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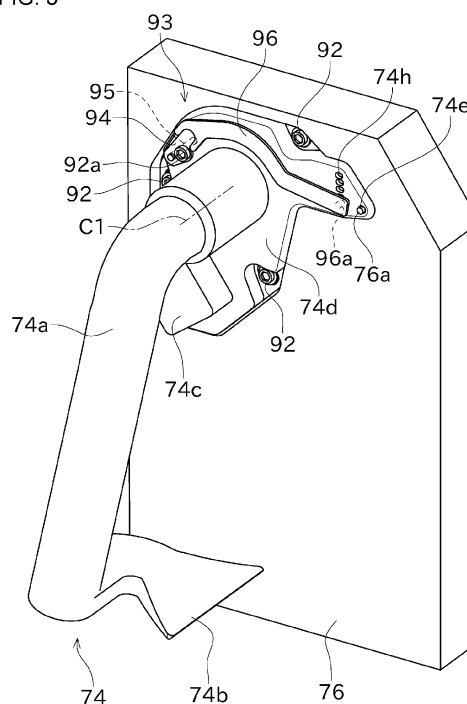
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(54) **TEXTILE MACHINE**

(57) A winding unit has a yarn winding device and a second yarn capturing device 74. The yarn winding device winds yarn to form a package. The second yarn capturing device 74 draws yarn from the package. The second yarn capturing device 74 has a capturing pipe 74a and a suction mouth 74b. The capturing pipe 74a is formed elongated and is rotatable around an end of the

capturing pipe 74a as a rotation center C1. The suction mouth 74b is provided at an end of the capturing pipe 74a that is far from the rotation center C1. The winding unit is provided with a position adjustment mechanism 93 to adjust a position of the rotation center C1 of the capturing pipe 74a.

FIG. 3



Description

TECHNICAL FIELD

[0001] This invention relates to a textile machine.

BACKGROUND ART

[0002] In the following description, the Japanese Patent Publication No. 2017-77970 may be referred to as PTL 1.

[0003] A textile machine having a yarn winder that winds spun yarn into a package is conventionally known. PTL 1 discloses this type of textile machine.

[0004] The textile machine of PTL 1 produces a traverse-wound package by rewinding yarn unwound from a spinning cup. This textile machine is equipped with a suction nozzle supported so that it is swingable. After the unwinding is interrupted, the suction nozzle swings to receive an end of the yarn wound onto the package.

[0005] In the textile machine of PTL 1, the distance between a suction opening of the suction nozzle stopped to receive the yarn and the traverse-wound package can be adjusted by changing the position where the suction nozzle stops in its swinging path.

SUMMARY OF THE INVENTION

[0006] In PTL 1, the suction nozzle changes its position in the direction along the swinging path to adjust the distance between the suction opening of the suction nozzle stopped to receive the yarn and the traverse-wound package. Depending on the material of the device or the configuration for mounting each part, the accuracy of the positional relationship between the suction opening of the suction nozzle and the yarn winder forming the package could not be fully achieved by simply adjusting the position in the above direction.

[0007] The present invention is made in view of the circumstances described above, and an object of the present invention is to provide a textile machine in which the position of the suction mouth drive can be adjusted.

[0008] The problem to be solved by the present invention is as described above, and next, means for solving the problem and effects thereof will be described.

[0009] According to an aspect of the present invention, a textile machine having the following configuration is provided. That is, the textile machine includes a yarn winding mechanism and a yarn drawer. The yarn winding mechanism winds yarn to form a package. The yarn drawer draws the yarn from the package. The yarn drawer includes a body part and a yarn capturer. The body part is formed elongated and rotatable around an end of the body part as a rotation center. The yarn capturer is provided at an end of the body part on a side far from the rotation center. The textile machine is provided with a position adjustment mechanism to adjust a position of

the rotation center of the body part.

[0010] This allows the position of the rotation center of the body part (and thus the capturing position of the yarn capturer) to be adjusted to an appropriate position.

[0011] In the textile machine described above, the following configuration is preferred. That is, the yarn winding mechanism includes a contact roller that rotates in contact with the package. The position adjustment mechanism adjusts, by moving the position of the rotation center of the body part, a distance between the yarn capturer of the yarn drawer and the contact roller when the yarn capturer is in a position to capture the yarn.

[0012] This allows the position of the suction mouth relative to the contact roller to be easily adjusted by adjusting the rotation center of the body part. The technique of adjusting the position of the package and the suction mouth when the yarn capturer is in the position to capture the yarn is conventionally known. In addition to this, by adjusting the position of the suction mouth relative to the contact roller, the position of the suction mouth can be determined more accurately.

[0013] In the textile machine described above, it is preferred that the position adjustment mechanism moves the rotation center of the body part in an up-down direction.

[0014] This allows the height of the entire swinging trajectory of the yarn capturer to be adjusted.

[0015] In the textile machine described above, it is preferred that the position adjustment mechanism moves integrally with the yarn drawer.

[0016] This allows the yarn drawer and the position adjustment mechanism to be handled together during manufacturing. Thus, the number of manufacturing man-hours can be reduced.

[0017] In the textile machine described above, the position adjustment mechanism preferably includes a lever member that moves the rotation center of the body part.

[0018] This allows the position adjustment of the rotation center of the body part to be performed with a simple configuration.

[0019] In the textile machine described above, it is preferred that the yarn drawer has a hole formed for attaching the lever member.

[0020] This allows the lever member to be easily attached to the yarn drawer.

[0021] In the textile machine described above, it is preferred to have the following configuration. That is, the lever member is formed elongated and rotatably supported. A fastening member is located at a rotation center part of the lever member. An angle of the lever member can be maintained by tightening the fastening member.

[0022] This allows the rotation center of the body part to be fixed so that it does not move, if necessary.

[0023] In the textile machine described above, it is preferable to have the following configuration. That is, the position adjustment mechanism includes a lever posture adjustment member that changes a posture of the lever member. The lever posture adjustment member can be

attached to the lever member without a tightening member.

[0024] This allows the lever posture adjustment member to be easily removed. By sharing the lever posture adjustment member with multiple textile machines, for example, the cost of parts can be reduced.

[0025] In the textile machine described above, it is preferable to have the following configuration. That is, the lever member is formed elongated and rotatably supported. A holding mechanism to hold an angle of the lever member is provided at a position different from a rotation center part of the lever member.

[0026] This allows the rotation center of the body part to be fixed so that it does not move, using a simple configuration.

[0027] In the textile machine described above, it is preferable that a jig can be mounted to the textile machine to check a capturing position of the yarn capturer, being changed as the rotation center of the body part moves, where the yarn capturer captures the yarn, the capturing position.

[0028] This allows the position of the yarn capturer with respect to the contact roller to be easily checked.

[0029] In the textile machine described above, it is preferred that the jig has a scale.

[0030] This allows the position of the yarn capturer to be checked more accurately.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031]

FIG. 1 is a diagonal view showing a configuration of an automatic winder according to one embodiment of the invention.

FIG. 2 is a schematic diagram showing an example configuration of a winding unit provided in the automatic winder.

FIG. 3 is a diagonal view showing a configuration of a second yarn capturing device.

FIG. 4 is an illustration showing an installation of the second yarn capturing device.

FIG. 5 is an enlarged view showing a part of a configuration of a position adjustment mechanism.

FIG. 6 is a diagram illustrating a change in a position of a root side of a capturing pipe.

FIG. 7 is a diagonal view showing a configuration of the jig for checking a position of a suction mouth.

FIG. 8 is an enlarged diagonal view showing around the jig.

EMBODIMENT FOR CARRYING OUT THE INVENTION

[0032] Next, embodiments of the present invention will be described with reference to the drawings. FIG. 1 is a diagonal view showing a configuration of an automatic winder 1 of this invention. FIG. 2 is a side view schematically showing an example configuration of a winding unit

4 provided in the automatic winder 1. FIG. 3 is a diagonal view showing a configuration of a second yarn capturing device 74.

[0033] The automatic winder 1 has a main frame 2, a plurality of winding units (textile machines) 4, 4, ..., and a machine controller not shown. The winding units 4 are lined up in a row and each of them is mounted on the main frame 2.

[0034] The winding units 4, 4, ... are lined up in a left-right direction in a front view. Each of the winding units 4 unwinds yarn from a yarn feeding bobbin 6 set in its yarn-feeding changer 3 or from a yarn feeding package which is not shown. Each of the winding units 4 winds the yarn which is unwound. As a result, a package 9 is formed at each of the winding units 4.

[0035] The machine controller is located at one end of the main frame 2 in a direction in which the plurality of winding units 4, 4, ... are lined up. The machine controller controls the winding units 4, 4, ... in an integrated manner by communicating with the unit controller 90 provided in each of the winding units 4. An operator can collectively control the plurality of winding units 4 by inputting an appropriate instruction into the machine controller.

[0036] Next, the configuration of the winding unit 4 will be described more specifically with reference to FIG. 2. FIG. 2 is a schematic side view of an example of a configuration of the winding unit 4 of the automatic winder 1.

[0037] As shown in FIG. 2, the winding unit 4 includes a yarn winder 5 and a yarn processor 10. In a vertical direction, the yarn winder 5 is located at an upper part of the main frame 2. In the vertical direction, the yarn processor 10 is located below the yarn winder 5. The yarn processor 10 includes a yarn-feeding changer 3 and a yarn joiner 8. The yarn-feeding changer 3 is located below the yarn processor 10. The yarn joiner 8 is disposed between the yarn winder 5 and the yarn-feeding changer 3.

