

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to textile machines. More specifically, the present invention relates to laying of pipes for supplying a working fluid in the textile machines.

2. Description of the Related Art

[0002] Generally, in the textile machines such as automatic winders, a compressed air is supplied to various structural components of the textile machines, and these structural components are driven by the compressed air. For example, in yarn winding machines, a swirling airflow is generated by the compressed air, and untwisting and joining of a yarn is performed by the swirling airflow. Apart from this, in the textile machines, acts such as removal of a waste yarn by an air blast (blowing of compressed air), and driving of the structural components by driving corresponding air cylinders are performed.

[0003] Typical textile machines also include structural components to which a driving force is transmitted via mechanical means such as cams or linkage mechanisms instead of the compressed air. In view of this fact, in the conventional textile machines, pipes for supplying the compressed air and the mechanical components such as the cams or the linkage mechanisms are also arranged in a space inside a body of the textile machines.

[0004] Recently, there has been a requirement for flexibly and individually controlling the various structural components in the textile machines. Therefore, possibilities are being researched to individually drive the structural components by using motors instead of transmitting the driving force to these structural components via the cams or the linkage mechanisms. When such a configuration is adapted, instead of the cams or the linkage mechanisms, circuit boards (control boards) for performing driving control of the motors occupy a major portion of the space inside the body of the textile machines. In addition, the pipes for supplying the compressed air are also arranged in the space inside the body of the textile machines.

[0005] Meanwhile, a maintenance operation needs to be performed periodically of the control boards arranged inside the body of the textile machines. It is therefore preferable that pipe laying be performed and structures for installing the pipes be arranged by taking into consideration the maintainability. For example, there is a need to lay the pipes in such a manner that the pipes do not hinder the maintenance operation of the control boards. Pipes made of an elastic material such as resin or rubber are advantageous from the view point of flexibility; however, disadvantageous from the view point of having greater chances of generation of defects such as kinks.

Therefore, pipe laying needs to be performed in such a manner that kinks are not generated in the pipes without discretion during the maintenance operation of the control boards.

[0006] Japanese Patent Application publication 2001-106434 discloses a technology for enhancing maintainability of a textile machine having air pipes. Japanese Patent Application publication 2001-106434 discloses a winding unit that can be moved during an inspection for maintenance. Specifically, an end of an air pipe is detachably coupled to the winding unit via a coupling. A flexible pipe is used as the air pipe in Japanese Patent Application publication 2001-106434 for easy detachment and coupling. The winding unit disclosed in Japanese Patent Application publication 2001-106434 has a closing piece to preclude variations in an air pressure in other winding unit even when the pipe is detached from the winding unit. Because the pipe can be easily detached or coupled by adapting this configuration, the inspection for maintenance can be performed smoothly.

[0007] However, the object of the technology disclosed in Japanese Patent Application publication 2001-106434 is to make it possible to move the winding unit to a position where the inspection for maintenance can be performed easily, and this object is achieved with a configuration in which the pipe is detachably coupled. Japanese Patent Application publication 2001-106434 does not specifically mention about handling of pipes (pipe laying) inside the winding unit. That is, the configuration disclosed in Japanese Patent Application publication 2001-106434 cannot solve the issues that arise in the maintenance of internal parts of the winding unit such as hindrance caused by an air pipe, generation of kinks in the air pipe, etc.

SUMMARY OF THE INVENTION

[0008] The present invention has been made to address the above-explained problems. It is an object of the present invention to enhance maintainability while preventing generation of kinks in a pipe that supplies a working fluid in textile machines.

[0009] The problems to be solved by the present invention are explained above. The means for solving the problem and the effect thereof are explained below.

[0010] According to an aspect of the present invention there is provided a textile machine that includes a unit body member; a structural component arranged in or near the unit body member; a pipe made of an elastic material and configured to supply a working fluid to the structural component; compartment members that partition an inner space of the unit body member; and pipe arrangement compartments formed due to partitioning of the inner space of the unit body member by the compartment members, wherein, inside the unit body member, the pipe is laid in the pipe arrangement compartments.

[0011] Other features, elements, processes, steps,

characteristics and advantages of the present invention will become more apparent from the following detailed description of preferred embodiments of the present invention with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 is an external perspective view of an overall configuration of an automatic winder according to an embodiment of the present invention;

FIG. 2 depicts a side view of a winder unit;

FIG. 3 is a partial sectional view from one side of a unit body member for showing internal parts thereof; and

FIG. 4 is an external perspective view of a configuration of a hinge mechanism.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] Exemplary embodiments of the present invention are explained below with reference to the accompanying drawings. FIG. 1 is an external perspective view of an automatic winder according to an embodiment of the present invention. An automatic winder (textile machine) 1 according to the present embodiment includes a plurality of winder units 2 that is arranged in a line and a main control device 3 arranged at one end of the line.

[0014] Each of the winder units 2 includes a unit body member 4 provided on either a left or a right side when viewed from a front side and various structural components (an unwinding assisting device 12, a tension applying device 13, a splicer device 14, a clearer 15, a cradle 23, a traversing drum 24, a lower yarn guiding pipe 25, an upper yarn guiding pipe 26, etc., shown in FIG. 2) attached to a lateral side of the unit body member 4.

[0015] FIG. 2 depicts a schematic side view of the winder unit 2. As shown in FIG. 2 the winder unit 2 includes a bobbin support unit 7 and a winding unit 8.

[0016] The bobbin support unit 7 includes a bobbin holding peg 9. The bobbin holding peg 9 is inserted in a yarn supplying bobbin 21 from an axis direction of a core tube of the yarn supplying bobbin 21 and holds the yarn supplying bobbin 21 in a substantially upright posture. The bobbin holding peg 9 can be tilted by an action of a not shown motor. The yarn supplying bobbin 21 that is held in the upright posture can be discharged by tilting the bobbin holding peg 9.

[0017] The winding unit 8 includes the cradle 23 and the traversing drum 24. The winding unit 8 winds a yarn 20 around a periphery of a winding bobbin to produce a package 29.

[0018] The cradle 23 includes a cradle arm 23a that holds the package 29. A center bearing 22 is arranged at an end of the cradle arm 23a, and the package 29 is rotatably supported by the center bearing 22.

