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(54) Yarn winding unit and yarn winding machine

Garnwickeleinheit und Garnwickelmaschine

Unité de bobinage de fil et machine de bobinage de fil

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a yarn winding unit and a yarn winding machine.

2. Description of the Related Art

[0002] Conventionally, as a technique in such a field, there is known a spinning machine described in Japanese Unexamined Patent Publication No. 2011-37608. The spinning machine includes a cradle device adapted to hold a package, an air cylinder adapted to drive a cradle arm of the cradle device, a supply line adapted to supply compressed air from a compressed air source to the air cylinder, and a control section adapted to control the supply of the compressed air to the air cylinder. In the spinning machine, for example, the cradle device is installed on a frame of the spinning machine, and the air cylinder is also separately installed on the frame of the spinning machine.

[0003] EP 1 092 667 A2 discloses an automatic winder that eliminates the need to attach and remove a tray guide and that can increase a tilting angle of a standing frame. The automatic winder has winding units each comprising a bobbin supply and ejection device, a yarn joining device, and a winding device. The winding unit is divided into a lower part including the bobbin supply and ejection device and an upper part including the yarn joining device and the winding device. The upper part can be tilted from a winding position where it is stood up to a tilted position where it is tilted toward an operation passage side.

[0004] JP S55 115554 A discloses a cradle arm comprising arm portions to hold a bobbin, wherein one of the arm portions is pivoted to allow the bobbin to be placed in the cradle arm or removed from the cradle arm.

[0005] DE 44 38 346 A1 discloses a textile machine comprising a number of winding positions, wherein each winding position is made up of a central assembly attached to a rigid suction duct and an upper winding assembly. The winding assembly is configured in such a way that it can easily be transferred from a working position to a servicing position. Preferably, the winding assembly is attached by a hinge so that the assembly can be swung forward where it is readily accessible.

[0006] JP 2011 037608 A discloses a textile machinery, in which a spinning frame includes a winding drum, a cradle arm, and an air cylinder. The air cylinder can apply a force for turning the cradle arm in an approaching direction or in a separating direction.

[0007] EP 1 092 666 A2 discloses an automatic winder comprising a plurality of winding units mountable to a base. Each winding unit comprises a winding unit support main body and constituting devices including an attachment member removably attached to the winding unit support main body.

BRIEF SUMMARY OF THE INVENTION

[0008] When performing a maintenance operation on the cradle device, cumbersome operations such as detaching the cradle device, the air cylinder, and the control section respectively from the frame, detaching an air pipe associated with the air cylinder, and the like are required. In this type of yarn winding machine, the maintenance operation of the cradle device is desired to be simplified.

[0009] An object of the present invention is to provide a yarn winding unit and a yarn winding machine in which a maintenance operation of a cradle device is simplified.

[0010] A yarn winding unit of the present invention is set forth in claim 1 and includes a frame and a cradle device. The cradle device includes a cradle arm adapted to rotatably hold a package around which a spun yarn is wound, a driving section adapted to drive the cradle arm, and a control section adapted to control the driving section. The cradle device is a module provided detachably to the frame. The cradle device includes a supporting section adapted to swingably support the cradle arm and fixed to the frame, and the driving section adapted to swing the cradle arm with respect to the supporting section. The driving section includes a first driving device adapted to swing the cradle arm by moving a prescribed point of application of force of the cradle arm with respect to the supporting section, and a second driving device adapted to swing the cradle arm by moving the point of application of force by moving the first driving device with respect to the supporting section. A moved amount of the point of application of force by the second driving device is greater than a moved amount of the point of application of force by the first driving device.

[0011] According to the yarn winding unit, the cradle arm, the driving section, and the control section are collectively attachable to or detachable from the frame as a module of the cradle device. Thus, when performing the maintenance operation of the cradle device, all components of the cradle device can be detached from the frame at once. Therefore, the maintenance operation of the cradle device can be easily performed.

[0012] In the yarn winding unit of the present invention, the driving section is the air cylinder. The yarn winding unit includes a plurality of air pipes. The plurality of air pipes are provided on the frame and are adapted to guide compressed air to the air cylinder. The plurality of air pipes are provided as a pipe group. Accordingly, a structure of the entire yarn winding unit can be simplified.

[0013] The cradle device further includes a first connecting section adapted to connect the air cylinder and the air pipes. The air pipes are provided with a second connecting section adapted to be connected to the first connecting section. The second connecting section includes a valve adapted to pass through the compressed air from the air pipes to the first connecting section when the first connecting section is connected, and to shut the

compressed air from the air pipes when the first connecting section is not connected.

[0014] In the yarn winding unit adapted to supply the compressed air from the air pipes to the cradle device, a compressed air path for the air cylinder can also be connected by the connection of the first and second connecting sections, and the cradle device can be easily attached or detached. When the first connecting section of the cradle device is detached from the second connecting section, leakage of the compressed air from the air pipes can be prevented.

[0015] The cradle arm includes two holding arms adapted to hold the package, and package holding sections respectively provided on the holding arms and adapted to rotatably hold the package by the holding arms. The respective cradle device includes: a swing shaft adapted to enable swinging of the cradle arm, a supporting section adapted to support the swing shaft and the driving section, and fixed on the frame, and an opening-and-closing shaft adapted to open and close the cradle arm by moving one of the holding arms between a holding position for holding the package and a releasing position for releasing the package. The opening-and-closing shaft is located opposite the package holding sections with respect to the swing shaft.

[0016] The package holding section and the opening-and-closing shaft are located away from one another. Therefore, even if a width of the package is changed, both holding arms can hold the package in an almost parallel state.

[0017] The cradle arm can be swung by moving the point of application of force of the cradle arm by the first driving device. The cradle arm can also be swung at a greater angle by more greatly moving the point of application of force of the cradle arm by the second driving device. Therefore, the first driving device and the second driving device can be used according to purpose to swing the cradle arm at different movable widths.

[0018] A yarn winding machine includes a frame, and a plurality of cradle devices. Each cradle device includes a cradle arm adapted to rotatably hold a package around which a spun yarn is wound, a driving section adapted to drive the cradle arm, and a control section adapted to control the driving section. Each of the cradle devices is an independent module provided detachably to the frame.

[0019] According to the yarn spinning machine, the cradle arm, the driving section, and the control section are collectively attachable to or detachable from the frame as a module of the cradle device. Thus, when performing the maintenance operation of each cradle device, all of the components of the cradle device can be detached from the frame at once. Therefore, the maintenance operation of the cradle device can be easily performed.

[0020] In the yarn winding machine, the driving section is an air cylinder. The yarn winding machine further includes a compressed air source adapted to supply compressed air to the air cylinder of each of the cradle devices, and a plurality of air pipes provided on a frame and adapted to guide the compressed air supplied from the compressed air source to the air cylinder of each of the cradle devices. The plurality of air pipes are collectively provided as a pipe group. Since the plurality of air pipes provided on the frame are provided as the pipe group, the structure of the entire yarn winding machine can be simplified.

[0021] Each cradle device further includes a first connecting section adapted to connect the air cylinder and the air pipes. The air pipes are provided with a plurality of second connecting sections adapted to be connected to the first connecting section of each of the cradle devices. The second connecting section includes a valve adapted to pass through the compressed air from the air pipes to the first connecting section when the first connecting section is connected, and to shut the compressed air from the air pipes when the first connecting section is not connected.