[0038] Thus, the winding unit 4 is a unit of modular-split type, configured by combining three modules, arranged in order from bottom to top, the yarn-feeding changer 3, the yarn joiner 8, and the yarn winder 5. Each of the devices installed to the yarn-feeding changer 3, the yarn joiner 8, and the yarn winder 5 is provided so that it is detachable and attachable to the main frame 2 as the module.

[0039] The yarn-feeding changer 3 is a part of the yarn processor 10. The yarn-feeding changer 3 is the part where a yarn feeding bobbin 6 (or yarn feeding package) that supplies the yarn to be rewound onto the package 9 is changeably set. The yarn-feeding changer 3 is installed on a lower part of the main frame 2 so that it is placed on a bottom plate 12 of the main frame 2.

[0040] The yarn-feeding changer 3 is configured by selectively installing any of a plurality of forms of yarn-feed changing devices. Specifically, any one of a magazine-type bobbin supplier, a tray-type bobbin supplier 30, and a package feeder can be installed to the yarn-feeding changer 3.

[0041] The yarn joiner 8 is a part of the yarn processor 10. The yarn joiner 8 is the part that joins the yarn supplied from the yarn-feeding changer 3 to the yarn winder 5. The yarn joiner 8 is installed to an intermediate portion of the main frame 2 in an up-down direction. Specifically, a position where the yarn joiner 8 is installed to the main frame 2 is above a position where the yarn-feeding changer 3 is provided to the main frame 2 and below a position where the yarn winder 5 is installed to the main frame 2. The yarn joiner 8 is attached to a front side of the main frame 2, for example, by an appropriate fixing member (for example, a bolt). In a state where the yarn joiner 8 is fixed to the main frame 2, the weight of the yarn joiner 8 is supported by a support shaft 14 provided by the main frame 2.

[0042] Hereinafter, the winding unit 4 configured with one example combination of these three modules will be described in detail.

[0043] The winding unit 4 shown in FIG. 2 is configured by installing an arm-traverse type yarn winding device (yarn winding mechanism) 60 to the yarn winder 5, a transporting-tray type bobbin supplier 30 to the yarn-feeding changer 3, and a suction-mouth type yarn joining mechanism 70 to the yarn joiner 8, respectively.

[0044] The yarn winding device 60 includes a rewinding bobbin 61, a rewinding bobbin rotation drive source not shown, a cradle 62, a contact roller 63, a yarn winding frame 64, a traverse arm 67, and a traverse drive motor 66.

[0045] The cradle 62 rotatably supports the rewinding bobbin 61. The rewinding bobbin 61 is connected to an output shaft of the rewinding bobbin rotation drive source and is driven to rotate. The traverse arm 67 is driven in a reciprocating swing manner by the traverse drive motor 66.

[0046] The contact roller 63 is rotatably supported by the yarn winding frame 64. One axial end of the contact roller 63 is attached to the yarn winding frame 64. The contact roller 63 can rotate in contact with a circumference of the rewinding bobbin 61. The contact roller 63 may be rotatably installed on, for example, a support arm not shown fixed to the yarn winding frame 64.

[0047] Various devices of the yarn winding device 60 are arranged on one side of the yarn winding frame 64 in the left-right direction. The various devices include the cradle 62, the rewinding bobbin rotation drive source, and the traverse drive motor 66. The traverse arm 67 is driven by the traverse drive motor 66 in a reciprocating swing manner.

[0048] The traverse arm 67 performs a reciprocating swing motion as a rotor of the traverse drive motor 66 repeats forward and reverse rotation. As a result, the yarn hooked at the tip of the traverse arm 67 is fed to the contact roller 63 side while being traversed, and is wound onto the rewinding bobbin 61 which is rotating. This allows the yarn from the yarn feeding bobbin 6 to be rewound to form the package 9.

[0049] The bobbin supplier 30 includes a bobbin set-

ting part 31, a yarn unwinding assist device 39, and a support body 38.

[0050] The bobbin setting part 31 can hold the yarn feeding bobbin 6 for unwinding the yarn in an upright orientation at a predetermined position. The yarn unwinding assist device 39 assists for unwinding the yarn by making a movable member contact with a balloon formed at the top of the yarn feeding bobbin 6 and appropriately controlling the size of this balloon. The support body 38 supports the yarn unwinding assist device 39 at a position above the bobbin setting part 31. The bobbin setting part 31 (and thus the transporting tray type bobbin supplier 30) is attached to the main frame 2 with a bottom of the bobbin setting part 31 placed on the bottom plate 12.

[0051] The yarn joining mechanism 70 of suction mouth type includes a yarn monitoring device 71, a splicer 72, a first yarn capturing device 73, a second yarn capturing device (yarn drawer) 74, a tension applying device 75, and a yarn joining frame 76.

[0052] The yarn joining frame 76 is a generally rectangular member which is vertically elongated. The yarn monitoring device 71, the splicer 72, the first yarn capturing device 73, the second yarn capturing device 74, and the tension applying device 75 are arranged on one side of the yarn joining frame 76 in the left-right direction. The yarn joining frame 76 supports each of these members in a cantilevered manner.

[0053] The yarn joining frame 76 is installed to an intermediate portion of the main frame 2 in the up-down direction, while supporting each of the above members supported. The yarn joining frame 76 is located at a position corresponding to the yarn winding frame 64 in the left-right direction so as to partition between the yarn joiners 8 of the winding units 4 adjacent to each other. The yarn winding frame 64 and the yarn joining frame 76 are not directly connected and a gap is formed between each other (in the up-down direction) as a space.

[0054] The unit controller 90 and the like are disposed inside the yarn joining frame 76. The unit controller 90 functions as a controller for controlling various parts of the winding unit 4.

[0055] The yarn monitoring device 71 monitors the thickness of the yarn to detect a slub and other defect in the yarn (hereinafter may be referred to as yarn defect). A cutter is located near the yarn monitoring device 71 to immediately cut the yarn when the yarn monitoring device 71 detects the yarn defect.

[0056] The splicer 72 joins together the yarn on the yarn-feeding changer 3 side and the yarn on the yarn winder 5 side, when the yarn monitoring device 71 detects the yarn defect and the yarn is cut by the cutter, when the yarn unwound from the yarn feeding bobbin 6 is broken, when the yarn feeding bobbin 6 is replaced, or the like. In the splicer 72 of the present embodiment, connecting in a twisting manner, etc. of the yarn is performed by compressed air supplied from a compressor not shown, and thus the joining of the yarn is performed.

[0057] The first yarn capturing device 73 and the sec-

ond yarn capturing device 74 are provided on the lower and upper sides of the splicer 72, respectively. The first yarn capturing device 73 sucks and captures the yarn on the yarn-feeding changer 3 side for guiding. The second yarn capturing device 74 sucks and captures the yarn on the yarn winder 5 side for guiding. A suction opening is formed at the tip of the first yarn capturing device 73 and a suction mouth (yarn capturer) 74b is provided at the tip of the second yarn capturing device 74. The first yarn capturing device 73 and the second yarn capturing device 74 are connected to an opening 13a of a blower duct 13 via piping or the like. This allows a suction flow to be generated at the suction opening and the suction mouth 74b.

[0058] In this configuration, when changing the yarn feeding bobbin 6 or the like, the suction opening of the first yarn capturing device 73 swings downward to capture the yarn on the yarn-feeding changer 3 side and then swings upward to guide the yarn to the splicer 72. At about the same time, the suction mouth 74b of the second yarn capturing device 74 captures the yarn unwound from the package 9 which is driven in a reverse direction, and then guides the yarn to the splicer 72 by swings downward. Then, the joining of the yarn from the yarn-feeding changer 3 and the yarn from the package 9 is performed by the splicer 72.

[0059] In the second yarn capturing device 74, a position of the suction mouth 74b when the suction flow acts on the surface of the package 9 may hereinafter be referred to as "capturing position" of the suction mouth 74b. It is important that positioning of the suction mouth 74b relative to the package 9 is accurate in order to improve the success rate of yarn capture by applying a suction flow well against the surface of the package 9.

[0060] Next, a configuration of the second yarn capturing device 74 in the winding unit 4 will be described in detail. FIG. 3 is a diagonal view showing the configuration of the second yarn capturing device 74. FIG. 4 is an exploded diagonal view showing the installation of the second yarn capturing device 74.

[0061] The second yarn capturing device 74 includes a capturing pipe (body part) 74a, the suction mouth 74b, a drive motor 74c, and a casing 74d.

[0062] The capturing pipe 74a is supported by the casing 74d and can swing upward and downward. The suction mouth 74b is installed at an end of the capturing pipe 74a that is far from a swinging center. In the following description, the side of the capturing pipe 74a on which the suction mouth 74b is located is referred to as "tip side" and the side closer to the swinging center is referred to as "root side".

[0063] With a swing motion of the capturing pipe 74a, the suction mouth 74b can rotate from a standby position shown by solid lines in FIG. 2 to a capturing position shown by chain lines in FIG. 2. That is, the suction mouth 74b swings around the root side of the capturing pipe 74a. The capturing pipe 74a is made of a rigid member. Therefore, the distance from the root-side end of the cap-

turing pipe 74a (and thus a rotation center C1) to the suction mouth 74b is constant regardless of a posture of the capturing pipe 74a.

[0064] The capturing pipe 74a is connected to the opening 13a of the blower duct 13 via piping or the like not shown. The capturing pipe 74a constitutes a path through which the suction flow for sucking the yarn flows. This allows the suction flow to act at an opening provided by the suction mouth 74b.

[0065] The drive motor 74c provides power to swing the capturing pipe 74a. The drive motor 74c is fixed to the casing 74d below the root part of the capturing pipe 74a. The position at which the drive motor 74c is mounted is not limited.