[0019] The traversing drum 24 is arranged opposed to the package 29, and the traversing drum 24 is rotationally driven by the action of a not shown motor. When the traversing drum 24 is driven, the package 29 is dependent driven following the rotation of the traversing drum 24. Therefore, by driving the traversing drum 24, yarn unwound from the yarn supplying bobbin 21 can be wound on a surface of the package 29. A not shown traversing groove is formed on a peripheral surface of the traversing drum 24, and the yarn 20 can be traversed for a predetermined width on the peripheral surface of the traversing drum 24 by an action of the traversing groove. With this structure, a package of a predetermined length and shape can be produced by winding the yarn 20 that is unwound from the yarn supplying bobbin 21 on the package 29 while subjecting the yarn 20 to a traversing motion.

[0020] The cradle 23 is swingable around a swing axis 23b. Even when the package 29 becomes thicker due to winding of the yarn 20, the surface of the package 29 can be appropriately maintained in contact with the traversing drum 24 by swinging the cradle 23 around the swing axis 23b. A package pressure cylinder 81 is coupled to the cradle 23. The package pressure cylinder 81 is a pneumatic cylinder and it can be operated by the action of a compressed air. By appropriately operating the package pressure cylinder 81, the cradle arm 23a can be swung in a clockwise direction or an anticlockwise direction with respect to the swing axis 23b. By appropriately operating the package pressure cylinder 81, a contact pressure (a pressing force by which the package 29 is pressed against the traversing drum 24) of the package 29 can be appropriately adjusted.

[0021] Furthermore, by appropriately operating the package pressure cylinder 81, the cradle arm 23a can also be swung so as to separate the package 29 from the traversing drum 24. In a state in which the package 29 is separated from the traversing drum 24, by operating a package brake mechanism, which is explained later, the rotating package 29 can be promptly brought to a halt.

[0022] The package brake mechanism is arranged at an end of the cradle arm 23a. The package brake mechanism includes a not shown brakeshoe and a not shown brake cylinder that operates the brakeshoe so as to press the brakeshoe against the center bearing 22. The brake cylinder is a pneumatic cylinder and it can be operated by the action of the compressed air. When the brake cylinder is operated, the brakeshoe is pressed against the center bearing 22, and the center bearing 22 comes to a halt due to a frictional force. Thus, by operating the package brake mechanism, the rotating package 29 that is held by the cradle 23 can be promptly brought to a halt.

[0023] The winder unit 2 includes, in a yarn running path, near the unit body member 4, various structural components between the bobbin support unit 7 and the winding unit 8. Concretely, the unwinding assisting device 12, the tension applying device 13, the splicer device 14, and the clearer (a yarn quality measuring device) 15

are arranged in the yarn running path from the bobbin holding peg 9 to the traversing drum 24.

[0024] The unwinding assisting device 12 causes a movable member 76 to touch a balloon that is formed above the yarn supplying bobbin 21 due to spinning of the yarn being unwound from the yarn supplying bobbin 21. The unwinding assisting device 12 thus assists the unwinding of the yarn by appropriately controlling a size of the balloon. A position of formation of the balloon varies depending on an amount of yarn remaining on the yarn supplying bobbin 21. Therefore, the unwinding assisting device 12 includes an unwinding assisting device cylinder 82 for moving the movable member 76 down depending on the amount of remaining yarn. The unwinding assisting device cylinder 82 is a pneumatic cylinder and it is operated by the action of the compressed air. Unwinding of the yarn from the yarn supplying bobbin 21 can be properly performed by moving the movable member 76 down to an appropriate position and then appropriately operating the unwinding assisting device cylinder 82.

[0025] The tension applying device 13 applies a predetermined tension to the running yarn 20. The tension applying device 13 according to the present embodiment is a gate type in which movable comb teeth are provided with respect to fixed comb teeth. The movable comb teeth can be rotated by the action of a rotary solenoid so as to be engaged with or released from the fixed comb teeth.

[0026] The clearer 15 detects yarn defects (yarn faults) such as a slub by monitoring a thickness of the yarn 20. A cutter 39 that cuts the yarn 20 immediately upon detection of a yarn defect by the clearer 15 is arranged near the clearer 15.

[0027] The splicer device 14 splices a lower yarn on the yarn supplying bobbin 21 side and an upper yarn on the package 29 side in any of the situations of a yarn cut, a yarn break, and a bobbin replacement. The yarn cut is a situation where the yarn is cut by the cutter 39 upon detection of a yarn defect by the clearer 15, the yarn break is a situation where the yarn breaks while being unwound from the yarn supplying bobbin 21, and the bobbin replacement is a situation where an old yarn supplying bobbin is replaced with a new yarn supplying bobbin. The splicer device 14 according to the present embodiment first untwists ends of the upper and lower yarns by blowing the compressed air onto the ends, causes the untwisted ends of the yarns to come closer to each other, and then joins the ends by twisting the ends together by generating a swirling airflow in an opposite direction.

[0028] Below and above the splicer device 14 are provided the lower yarn guiding pipe 25 and the upper yarn guiding pipe 26, respectively. The lower yarn guiding pipe 25 traps and guides the lower yarn on the yarn supplying bobbin 21 side, and the upper yarn guiding pipe 26 traps and guides the upper yarn on the package 29 side. A suction port 32 is provided at an end of the lower yarn guiding pipe 25, and a suction mouth 34 is provided on an end of the upper yarn guiding pipe 26. A negative-pressure source is appropriately connected to each of

the lower yarn guiding pipe 25 and the upper yarn guiding pipe 26, and a suction airflow is caused to act on the suction port 32 and the suction mouth 34.

[0029] In any of the yarn cut, the yarn break, and the bobbin replacement situations, the lower yarn is suction trapped by rotating the lower yarn guiding pipe 25 such that the suction port 32 locates downward, and then the lower yarn guiding pipe 25 is rotated around an axis 33 such that the lower yarn is guided to the splicer device 14. Substantially simultaneously with this operation, the upper yarn guiding pipe 26 is rotated upward around an axis 35 from its position in FIG. 2, and the package 29 is rotated in a reverse direction to its normal rotation direction, thereby trapping the upper yarn unwound from the package 29 with the suction mouth 34. Subsequently, the upper yarn guiding pipe 26 is rotated downward around the axis 35 to guide the upper yarn to the splicer device 14. Finally, splicing of the lower yarn and the upper yarn is performed in the splicer device 14.