[0022] In the yarn winding machine adapted to supply the compressed air from the air pipes to each of the cradle devices, a compressed air path for the air cylinder can also be connected by the connection of the first and second connecting sections, and the cradle device can be easily attached or detached. Even when the first connecting section is detached from the second connecting section in some of the plurality of cradle devices, the compressed air from the air pipes is shut in the second connecting section, and the supply of the compressed air to other cradle devices is not influenced. Even when performing the maintenance operation of some of the cradle devices, a yarn winding operation can be continued in the other cradle devices.

[0023] The cradle arm includes two holding arms adapted to hold the package, and package holding sections respectively provided on the holding arms and adapted to rotatably hold the package by the holding arms. The respective cradle device includes a swing shaft adapted to enable swinging of the cradle arm, a supporting section adapted to support the swing shaft and the driving section, and fixed on the frame, and an opening-and-closing shaft adapted to open and close the cradle arm by moving one of the holding arms between a holding position for holding the package and a releasing position for releasing the package. The opening-and-closing shaft is located opposite the package holding sections with respect to the swing shaft.

[0024] The package holding section and the opening-and-closing shaft are located away from one another. Therefore, even if the width of the package is changed, both holding arms can sandwich and hold the package in an almost parallel state.

[0025] The yarn winding machine further includes a doffing device adapted to perform a doffing operation of the package with respect to the cradle device. The doffing device includes a cradle operating section adapted to open and close the cradle arm. Since the opening and

closing of the cradle arm are performed by the cradle operating section of the doffing device, workability of the doffing operation is improved.

[0026] The yarn winding machine further includes a draft device adapted to draft a fiber bundle, and an air-jet spinning device adapted to spin using whirling airflow, the fiber bundle drafted by the draft device. In the yarn winding machine including the air-jet spinning device, the maintenance operation of the cradle device can be easily performed.

[0027] Each cradle device includes a supporting section adapted to swingably support the cradle arm and fixed to the frame, and the driving section adapted to swing the cradle arm with respect to the supporting section. The driving section includes a first driving device adapted to swing the cradle arm by moving a prescribed point of application of force of the cradle arm with respect to the supporting section, and a second driving device adapted to swing the cradle arm by moving the point of application of force by moving the first driving device with respect to the supporting section. A moved amount of the point of application of force by the second driving device is greater than a moved amount of the point of application of force by the first driving device.

[0028] The cradle arm can be swung by moving the point of application of force of the cradle arm by the first driving device. The cradle arm can also be swung at a greater angle by more greatly moving the point of application of force of the cradle arm by the second driving device. Therefore, the first driving device and the second driving device can be used according to the purpose to swing the cradle arm at different movable widths.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029]

FIG. 1 is a front view of a spinning machine according to one embodiment of the present invention;
FIG. 2 is a side view of a spinning unit of the spinning machine of FIG. 1;
FIG. 3 is a block diagram illustrating a supply path of compressed air for driving a cradle arm;
FIG. 4 is a side view of a doffing device of the spinning machine of FIG. 1;
FIG. 5 is a perspective view illustrating a cradle device of a spinning unit and a frame;
FIG. 6 is a side view illustrating the cradle device of the spinning unit and the frame; and
FIG. 7 is a front view illustrating the cradle device of the spinning unit.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0030] A spinning machine (yarn winding machine) according to one embodiment of the present invention will be described with reference to FIG. 1 to FIG. 4. "Upstream" and "downstream" respectively refer to upstream and downstream in a travelling direction of a yarn during spinning.

[0031] A spinning machine 1 illustrated in FIG. 1 includes a plurality of spinning units (winding units) 2 arranged in line. The spinning machine 1 includes a yarn joining cart 3, a doffing cart 4, a blower box 93, and a motor box 5.

[0032] Each spinning unit 2 includes a draft device 7, an air-jet spinning device 9, a yarn accumulating device 12, and a winding device 13 arranged in this order from upstream to downstream. The draft device 7 is arranged in proximity to an upper end of a frame 6 of the spinning machine 1. A fiber bundle 8 fed from the draft device 7 is spun by the air-jet spinning device 9. A spun yarn 10 produced by the air-jet spinning device 9 is fed via a yarn accumulating roller 21 and wound by the winding device 13, thus forming a package 45. A bobbin 48 (to be described later), and a yarn layer of the spun yarn 10 wound around the bobbin 48 are collectively referred to as the package 45. As illustrated in FIG. 1 and the like, in the present embodiment, the spinning unit 2 forms a cylindrical package (cheese package) 45 using the cylindrical bobbin 48, but may also form a conical package (cone package) using a conical bobbin.

[0033] The draft device 7 drafts a sliver 15 to obtain the fiber bundle 8. As illustrated in FIG. 2, the draft device 7 includes four roller pairs, i.e., a back roller pair 16, a third roller pair 17, a middle roller pair 19 provided with an apron belt 18, and a front roller pair 20. A bottom roller of each of the roller pairs 16, 17, 19, and 20 is driven by power from the motor box 5, or by power of electric motors (not illustrated) arranged in each spinning unit 2. Each of the roller pairs 16, 17, 19, and 20 is driven with a different rotation speed. As a result, the draft device 7 can draft the sliver 15 supplied from the upstream to form the fiber bundle 8, and feed the fiber bundle 8 to the air-jet spinning device 9 located downstream.

[0034] The air-jet spinning device 9 applies twists to the fiber bundle 8 using whirling airflow to produce the spun yarn 10. Although detailed description and illustration will be omitted, the air-jet spinning device 9 includes a fiber guiding section, a whirling airflow generating nozzle, and a hollow guide shaft body. The fiber guiding section guides the fiber bundle 8 fed from the draft device 7 to a spinning chamber formed inside the air-jet spinning device 9. The whirling airflow generating nozzle is arranged at a periphery of a path of the fiber bundle 8 to generate the whirling airflow in the spinning chamber. This whirling airflow causes fiber ends of the fiber bundle 8 in the spinning chamber to be reversed and to whirl. The hollow guide shaft body guides the spun yarn 10 from the spinning chamber to an outside of the air-jet spinning device 9. Driving and stopping of the air-jet spinning device 9 are controlled by a unit controller (not illustrated) .

[0035] The yarn accumulating device 12 is arranged downstream of the air-jet spinning device 9. The yarn

accumulating device 12 includes the yarn accumulating roller 21, a yarn hooking member 22, an upstream guide 23, an electric motor 25, a downstream guide 26, and an accumulated amount sensor 27.

[0036] The yarn hooking member 22 can be engaged (hooked) with the spun yarn 10. The yarn hooking member 22 integrally rotates with the yarn accumulating roller 21 while being engaged with the spun yarn 10 to guide the spun yarn 10 to an outer peripheral surface of the yarn accumulating roller 21. The yarn hooking member 22 is supported in a relatively rotatable manner with respect to the yarn accumulating roller 21. The yarn accumulating device 12 is configured to generate a torque against the relative rotation of the yarn hooking member 22 with respect to the yarn accumulating roller 21 by a torque generating means (not illustrated) including a magnetic means, for example. Such a resistance torque enables the yarn hooking member 22 to rotate following a rotation of the yarn accumulating roller 21. As a result, the yarn hooking member 22 and the yarn accumulating roller 21 can integrally rotate. When a force that overcomes the resistance torque is applied on the yarn hooking member 22, the yarn hooking member 22 can relatively rotate with respect to the yarn accumulating roller 21.