[0066] The casing 74d is formed in a form of a thin cover. The casing 74d can be constructed, for example, as a metal press product, but the material of the casing 74d is not limited. For example, it can also be formed by synthetic resin. As shown in FIG. 3, the capturing pipe 74a is attached to one side of the casing 74d in the thickness direction so that it is swingable.

[0067] The casing 74d is attached to one side of the yarn joining frame 76 in the left-right direction via appropriate fastening members (for example, bolts 92, screws, etc.). As a result, an accommodation space is formed between the casing 74d and the yarn joining frame 76. Although not shown in the figure, gears for swinging the capturing pipe 74a and belts, etc. for transmitting power from the drive motor 74c to the gears are located in this accommodation space.

[0068] As shown in FIG. 4, the casing 74d has a positioning hole 74e and a plurality of first mounting holes 74f. The positioning hole 74e and the first mounting holes 74f are used to install the casing 74d (i.e., the second yarn capturing device 74) to the yarn joining frame 76. Additionally, the casing 74d has a passage hole 74g and a lever hole 74k. A reference pin 95 which will be described later is inserted through the passage hole 74g. A transmission lever 94 which will be described later is attached at the lever hole 74k.

[0069] Corresponding to these, in this embodiment of the winding unit 4, the yarn joining frame 76 has a positioning pin 76a, a reference pin hole 76b, and a plurality of second mounting holes 76c. The plurality of second mounting holes 76c are preferably formed at a plurality of positions in the front-back direction and the up-down direction (i.e., the vertical direction) shown in FIG. 4.

[0070] The positioning pin 76a and the second mounting holes 76c are used to install the second yarn capturing device 74 to the yarn joining frame 76. The reference pin hole 76b is used to change the position of the swinging center of the capturing pipe 74a via a change in the posture of the casing 74d.

[0071] The positioning hole 74e is a hole in the casing 74d and positioning pin 76a is a cylindrical pin. The inner diameter of the positioning hole 74e is substantially equal to the outer diameter of the positioning pin 76a. When the second yarn capturing device 74 is installed to the

yarn joining frame 76, the positioning pin 76a is inserted into the positioning hole 74e of the casing 74d. The positioning pin 76a serves as a center axis for changing the posture of the casing 74d with respect to the yarn joining frame 76.

[0072] The first mounting holes 74f are formed at positions corresponding to the second mounting holes 76c. Each of the first mounting holes 74f is formed slightly larger than the thickness of a shaft part of the bolt 92. This permits some position adjustment of the casing 74d relative to the yarn joining frame 76. The first mounting hole 74f may be formed as a slotted hole or a round hole, as long as it is larger than a circle corresponding to the shaft part of the bolt 92.

[0073] The positioning pin 76a is inserted into the positioning hole 74e, thereby supporting the casing 74d of the second yarn capturing device 74 so that it is rotatable with respect to the yarn joining frame 76. In other words, the positioning pin 76a serves as a reference point for fixing the casing 74d. With the casing 74d rotated around the positioning pin 76a to the appropriate position, the bolts 92 and the like are inserted into the first mounting holes 74f and fastened into the second mounting holes 76c. Thereby, the second yarn capturing device 74 is installed to the yarn joining frame 76.

[0074] The passage hole 74g is formed as a slotted hole. In this embodiment, the passage hole 74g is formed sufficiently large relative to a trajectory of the reference pin 95 relatively swinging around a pivot bolt 92a.

[0075] Next, a position adjustment mechanism 93 for adjusting the position of the second yarn capturing device 74 (and thus the position of the rotation center C1 of the capturing pipe 74a) will be described in detail with reference to FIGS. 4, 5, and the like. FIG. 5 is an enlarged view of a part of the configuration of the position adjustment mechanism 93.

[0076] The position adjustment mechanism 93 includes a transmission lever (lever member) 94, the reference pin 95, and an operation lever (lever posture adjustment member) 96, as shown in FIG. 4. The transmission lever 94 and the operation lever 96 are provided on a surface on the opposite side of the casing 74d from the yarn joining frame 76 in the thickness direction of the casing 74d (the left-right direction of the yarn joining frame 76), as shown in FIG. 4. The surface on which the transmission lever 94 and the operation lever 96 are installed on the casing 74d can also be said to be the side from which the root part of the capturing pipe 74a protrudes from the casing 74d.

[0077] The transmission lever 94 is formed in a shape of an elongated plate. The reference pin 95 is fixed to one end of the transmission lever 94 in the longitudinal direction. A projection is formed on the side opposite the reference pin 95 in the longitudinal direction of the transmission lever 94. The operation lever 96 is attached to this projection. In the following description, the side of the transmission lever 94 that is closer to the reference pin 95 in the longitudinal direction is referred to as "ref-

erence pin side" and the side to which the operation lever 96 is attached is referred to as "manipulation input side".

[0078] An intermediate portion of the transmission lever 94 in the longitudinal direction is attached to the casing 74d via the pivot bolt 92a. The pivot bolt 92a is fixed to the lever hole 74k formed in the casing 74d. As a result, the transmission lever 94 is supported by the casing 74d in a rotatable manner around an axis of the pivot bolt 92a.

[0079] The pivot bolt 92a connects the transmission lever 94 to the casing 74d, but is not involved in the connection between the casing 74d and the yarn joining frame 76. The pivot bolt 92a is coupled in a threaded manner to the casing 74d and can be tightened to hold the transmission lever 94 at an angle to prevent it from rotating.

[0080] As shown in FIGS. 4 and 5, the pivot bolt 92a is located rearward the root-side end of the capturing pipe 74a in the front-back direction of the winding unit 4 (yarn joining frame 76). With reference to the pivot bolt 92a as the rotation center, the reference pin side is located rearward and downward, and the manipulation input side is located forward and upward.

[0081] The reference pin 95 is a member in a round-bar shape. The reference pin 95 protrudes from the transmission lever 94 toward the yarn joining frame 76 in the thickness direction of the transmission lever 94 (the left-right direction of the yarn joining frame 76). The reference pin 95 passes through the passage hole 74g formed in the casing 74d and is inserted into the reference pin hole 76b formed in the yarn joining frame 76.

[0082] As a result, as the transmission lever 94 rotates around the axis of the pivot bolt 92a, the reference pin 95 moves relatively along a trajectory that is arc-shaped around the axis of the pivot bolt 92a. The radius of this arc is equal to the distance between the axis of the pivot bolt 92a and the axis of the reference pin 95. The passage hole 74g has a sufficient margin with respect to the reference pin 95 so that the reference pin 95 does not contact the passage hole 74g when it moves along the trajectory.

[0083] When the second yarn capturing device 74 is installed to the yarn joining frame 76, the reference pin 95 is inserted into the reference pin hole 76b formed in the yarn joining frame 76. The reference pin hole 76b is formed as a hole elongated in the front-back direction. A vertical dimension of the reference pin hole 76b is substantially equal to the outer diameter of the reference pin 95.

[0084] Changes in the height of the reference pin 95 are avoided by the reference pin hole 76b. Thus, when the reference pin 95 moves upward relative to the pivot bolt 92a as the transmission lever 94 rotates, the pivot bolt 92a is pushed down against the reference pin hole 76b. When the reference pin 95 moves downward relative to the pivot bolt 92a as the transmission lever 94 rotates, the pivot bolt 92a is pushed up against the reference pin hole 76b. By the above, the casing 74d can rotate around the positioning pin 76a and change its pos-

ture.

[0085] The operation lever 96 is formed in the form of a plate that is elongated generally in a front-back direction. The operation lever 96 is positioned so that it passes above the root-side end of the capturing pipe 74a. The operation lever 96 is disposed on a surface of the side where the transmission lever 94 is attached in the casing 74d. The operation lever 96 is located along the surface of the casing 74d. The operation lever 96 in this embodiment has an arc-shaped portion that bypasses upward to the root-side end of the capturing pipe 74a. However, the shape of the operation lever 96 is not limited to.

[0086] As shown in FIG. 4, etc., the operation lever 96 is provided so that it extends in the front-back direction of the yarn joining frame 76 (i.e., the casing 74d).

[0087] One end of the operation lever 96 in the longitudinal direction (the rear end shown in FIG. 4) is U-shaped when viewed in its thickness direction. The manipulation input side of the transmission lever 94 is fitted into the recess of this U-shaped portion. When the operation lever 96 is attached to the transmission lever 94, the angle of the transmission lever 94 changes integrally as the angle of the operation lever 96 changes. In the following description, the side of the operation lever 96 that is connected to the transmission lever 94 in the longitudinal direction is referred to as "connecting side".

[0088] A fixing pin 96a is provided at the end of the operation lever 96 that is far from the transmission lever 94 (the front side shown in FIG. 4) in the longitudinal direction, as shown in FIG. 4. In the following description, this side of the operation lever 96 is referred to as "manipulating side". The operator can change the angle of the operation lever 96 by pushing the manipulating side of the operation lever 96 in the up-side direction with his/her hand.

[0089] A plurality of fixing pin holes 74h are formed in the casing 74d corresponding to the fixing pin 96a of the operation lever 96. The fixing pin holes 74h are lined up in the up-down direction at the front end side of the casing 74d, as shown in FIG. 4, etc. The fixing pin 96a can be inserted into selected one of the plurality of fixing pin holes 74h. This allows the operating side of the operation lever 96 to be held in various positions in the up-down direction.

[0090] Thus, the connecting side of the operation lever 96 engages with the manipulation input side of the transmission lever 94, and the manipulating side is held by the fixing pin 96a inserted into the fixing pin hole 74h. The connecting side of the operation lever 96 can be detached from the transmission lever 94, and the manipulating side can also be detached from the casing 74d. That is, the operation lever 96 can be easily removed from the casing 74d.