[0030] A magazine-type bobbin supplying device 60 is arranged on the front side of the winder unit 2. The bobbin supplying device 60 supplies a new bobbin to the bobbin support unit 7 when the yarn supplying bobbin in the bobbin support unit 7 from which the yarn is being unwound becomes empty. Concretely, the bobbin supplying device 60 includes a magazine can 65 that can stock a plurality of the yarn supplying bobbins 21. A new yarn supplying bobbin 21 can be supplied one by one to the bobbin support unit 7 by driving the magazine can 65 with a not shown motor.

[0031] In the above structure, when a new yarn supplying bobbin is supplied from the bobbin supplying device 60 to the bobbin support unit 7, yarn splicing is performed between a lower yarn from the new yarn supplying bobbin 21 side and an upper yarn from the package 29 side. After the yarn splicing is over, the yarn is unwound from the yarn supplying bobbin 21 and wound on the surface of the package 29 by driving the traversing drum 24.

[0032] Although not specifically shown in the diagrams, waste yarn removal mechanisms are appropriately provided near each of the above-mentioned structural components. The waste yarn removal mechanism is a means that removes yarn stuck to the corresponding structural component by blowing the compressed air (air blast) from an exhaust nozzle thereof arranged at an appropriate position.

[0033] As shown in FIG. 2, the unit body member 4 is divided into an upper part 4a and a lower part 4b. As shown in FIG. 2, the winding unit 8, the splicer device 14, etc., are arranged in the upper part 4a. The unwinding assisting device 12 is arranged in the lower part 4b.

[0034] The upper part 4a and the lower part 4b are coupled to each other with a hinge mechanism 10 arranged on the front side of the device. The lower part 4b is fixedly attached to a supporting frame (not shown) arranged on the left and right sides of the device. That is, the lower part 4b can be considered as a non-moving

member. On the other hand, the upper part 4a can be rotated toward the front side around the hinge mechanism 10. That is, the upper part 4a can be considered as a moving member. A situation in which the upper part 4a is rotated from its normal position toward the front side is shown in FIG. 2 with a two-dot chain line.

[0035] In this manner, the upper part 4a that is the moving member can be rotated up to a position at which it is easy to perform inspection for maintenance of the splicer device 14 and the winding unit 8 that require very frequent inspection for maintenance. When the inspection for maintenance is not to be performed, the upper part 4a is fixed with screws to a duct 92, etc., provided on a back side of the device.

[0036] An internal configuration of the unit body member 4 is explained next while referring to FIG. 3. FIG. 3 is a partial sectional view from one side of the unit body member 4.

[0037] As shown in FIG. 3, inside of the lower part 4b, which is the non-moving member, is partitioned into a first air-pipe arrangement compartment 50, a first board arrangement compartment 51, and a second air-pipe arrangement compartment 52. The first air-pipe arrangement compartment 50 is arranged in a lower half of the lower part 4b, the first board arrangement compartment 51 is provided above the first air-pipe arrangement compartment 50, and the second air-pipe arrangement compartment 52 is provided in front of the first air-pipe arrangement compartment 50 in a narrow and elongated shape in a vertical direction.

[0038] As shown in FIG. 3, inside of the lower part 4b is further partitioned into a second board arrangement compartment 53 and a third air-pipe arrangement compartment 54. The third air-pipe arrangement compartment 54 is provided in front of the second board arrangement compartment 53 in a narrow and elongated shape in the vertical direction.

[0039] The first, second, and third air-pipe arrangement compartments 50, 52, and 54 are for laying pipes 61. The pipes 61 are for supplying the working fluid (specifically, a compressed air) to the splicer device 14, the package pressure cylinder 81, the unwinding assisting device cylinder 82, the package brake mechanism, the waste yarn removal mechanism, etc.

[0040] On the other hand, the first and second board arrangement compartments 51 and 53 are for arranging control boards 63. The control boards 63 control driving of driving units (specifically, motors) that drive the bobbin holding peg 9, the traversing drum 24, the magazine can 65, etc.

[0041] No pipes 61 are laid in the first and second board arrangement compartments 51 and 53. In the lower part 4b, a partition wall (compartment member) 55a is provided between the first air-pipe arrangement compartment 50 and the first board arrangement compartment 51 to divide the two, and a partition wall (compartment member) 55b is provided between the first board arrangement compartment 51 and the second air-pipe ar-

angement compartment 52 to divide the two. In the upper part 4a, a partition wall (compartment member) 55c is provided between the second board arrangement compartment 53 and the third air-pipe arrangement compartment 54 to divide the two.

[0042] In this manner, by providing separate compartments for arranging the control boards 63 (the first and second board arrangement compartments 51 and 53) and for arranging the pipes 61 (the first, second, and third air-pipe arrangement compartments 50, 52, and 54) that supply the compressed air, it is possible to present an arrangement in which the pipes 61 do not pass near the control boards 63. As a result, undesired situations such as cutting of the pipes 61 or generation of defects due to generation of kinks in the pipes 61 do not occur at the time of maintenance of the control boards 63. Furthermore, the pipes 61 also do not cause hindrance at the time of maintenance of the control boards 63.

[0043] At the boundaries between the compartments for arranging the control board 63 and the compartments for arranging the pipes 61 that supply the compressed air are provided the partition walls 55a, 55b, and 55c. Therefore, if by any chance, any of the pipes 61 is ruptured, the compressed air leaking from the ruptured pipe 61 does not pass near the control boards 63. Consequently, an undesired situation in which the compressed air leaking from the ruptured pipe 61 spreads a fly waste inside the first and second board arrangement compartments 51 and 53 does not occur. In addition, undesired situations such as a contact failure of connectors of the control boards 63 can be avoided.

[0044] How the pipes 61 are laid and electric cables 64 are wired is explained next. The electric cables are for supplying an electric power and/or electric signals to the control boards 63.

[0045] As shown in FIG. 3, the pipes 61 laid and the electric cables 64 wired near the unit body member 4 are introduced in the lower part 4b from the back side thereof and then laid/wired inside each compartment of the unit body member 4. As a result, it is not necessary to take off introduction parts of the pipes 61 and the electric cables 64 when rotating the upper part 4a around the hinge mechanism 10. That is, in the configuration disclosed in Japanese Patent Application publication 2001-106434, because air pipes are introduced from an upper part of the winding unit, the air pipes need to be taken off when tilting the upper part. In contrast, in the present embodiment, as explained above, by introducing the pipes 61, etc., from the lower part 4b, the upper part 4a can be moved without taking off the introduction parts. Consequently, the inspection for maintenance can be performed smoothly.

