover member 72 includes the opposed portion 72a which opposes the end portion on the other side of the main body member 71 in the longitudinal direction. The second capturing mechanism 82 is in the capturing state in which the yarn Y can be pinched and captured between the end portion on the other side of the main body member 71 and the opposed portion 72a of the cover member 72 when the opposed portion 72a of the cover member 72 makes contact with the end portion on the other side of the main body member 71 in such a way that the cover member 72 slides along the longitudinal direction. Therefore, by being arranged that a yarn Y is pinched between the other end portion at which the suction port 71a of the main body member 71 is provided and the opposed portion 72a of the cover member 72, the second capturing mechanism 82 in which the yarn Y can be pinched and captured is achievable with the simple structure.

[0072] In the present embodiment, the yarn handling device 7 further includes the spring 76 biasing the cover member 72 toward the one side, and the pressing member 78 which is provided in the fluid supply passage 85 and which applies the force to the cover member 72 so that the cover member 72 slides toward the other side against the biasing force of the spring 76 in such a way that the pressing member 78 is pressed by the compressed air supplied to the fluid supply passage 85. Because of this, the cover member 72 is slidable along the longitudinal direction of the main body member 71 by means of compressed air. As a result, the state of the second capturing mechanism 82 can be switched between the capturing state and the unlocked state with the simple structure.

[0073] The present embodiment is applied to handle a yarn in the yarn joining in which the yarn Y1 provided on the inner layer side of one of the two yarn supply packages Ps1 and Ps2 held by the creel stand 5 of the yarn supplying unit 2 is joined to the yarn Y2 provided on the outer layer side of the other of the two yarn supply packages Ps1 and Ps2 in the draw texturing machine 1 including the yarn supplying unit 2 configured to hold the yarn supply packages Ps, the processing unit 3 provided for false-twisting the yarns Y supplied from the yarn supply packages Ps, and the winding unit 4 provided for winding the yarns Y false-twisted by the processing unit 3. The following operations are performed when the yarn joining is performed for two yarn supply packages Ps1 and Ps2 held by the creel stand 5: the yarn threading to the guides; and the yarn cutting in which end portions of the joined yarns Y1 and Y2 are cut. In the present invention, the yarns Y1 and Y2 are preferably threaded without slackening in the yarn threading, in such a way that the yarns Y1 and Y2 are sucked and captured by the first capturing mechanism 81. In addition to that, the yarns Y1 and Y2 are appropriately cuttable in the yarn cutting, in such a way that the yarns Y1 and Y2 are pinched and captured by the second capturing mechanism 82. It is preferable to use the small yarn handling device of the present invention because the yarns Y1 and Y2 are handled in a narrow space.

(Modifications)

[0074] The embodiment of the present invention is described hereinabove. However, the specific structure of the present invention shall not be interpreted as to be limited to the above described embodiment. The scope of the present invention is defined not by the above embodiment but by claims set forth below, and shall encompass the equivalents in the meaning of the claims and every modification within the scope of the claims.

[0075] While in the embodiment above the cover member 72 is slidable along the longitudinal direction of the main body member 71, the disclosure is not limited to this. The main body member 71 and the cover member 72 may be differently arranged as long as the main body member 71 and the cover member 72 are movable relative to each other in the longitudinal direction of the main body member 71. Therefore, the main body member 71 may be arranged to be slidable along the longitudinal direction.

[0076] While in the embodiment above the movement of the pressing member 78 is transmitted to the cover member 72 via the pivoting member 77 biased by the spring 76, the mechanism causing the cover member 72 to slide is not limited to this. As shown in FIG. 9, for example, a cover member 172 includes a pressing portion 178 fitted in the through hole 73a forming the fluid supply passage 85 in a yarn handling device 107 related to a first modification of the present embodiment. In other words, the part corresponding to the pressing member 78 of the embodiment above is integrally formed with the cover member 172. The cover member 172 is biased toward the one side by the spring 76 via a biasing plate 177.

[0077] As shown in FIG. 10, a cover member 272 includes a pressing portion 278 in a yarn handling device 207 related to a second modification of the present embodiment in the same manner as the first modification. A part on one side of the pressing portion 278 fitted into the through hole 73a forming the fluid supply passage 85 is equivalent to a large diameter portion 278a which is larger in diameter than a part on the other side. In addition to that, a protruding portion 273e protruding inward is provided on the end portion on the other side of the through hole 73a. The protruding portion 273e may be integrally formed with the base portion 73, or may be formed of other components. Springs 276 are provided between the large diameter portion 278a of the pressing portion 278 and the protruding portion 273e of the through hole 73a. The cover member 272 is biased toward the one side in the longitudinal direction by the springs 276. The cover member 272 may be integrally formed with the pressing portion 278, or may be formed of other components in the same manner as the embodiment above.

[0078] In the embodiment above, the second capturing mechanism 82 pinches and captures a yarn Y between the opposed portion 72a of the cover member 72 and the end portion of the main body member 71, in which the suction port 71a is formed. However, the disclosure is not limited to this. In other words, for example, the cover member 72 may not include the opposed portion 72a, and thus a yarn Y may be pinched and captured between the edge of the cutout 72b formed on the side wall of the cover member 72 and the edge of the end portion in which the suction port 71a of the main body member 71 is formed. Similarly, the yarn handling device 107 related to the first modification and shown in FIG. 9 and the yarn handling device 207 related to the second modification and shown in FIG. 10 are also changeable to a structure in which the opposed portion 72a is not provided.

[0079] While in the embodiment above the cover member 72 is biased toward the one side by the spring 76 which is a coil spring, the disclosure is not limited to this. The spring 76 may not be limited to a coil spring, and may be a flat spring. Alternatively, a member made of rubber may be used instead of the spring 76.

[0080] While in the embodiment above the main body member 71 is hollow and cylindrical, the disclosure is not limited to this. The main body member 71 may be arranged as long as it is pipe-shaped and may be a polygon in shape in cross section.

[0081] In the embodiment above, the creel stand 5 is able to hold the yarn supply packages Ps in a matrix manner in the up-down direction and the base longitudinal direction, and includes the pair of the creel stands 5 provided back to back in the base width direction. However, the arrangement of the creel stands 5 is not limited to this. The creel stands 5 may be aligned along, e.g., the base longitudinal direction. The creel stand 5 may be a rotary creel stand which is able to hold the yarn supply packages Ps around the axis parallel to the up-down direction, in which yarn supply packages Ps go around the axis of the stand, as the axis rotates. By using the rotary creel stand, as compared to cases where the creel stands 5 of the above-described embodiment are aligned along the base longitudinal direction, increase in height of each creel stand is suppressed on condition that each of the creel stands is provided with the same number of yarn supply packages Ps. In the embodiment above, the rails R are provided so as to pinch the pair of the creel stands 5 provided back to back. The arrangement of the rails R is, however, suitably changed in accordance with the arrangement of the creel stands 5.