[0091] As mentioned above, the casing 74d is rotatable about the positioning pin 76a. The posture of the operation lever 96 in its attached state to the transmission lever 94 corresponds one-to-one with the posture of the casing 74d. Thus, practically speaking, the posture of the casing

74d can be held at one of several different positions by using the positioning pin 76a and the fixing pin hole 74h.

[0092] Parts such as the transmission lever 94 and the pivot bolt 92a, constituting the position adjustment mechanism 93, are attached to the casing 74d. Therefore, when the second yarn capturing device 74 moves in the up-down direction due to the position adjustment, the position adjustment mechanism 93 also moves in the up-down direction accordingly. The position adjustment mechanism 93 can be handled integrally with the second yarn capturing device 74 in the form of being installed to the second yarn capturing device 74. Thus, the number of assembly man-hours can be reduced.

[0093] Next, with reference to FIGS. 5, 6, and 7, the adjustment of the posture of the second yarn capturing device 74 (and thus the adjustment of the position of the rotation center C1 of the capturing pipe 74a) will be described in detail. FIG. 6 is a diagram showing the change in the position of the root-side end of the capturing pipe 74a. FIG. 7 is a diagram showing the relative position change between the suction mouth 74b and the contact roller 63.

[0094] In this embodiment, the position adjustment of the rotation center C1 (the root-side end) of the capturing pipe 74a is performed with the second yarn capturing device 74 attached to the yarn joining frame 76.

[0095] Specifically, the operator first attaches the operation lever 96 to the transmission lever 94. At this time, the position of the fixing pin 96a of the operation lever 96 usually matches one of the plurality of fixing pin holes 74h. The operator inserts the fixing pin 96a of the operation lever 96 into the fixing pin hole 74h whose position is matched.

[0096] Next, the operator loosens the pivot bolt 92a. This allows the transmission lever 94 to rotate freely.

[0097] The operator then loosens the plurality of the bolts 92 (three in this embodiment) that fix the casing 74d to the yarn joining frame 76. Even if the casing 74d loses its fixation, the posture of the casing 74d will not change by its own weight because the position of the operation lever 96 is held by the fixing pin 96a and the fixing pin hole 74h.

[0098] The operator then moves only the manipulating side slightly away from the casing 74d, while maintaining the operation lever 96 connected to the transmission lever 94. As a result, the fixing pin 96a is disconnected from the fixing pin hole 74h. In this state, the operator changes the vertical position of the manipulating side of the operation lever 96.

[0099] As described above, when the operation lever 96 is pushed up, the pivot bolt 92a moves upward relative to the reference pin hole 76b. Accordingly, the casing 74d is pushed up and rotates around the positioning pin 76a. As a result, the height of the root-side end of the capturing pipe 74a increases.

[0100] The left and right sides of FIG. 6 show the state before and after pushing up, respectively. By moving upward the operation lever 96 from the lowest fixing pin

hole 74h to the highest fixing pin hole 74h, the rotation center C1 of the capturing pipe 74a moves upward by a distance L1. Strictly speaking, the rotation center C1 of the capturing pipe 74a moves along an arc around the positioning pin 76a. However, in effect, the trajectory of movement of the rotation center C1 of the capturing pipe 74a can be regarded as a straight line in the up-down direction.

[0101] When the operation lever 96 is pushed down, the pivot bolt 92a moves downward relative to the reference pin hole 76b. Thus, the casing 74d is pushed down and rotates around the positioning pin 76a. As a result, the height of the root-side end of the capturing pipe 74a decreases.

[0102] The operation lever 96 and the transmission lever 94 function as leverage with the pivot bolt 92a as a pivot point. Therefore, even if the operation lever 96 is moved widely, the height of the second yarn capturing device 74 can be adjusted finely, which makes the operation smooth.

[0103] After adjusting the capturing pipe 74a to an appropriate height, the operator moves only the manipulating side of the operation lever 96 slightly close to the casing 74d while maintaining the operation lever 96 connected to the transmission lever 94. As a result, the fixing pin 96a and the fixing pin hole 74h are reconnected at the changed lever angle. Even if the operator removes his/her hand from the casing 74d in this state, the posture of the casing 74d does not change by its own weight.

[0104] In this state, the operator tightens the plurality of bolts 92 to fix the casing 74d to the yarn joining frame 76. Then, after the pivot bolt 92a is tightened, the operation lever 96 is removed from the transmission lever 94. By the above, the height adjustment of the second yarn capturing device 74 is completed.

[0105] If the height of the root-side end of the capturing pipe 74a is changed, the height of the capturing position of the suction mouth 74b stated above is also changed accordingly. The upward arrow in FIG. 7 shows an example of the capturing position of the suction mouth 74b moving upward with respect to the contact roller 63 (a rotation axis of the contact roller 63) as a result of the root-side end of the capturing pipe 74a moving upward. If the root-side end of the capturing pipe 74a moves downward, the capturing position moves downward with respect to the contact roller 63. In FIG. 7, the package 9 has been removed from the cradle 62 for the adjustment work and is not depicted, but the adjustment can also be performed with the package 9 set to the cradle 62. Thus, the position adjustment mechanism 93 substantially functions as a height adjustment mechanism for the capturing position.

[0106] The capturing position of the suction mouth 74b can also be changed along an arc centered at the root-side end of the capturing pipe 74a (the rotation center C1). This change is accomplished by software-oriented modification of the angle setting at which the unit controller 90 controls the drive motor 74c so that the captur-

ing pipe 74a stops swinging. In this embodiment, in effect, the adjustment of the capturing position of the suction mouth 74b in the up-down direction is realized by the position adjustment mechanism 93, and the adjustment in the front-back direction is realized by software settings. This allows for a position adjustment work in a highly flexible manner.

[0107] In this embodiment, the yarn joiner 8 and the yarn winder 5, which is included in one winding unit 4, are physically separate modules and are fixed separately to the main frame 2. Therefore, there tend to be many cases where there are differences in the relative positions of the yarn winder 5 and the yarn joiner 8 between different winding units 4. Even in this case, since the position of the rotation center C1 of the capturing pipe 74a can be adjusted in the height direction in this embodiment, it is easy to align the distance between the suction mouth 74b and the contact roller 63 among the winding units 4. As a result, in the automatic winder 1 comprising a plurality of winding units 4, inconstancy in the efficiency and production quality of each winding unit 4 can be reduced.

[0108] As shown in FIG. 7, the winder unit 4 can be fitted with a jig 68 to check the position of the suction mouth 74b in the capturing position.

[0109] As shown in FIGS. 7 and 8, the jig 68 has a base member 68a and a scale member 68b.

[0110] The base member 68a is formed in the shape of a plate and aligned horizontally. Two installation pins 68e protruding downwardly are fixed to the bottom surface of the base member 68a. The two installation pins 68e are spaced apart in the left-right direction shown in FIG. 7.

[0111] A flat mounting surface is formed on the top surface of the yarn winding frame 64 for mounting the jig. Two installation holes 64a are formed in the mounting surface corresponding to the two installation pins 68e. By inserting the installation pins 68e of the base member 68a into the two installation holes 64a, the jig 68 is attached to the top of the yarn winding frame 64 in a detachable manner. The mounting surface contacts the bottom surface of the base member 68a, thereby positioning the jig 68 in the height direction.

[0112] The scale member 68b is formed as a plate-like member. The scale member 68b is fixed to the front surface of the base member 68a via bolts or the like, which are not shown. The scale member 68b has a portion extending horizontally from the base member 68a to one side.

[0113] The scale member 68b is provided so that its thickness direction coincides with the front-back direction shown in FIG. 7. On one side of the scale member 68b in the thickness direction, two types of scales 68c and 68d are applied. Hereinafter, the surface on which the scales are marked on the scale member 68b may be referred to as scale surface. When the suction mouth 74b is positioned near the capturing position, the tip of the suction mouth 74b, which is tapered, faces the scale sur-

face.

[0114] The scale 68c includes a plurality of grooves extending in the left-right direction shown in FIGS. 7 and 8. The plurality of grooves are formed so that they are lined up in the up-down direction and are spaced equally apart.

[0115] The scale 68d comprises a plurality of round holes. The scale 68d is located above the scale 68c. The plurality of holes included in the scale 68d are formed so that they are lined up in a plurality of rows (two rows in this embodiment) with equal intervals in the up-down direction.

[0116] As shown in FIG. 7, when the jig 68 is attached to the yarn winding frame 64, a part of the scale members 68b is in close proximity above the contact roller 63. The scale 68c and the scale 68d are marked to the portion of the scale member 68b that is above the contact roller 63. The portion of the scale member 68b that is above the contact roller 63 can be in contact with the suction mouth 74b in the capturing position or the suction mouth 74b in the process of moving.

[0117] This configuration allows for easy and accurate confirmation of the relative position of the suction opening of the suction mouth 74b and the contact roller 63.

[0118] As described above, the winding unit 4 of this embodiment has the yarn winding device 60, the second yarn capturing device 74, and the position adjustment mechanism 93. The yarn winding device 60 winds the yarn to form the package 9. The second yarn capturing device 74 draws the yarn from the package 9. The second yarn capturing device 74 includes the capturing pipe 74a and the suction mouth 74b. The capturing pipe 74a is formed elongated and is rotatable around its end as the rotation center C1. The suction mouth 74b is provided at the end of the capturing pipe 74a on the side far from the rotation center C1. The winding unit 4 is provided with the position adjustment mechanism 93 to adjust the position of the rotation center C1 of the capturing pipe 74a.