[0037] The yarn accumulating roller 21 can accumulate the spun yarn 10 by winding the spun yarn 10 around the outer peripheral surface thereof. The yarn accumulating roller 21 is rotatably driven at a prescribed rotation speed by the electric motor 25 controlled by the unit controller. The spun yarn 10 guided to the outer peripheral surface of the yarn accumulating roller 21 by the yarn hooking member 22 is wound to tighten the yarn accumulating roller 21 by the rotation of the yarn accumulating roller 21, and the spun yarn 10 located upstream of the yarn accumulating device 12 is pulled. Accordingly, the spun yarn 10 can be continuously pulled out from the air-jet spinning device 9.

[0038] When the spun yarn 10 on the yarn accumulating roller 21 becomes greater than or equal to a prescribed amount, a contacting area between the yarn accumulating roller 21 and the spun yarn 10 becomes large, and a slip or the like hardly occurs. Therefore, by rotatably driving the yarn accumulating roller 21 with the spun yarn 10 of the prescribed amount or more wound around the yarn accumulating roller 21, the spun yarn 10 can be pulled out from the air-jet spinning device 9 at a stable speed without causing a slip or the like.

[0039] The accumulated amount sensor 27 detects, in a non-contacting manner, an accumulated amount of the spun yarn 10 wound around the yarn accumulating roller 21, and transmits the accumulated amount to the unit controller.

[0040] The upstream guide 23 is arranged slightly upstream of the yarn accumulating roller 21. The upstream guide 23 appropriately guides the spun yarn 10 with respect to the outer peripheral surface of the yarn accumulating roller 21. The upstream guide 23 prevents a twist of the spun yarn 10 propagating from the air-jet spinning device 9 from being transmitted downstream of the upstream guide 23.

[0041] The downstream guide 26 is arranged slightly downstream of the yarn accumulating roller 21. The downstream guide 26 regulates a path of the spun yarn 10 swung by the rotating yarn hooking member 22, and guides the spun yarn 10 while stabilizing a travelling path of the spun yarn 10 located downstream.

[0042] A yarn clearer (yarn defect detection device) 52 is arranged on a front side of the frame 6 of the spinning machine 1, and at a position between the air-jet spinning device 9 and the yarn accumulating device 12. The spun yarn 10 spun by the air-jet spinning device 9 is passed through the yarn clearer 52 before being wound by the yarn accumulating device 12. The yarn clearer 52 monitors a thickness of the travelling spun yarn 10, and when a yarn defect of the spun yarn 10 is detected, the yarn clearer 52 transmits a yarn defect detection signal to the unit controller. The yarn clearer 52 may detect presence or absence of foreign substances contained in the spun yarn 10, in addition to the yarn defect of the thickness of the spun yarn 10.

[0043] Upon receiving a yarn defect detection signal, the unit controller immediately stops ejection of compressed air from the whirling airflow generating nozzle of the air-jet spinning device 9. Accordingly, the whirling airflow is stopped, the twist of the fiber bundle 8 is stopped, and introduction of the fiber bundle 8 to the air-jet spinning device 9 is also stopped. A continuation of the fibers is disconnected in the air-jet spinning device 9, and the spun yarn 10 is cut. Thereafter, the unit controller further stops the draft device 7 and the like. The unit controller transmits a control signal to the yarn joining cart 3, and the yarn joining cart 3 travels to the front of the spinning unit 2. Thereafter, the unit controller drives the air-jet spinning device 9 and the like again, the yarn joining cart 3 performs the yarn joining operation, and the winding is resumed. In this case, after the air-jet spinning device 9 resumes the spinning and until the winding is resumed, the yarn accumulating device 12 accumulates the spun yarn 10 continuously fed from the air-jet spinning device 9 around the yarn accumulating roller 21 to remove slackening of the spun yarn 10.

[0044] The winding device 13 includes a cradle arm 71, a winding drum 72, and a traverse device 75.

[0045] The winding drum 72 is adapted to be driven while making contact with an outer peripheral surface of the package 45. The traverse device 75 includes a traverse guide 76 capable of being engaged with the spun yarn 10. The winding device 13 drives the winding drum 72 with an electric motor (not illustrated) while reciprocating the traverse guide 76 by a driving means (not illustrated). The package 45 making contact with the winding drum 72 can be rotated and the spun yarn 10 can be wound into the package 45 while being traversed.

[0046] As illustrated in FIG. 2, the cradle arm 71 can rotatably support the bobbin 48, and is swingably sup-

ported about a supporting shaft (swing shaft) 70. Therefore, even if a yarn layer diameter of the package 45 is increased accompanying the winding of the spun yarn 10, the increase in the yarn layer diameter is absorbed by the swinging of the cradle arm 71, and the surface of the package 45 can be appropriately made in contact with the winding drum 72 continuously.

[0047] An air cylinder (driving section, first driving device) 60 is connected to the cradle arm 71. The air cylinder 60 is configured as a double-action type pneumatic cylinder, and includes a piston rod 61, a piston 62 fixed to the piston rod 61, a contact pressure port 63, and a back pressure port 64. The air cylinder 60 can supply air from the contact pressure port 63 and the back pressure port 64 into a cylinder case of the air cylinder 60. If there is a difference in air pressure of the air supplied to the contact pressure port 63 and the back pressure port 64, the air pushes the piston 62 and drives the piston rod 61. When the piston rod 61 is pushed upward (direction towards the cradle arm 71), the cradle arm 71 is swung towards a front side of the spinning unit 2 (leftward in FIG. 2) with the supporting shaft (the swing shaft) 70 as a center, and the package 45 is moved in a direction away from the winding drum 72. When the piston rod 61 is pushed downward (direction of moving away from the cradle arm 71), the cradle arm 71 is swung towards the rear side of the spinning unit 2 (rightward in FIG. 2) with the supporting shaft 70 as the center, and the package 45 is pushed against the winding drum 72. FIG. 2 is a side view describing the structure of the spinning unit 2, where mounting of a cradle device 100 to the frame 6 is schematically illustrated in a simplified manner. The structure of the cradle device 100 is as illustrated in FIG. 5 to FIG. 7.

[0048] As illustrated in FIG. 3, the contact pressure port 63 is connected to a contact pressure compressed air source 65 provided in a blower box 93. The back pressure port 64 is connected to the contact pressure compressed air source 65 through a depressurization valve 67. An electromagnetic valve (control section) 63a is arranged between the contact pressure port 63 and the contact pressure compressed air source 65. Whether or not to supply air pressure to the contact pressure port 63 can be switched by control of the unit controller. An electromagnetic valve (control section) 64a is arranged between the back pressure port 64 and the depressurization valve 67. Supplying and stopping of air pressure to the back pressure port 64 can be controlled by the unit controller.

[0049] In order to drive the piston rod 61 slightly upward, the air cylinder 60 is provided with a lifter port 68 adapted to supply compressed air and provided separately from the back pressure port 64. The lifter port 68 is connected to a lifter compressed air source 69. When the compressed air from the lifter compressed air source 69 is supplied to the lifter port 68, the piston rod 61 is pushed slightly upward, and the package 45 can be slightly moved away from the winding drum 72. Such driving of the package 45 is used to finely adjust the winding speed of the spun yarn 10 and adjust the accumulated amount of the spun yarn 10 of the yarn accumulating device 12. An electromagnetic valve (control section) 68a is arranged between the lifter port 68 and the lifter compressed air source 69. Supplying and stopping of the air pressure to the lifter port 68 can be controlled by the unit controller.

[0050] Although details will be described later, each supply path of the compressed air to the air cylinder 60 is connected by a male connector section 103 and a female connector section 107. The male connector section 103 includes the electromagnetic valves 68a, 63a, and 64a described above. The female connector section 107 includes a valve 107b, to be described later.