[0082] In the embodiment above, the yarn handling device 7 is applied to handle a yarn Y in the yarn joining in which the yarn Y1 provided on the inner layer of the one of the two yarn supply packages Ps1 and Ps2 held by the creel stand 5 of the yarn supplying unit 2 is joined to the yarn Y2 provided on the outer layer of the other of the two yarn supply packages Ps1 and Ps2, in the draw texturing machine 1. However, the range of applications of the yarn handling device 7 of the present invention is not limited to this and is applicable to the whole yarn handling in textile machine.

Claims

1. A yarn handling device (7) comprising: a fluid supply passage (85) to which a compressed fluid is supplied;
a first capturing mechanism (81) which is able to suck and capture a yarn (Y) by means of negative pressure generated when the compressed fluid is supplied to the fluid supply passage (85); and
a second capturing mechanism (82) which is able to pinch and capture the yarn (Y),
the second capturing mechanism (82) being in a capturing state in which the yarn (Y) is able to be pinched and captured when the compressed fluid is not supplied to the fluid supply passage (85), whereas the second capturing mechanism (82) being switched from the capturing state into an unlocked state in which the yarn (Y) is not pinched when the compressed fluid is supplied to the fluid supply passage (85).

2. The yarn handling device (7) according to claim 1, further comprising: a main body member (71) which is hollow and cylindrical and which forms at least a part of a suction passage (86) connected to the fluid supply passage (85); and
a cover member (72) which covers the outer circumferential surface of the main body member (71),
the main body member (71) and the cover member (72) being movable relative to each other in a longitudinal direction of the main body member (71), and the state of the second capturing mechanism (82) being switchable between the capturing state and the unlocked state in such a way that the main body member (71) and the cover member (72) move relative to each other in the longitudinal direction.

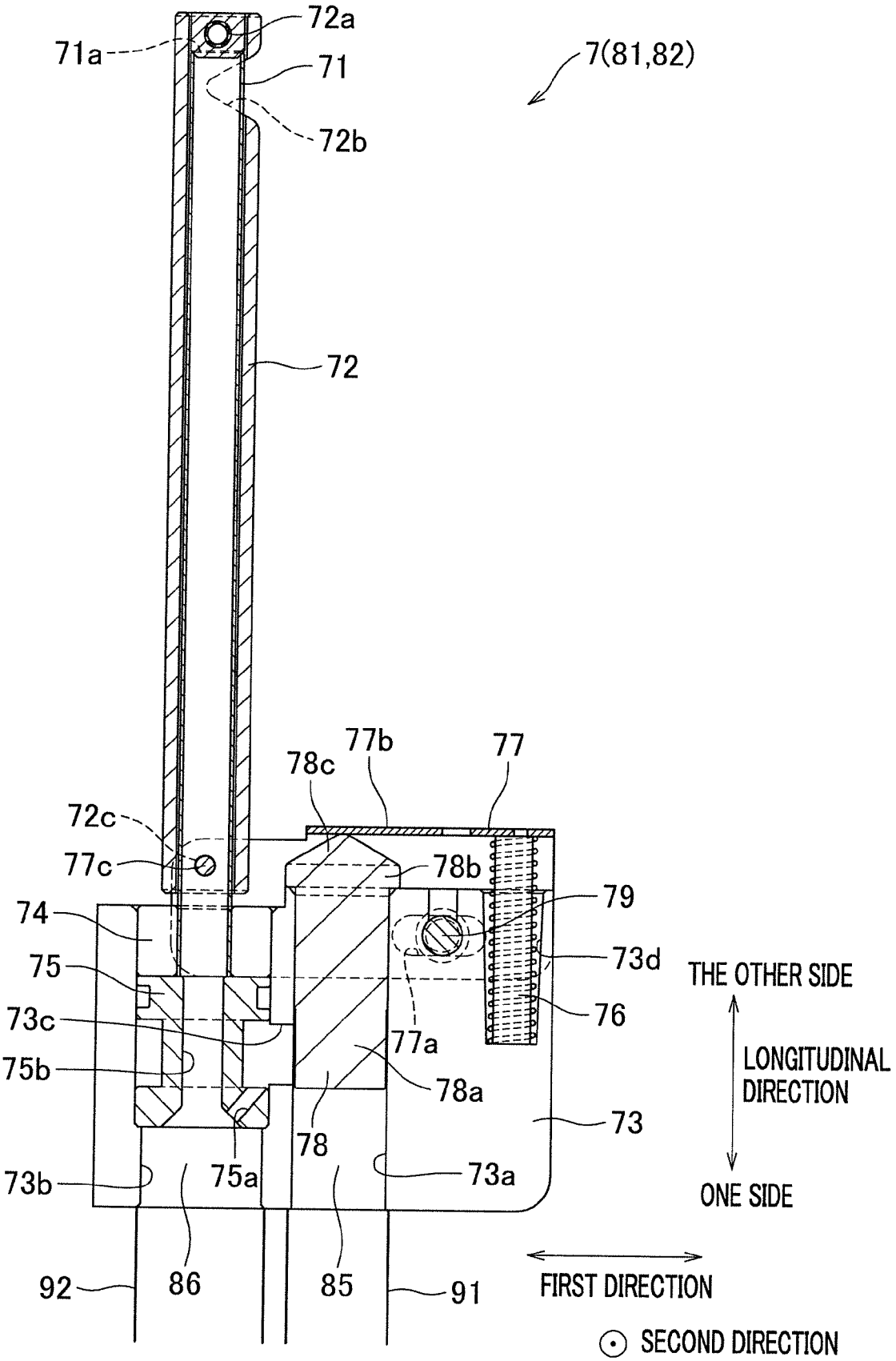
3. The yarn handling device (7) according to claim 2, wherein, one end portion of the main body member (71) is connected to the fluid supply passage (85) in the longitudinal direction, the main body member (71) includes a suction port (71a) which is provided at the other end portion of the main body member (71) which is opposite to the one end portion of the main body member (71),
the cover member (72) includes an opposed portion (72a) which opposes the other end portion of the main body member (71) in the longitudinal direction, and
the second capturing mechanism (82) is in the capturing state in which the yarn (Y) is able to be pinched and captured between the other end portion of the main body member (71) and the opposed portion (72a) of the cover member (72) when the main body member (71) and the cover member (72) move relative to each other in the longitudinal direction so that the opposed portion (72a) of the cover member (72) makes contact with the other end portion of the main body member (71).