[0119] This allows the position of the rotation center C1 of the capturing pipe 74a (and thus the capturing position of the suction mouth 74b) to be adjusted to an appropriate position.

[0120] In the winding unit 4 of this embodiment, the yarn winding device 60 includes the contact roller 63. The contact roller 63 rotates in contact with the package 9. The position adjustment mechanism 93 adjusts, by moving the position of the rotation center C1 of the capturing pipe 74a, the distance between the suction mouth 74b and the contact roller 63 when the suction mouth 74b is in a position to capture the yarn.

[0121] This allows the position of the suction mouth 74b relative to the contact roller 63 to be easily adjusted by adjusting the rotation center C1 of the capturing pipe 74a.

[0122] In the winding unit 4, the position adjustment mechanism 93 moves the rotation center C1 of the capturing pipe 74a in the up-down direction.

[0123] This allows the height of the entire swinging tra-

jectory of the suction mouth 74b to be adjusted.

[0124] In the winding unit 4, the position adjustment mechanism 93 moves integrally with the second yarn capturing device 74.

[0125] This allows the second yarn capturing device 74 and the position adjustment mechanism 93 to be handled together during manufacturing. Thus, the number of manufacturing man-hours can be reduced.

[0126] In the winding unit 4 of this embodiment, the position adjustment mechanism 93 includes the transmission lever 94 that moves the rotation center C1 of the capturing pipe 74a.

[0127] This allows the position adjustment of the rotation center C1 of the capturing pipe 74a to be performed with a simple configuration.

[0128] In the winding unit 4 of this embodiment, the second yarn capturing device 74 has the lever hole 74k formed for attaching the transmission lever 94.

[0129] This allows the transmission lever 94 to be easily attached to the second yarn capturing device 74.

[0130] In the winding unit 4 of this embodiment, the transmission lever 94 is formed elongated and rotatably supported. The pivot bolt 92a is located at the rotation center part of the transmission lever 94. The angle of the transmission lever 94 can be maintained by tightening the pivot bolt 92a.

[0131] This allows the rotation center C1 of the capturing pipe 74a to be fixed so that it does not move, if necessary.

[0132] In the winding unit 4 of this embodiment, the position adjustment mechanism 93 includes the operation lever 96 that changes the posture of the transmission lever 94. The operation lever 96 can be attached to the transmission lever 94 without a tightening member.

[0133] This allows the operation lever 96 to be easily removed. By sharing the operation lever 96 with multiple winding units 4, the cost of parts can be reduced.

[0134] In the winding unit 4 of this embodiment, the transmission lever 94 is formed elongated and rotatably supported. The holding mechanism having the fixing pin 96a and the fixing pin hole 74h to hold the angle of the transmission lever 94 (indirectly through the operation lever 96) is provided at the position different from the rotation center part of the lever member.

[0135] This allows the rotation center C1 of the capturing pipe 74a to be fixed so that it does not move, using a simple configuration.

[0136] The jig 68 for checking the position of the suction mouth 74b can be attached to the winding unit 4 of this embodiment.

[0137] This allows the position of the suction mouth 74b with respect to the contact roller 63 to be easily checked.

[0138] In the winding unit 4 of this embodiment, the jig 68 has the scales 68c, 68d.

[0139] This allows the position of the suction mouth 74b to be checked more accurately.

[0140] While some preferred embodiments of the

present invention have been described above, the foregoing configurations may be modified, for example, as follows. The modification can be singly made and any combination of several modifications can be made.

[0141] A yarn winding device of traverse drum type can be attached to the yarn winder 5.

[0142] It is also possible to attach, for example, a magazine-type bobbin supplier, package feeder, etc. to the yarn-feeding changer 3.

[0143] Instead of the yarn joining mechanism 70 of suction mouth type, it is also possible to attach a yarn joining mechanism of yarn storage type, for example, to the yarn joiner 8.

[0144] The winding unit 4 may be configured as an air spinning unit or a rotor type spinning unit.

[0145] The position adjustment mechanism 93 may adjust the rotation center C1 of the capturing pipe 74a in a diagonal vertical direction.

[0146] The position adjustment mechanism 93 may be provided, for example, on the yarn joining frame 76 side instead of the second yarn capturing device 74 side.

[0147] The position adjustment mechanism may comprise, for example, a feed mechanism having a screw shaft in the vertical direction. In this case, the transmission lever 94 and the operation lever 96 can be omitted.

[0148] Instead of the lever hole 74k, a protruding pivot shaft may be provided at the casing 74d, and the transmission lever 94 may be rotatably supported on this pivot shaft.

[0149] The operation lever 96 may be fixed to the transmission lever 94 via a fastening member, such as a bolt, for example. The operation lever 96 may be fixed to the transmission lever 94 in a non-removable manner. The operation lever 96 may be integrally provided with respect to the transmission lever 94.

[0150] The transmission lever 94 may be mounted so that it cannot be tightened by the pivot bolt 92a. The holding mechanism for the operation lever 96 by means of the fixing pin 96a and the fixing pin hole 74h may be omitted.

[0151] In the above embodiment, the reference pin 95 is positioned on the opposite side of the operation lever 96 with respect to the pivot bolt 92a. As a result, an intuitive adjustment work can be realized since operating the operation lever 96 upwardly moves upward the rotation center C1 of the capturing pipe 74a and operating it downwardly moves downward the rotation center C1 of the capturing pipe 74a. However, the reference pin 95 may be placed on the same side as the operation lever 96 with respect to the pivot bolt 92a.

[0152] The scale of the jig 68 may consist of only one of the scale 68c having grooves or the scale 68d having round holes.

[0153] The jig 68 may be mounted on top of the yarn winding frame 64 so that it slides in the left-right direction and a part of the scale member 68b advances above the contact roller 63.

[0154] Instead of the jig 68, a non-contact distance me-

ter may be used, for example, to check the position of the suction mouth 74b.

[0155] The yarn winding frame 64 of the yarn winder 5 and the yarn joining frame 76 of the yarn joiner 8 may be directly fixed to each other.

[0156] The winding unit 4 is not limited to the modular-split type. The position adjustment mechanism 93 may be applied, for example, to a winding unit in which the yarn winding device 60 and the second yarn capturing device 74 are fixed to a common unit frame.

[0157] The textile machine is not limited to the winding unit 4 of the automatic winder 1. The position adjustment mechanism 93 can also be applied, for example, to the spinning unit of a spinning machine.

Claims

1. A textile machine (4) comprising:

a yarn winding mechanism (60) that winds yarn to form a package (9); and
a yarn drawer (74) that draws the yarn from the package (9), wherein
the yarn drawer (74) comprises:

a body part (74a) formed elongated and rotatable around an end of the body part (74a) as a rotation center (C1); and
a yarn capturer (74b) provided at an end of the body part (74a) on a side far from the rotation center (C1), and
a position adjustment mechanism (93) is provided to adjust a position of the rotation center (C1) of the body part (74a).

2. The textile machine (4) according to claim 1, wherein

the yarn winding mechanism (60) includes a contact roller (63) that rotates in contact with the package (9), and
the position adjustment mechanism (93) adjusts, by moving the position of the rotation center (C1) of the body part (74a), a distance between the yarn capturer (74b) of the yarn drawer (74) and the contact roller (63) when the yarn capturer (74b) is in a position to capture the yarn.

3. The textile machine (4) according to claim 1 or 2, wherein

the position adjustment mechanism (93) moves the rotation center (C1) of the body part (74a) in an up-down direction.

4. The textile machine (4) according to one of claims 1 to 3, wherein

the position adjustment mechanism (93) moves integrally with the yarn drawer (74).

5. The textile machine (4) according to one of claims 1 to 4, wherein the position adjustment mechanism (93) includes a lever member (94) that moves the rotation center (C1) of the body part (74a). 5
6. The textile machine (4) according to claim 5, wherein the yarn drawer (74) has a hole (74k) formed for attaching the lever member (94). 10
7. The textile machine (4) according to claim 5 or 6, wherein

the lever member (94) is formed elongated and rotatably supported, 15

a fastening member (92a) is located at a rotation center part of the lever member (94), and

an angle of the lever member (94) can be maintained by tightening the fastening member (92a). 20
8. The textile machine (4) according to one of claims 5 to 7, wherein

the position adjustment mechanism (93) includes a lever posture adjustment member (96) that changes the posture of the lever member (94), and 25

the lever posture adjustment member (96) can be attached to the lever member (94) without a tightening member. 30
9. The textile machine (4) according to one of claims 5 to 8, wherein 35

the lever member (94) is formed elongated and rotatably supported, and

a holding mechanism (96a, 74h) to hold an angle of the lever member (94) is provided at a position different from a rotation center part of the lever member (94). 40
10. The textile machine (4) according to one of claims 1 to 9, wherein

a jig (68) can be mounted to the textile machine (4) to check a capturing position of the yarn capturer (74b), being changed as the rotation center (C1) of the body part (74a) moves, where the yarn capturer (74b) captures the yarn. 45