[0051] As illustrated in FIG. 2, the yarn joining cart 3 includes a splicer (yarn joining device) 43, a suction pipe 44, and a suction mouth 46. When yarn breakage or yarn cut occurs in a spinning unit 2, according to the control signal from the unit controller, the yarn joining cart 3 travels on a rail 41 fixed to the frame 6 (see FIG. 1) to the target spinning unit 2 and stops thereat to perform the yarn joining operation.

[0052] The suction pipe 44 can be swung vertically with a shaft as a center, and can suck and catch a yarn end fed from the air-jet spinning device 9 (upper yarn) to guide the yarn end to the splicer 43. The suction mouth 46 can be swung vertically with a shaft as the center, and can suck and catch a yarn end from the package 45 (lower yarn) to guide the yarn end to the splicer 43. Although description on the detailed configuration of the splicer 43 will be omitted, the upper yarn and the lower yarn are joined by twisting the yarn ends by means of the whirling airflow.

[0053] As illustrated in FIG. 4, the doffing cart 4 includes a doffing device 59. The doffing device 59 performs a bobbin setting operation of supplying the bobbin 48 to the cradle arm 71 to prepare for the winding of the spun yarn 10, and a doffing operation of detaching the fully-wound package 45 from the cradle arm 71. The doffing cart 4 is provided with a travelling wheel 92 at a lower part, and upon receiving an instruction to perform the bobbin setting operation or the doffing operation with respect to a spinning unit 2, the doffing cart 4 travels to the target spinning unit 2 on a travelling path 91 formed on the frame 6. The doffing cart 4 stops in front of the spinning unit 2, as instructed, and performs the bobbin setting operation or the doffing operation (or both operations).

[0054] In order to perform the bobbin setting operation, the doffing device 59 includes a bobbin supplying section 50, a suction pipe 88, and a cradle operating arm (cradle operating section) 89. The suction pipe 88 is swingable and extendable. The suction pipe 88 sucks and catches the spun yarn 10 discharged from the air-jet spinning device 9, and guides the caught spun yarn 10 to the winding device 13.

[0055] The bobbin supplying section 50 is swingable with a swing shaft 50a as a center, and can clamp the bobbin 48 with a bobbin clamping section 51. The doffing device 59 swings the bobbin supplying section 50 with

the bobbin 48 clamped by the bobbin clamping section 51 to supply the bobbin 48 to a position between a pair of bobbin holders 105 of the cradle arm 71. The bobbin supplying section 50 includes a bunch-winding roller 53 for performing a bunch-winding operation. The bunch-winding operation refers to straight winding of the spun yarn 10 around the bobbin 48 to fix the spun yarn 10 to the bobbin 48.

[0056] In the bobbin setting operation and the doffing operation, in order to detachably mount the bobbin 48 or the package 45 to the cradle arm 71, the cradle operating arm 89 performs an operation of opening and closing the cradle arm 71. When the cradle operating arm 89 pushes an operation lever 71d of the cradle arm 71, the cradle arm 71 opens, and the bobbin 48 or the package 45 can be detached from the cradle arm 71. When the cradle operating arm 89 releases the operation lever 71d, the cradle arm 71 returns to a closed state. When the cradle arm 71 is in the closed state, the cradle arm 71 holds and rotatably supports the bobbin 48 or the package 45.

[0057] A position of the cradle arm 71 differs between the bobbin setting operation and the doffing operation due to an amount of wound thickness of the package 45. A position of the cradle operating arm 89 can be changed according to a position of the cradle arm 71 with a cam mechanism or the like (not illustrated).

[0058] The doffing device 59 includes a guiding section 58. The guiding section 58 is swung with a supporting shaft 58a as a center to guide the fully-wound package 45 received from the cradle arm 71 to a package receiving section 84. The package receiving section 84 includes an inclined portion 81 for rolling and moving the package 45, and a placing portion 82 on which the rolled package 45 is temporarily placed. The placing portion 82 has a function of a conveyor, and transports the package 45 in an arrangement direction of the spinning units 2 to transfer the package 45 to a next process. The function of the conveyor may be omitted.

[0059] The winding device 13 described above will be described in detail with reference to FIG. 2 and FIG. 5 to FIG. 7. Hereinafter, based on an up and down relationship of the cradle device 100 under a state illustrated in FIG. 5 to FIG. 7, a term having a concept of "top" and/or "bottom" is sometimes used in describing a positional relationship of each section. When using a term having a concept of "front" and/or "back" in describing the positional relationship of each section, a front side of the spinning machine 1 (left side in FIG. 6) is referred to as "front", and a rear side of the spinning machine (right side of FIG. 6) is referred to as "back".

[0060] The winding device 13 includes the cradle device 100 adapted to hold the package 45. The cradle device 100 includes a supporting leg section (supporting section) 101 fixed to the frame 6, the cradle arm 71 enabled to swing towards front and back with respect to the supporting leg section 101, the air cylinder 60 adapted to swing the cradle arm 71, and another lift-up air cylinder (driving section, second driving device) 160. The cradle device 100 includes the male connector section 103. The male connector section 103 connects a flow path of compressed air to be supplied to the air cylinder 60 and a flow path of compressed air to be supplied to the air cylinder 160 to a flow path located on the frame 6 side. The cradle device 100 is an assembly in which the supporting leg section 101, the cradle arm 71, the air cylinder 60, the lift-up air cylinder 160, and the male connector section 103 are integrally assembled as a module. The cradle device 100 can be detachably mounted in one group as a module with respect to the frame 6. The cradle device 100 includes a compressed air pipe tube for connecting the male connector section 103 and each port of the air cylinder 60, and a compressed air pipe tube for connecting the male connector section 103 and a port of the lift-up air cylinder 160. The compressed air pipe tubes are not illustrated.

[0061] The supporting leg section 101 is fixed to a horizontal surface 6a and a vertical surface 6b of the frame 6 located below the winding drum 72. The supporting leg section 101 includes an engagement groove 101a to be engaged with a lock member 6c provided on the horizontal surface 6a. The engagement groove 101a is engaged with the lock member 6c to position the cradle device 100 with respect to the frame 6. By screwing the cradle device 100 to the vertical surface 6b at a screwing portion 101b provided in the supporting leg section 101, the cradle device 100 is detachably mounted to the frame 6.

[0062] The supporting shaft 70 of the cradle arm 71 is mounted to the supporting leg section 101. The cradle arm 71 is swingably supported about the supporting shaft 70 with respect to the supporting leg section 101. A rotation link 161 having a rotation shaft 161a is provided at a lower plate portion 102 of the supporting leg section 101. The rotation shaft 161a penetrates through the lower plate portion 102 in a thickness direction (the arrangement direction of the spinning units 2). At a position located away from the rotation shaft 161a in a rotation diameter direction, the rotation link 161 and a lower end portion 60a of the cylinder case of the air cylinder 60 are coupled. A tip-end 61a of the piston rod 61 of the air cylinder 60 is coupled to a point of application of force 71h located at a back end portion of a plate 71f extending backward from the cradle arm 71. The air cylinder 160 is arranged opposite to the air cylinder 60 with the lower plate portion 102 therebetween. At the position located away from the rotation shaft 161a in the rotation diameter direction, the rotation link 161 and a tip-end 160a of a piston rod of the air cylinder 160 are coupled. An upper end 160b of the cylinder case of the air cylinder 160 is coupled to the lower plate portion 102.