4. The yarn handling device (7) according to claim 2 or 3, further comprising:

a biasing member (76) which biases the cover member (72) toward the one end portion of the main body member (71) ; and
a pressing member (78) which is provided in the fluid supply passage (85) and which is pressed by the compressed fluid supplied to the fluid supply passage (85) so as to apply force to the cover member (72) which is slidable along the longitudinal direction so that the cover member (72) slides toward the other end portion of the main body member (71) against the biasing force of the biasing member (76).

5. The yarn handling device (7) according to any one of claims 1 to 4, being applied to handle the yarn (Y) in yarn joining in which a yarn provided on the inner layer side of one of two yarn supply packages (Ps) held by a yarn supplying unit (2) is joined to a yarn provided on the outer layer side of the other of the two yarn supply packages (Ps) in a draw texturing machine (1) including the yarn supplying unit (2) configured to hold each yarn supply package (Ps), a processing unit (3) provided for false-twisting the yarn (Y) supplied from the yarn supply package (Ps), and a winding unit (4) provided for winding the yarn (Y) false-twisted by the processing unit (3).

FIG.1


72a
71a
71
7(81,82)
72b
72
77b
77
78c
72c
77c
78b
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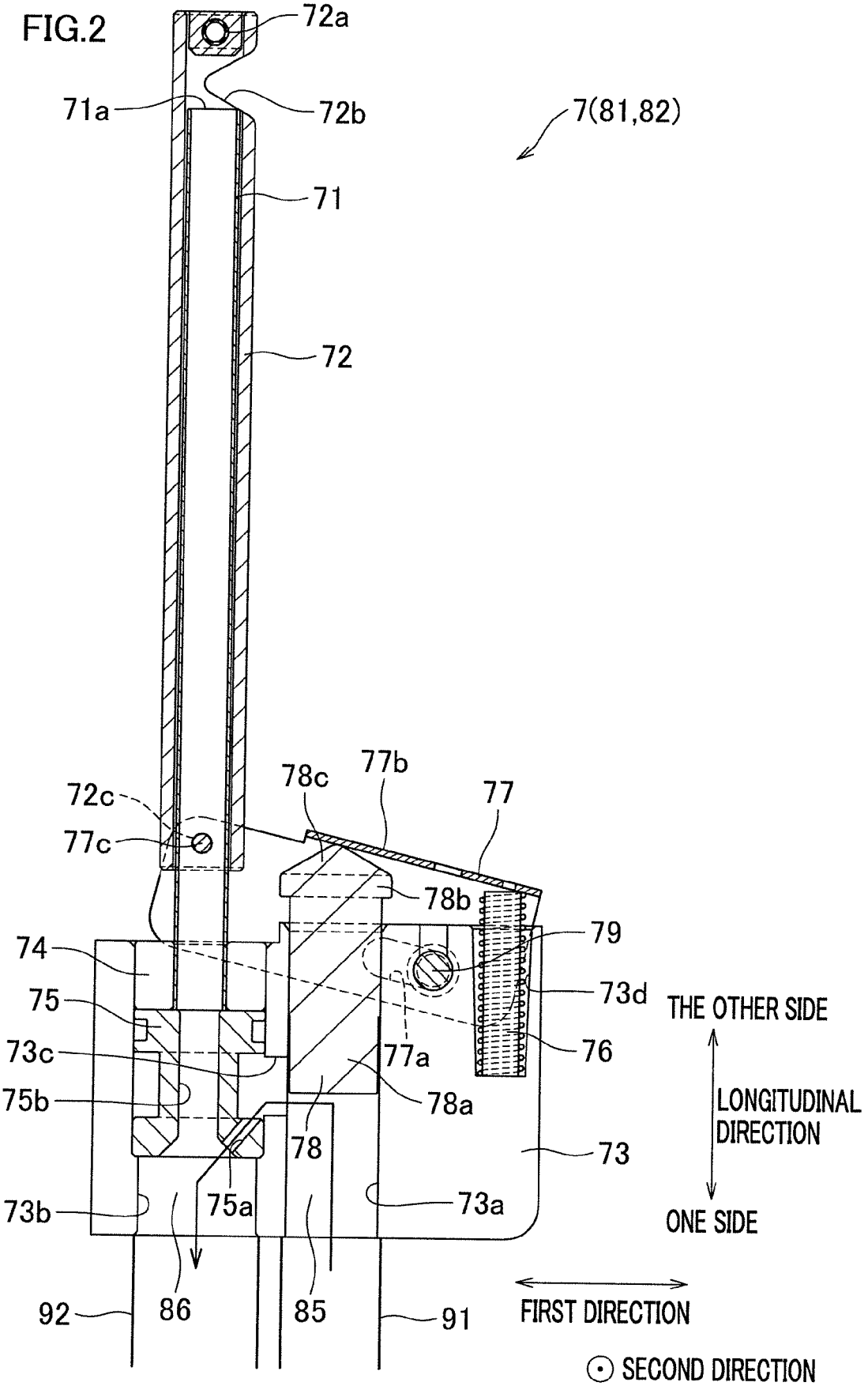
74
73d
75
THE OTHER SIDE
76
73c
77a
LONGITUDINAL DIRECTION
75b
78a
73
78
73b
75a
73a
ONE SIDE
92
86
85
91
FIRST DIRECTION
SECOND DIRECTION

FIG.2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71a
72b
7(81,82)
71
72
72c
77c
78c
77b
77
78b
79
74
73d
75
THE OTHER SIDE
76
73c
77a
LONGITUDINAL DIRECTION
75b
78a
78
73
73b
75a
73a
ONE SIDE
92
86
85
91
FIRST DIRECTION
SECOND DIRECTION