[0046] The pipes 61 are introduced in the first air-pipe arrangement compartment 50 from an outside of the lower part 4b. Concretely, the pipes 61 constitute a plurality of tubes made from a material having certain flexibility (elastic material). High-pressure air is passed through each of these tubes. Electromagnetic valves 62 are ar-

ranged inside the first air-pipe arrangement compartment 50 for controlling a supply of the compressed air to each of the structural components, and each of the tubes is connected to a corresponding electromagnetic valve 62. Meanwhile, it is needless to say that there can be a tube that is not connected to any electromagnetic valve 62.

[0047] From the first air-pipe arrangement compartment 50, the pipes 61, after passing through the electromagnetic valves 62, are drawn to the second air-pipe arrangement compartment 52. As explained above, the second air-pipe arrangement compartment 52 is formed in a narrow and elongated shape in a vertical direction. Consequently, the pipes 61 are laid in the vertical direction inside the second air-pipe arrangement compartment 52. As a result, the pipes 61 can be introduced from the lower part 4b to the upper part 4a by detouring the compartments in which the control boards 63 are arranged (first board arrangement compartment 51).

[0048] Meanwhile, some of the tubes that constitute the pipes 61 are connected to the structural components arranged within the lower part 4b (for example, unwinding assisting device cylinder 82). Such tubes that need not be introduced into the upper part 4a are not laid in the second air-pipe arrangement compartment 52. The tubes (not shown) that need not be introduced into the upper part 4a are directly laid to the corresponding structural component from the first air-pipe arrangement compartment 50.

[0049] The pipes 61 that are laid inside the second air-pipe arrangement compartment 52 in the vertical direction are drawn from an upper side of the lower part 4b and introduced into the third air-pipe arrangement compartment 54 of the upper part 4a. As shown in FIG. 3, the hinge mechanism 10 is located in a pipe-path that connects the second air-pipe arrangement compartment 52 and the third air-pipe arrangement compartment 54, and the pipes 61 are passed through an axis of the hinge mechanism 10.

[0050] The hinge mechanism 10 is explained with reference to FIG. 4. FIG. 4 is a perspective view for explaining a configuration of the hinge mechanism 10, and it is a view of a situation in which front covers 57 and 58 (see FIG. 3) that function as covers of the second and third air-pipe arrangement compartments 52 and 54 from the front side of the device, respectively, have been dismounted.

[0051] As shown in FIG. 4, the hinge mechanism 10 is divided into a left hinge mechanism (a first hinge mechanism) and a right hinge mechanism (a second hinge mechanism), and a space is secured between the two for passing the pipes 61 between the left and right hinge mechanisms. By laying the pipes 61 in this space, the pipes 61 can be laid so as to pass through the axis of the hinge mechanism 10. In this configuration, bending of the pipes 61 can be suppressed to the maximum when the upper part 4a is rotated around the axis of the hinge mechanism 10. Therefore, because no unreasonable force acts on the pipes 61, generation of kinks in the

pipes 61 can be suppressed. Furthermore, in this configuration, the upper part 4a can be rotated without disconnecting the pipes 61 in a portion between the upper part 4a and the lower part 4b.

[0052] After passing through the axis of the hinge mechanism 10, the pipes 61 are introduced into the third air-pipe arrangement compartment 54 and are laid up to the structural components arranged in the upper part 4a. Thus, the compressed air can be supplied to the various structural components arranged in the upper part 4a. These structural components are, for example, the package pressure cylinder 81 and the splicer device 14.

[0053] On the other hand, as shown in FIG. 3, the electric cables 64 are introduced from the lower part 4b into the first board arrangement compartment 51. Connection destinations of all the electric cables 64 are not shown in the diagrams with an aim to keep the diagrams simple. Meanwhile, some of the electric cables 64 are connected to the control boards 63 arranged inside the first board arrangement compartment 51. In the following explanation, the electric cables 64 include electric cables for internal connections in addition to the electric cables for external connections that are drawn from the outside to an inside of the unit body member 4.

[0054] Some of the electric cables 64 arranged within the first board arrangement compartment 51 are drawn inside the first air-pipe arrangement compartment 50 and connected to the electromagnetic valves 62, etc. Thus, the electromagnetic valves 62 can be controlled. An opening 71 is provided in the partition wall 55a of the first board arrangement compartment 51 and the first air-pipe arrangement compartment 50 to pass the electric cables 64 from the first air-pipe arrangement compartment 50 to the first board arrangement compartment 51. A sealing member (packing) 72 is arranged in the opening 71. The sealing member 72 seals a gap between the walls of the opening 71 and the electric cables 64. Thus, if by any chance, any of the pipes 61 in the first air-pipe arrangement compartment 50 is ruptured, the compressed air leaking from the ruptured pipe is prevented from flowing in the first board arrangement compartment 51 through the opening 71.

[0055] Some of the electric cables 64 arranged within the first board arrangement compartment 51 are drawn from above the first board arrangement compartment 51 and are introduced into the second board arrangement compartment 53. The electric cables 64 introduced into the second board arrangement compartment 53 are connected to the control boards 63, etc., inside the second board arrangement compartment 53. A partition wall (compartment member) 55d is provided on an upper side of the first board arrangement compartment 51. An opening 73 is provided in the partition wall 55d to draw the electric cables 64 to the upper side. On the other hand, a partition wall (compartment member) 55e is provided on a lower side of the second board arrangement compartment 53. An opening 74 is provided in the partition wall 55e at a position corresponding to that of the opening

73 to draw the electric cables 64 from the lower side.

[0056] As shown in FIG. 3, when seen in a side view, the openings 73 and 74 are formed nearer to the hinge mechanism 10 (nearer to the front side of the device). By laying the electric cables 64 nearer to the hinge mechanism, bending of the electric cables 64 produced at the time of rotation of the upper part 4a around the hinge mechanism 10 can be suppressed to the maximum. Therefore, no unreasonable force acts on the electric cables 64. Furthermore, in this configuration, the upper part 4a can be rotated without disconnecting the electric cables 64 in the portion between the upper part 4a and the lower part 4b.