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11. The textile machine (4) according to claim 10, wherein

the jig (68) has a scale (68c, 68d). 55

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FIG. 1

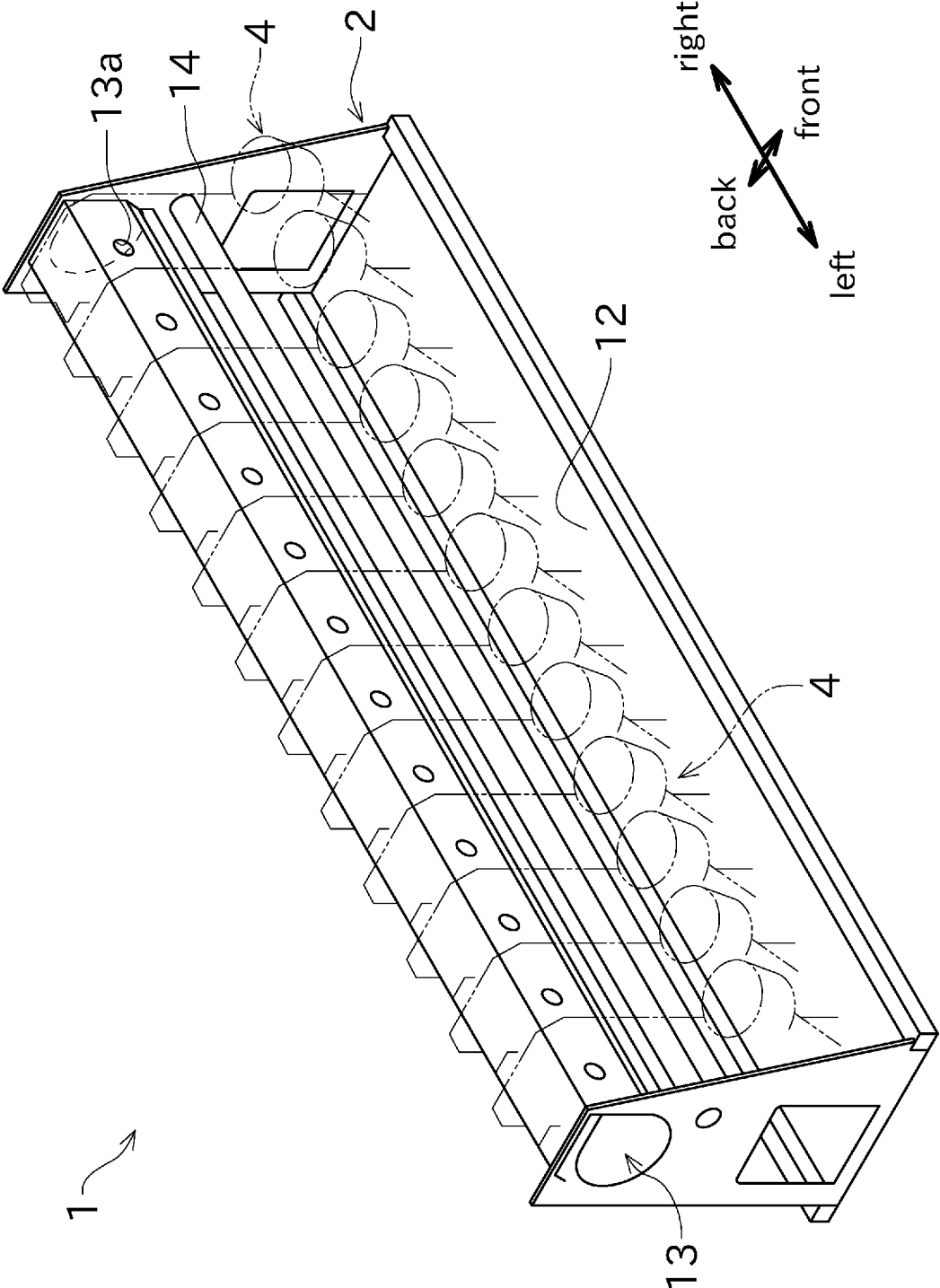


FIG. 2

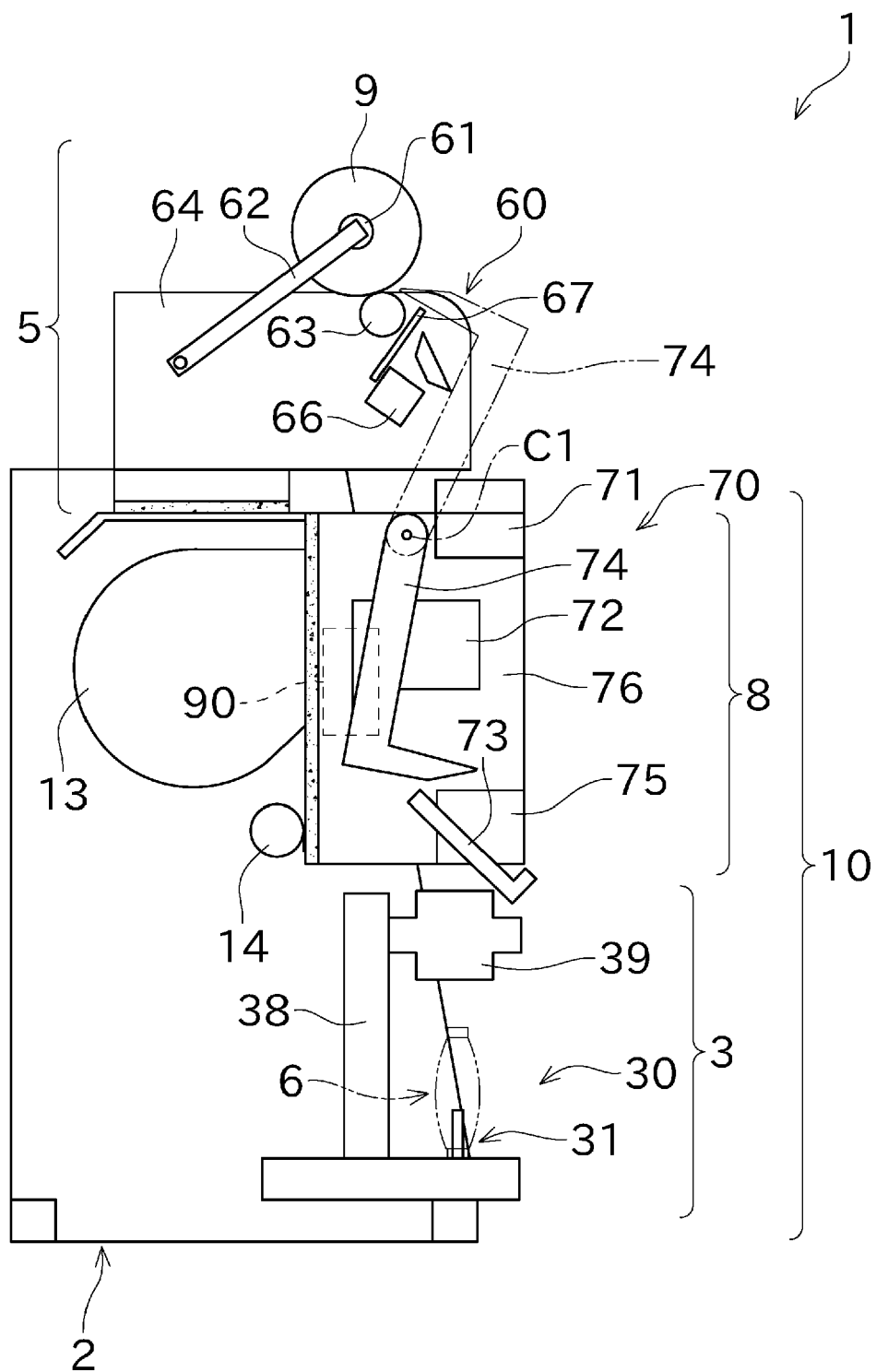