FIG.3

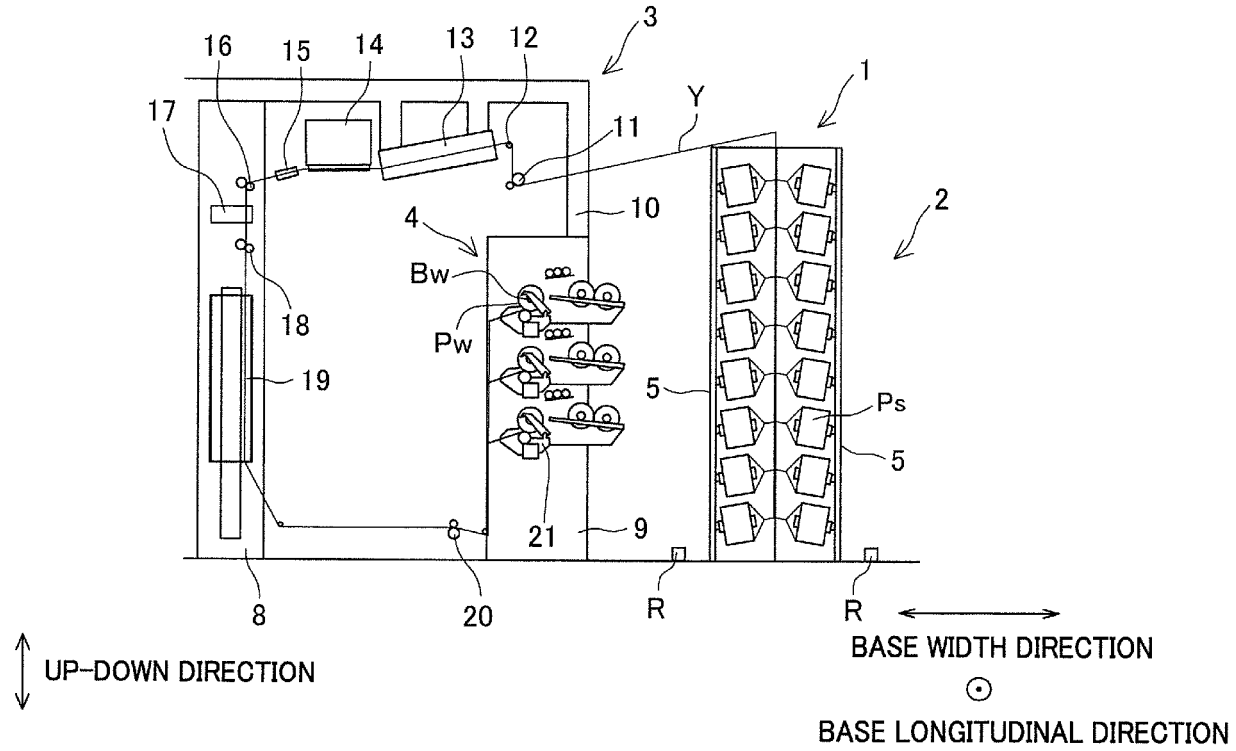

3
16
15
14
13
12
1
17
Y
11
2
10
4
Bw
18
Pw
19
5
Ps
5
21
9
8
20
R
R
BASE WIDTH DIRECTION
UP-DOWN DIRECTION
BASE LONGITUDINAL DIRECTION