[0057] As explained above, the automatic winder 1 according to the present embodiment includes the unit body member 4, structural components, and the pipes 61. The structural components (concretely, the splicer device 14, the package pressure cylinder 81, the unwinding assisting device cylinder 82, the package brake mechanism, the waste yarn removal mechanism, etc.) are arranged in or near the unit body member 4. The pipes 61 are made of the elastic material and supply the compressed air to the structural components to operate the structural components. The space inside the unit body member 4 is partitioned into the first and second board arrangement compartments 51 and 53 and the first, second, and third air-pipe arrangement compartments 50, 52, and 54 by the partition walls 55a, 55b, 55c, 55d, and 55e. Inside the unit body member 4, the pipes 61 are arranged in the first, second, and third air-pipe arrangement compartments 50, 52, and 54, and the control boards 63 are arranged in the first and second board arrangement compartments 51 and 53.

[0058] By providing separate spaces for arranging the pipes 61 and the control boards 63, the pipes 61 and the control boards 63 can be arranged at separate locations. As a result, undesired situations such as cutting of the pipes 61 and generation of defects due to generation of kinks in the pipes 61 can be prevented from occurring at the time of maintenance of the control boards 63. Therefore, undesired situation in which supply of the compressed air to the devices such as the package pressure cylinder 81 that require the compressed air as the working fluid becomes poor can be prevented from occurring. By arranging the pipes 61 in a compartment that is separate from the compartment of the other structural components, the pipes 61 do not cause hindrance at the time of maintenance of the control boards 63. Furthermore, if by any chance, any of the pipes 61 is ruptured and the compressed air leaks, adverse effect produced on the control boards 63 due to spreading of the fly waste by the compressed air is prevented from occurring.

[0059] Moreover, the automatic winder 1 according to the present embodiment is configured in the following manner. That is, inside the unit body member 4, the opening 71 for passing the electric cables 64 for transmitting the electric power and/or the electric signals is formed in the partition wall 55a. Furthermore, the sealing member

72 is arranged in the gap between the walls of the opening 71 and the electric cables 64.

[0060] By arranging the sealing member 72 in the gap between the walls of the opening 71 and the electric cables 64, if by any chance, any of the pipes 61 is ruptured and the compressed air leaks, adverse effect produced on the control boards 63 such as a contact failure due to spreading of the fly waste by the compressed air that passes through the opening 71 is prevented from occurring.

[0061] Moreover, the automatic winder 1 according to the present embodiment is configured in the following manner. That is, the automatic winder includes the not shown supporting frame for supporting the unit body member 4. The unit body member 4 includes the lower part 4b that is immovably fixed to the supporting frame, and the upper part 4a that is movable with respect to the lower part 4b. Furthermore, the pipes 61 are laid from the outside of the unit body member 4 to the upper part 4a via the lower part 4b.

[0062] By configuring a member of the unit body member 4 in a movable manner, the maintainability of the structural components provided in the upper part 4a can be enhanced. Furthermore, because the pipes 61 coming from the outside are introduced from the lower part 4b and the pipes 61 are laid up to the upper part 4a via the lower part 4b, the portion from where the pipes 61 are introduced does not move even when the upper part 4a is moved. Therefore, it is not necessary to take off the pipes 61 in the portion from where the pipes 61 are introduced when moving the upper part 4a. Consequently, the maintainability can be enhanced further.

[0063] Moreover, the automatic winder 1 according to the present embodiment is configured in the following manner. That is, the lower part 4b and the upper part 4a are coupled to each other by the hinge mechanism 10. Furthermore, the pipes 61 are passed near the hinge mechanism 10.

[0064] By having such a configuration, the upper part 4a can be moved by using a simple structure consisting of the hinge mechanism 10. Furthermore, by laying the pipes 61 near the hinge mechanism 10, the upper part 4a can be moved without taking off the pipes 61 that are located between the upper part 4a and the lower part 4b.

[0065] In the automatic winder 1 according to the present embodiment, the pipes 61 are passed through the axis of the hinge mechanism 10.

[0066] By laying the pipes in this manner, bending of the pipes 61 produced at the time of rotation of the upper part 4a around the hinge mechanism 10 can be reduced. In addition, an undesired situation in which a large force that can bend the pipes 61 can be produced is prevented from occurring.

[0067] In the automatic winder 1 according to the present embodiment, the pipes 61 are for supplying the compressed air.

[0068] In the textile machines, apart from using the compressed air as the working fluid for various cylinders,

the compressed air is also used to generate the swirling airflow to twist the ends of the yarns. The compressed air is also used as the air blast to remove the waste yarn. Therefore, the configuration in which the pipes 61 that carry the compressed air and the control boards 63 are arranged in the separate compartments is particularly suitable.

[0069] A preferable embodiment of the present invention is explained above; however, the above-described configuration can be modified in the manner explained below.

[0070] The above-embodiment is explained by taking the automatic winder as an example; however, the present embodiment can be similarly applied to other types of textile machines such as spinning frames.

[0071] Furthermore, the working fluid is not limited to the compressed air but it can be hydraulic oil.

[0072] The way the inner space of the unit main body is partitioned in the above-explained embodiment is only exemplary, and the manner of partitioning is not limited to this. For example, compartments other than the compartments for arranging the boards and the compartments for arranging the pipes can be formed.

[0073] According to an aspect of the present invention, a textile machine having the following configuration is presented. That is, the textile machine includes a unit body member, a structural component, and a pipe. The structural component is arranged in or near the unit body member. The pipe is made of an elastic material and supplies a compressed air to the structural component to operate the structural component. An inner space of the unit body member is partitioned into at least pipe arrangement compartments by compartment members. Inside the unit body member, the pipe is laid in the pipe arrangement compartments.

[0074] In this manner, by laying the pipe in separate compartments, the pipe can be separated from other component such as a control board, so that undesired situations such as bending of the pipe or rupturing of the pipe due to development of kinks can be prevented from occurring at the time of maintenance of the other component. Because the pipe is arranged separately from the other component, the pipe does not cause hindrance at the time of maintenance of the other component. Furthermore, if by any chance, the pipe is ruptured and the working fluid leaks, adverse effect produced on the other component due to spreading of fly waste by the working fluid is prevented from occurring.

[0075] It is preferable that the textile machine is configured as follows. That is, in the unit body member, an opening for passing a cable for transmitting electric power and/or electric signals is formed in the compartment member. Moreover, a sealing member is arranged in a gap between the walls of the opening formed in the compartment member and the cable.

[0076] By arranging the sealing member in the gap between the walls of the opening and the cable, if by any chance, the pipe is ruptured and the working fluid leaks,

adverse effect produced on the control board such as a contact failure due to spreading of the fly waste by the working fluid that leaks through the opening is prevented from occurring.