[0063] When the compressed air is supplied to the air cylinder 160 and the piston rod is retracted into the cylinder case, the rotation link 161 rotates about the rotation shaft 161a (counterclockwise in FIG. 7). Accompanied with such a rotation, the lower end portion 60a of the air cylinder 60 is pushed up by the rotation link 161. The entire air cylinder 60 is thereby pushed upward at a rel-

atively large stroke. As a result, as illustrated with a chain double-dashed line in FIG. 7, the point of application of force 71h is moved diagonally upward, and the cradle arm 71 is swung forward (leftward in FIG. 7). Accordingly, the package 45 moves away from the winding drum 72 with a relatively large gap.

[0064] As already described in the description of FIG. 2, the point of application of force 71h is pushed up also by the driving of the air cylinder 60, and the cradle arm 71 is swung forward. When the air cylinder 160 is driven, the point of application of force 71h is moved more greatly than when the air cylinder 60 is driven, and the cradle arm 71 is swung forward at a larger angle. The driving of the cradle arm 71 by the air cylinder 160 is carried out when the package 45 is greatly separated from the winding drum 72 in the doffing operation, for example. The compressed air from one of the electromagnetic valves 63a, 64a, and 68a is supplied to the port of the air cylinder 160. The air cylinder 60 and the lift-up air cylinder 160 are respectively used according to the purpose as the driving source of the cradle arm 71 to swing the cradle arm 71 at two different movable widths (lengths) corresponding to the purpose.

[0065] The cradle arm 71 includes holding arms 71a and 71b extending substantially parallel to one another to sandwich and hold the package 45. Bobbin holders (package holding sections) 105 are respectively arranged at a position facing one another at the package holding position of the holding arms 71a and 71b. One bobbin holder 105 is rotatably supported by the holding arm 71a through a bearing (not illustrated). The other bobbin holder 105 is rotatably supported by the holding arm 71b through a bearing (not illustrated). The two bobbin holders 105 facing one another respectively make contact with both ends of the bobbin 48 of the package 45 to sandwich and clamp the package 45. The package 45 becomes integral with the two bobbin holders 105 and rotates with respect to the cradle arm 71 by the driving force of the winding drum 72.

[0066] The holding arm 71a is axially supported by an opening-and-closing shaft 71c with respect to the holding arm 71b. The holding arm 71a can be swung about the opening-and-closing shaft 71c to move towards or move away from the holding arm 71b. The holding arm 71a is urged in a direction towards the holding arm 71b by a built-in spring (not illustrated). The opening-and-closing shaft 71c is provided at a position opposite to the bobbin holder 105 when seen from the supporting shaft 70. The opening-and-closing shaft 71c is located below the supporting shaft 70. The bobbin holder 105 is located above the supporting shaft 70.

[0067] An operation lever 71d extending further upward from the position of the bobbin holder 105 is attached to an upper end portion of the holding arm 71a. The operation lever 71d is operated by the cradle operating arm 89 of the doffing device 59 (see FIG. 4).

[0068] In the doffing operation, as illustrated in FIG. 7, when the operation lever 71d is pushed in the direction of moving away from the holding arm 71b by the cradle operating arm 89 (see FIG. 4), the holding arm 71a is swung with the opening-and-closing shaft 71c as the center against an urging force of the built-in spring, and the holding arm 71a moves to a releasing position P2. When the bobbin holders 105 move away from one another, the package 45 is released and the package 45 is detached from the cradle arm 71. In the bobbin setting operation, the operation lever 71d is pushed in the direction of moving away from the holding arm 71b, and then the bobbin supplying section 50 supplies the bobbin 48 to a predetermined position and the cradle operating arm 89 releases the operation lever 71d. The holding arm 71a returns to a holding position P1 by the urging force of the built-in spring, and the bobbin 48 is sandwiched and held between the bobbin holders 105.

[0069] The male connector section 103 is provided on the lower plate portion 102 of the supporting leg section 101 so as to face the vertical surface 6b of the frame 6. The male connector section 103 is connected to each of the ports 63, 64, and 68 of the air cylinder 60 through a compressed air pipe tube (not illustrated). The male connector section 103 includes the electromagnetic valves 63a, 64a, and 68a (see FIG. 2). The supply of the compressed air to each of the ports 63, 64, and 68 is controlled according to a control signal from the unit controller to control the operation of the air cylinder 60. The male connector section 103 includes three connecting ports 103a provided in correspondence with each of the electromagnetic valves 63a, 64a, and 68a and projected out towards the frame 6. The connecting ports 103a are inserted to connecting ports 107a of the female connector section 107 (described later) provided on the frame 6 side.

[0070] On the vertical surface 6b of the frame 6, the female connector section 107 is provided at a position corresponding to the male connector section 103. The female connector section 107 includes three connecting ports 107a that receive the three connecting ports 103a, respectively. The female connector section 107 is formed as one component having the three connecting ports 107a.

[0071] In the frame 6, a compressed air pipe L69 that connects the lifter compressed air source 69 and one connecting port 107a, a compressed air pipe L65 that connects the contact pressure compressed air source 65 and another connecting port 107a, and a compressed air pipe L67 that connects the depressurization valve 67 and still another connecting port 107a are arranged. Specifically, a pipe unit 109 extending in the arrangement direction of the spinning units 2 is mounted on an inner wall of the frame 6. The compressed air pipes L65, L67, and L69 are three parallel hollow tubes extending in the pipe unit 109 in an extending direction of the pipe unit 109. The three compressed air pipes L65, L67, and L69 are provided as a pipe group.

[0072] One pipe unit 109 extends over a plurality of spinning units 2. In the entire spinning machine 1, a plurality of pipe units 109 are coupled at several coupling

portions. The compressed air pipes L65, L67, and L69 adjacent to one another at the coupling portion are respectively connected with an extendable extension pipe (not illustrated). An insert port is provided on both ends of the extension pipe. The insertion port can be detachably mounted to an opening at the end of the compressed air pipes L65, L67, and L69 without using a tool. The compressed air pipes L65, L67, and L69 adjacent via the extension pipe are continuously coupled, and the compressed air pipes L65, L67, and L69 are used to supply the compressed air to the plurality of spinning units 2. Through the use of the extension pipe, the compressed air pipes L65, L67, and L69 of each pipe unit 109 can be connected to one another without a tool, and the operation can be efficiently performed even in a narrow place. The pipe unit 109 may be provided for each spinning unit 2.

[0073] Under a state in which the cradle device 100 is mounted to the frame 6, each of the connecting ports 103a of the male connector section 103 is inserted to each of the connecting ports 107a of the female connector section 107. Accordingly, each of the compressed air pipes L65, L67, and L69 on the frame 6 side is connected to the port of the corresponding air cylinder 60 or the port of the lift-up air cylinder 160. A valve 107b (see FIG. 2) for preventing the leakage of the compressed air when the male connector section 103 is detached is provided at each of the connecting ports 107a of the female connector section 107.

[0074] The valve 107b includes a valve body (not illustrated) urged from the compressed air pipes L65, L67, and L69 towards the connecting port 107a on the flow path of the compressed air. Under a state in which the male connector section 103 is not connected to the female connector section 107, the valve body closely makes contact with the connecting port 107a to block the connecting port 107a. Accordingly, the compressed air pipes L65, L67, and L69 are shut from the outside. When the male connector section 103 is connected to the female connector section 107, the flow path of the air is formed by having the connecting ports 103a of the male connector section 103, which is inserted to the connecting ports 107a, pushing the valve body, and the compressed air pipes L65, L67, and L69 are connected to the male connector section 103.

[0075] A specific example of the valve 107b includes a check valve. The check valve is a device mounted to a pipe of a fluid to prohibit backflow of the fluid. The check valve is an example of the valve 107b, and a function of the check valve may be realized by providing a shutter or the like for preventing air leakage on the compressed air pipes L65, L67, and L69.