FIG.4

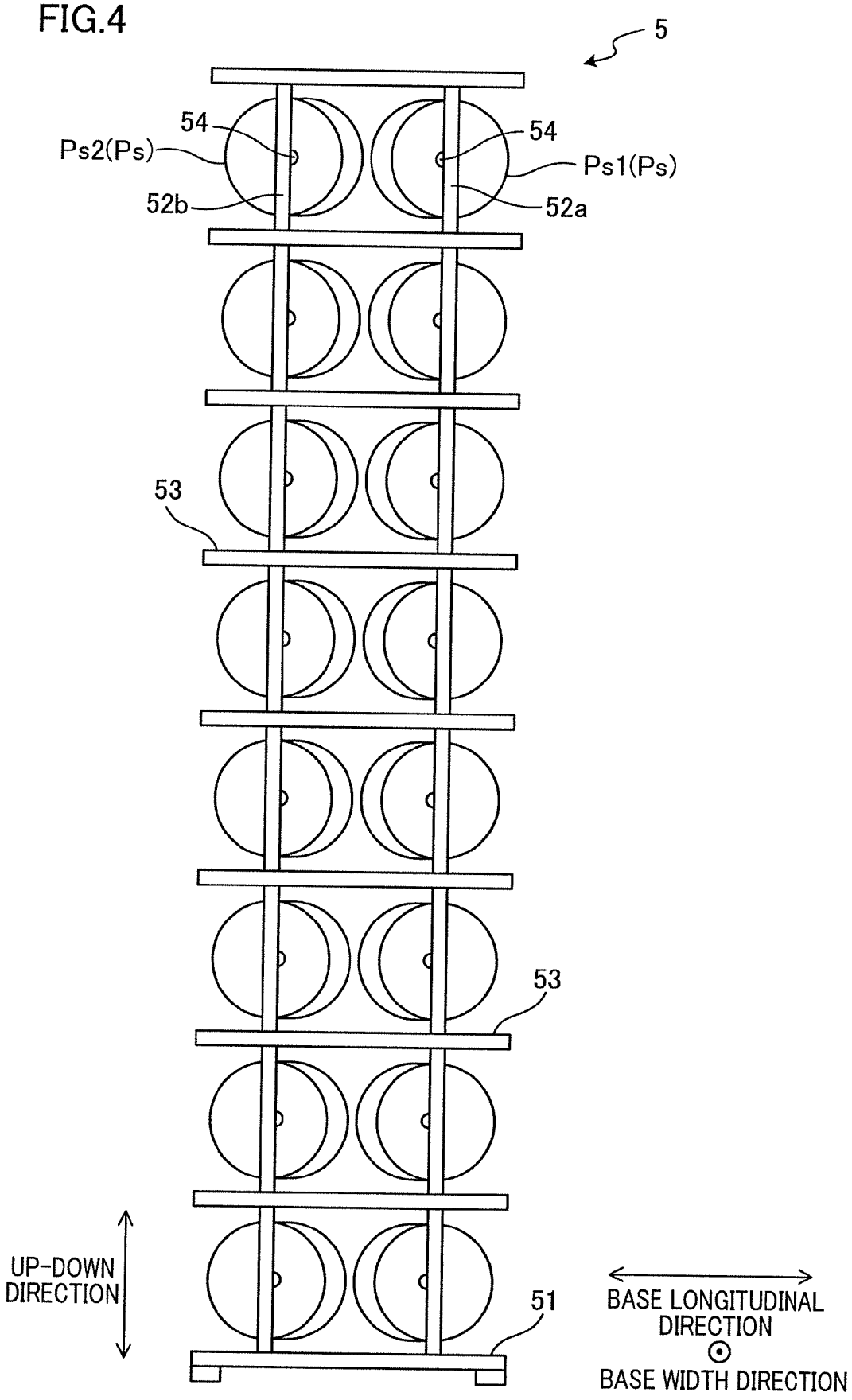

5
54
54
Ps2(Ps)
Ps1(Ps)
52b
52a
53
53
51
UP-DOWN DIRECTION
BASE LONGITUDINAL DIRECTION
BASE WIDTH DIRECTION

FIG.5

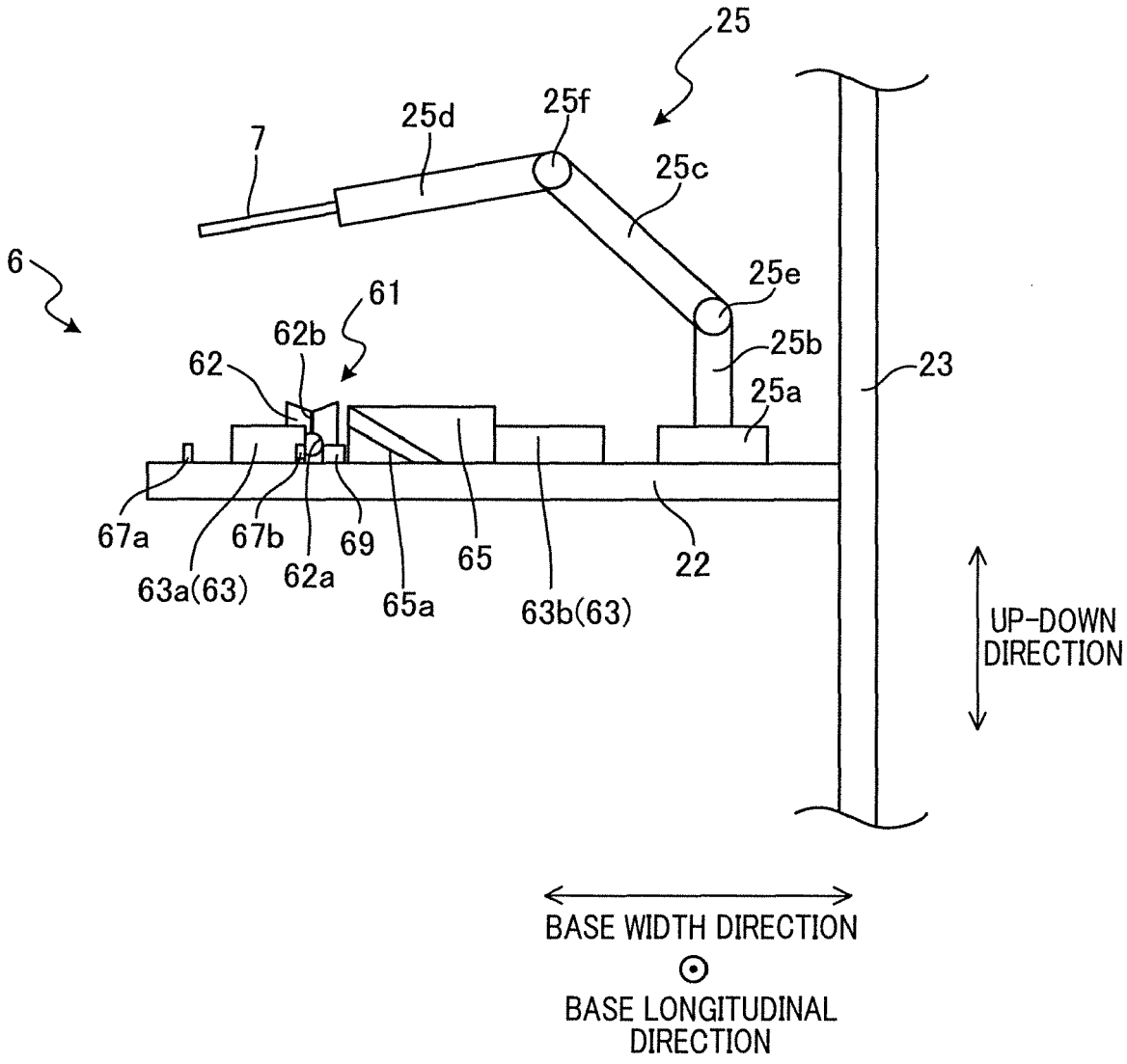

25
25d
25f
7
25c
6
25e
61
62b
25b
23
62
25a
67a
67b
69
65
22
63a(63)
62a
65a
63b(63)
UP-DOWN DIRECTION
BASE WIDTH DIRECTION
BASE LONGITUDINAL DIRECTION