FIG. 3

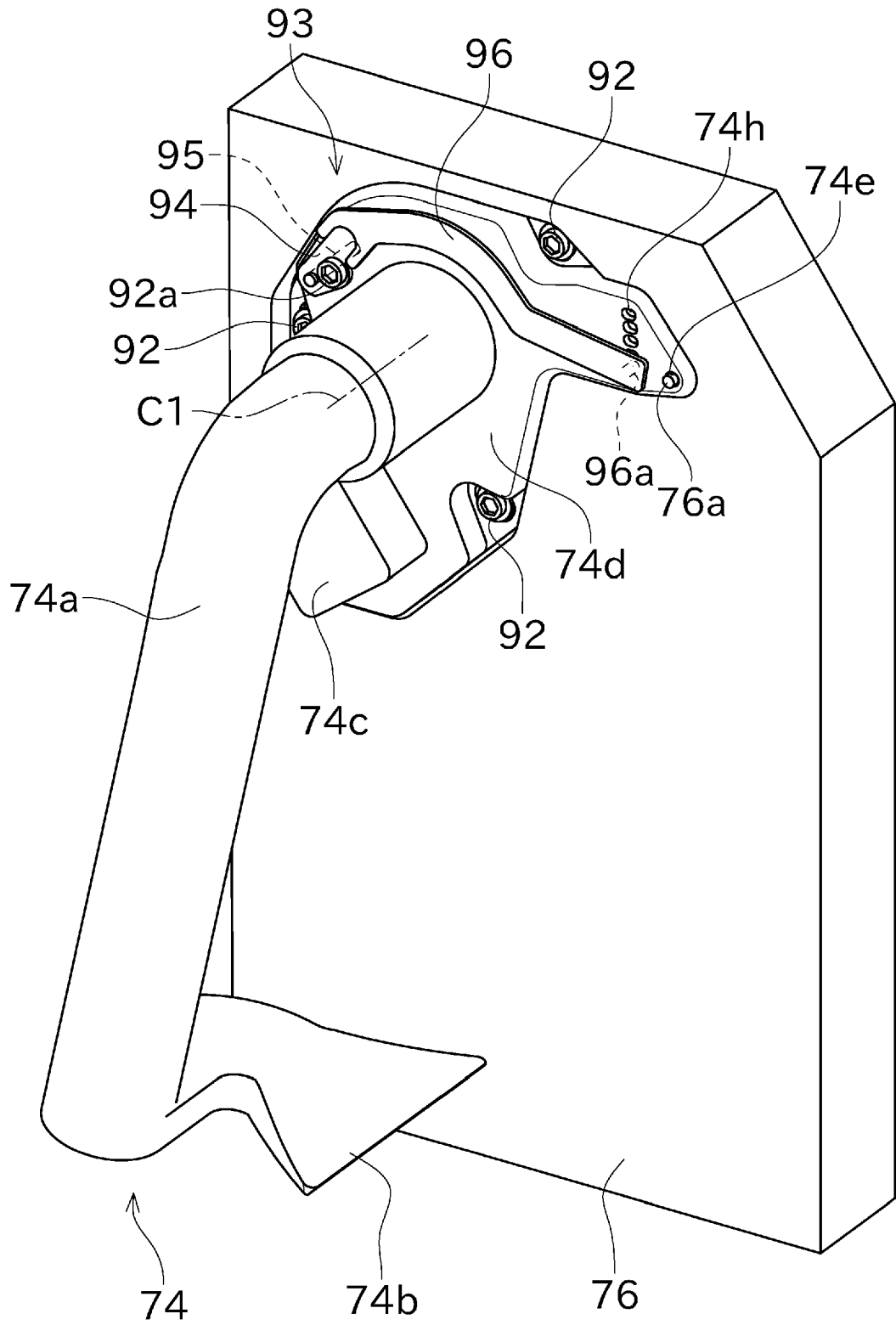


FIG. 4

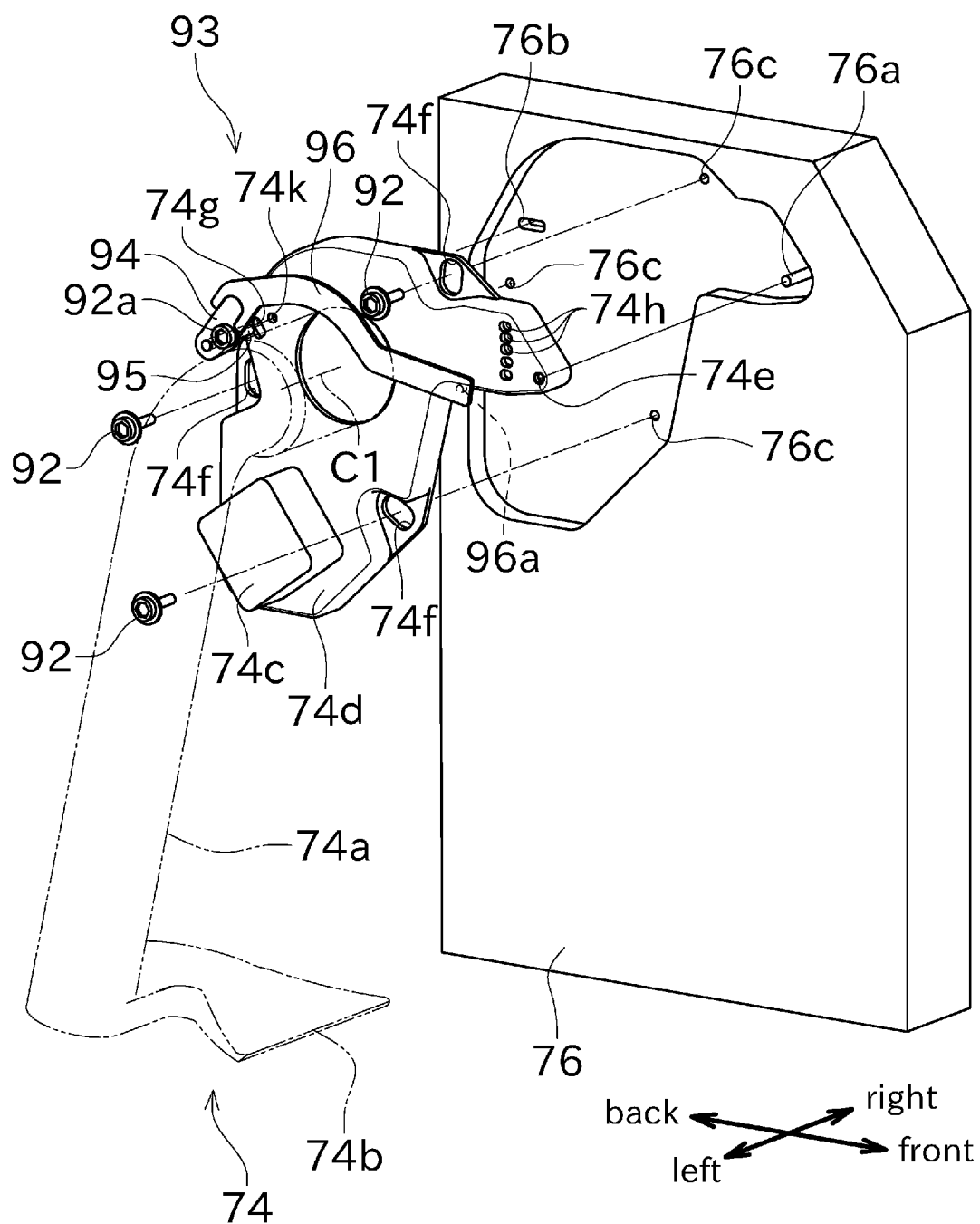


FIG. 5

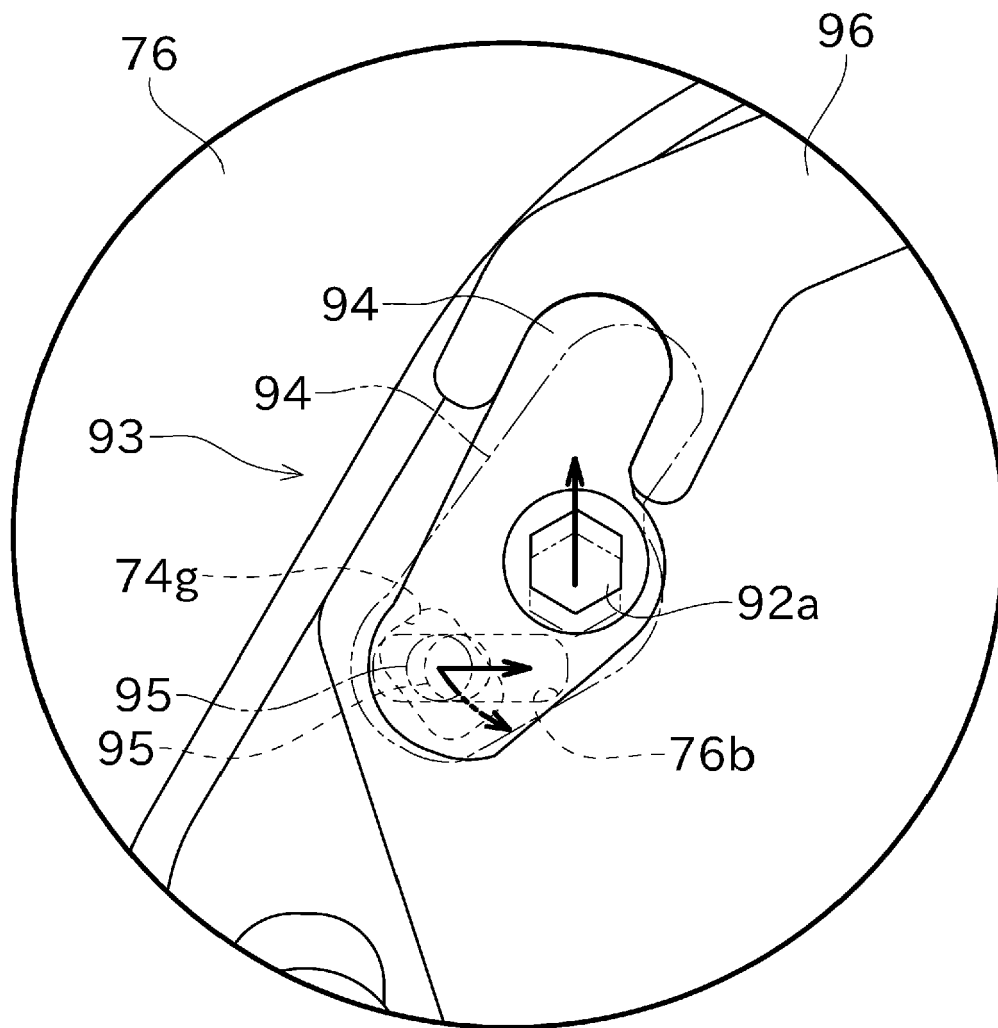


FIG. 6

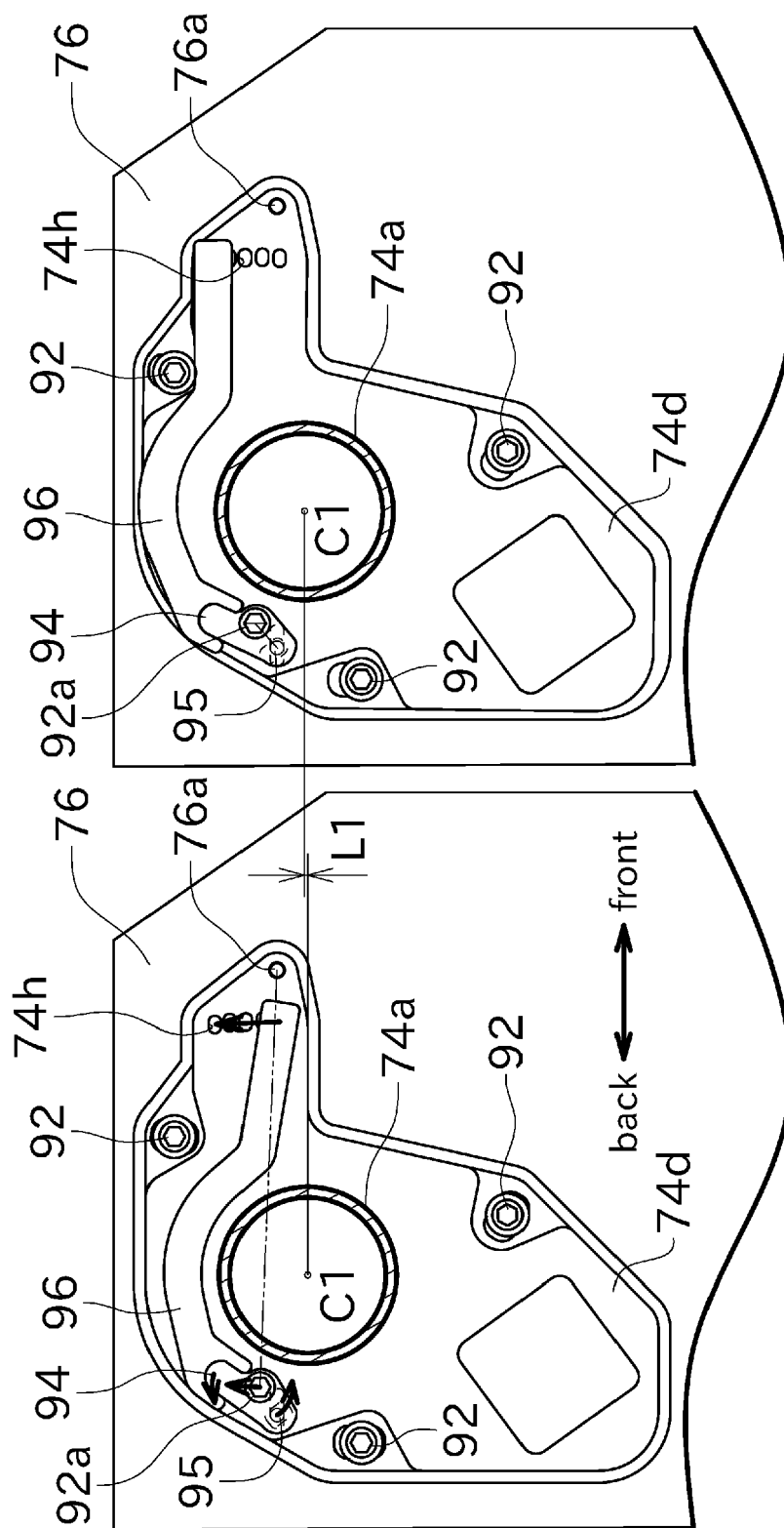


FIG. 7

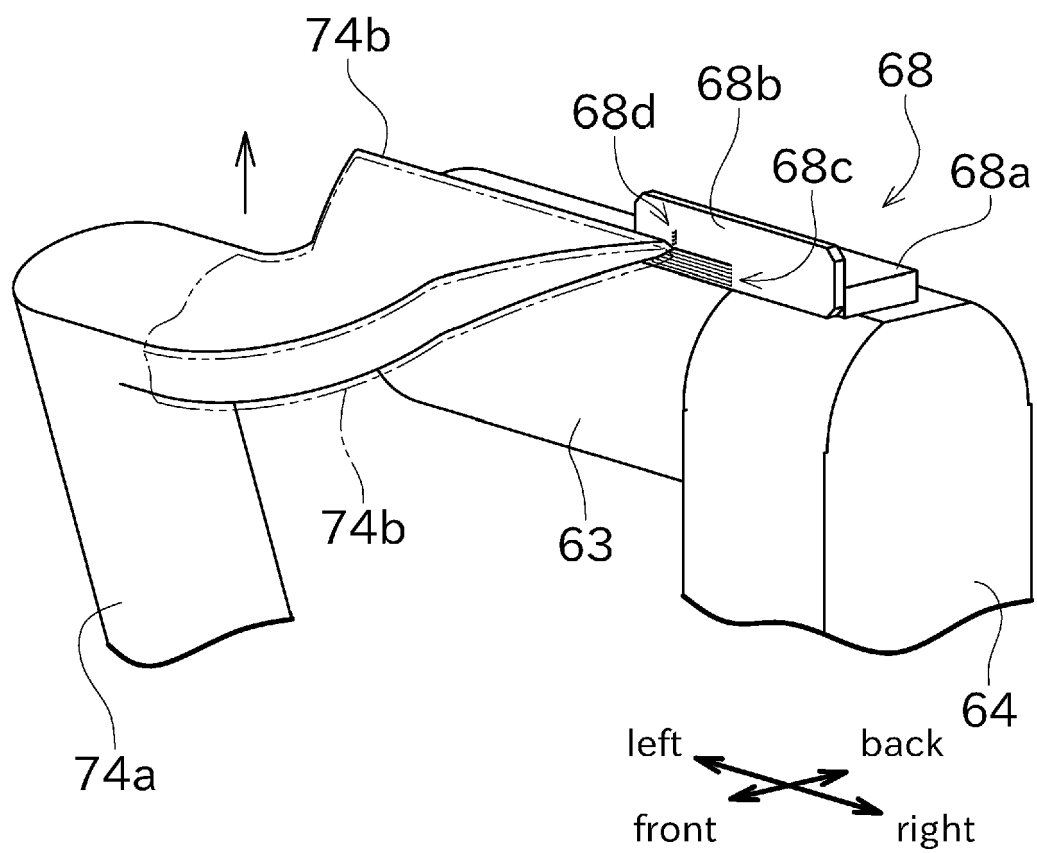
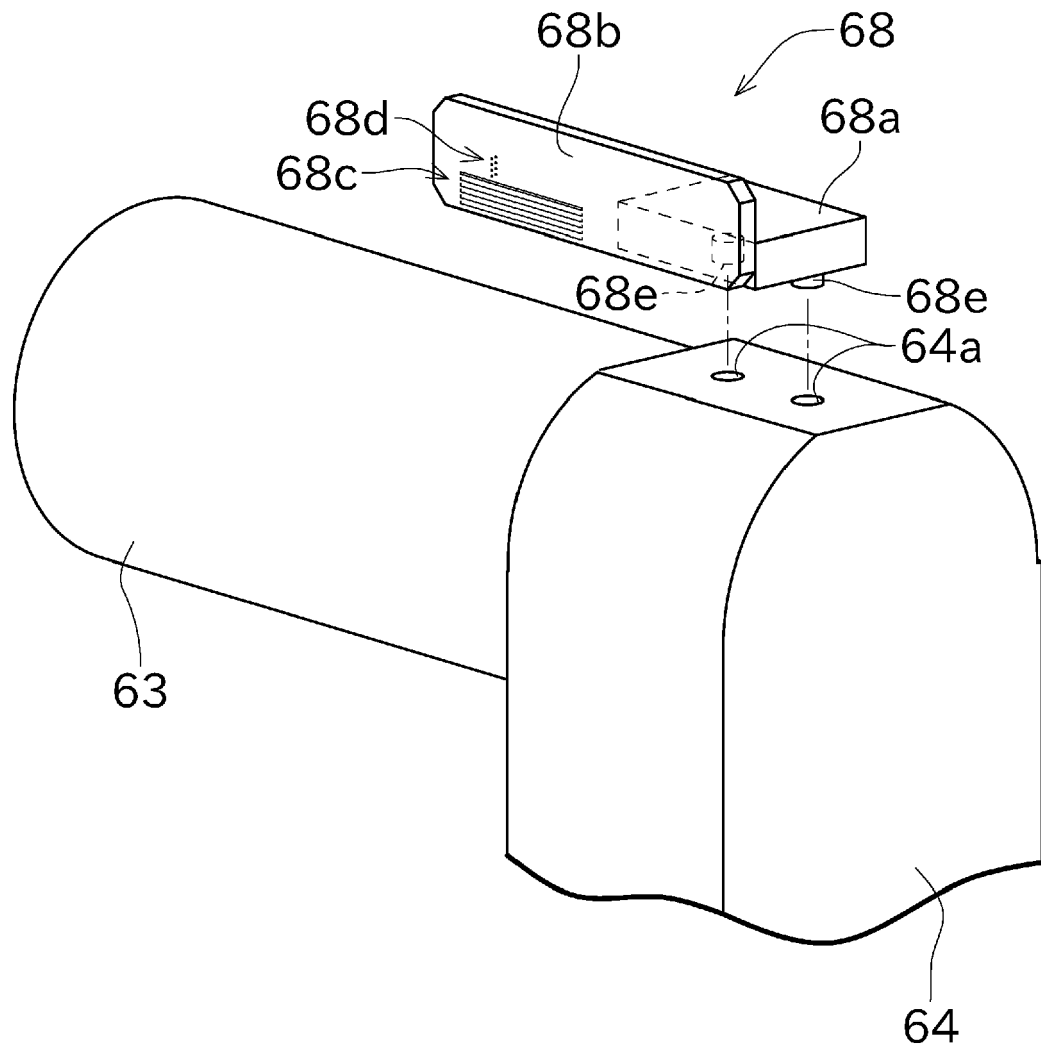


FIG. 8





EUROPEAN SEARCH REPORT

Application Number

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Place of search The Hague		Date of completion of the search 12 January 2024	Examiner Pussemier, Bart
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

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