[0076] If the male connector section 103 is connected to the female connector section 107, the valve 107b is opened to pass through the compressed air from the compressed air pipes L65, L67, and L69 to the male connector section 103. If the male connector section 103 is detached from the female connector section 107, the valve 107b is closed, and the compressed air from the compressed air pipes L65, L67, and L69 is shut such that the compressed air does not leak outside. Even if the cradle device 100 of a spinning unit 2 is detached from the frame 6, since the compressed air does not leak out from the compressed air pipes L65, L67, and L69, the operation of other spinning units 2 is not required to be stopped. The cradle device 100 receives the supply of the compressed air from the three compressed air pipes L65, L67, and L69, but similar configuration can be realized when receiving the supply of the compressed air from two or four or more compressed air pipes.

[0077] Next, effects of the spinning unit 2 and the spinning machine 1 will be described.

[0078] In the spinning unit 2, the cradle device 100 can be collectively attached to or detached from the frame 6 as a module. When performing the maintenance operation of the cradle device 100, all components of the cradle device 100 can be attached to or detached from the frame 6 at once. Therefore, the maintenance operation of the cradle device 100 can be easily performed. Furthermore, since the compressed air pipes L65, L67, and L69 provided on the frame 6 are also provided as a pipe group, the configuration of the entire spinning unit 2 and the entire spinning machine 1 can be simplified.

[0079] Since the compressed air path can be connected with the male connector section 103 of the cradle device 100 and the female connector section 107 of the frame 6, a cumbersome operation such as attaching or detaching the tube does not arise and the cradle device 100 can be easily attached or detached. A plurality of cradle devices 100 of the spinning machine 1 can be individually detached from the frame 6 as a module. Even if at least one of the plurality of cradle devices 100 is detached, since flow of the compressed air from the compressed air pipes L65, L67, and L69 to the outside is shut by the valve 107b of the female connector section 107, a supplying state of the compressed air to other cradle devices 100 is hardly influenced. Thus, even when performing the maintenance operation on at least one of the cradle devices 100, the yarn winding operation can be continued in the other cradle devices 100.

[0080] The opening-and-closing shaft 71c adapted to open and close the cradle arm 71 of the cradle device 100 is provided below the supporting shaft 70 of the cradle arm 71. The bobbin holder 105 and the opening-and-closing shaft 71c are located away from one another. Thus, even if the width of the package 45 is changed, change in an angle formed by the holding arm 71a and the holding arm 71b for sandwiching the package 45 is small. The package 45 can be sandwiched and held under a state in which the holding arm 71a and the holding arm 71b are almost parallel. As a result, a shift in rotational axis of the bobbin holders 105 is small, and the held package 45 can be smoothly rotated. In the conventional spinning machine, the swing shaft of the cradle arm may extend across the plurality of spinning units 2, and may be commonly used for the plurality of spinning

units 2. In the conventional spinning machine, arranging the opening-and-closing shaft of the holding arm at a position lower than the swing shaft of the cradle arm is difficult. In the spinning machine 1, since the cradle device 100 is individually modularized for every spinning unit 2, the supporting shaft 70 and the opening-and-closing shaft 71c can be relatively freely arranged. As a result, the above-described configuration is achieved.

[0081] The doffing device 59 performs the opening and closing of the cradle arm 71 by the cradle operating arm 89 to detach the package 45 or mount the bobbin 48. Thus, workability of the doffing operation is improved.

[0082] One embodiment of the present invention has been described above, but the present invention is not limited to the above embodiment, and modifications may be made within a scope of not changing the gist described in each claim.

[0083] In the embodiment, the male connector section 103 is arranged to horizontally face the female connector section 107 provided on the vertical surface 6b of the frame 6, but the male connector section (the first connecting section) and the female connector section (the second connecting section) may be arranged to vertically face one another in the present invention. For example, the female connector section may be provided on the horizontal surface 6a of the frame 6 with the connecting port directed upward, and the male connector section may be arranged at the corresponding position of the supporting leg section 101 with the connecting port directed downward. Combination of the male connector section and the female connector section is not limited to those described in the embodiment, and the male connector may be provided on the frame 6 and the female connector may be provided on the cradle device 100.

[0084] In the embodiment, the compressed air path is connected with the male connector section (the first connecting section) 103 and the female connector section (the second connecting section) 107, but the first and second connecting sections of the present invention may be connecting sections for connecting electrical wiring.

[0085] For example, in the spinning machine 1 and the spinning unit 2 of the embodiment, the spun yarn 10 is pulled out from the air-jet spinning device 9 by the yarn accumulating roller 21. The present invention may be applied to a spinning machine and a spinning unit in which a spun yarn is pulled out from the air-jet spinning device with a delivery roller and a nip roller.

[0086] In the spinning machine 1 and the spinning unit 2 of the embodiment, the whirling airflow of the air-jet spinning device 9 is stopped when the yarn defect is detected, and the spun yarn 10 is cut. The present invention may be applied to a spinning machine and a spinning unit in which a spun yarn is cut using a cutter.

[0087] In the spinning machine 1 and the spinning unit 2 of the embodiment, the yarn path is arranged such that the spun yarn 10 travels downward from the draft device 7 at an upper part towards the winding device 13 at a lower part. The present invention may be applied to a spinning machine and a spinning unit in which a yarn path is arranged to travel from bottom to top.

[0088] In the spinning machine 1 and the spinning unit 2 of the embodiment, the air-jet spinning device 9 may include a needle held by the fiber guiding section, and arranged to protrude into the spinning chamber. The needle prevents the twists of the fiber bundle 8 from being propagated towards the upstream of the air-jet spinning device 9. In place of the needle, the air-jet spinning device 9 may prevent the propagation of the twist of the fiber bundle 8 by a downstream edge of the fiber guiding section. The air-jet spinning device 9 may include a pair of air-jet nozzles adapted to apply twists in opposite directions from one another.

[0089] In the spinning machine 1 and the spinning unit 2 of the embodiment, the bottom rollers of the draft device 7 and the traverse mechanism of the traverse device 75 are commonly driven for a plurality of spinning units 2. The present invention may be applied to a spinning machine and a spinning unit in which each section of the spinning unit (e.g., the draft device, the air-jet spinning device, the yarn winding device, or the like) is independently driven for each spinning unit 2.

[0090] The present invention is not limited to the air-jet spinning machine, and can be applied to other yarn winding machines such as an open-end spinning machine, an automatic winder, and the like.

Claims

1. A yarn winding unit comprising:

a frame (6), and
a cradle device (100) including a cradle arm (71) adapted to rotatably hold a package (45) around which a spun yarn (10) is wound, a driving section (60, 160) adapted to drive the cradle arm (71), and a control section (63a, 64a, 68a) adapted to control the driving section (60, 160), the cradle device (100) being a module provided detachably to the frame (6),
wherein the cradle device (100) includes:

a supporting section (101) adapted to swingably support the cradle arm (71) and fixed to the frame (6), and
the driving section (60, 160) adapted to swing the cradle arm (71) with respect to the supporting section (101),
characterized in that the driving section includes:

a first driving device (60) adapted to swing the cradle arm (71) by moving a prescribed point of application of force of the cradle arm (71) with respect to the supporting section (101), and

a second driving device (160) adapted to swing the cradle arm (71) by moving the point of application of force by moving the first driving device (60) with respect to the supporting section (101), and

a moved amount of the point of application of force by the second driving device (160) is greater than a moved amount of the point of application of force by the first driving device (60).