FIG.6

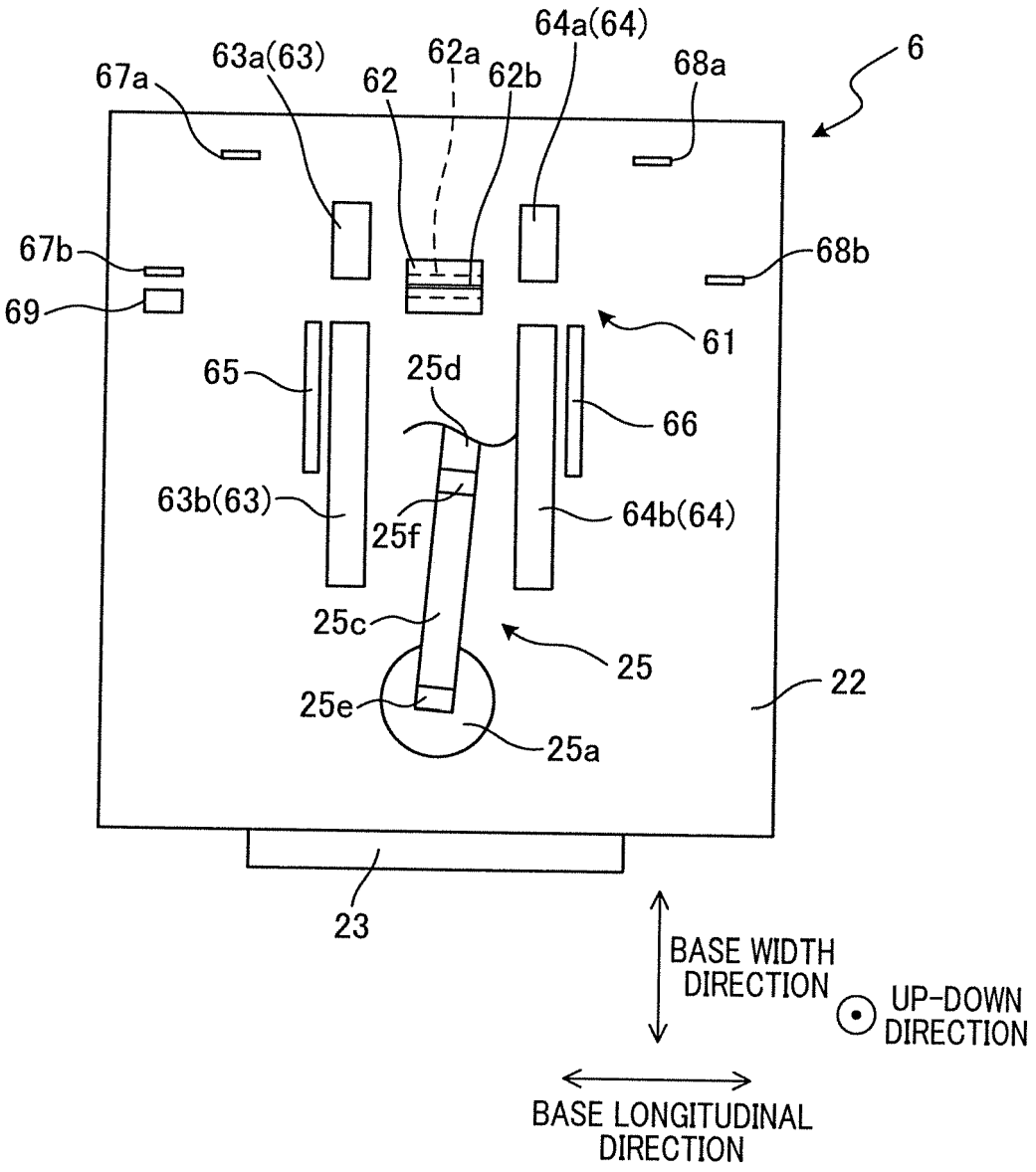

64a(64)
6
67a
63a(63)
62
62a
62b
68a
67b
68b
69
61
65
25d
66
63b(63)
25f
64b(64)
25c
25
22
25e
25a
23
BASE WIDTH DIRECTION
UP-DOWN DIRECTION
BASE LONGITUDINAL DIRECTION

FIG.7

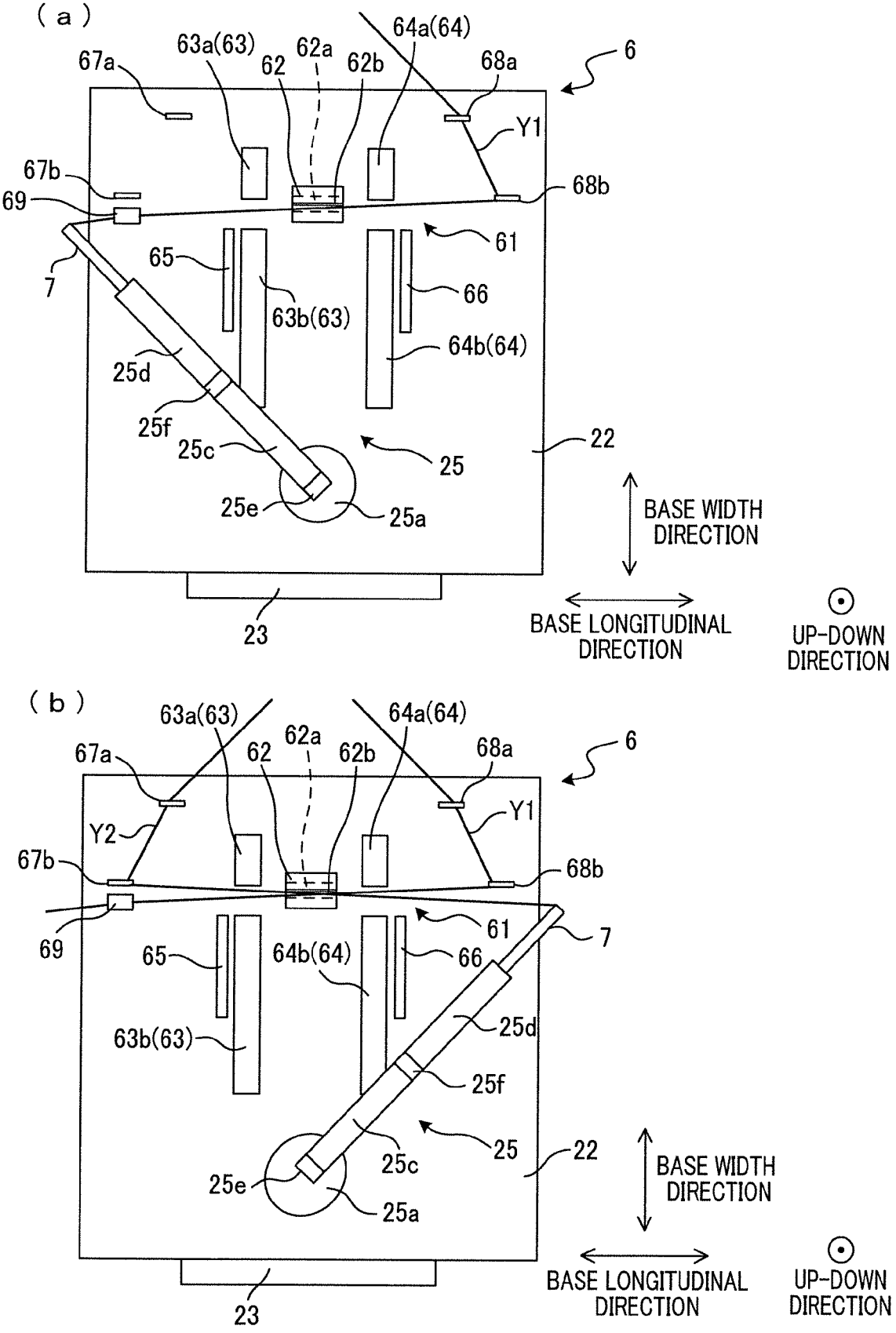

(a)
63a(63)
64a(64)
62
62a
62b
67a
68a
6
Y1
67b
68b
69
61
65
7
66
63b(63)
64b(64)
25d
25f
25c
25
22
25e
25a
BASE WIDTH DIRECTION
23
BASE LONGITUDINAL DIRECTION
UP-DOWN DIRECTION
(b)
63a(63)
64a(64)
62a
62
62b
67a
68a
6
Y1
Y2
67b
68b
69
61
7
65
64b(64)
66
25d
63b(63)
25f
25
22
25c
25e
25a
BASE WIDTH DIRECTION
23
BASE LONGITUDINAL DIRECTION
UP-DOWN DIRECTION