[0077] It is preferable that the textile machine is configured as follows. That is, the textile machine includes a supporting member for supporting the unit body member. The unit body member includes a non-moving member that is immovably fixed to the supporting member, and a moving member that is movable with respect to the non-moving member. Furthermore, the pipe is laid from outside of the unit body member to the moving member via the non-moving member.

[0078] By configuring a member of the unit body member in a movable manner, the maintainability of the structural components provided in the moving member can be enhanced. Furthermore, because the pipe coming from the outside is introduced from the non-moving member and the pipe is laid up to the moving member via the non-moving member, the portion from where the pipe is introduced in the moving member does not move even when the moving member is moved. Therefore, it is not necessary to take off the pipe in the portion from where the pipe is introduced in the moving member when moving the moving member. Consequently, the maintainability can be enhanced further.

[0079] It is preferable that the textile machine is configured as follows. That is, the non-moving member and the moving member are coupled to each other with a hinge mechanism. Furthermore, the pipe is passed near the hinge mechanism.

[0080] By having such a configuration, the moving member can be moved by using a simple structure consisting of the hinge mechanism. Furthermore, by laying the pipe near the hinge mechanism, the moving member can be moved without taking off the pipe that is located between the moving member and the non-moving member.

[0081] It is preferable that, in the textile machine, the pipe is passed through an axis of the hinge mechanism.

[0082] By laying the pipe in this manner, because a bending of the pipe produced due to a movement of the moving member around the hinge mechanism can be made smaller, an undesired situation in which a large force that may bend the pipe largely is prevented from occurring.

[0083] It is preferable that, in the textile machine, the working fluid is a compressed air.

[0084] The compressed air is used as the working fluid for various cylinders in the textile machine. Moreover, the compressed air is used to generate a swirling airflow to twist ends of yarns. The compressed air is also used as an air blast to remove the waste yarn. Thus, a configuration in which the pipe that carries the compressed air and the other component such as the control board are arranged in separate compartments is particularly suitable.

[0085] While the present invention has been described

with respect to preferred embodiments thereof, it will be apparent to those skilled in the art that the disclosed invention may be modified in numerous ways and may assume many embodiments other than those specifically set out and described above. Accordingly, it is intended by the appended claims to cover all modifications of the present invention that fall within the true spirit and scope of the present invention.

Claims

1. A textile machine comprising:

a unit body member;
a structural component arranged in or near the unit body member;
a pipe made of an elastic material and configured to supply a working fluid to the structural component;
compartment members that partition an inner space of the unit body member; and
pipe arrangement compartments formed due to partitioning of the inner space of the unit body member by the compartment members, wherein inside the unit body member, the pipe is laid in the pipe arrangement compartments.

2. The textile machine according to Claim 1, wherein inside the unit body member, an opening is provided in the compartment members for passing a cable for transmitting an electric power and/or electric signals, and
a sealing member is arranged in a gap between a wall of the opening and the cable.

3. The textile machine according to Claim 1 or 2, further comprising, inside the unit body member, a board arrangement compartment formed due to partitioning of the inner space of the unit body member by the compartment members, wherein
a control board that controls the structural component is arranged in the board arrangement compartment.

4. The textile machine according to any one of Claims 1 to 3, further comprising an electromagnetic valve arranged in the pipe arrangement compartment for controlling supply of the working fluid to the structural component, wherein
the pipe is connected to the electromagnetic valve.

5. The textile machine according to any one of Claims 1 to 4, further comprising a supporting member that supports the unit body member, wherein
the unit body member includes a non-moving member fixedly attached to the supporting member and a moving member movable with respect to the non-

moving member, and
the pipe is laid from outside of the unit body member to the moving member via the non-moving member.

6. The textile machine according to Claim 5, wherein the moving member and the non-moving member are coupled with a hinge mechanism, and when laying the pipe from the non-moving member to the moving member, the pipe is passed near the hinge mechanism.

7. The textile machine according to Claim 6, wherein the pipe laid so as to pass through an axis of the hinge mechanism.

8. The textile machine according to Claim 7, wherein the hinge mechanism is divided into a first hinge mechanism and a second hinge mechanism, and a space for passing the pipe is secured between the first hinge mechanism and the second hinge mechanism.

9. The textile machine according to any one of Claims 1 to 8, wherein the working fluid is a compressed air.

10. The textile machine according to Claim 9, wherein the structural component includes one or more selected from a splicer device, a package pressure cylinder, an unwinding assisting device cylinder, a package brake mechanism, and a waste yarn removal mechanism.