2. The yarn winding unit according to claim 1, wherein the driving section (60, 160) is an air cylinder,
the yarn winding unit further comprising a plurality of air pipes (L65, L67, L69) adapted to guide compressed air to the air cylinder (60, 160) and collectively provided on the frame (6) as a pipe group.

3. The yarn winding unit according to claim 2, wherein the cradle device (100) further includes a first connecting section (103) adapted to connect the air cylinder (60, 160) and the air pipes (L65, L67, L69),
the air pipes (L65, L67, L69) are provided with a second connecting section (107) adapted to be connected to the first connecting section (103), and
the second connecting section (107) includes a valve (107b) adapted to pass through the compressed air from the air pipes (L65, L67, L69) to the first connecting section (103) when the first connecting section (103) is connected, and to shut the compressed air from the air pipes (L65, L67, L69) when the first connecting section (103) is not connected.

4. The yarn winding unit according to any one of claim 1 through claim 3, wherein the cradle arm (71) includes:

two holding arms (71a, 71b) adapted to hold the package (45), and
package holding sections (105) respectively provided on the holding arms (71a, 71b), and adapted to rotatably hold the package (45) by the holding arms (71a, 71b),
the respective cradle device (100) includes:

a swing shaft (70) adapted to enable swinging of the cradle arm (71),
a supporting section (101) adapted to support the swing shaft (70) and the driving section (60, 160), and fixed on the frame (6), and
an opening-and-closing shaft (71c) adapted to open and close the cradle arm (71) by moving one of the holding arms (71a, 71b) between a holding position for holding the package (45) and a releasing position for releasing the package (45), the opening-and-closing shaft (71c) being located opposite the package holding sections (105) with respect to the swing shaft (70).

5. A yarn winding machine comprising the yarn winding unit according to claim 1, wherein
a plurality of corresponding cradle devices (100), each of the cradle devices (100) being an independent module, are provided detachably to the frame (6).

6. The yarn winding machine according claim 5, wherein the driving section (60, 160) is an air cylinder,
the yarn winding machine further comprising:

a compressed air source (65, 69) adapted to supply compressed air to the air cylinder of each of the cradle devices (100), and
a plurality of air pipes (L65, L67, L69) adapted to guide the compressed air from the compressed air source (65, 69) to the air cylinder (60, 160) of each of the cradle devices (100) and collectively provided on the frame (6) as a pipe group.

7. The yarn winding machine according to claim 6, wherein each of the cradle devices (100) further includes a first connecting section (103) adapted to connect the air cylinder (60, 160) and the air pipes (L65, L67, L69),
the air pipes (L65, L67, L69) are provided with a second connecting section (107) adapted to be connected to the first connecting section (103), and
the second connecting section (107) includes a valve (107b) adapted to pass through the compressed air from the air pipes (L65, L67, L69) to the first connecting section (103) when the first connecting section (103) is connected, and to shut the compressed air from the air pipes (L65, L67, L69) when the first connecting section (103) is not connected.

8. The yarn winding machine according to any one of claim 5 through claim 7, wherein the cradle arm (71) includes:

two holding arms (71a, 71b) adapted to hold the package (45), and
package holding sections (105) respectively provided on the holding arms (71a, 71b), and adapted to rotatably hold the package (45) by the holding arms (71a, 71b),
the respective cradle device (100) includes:

a swing shaft (70) adapted to enable swinging of the cradle arm (71),
a supporting section (101) adapted to support the swing shaft (70) and the driving section (60, 160), and fixed on the frame (6),

and
an opening-and-closing shaft (71c) adapted to open and close the cradle arm (71) by moving one of the holding arms (71a, 71b) between a holding position for holding the package (45) and a releasing position for releasing the package (45), the opening-and-closing shaft (71c) being located opposite the package holding sections (105) with respect to the swing shaft (70).

9. The yarn winding machine according to claim 8, further comprising a doffing device (59) adapted to perform a doffing operation of the package (45) with respect to the cradle device (100),
wherein the doffing device (59) includes a cradle operating section (89) adapted to open and close the cradle arm (71).

10. The yarn winding machine according to any one of claim 5 through claim 9, further comprising:

a draft device (7) adapted to draft a fiber bundle (8), and
an air-jet spinning device (9) adapted to spin using whirling airflow, the fiber bundle (8) drafted by the draft device (7).

Patentansprüche

1. Eine Garnwickeleinheit, die folgende Merkmale aufweist:

einen Rahmen (6) und
eine Gestellvorrichtung (100), die einen Gestellarm (71) umfasst, der angepasst ist, einen Wickelkörper (45), um den ein gesponnenes Garn (10) gewickelt ist, einen Antriebsabschnitt (60, 160), der angepasst ist, den Gestellarm (71) anzutreiben, und einen Steuerabschnitt (63a, 64a, 68a), der angepasst ist, den Antriebsabschnitt (60, 160) zu steuern, drehbar zu halten, wobei die Gestellvorrichtung (100) ein Modul ist, das dem Rahmen (6) abnehmbar bereitgestellt ist,
wobei die Gestellvorrichtung (100) Folgendes umfasst:

einen Trägerabschnitt (101), der angepasst ist, den Gestellarm (71) schwenkbar zu tragen, und an dem Rahmen (6) befestigt ist, und
den Antriebsabschnitt (60, 160), der angepasst ist, den Gestellarm (71) bezüglich des Trägerabschnitts (101) zu schwenken,
dadurch gekennzeichnet, dass der Antriebsabschnitt Folgendes umfasst:

eine erste Antriebsvorrichtung (60), die angepasst ist, den Gestellarm (71) durch Verlagern eines vorgeschriebenen Kraftangriffspunkts des Gestellarms (71) bezüglich des Trägerabschnitts (101) zu schwenken, und
eine zweite Antriebsvorrichtung (160), die angepasst ist, den Gestellarm (71) durch Verlagern des Kraftangriffspunkts durch Verlagern der ersten Antriebsvorrichtung (60) bezüglich des Trägerabschnitts (101) zu schwenken, und

wobei ein durch die zweite Antriebsvorrichtung (160) verlagerter Betrag des Kraftangriffspunkts größer ist als ein durch die erste Antriebsvorrichtung (60) verlagerter Betrag des Kraftangriffspunkts.

2. Die Garnwickeleinheit gemäß Anspruch 1, bei der der Antriebsabschnitt (60, 160) ein Luftzylinder ist,
wobei die Garnwickeleinheit ferner eine Mehrzahl von Luftrohren (L65, L67, L69) aufweist, die angepasst ist, Druckluft zu dem Luftzylinder (60, 160) zu leiten, und gemeinsam als eine Rohrgruppe an dem Rahmen (6) vorgesehen ist.

3. Die Garnwickeleinheit gemäß Anspruch 2, bei der die Gestellvorrichtung (100) ferner einen ersten Verbindungsabschnitt (103) umfasst, der angepasst ist, den Luftzylinder (60, 160) und die Luftrohre (L65, L67, L69) zu verbinden,
die Luftrohre (L65, L67, L69) mit einem zweiten Verbindungsabschnitt (107) versehen sind, der angepasst ist, mit dem ersten Verbindungsabschnitt (103) verbunden zu sein, und
der zweite Verbindungsabschnitt (107) ein Ventil (107b) umfasst, das angepasst ist, die Druckluft von den Luftrohren (L65, L67, L69) zu dem ersten Verbindungsabschnitt (103) durchzulassen, wenn der erste Verbindungsabschnitt (103) verbunden ist, und die Druckluft von den Luftrohren (L65, L67, L69) abzusperren, wenn der erste Verbindungsabschnitt (103) nicht verbunden ist.