FIG.8

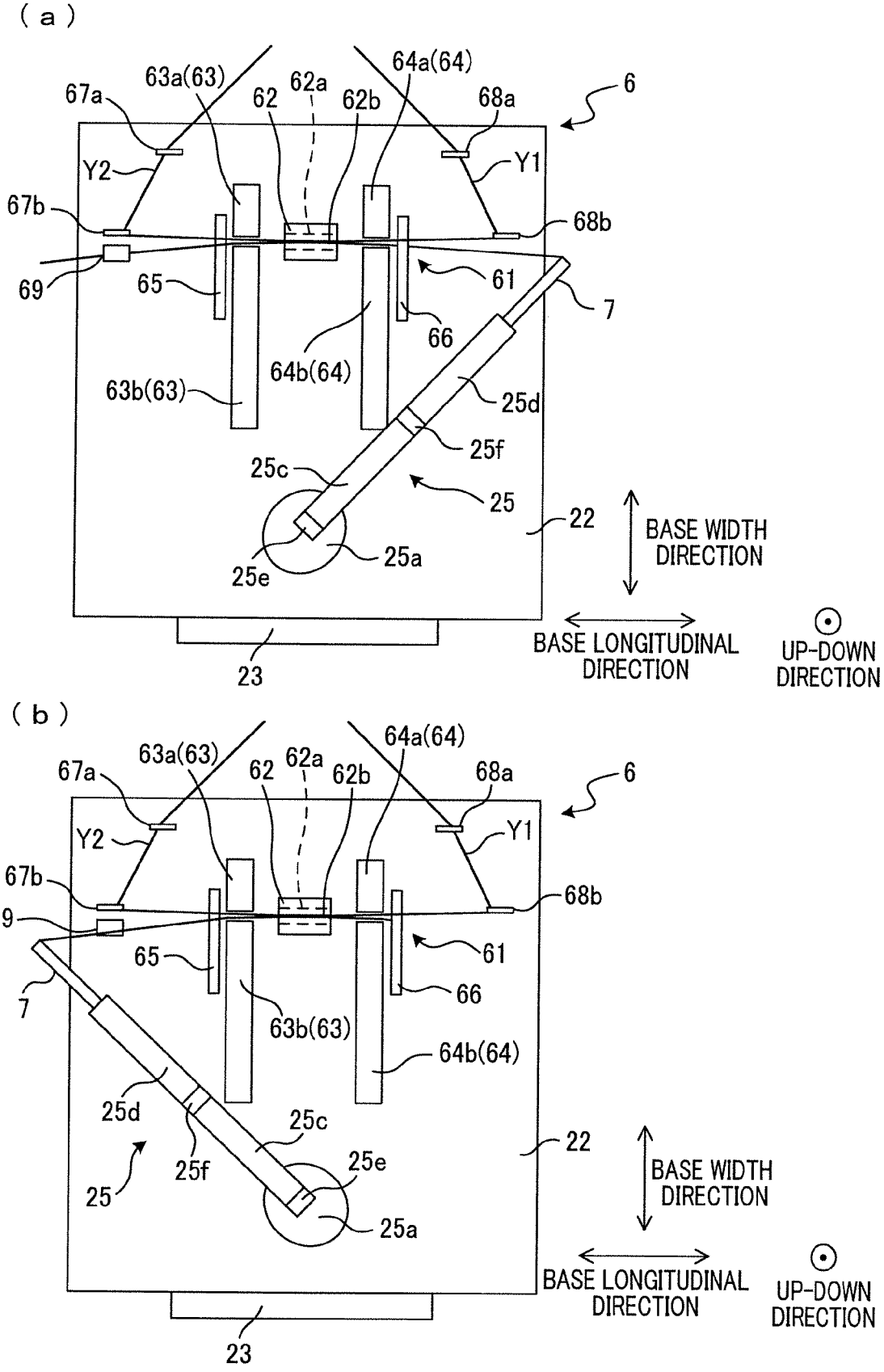

(a)
67a
63a(63)
62
62a
62b
64a(64)
68a
6
Y2
Y1
67b
68b
69
65
61
7
66
64b(64)
63b(63)
25d
25f
25c
25
22
25e
25a
BASE WIDTH DIRECTION
BASE LONGITUDINAL DIRECTION
UP-DOWN DIRECTION
23
(b)
67a
63a(63)
62
62a
62b
64a(64)
68a
6
Y2
Y1
67b
68b
69
65
61
7
66
63b(63)
64b(64)
25d
25c
25f
25e
25
22
25a
BASE WIDTH DIRECTION
BASE LONGITUDINAL DIRECTION
UP-DOWN DIRECTION
23