FIG. 1

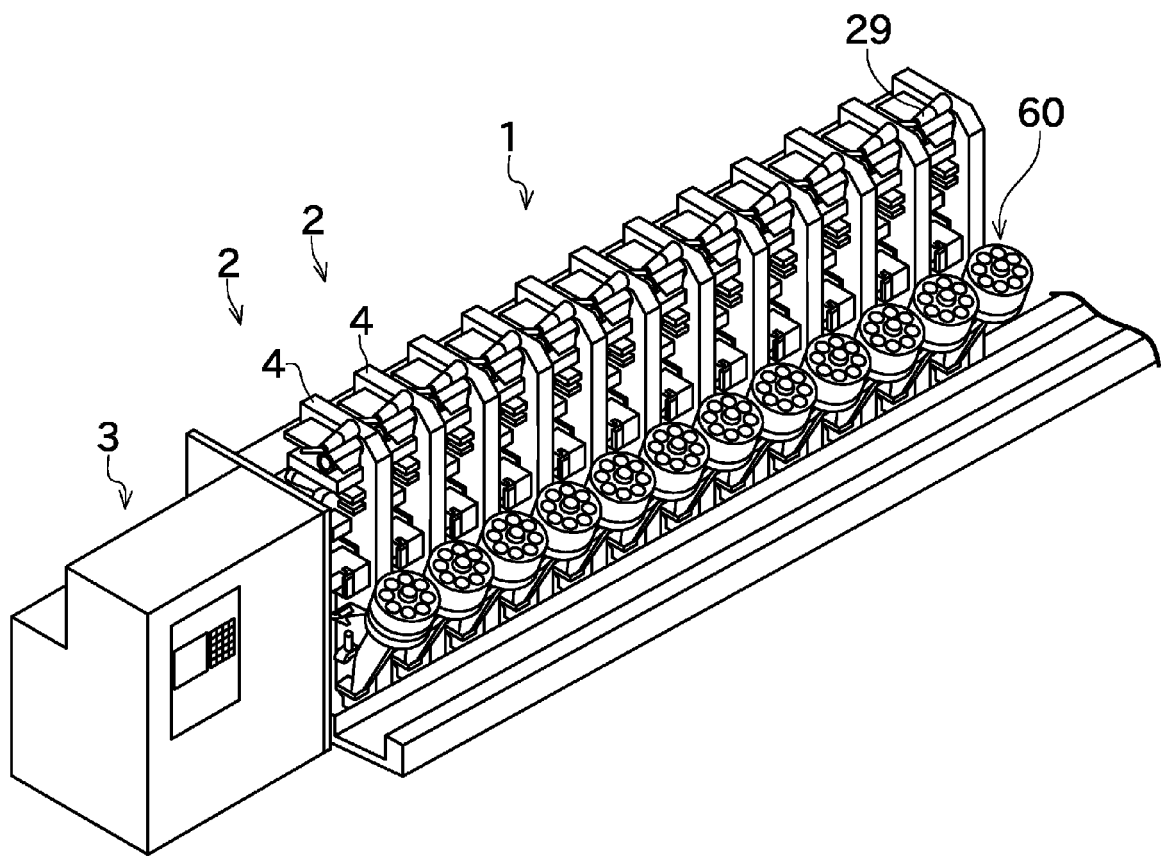


FIG. 2

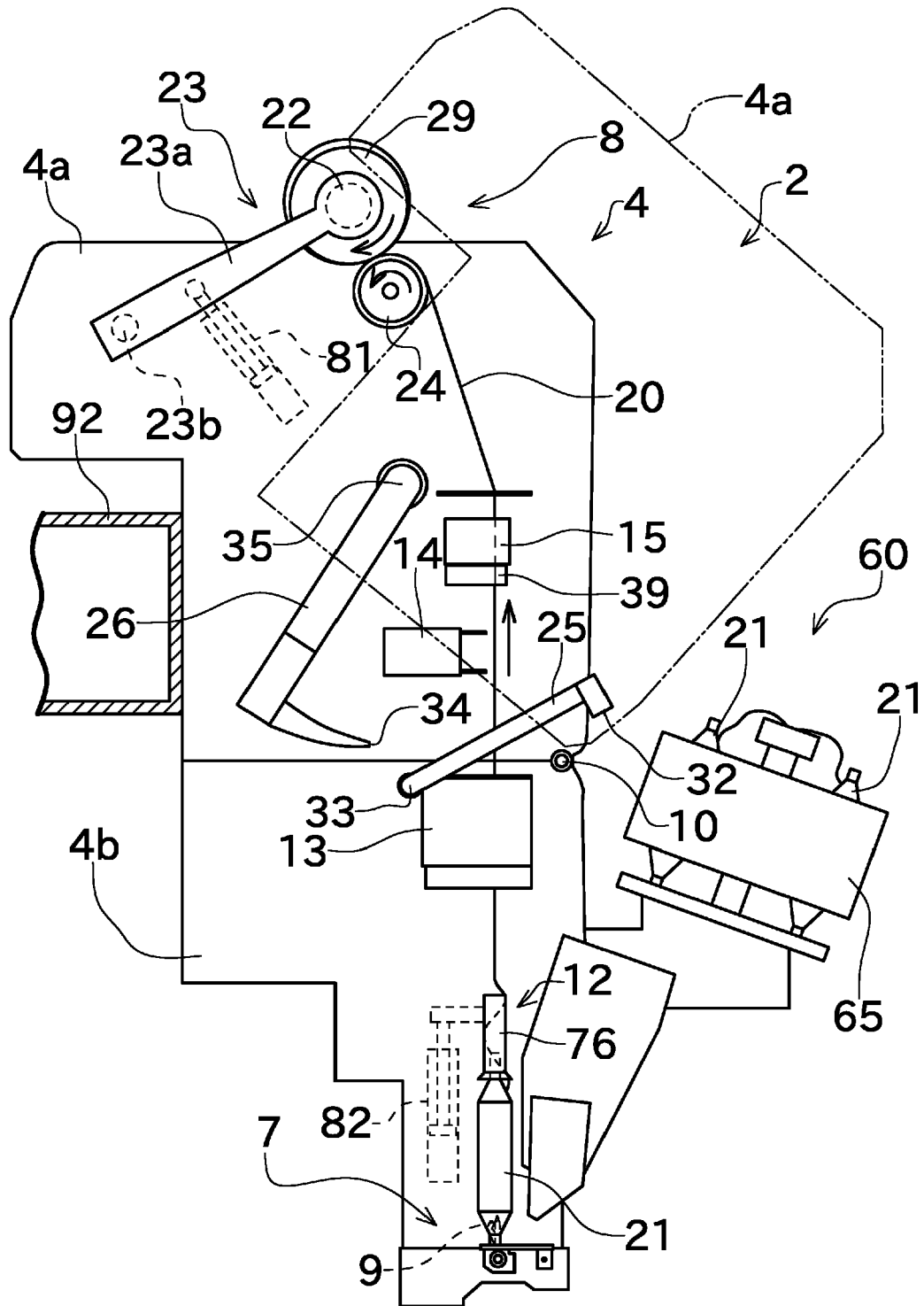


FIG. 3

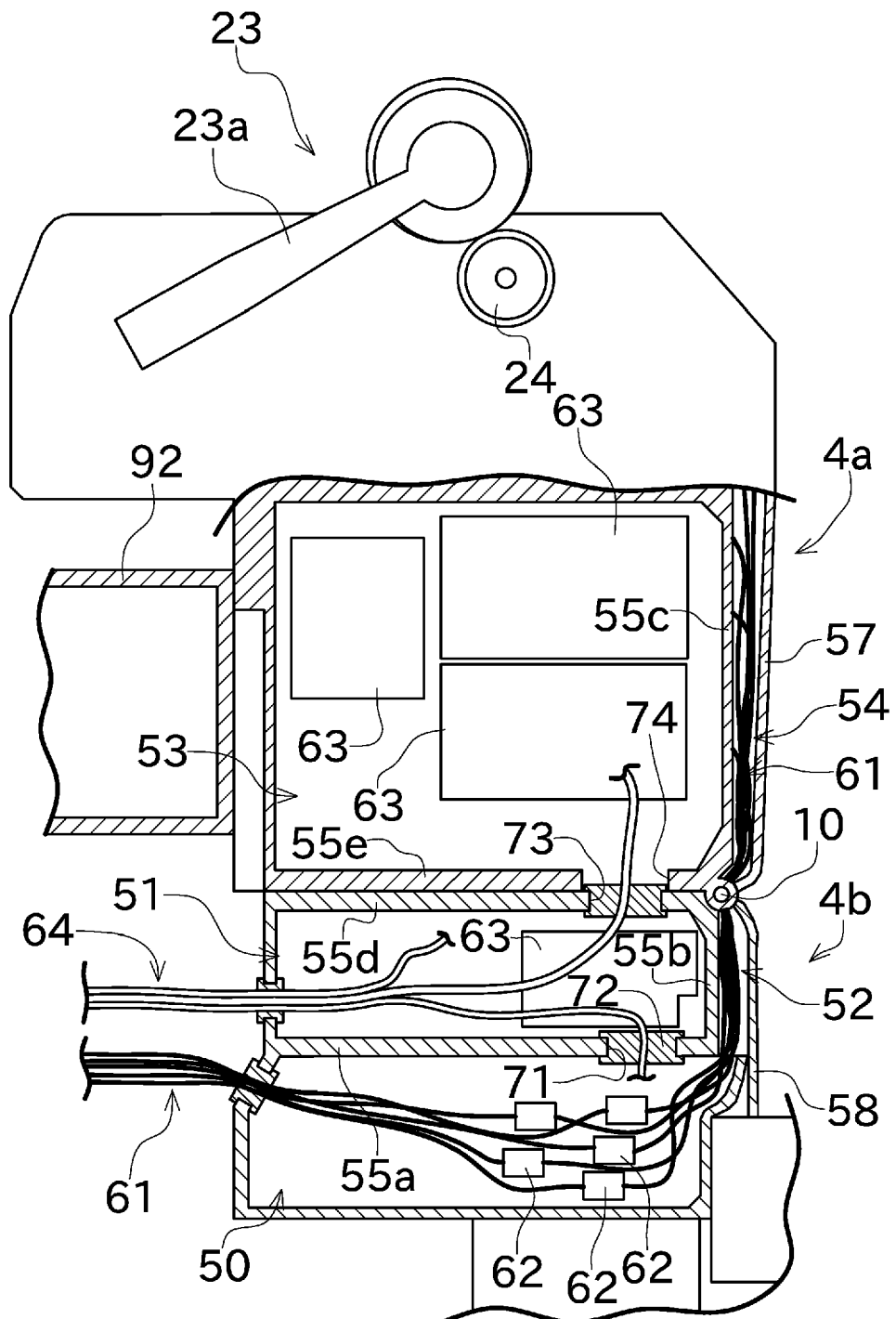