FIG.9

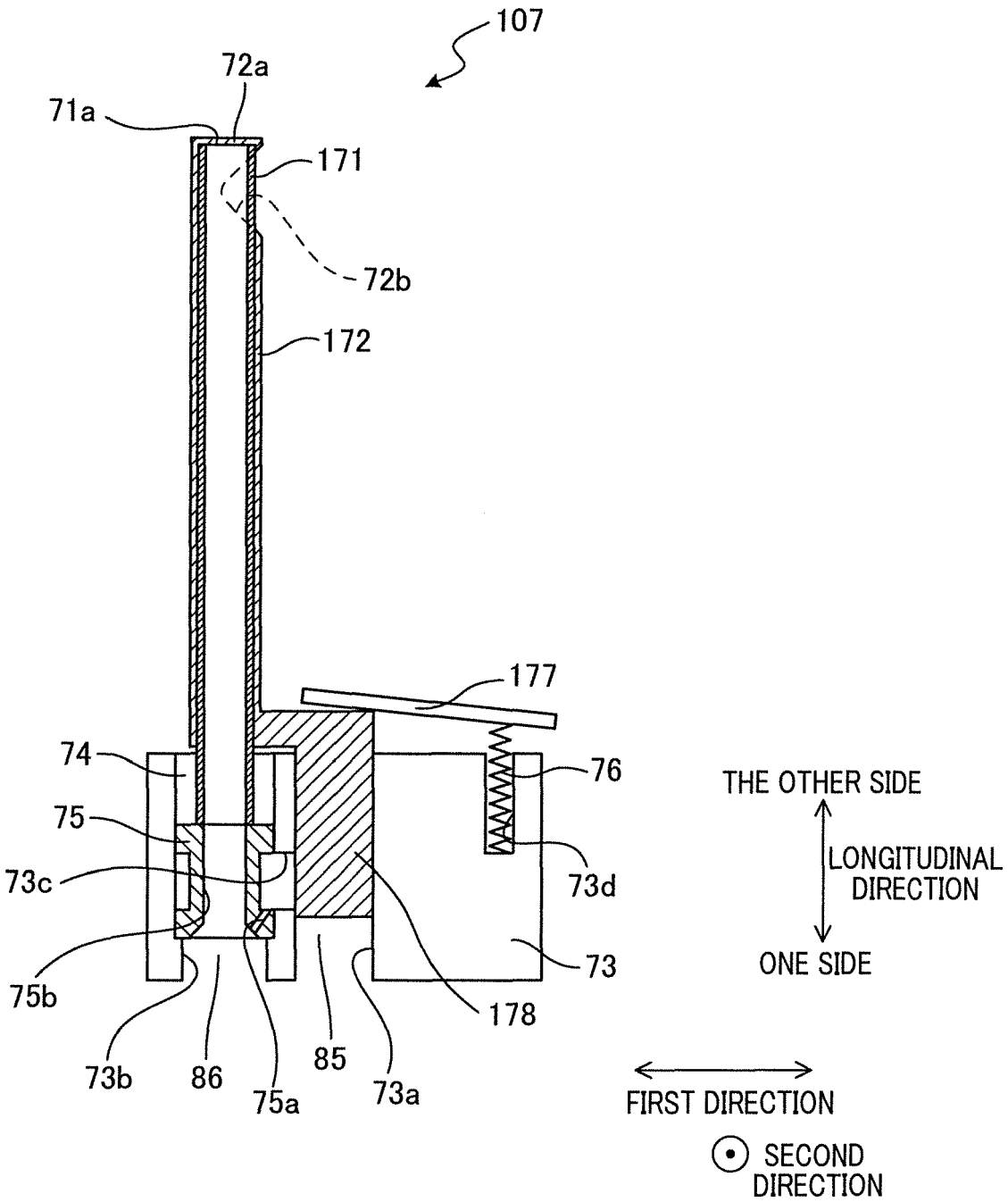
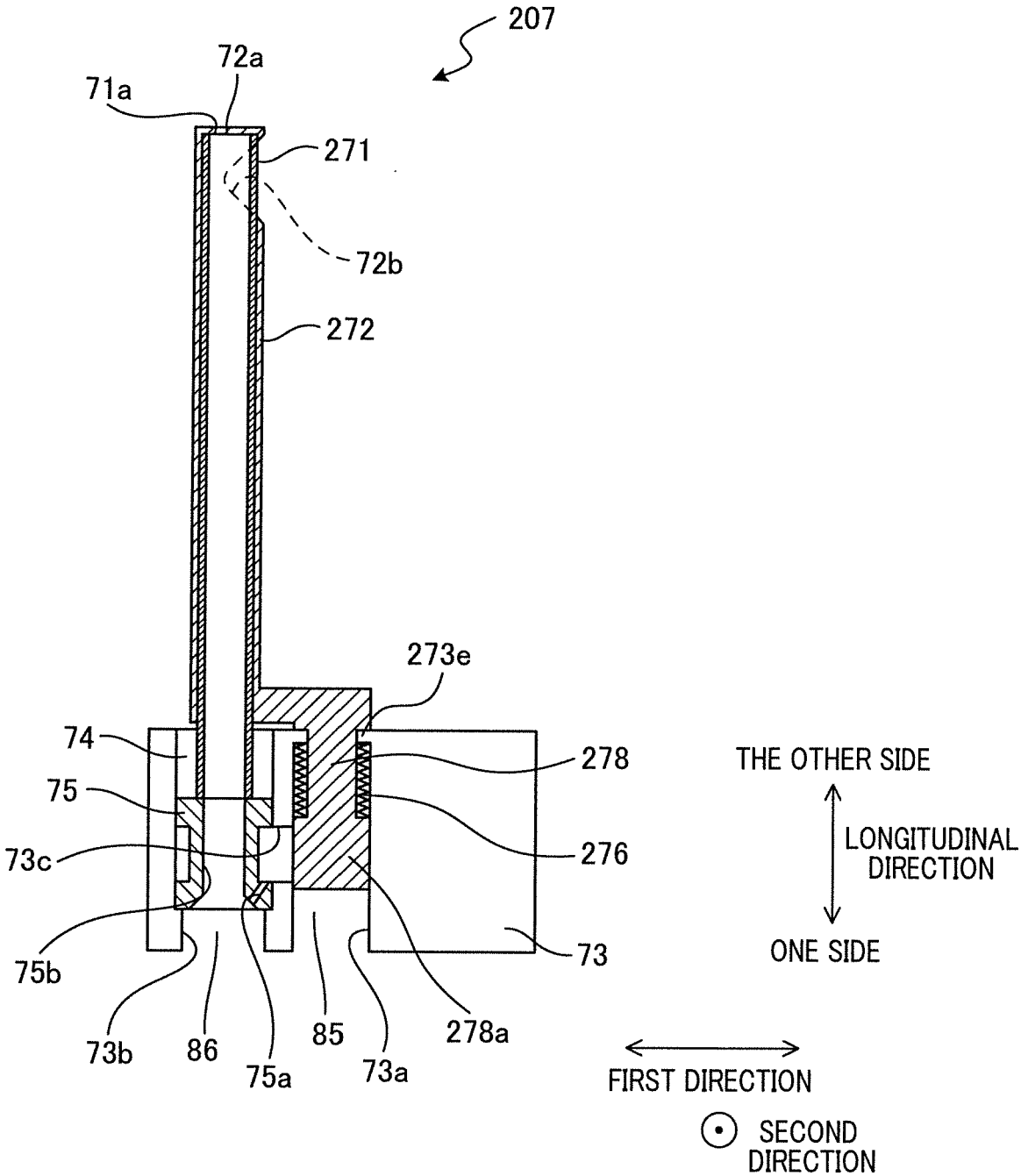

107
72a
71a
171
72b
172
177
74
76
75
73c
73d
73
75b
178
73b
86
75a
85
73a
THE OTHER SIDE
LONGITUDINAL DIRECTION
ONE SIDE
FIRST DIRECTION
SECOND DIRECTION

FIG.10


207
72a
71a
271
72b
272
273e
74
75
73c
75b
73b
86
75a
85
73a
278a
278
276
73
THE OTHER SIDE
LONGITUDINAL DIRECTION
ONE SIDE
FIRST DIRECTION
SECOND DIRECTION

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EUROPEAN SEARCH REPORT

Application Number
EP 20 20 9491

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 April 2021	Humbert, Thomas

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