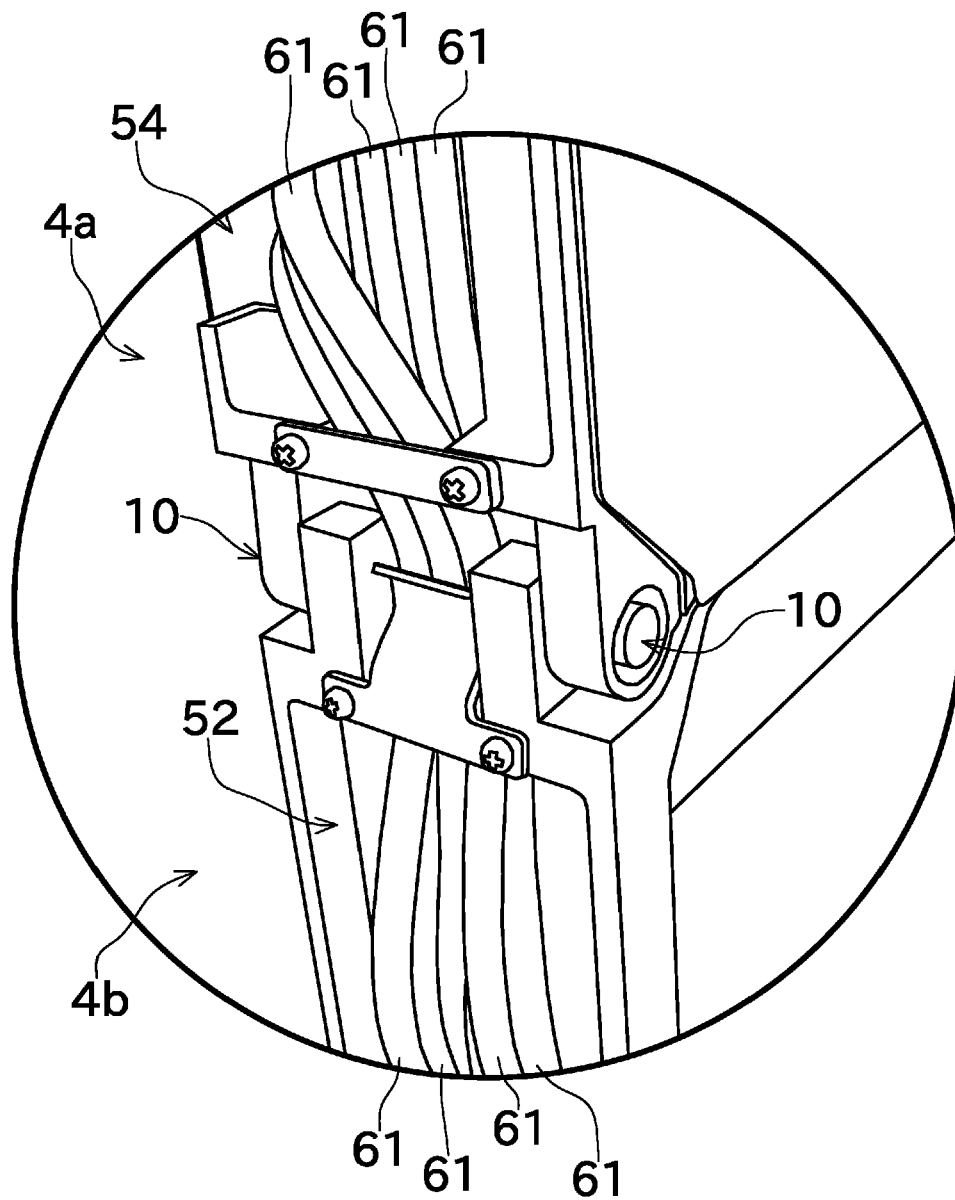


FIG. 4



REFERENCES CITED IN THE DESCRIPTION

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