4. Die Garnwickeleinheit gemäß einem der Ansprüche 1 bis 3, bei der der Gestellarm (71) Folgendes umfasst:

zwei Haltearme (71a, 71b), die angepasst sind, den Wickelkörper (45) zu halten, und
Wickelkörper-Halteabschnitte (105), die jeweils an den Haltearmen (71a, 71b) vorgesehen und angepasst sind, den Wickelkörper (45) mittels der Haltearme (71a, 71 b) drehbar zu halten,
wobei die jeweilige Gestellvorrichtung (100) Folgendes umfasst:

eine Schwenkwelle (70), die angepasst ist, ein Schwenken des Gestellarms (71) zu ermöglichen,
einen Trägerabschnitt (101), der angepasst ist, die Schwenkwelle (70) und den Antriebsabschnitt (60, 160) zu tragen, und der an dem Rahmen (6) befestigt ist, und
eine Öffnen-und-Schließen-Welle (71 c), die angepasst ist, den Gestellarm (71) durch Bewegen eines der Haltearme (71a, 71b) zwischen einer Halteposition zum Halten des Wickelkörpers (45) und einer Freigabeposition zum Freigeben des Wickelkörpers (45) zu öffnen und zu schließen, wobei sich die Öffnen-und-Schließen-Welle (71 c) bezüglich der Schwenkwelle (70) gegenüber den Wickelkörper-Halteabschnitten (105) befindet.

5. Eine Garnwickelmaschine, die die Garnwickeleinheit gemäß Anspruch 1 aufweist, wobei
eine Mehrzahl von entsprechenden Gestellvorrichtungen (100), von denen jede Gestellvorrichtung (100) ein unabhängiges Modul ist, dem Rahmen (6) abnehmbar bereitgestellt ist.

6. Die Garnwickelmaschine gemäß Anspruch 5, bei der der Antriebsabschnitt (60, 160) ein Luftzylinder ist, wobei die Garnwickelmaschine ferner folgende Merkmale aufweist:

eine Druckluftquelle (65, 69), die angepasst ist, dem Luftzylinder jeder der Gestellvorrichtungen (100) Druckluft zuzuführen, und
eine Mehrzahl von Luftrohren (L65, L67, L69), die angepasst ist, die Druckluft von der Druckluftquelle (65, 69) zu dem Luftzylinder (60, 160) jeder der Gestellvorrichtungen (100) zu leiten, und gemeinsam als eine Rohrgruppe an dem Rahmen (6) vorgesehen ist.

7. Die Garnwickelmaschine gemäß Anspruch 6, bei der jede der Gestellvorrichtungen (100) ferner einen ersten Verbindungsabschnitt (103) umfasst, der angepasst ist, den Luftzylinder (60, 160) und die Luftrohre (L65, L67, L69) zu verbinden,
die Luftrohre (L65, L67, L69) mit einem zweiten Verbindungsabschnitt (107) versehen sind, der angepasst ist, mit dem ersten Verbindungsabschnitt (103) verbunden zu sein, und
der zweite Verbindungsabschnitt (107) ein Ventil (107b) umfasst, das angepasst ist, die Druckluft von den Luftrohren (L65, L67, L69) zu dem ersten Verbindungsabschnitt (103) durchzulassen, wenn der erste Verbindungsabschnitt (103) verbunden ist, und die Druckluft von den Luftrohren (L65, L67, L69) abzusperren, wenn der erste Verbindungsabschnitt (103) nicht verbunden ist.

8. Die Garnwickelmaschine gemäß einem der Ansprüche 5 bis 7, bei der der Gestellarm (71) Folgendes umfasst:

zwei Haltearme (71a, 71b), die angepasst sind, den Wickelkörper (45) zu halten, und
Wickelkörper-Halteabschnitte (105), die jeweils an den Haltearmen (71a, 71b) vorgesehen und angepasst sind, den Wickelkörper (45) mittels der Haltearme (71a, 71b) drehbar zu halten,
wobei die jeweilige Gestellvorrichtung (100) Folgendes umfasst:

eine Schwenkwelle (70), die angepasst ist, ein Schwenken des Gestellarms (71) zu ermöglichen,
einen Trägerabschnitt (101), der angepasst ist, die Schwenkwelle (70) und den Antriebsabschnitt (60, 160) zu tragen, und der an dem Rahmen (6) befestigt ist, und
eine Öffnen-und-Schließen-Welle (71 c), die angepasst ist, den Gestellarm (71) durch Bewegen eines der Haltearme (71a, 71b) zwischen einer Halteposition zum Halten des Wickelkörpers (45) und einer Freigabeposition zum Freigeben des Wickelkörpers (45) zu öffnen und zu schließen, wobei sich die Öffnen-und-Schließen-Welle (71 c) bezüglich der Schwenkwelle (70) gegenüber den Wickelkörper-Halteabschnitten (105) befindet.

9. Die Garnwickelmaschine gemäß Anspruch 8, die ferner eine Spulenabnahmevorrichtung (59) aufweist, die angepasst ist, einen Spulenabnahmevorgang des Wickelkörpers (45) bezüglich der Gestellvorrichtung (100) durchzuführen,
wobei die Spulenabnahmevorrichtung (59) einen Gestellbetätigungsabschnitt (89) umfasst, der angepasst ist, den Gestellarm (71) zu öffnen und zu schließen.

10. Die Garnwickelmaschine gemäß einem der Ansprüche 5 bis 9, die ferner folgende Merkmale aufweist:

eine Ziehvorrichtung (7), die angepasst ist, ein Faserbündel (8) zu ziehen, und
eine Luftstrahl-Spinnvorrichtung (9), die angepasst ist, unter Verwendung eines Wirbelluftstroms das seitens der Vorrichtung (7) gezogene Faserbündel (8) zu verspinnen.

Revendications

1. Unité de bobinage de fil comprenant:

un châssis (6), et

un dispositif de berceau (100) comportant un bras de berceau (71) adapté pour maintenir de manière rotative un paquet (45) autour duquel est enroulé un fil filé (10), un segment d'entraînement (60, 160) adapté pour entraîner le bras de berceau (71), et un segment de commande (63a, 64a, 68a) adapté pour commander le segment d'entraînement (60, 160), le dispositif de berceau (100) étant un module prévu de manière amovible sur le châssis (6),
dans lequel le dispositif de berceau (100) comporte:

un segment de support (101) adapté pour supporter de manière oscillante le bras de berceau (71) et fixé au châssis (6), et
le segment d'entraînement (60, 160) adapté pour faire osciller le bras de berceau (71) par rapport au segment de support (101),
caractérisée par le fait que le segment d'entraînement comporte:

un premier dispositif d'entraînement (60) adapté pour faire osciller le bras de berceau (71) en déplaçant un point prescrit d'application de force du bras de berceau (71) par rapport au segment de support (101), et
un deuxième dispositif d'entraînement (160) adapté pour faire osciller le bras de berceau (71) en déplaçant le point d'application de force en déplaçant le premier dispositif d'entraînement (60) par rapport au segment de support (101), et
une quantité déplacée du point d'application de force par le deuxième dispositif d'entraînement (160) est supérieure à une quantité déplacée du point d'application de force par le premier dispositif d'entraînement (60).

2. Unité de bobinage de fil selon la revendication 1, dans laquelle le segment d'entraînement (60, 160) est un cylindre à air,
l'unité de bobinage de fil comprenant par ailleurs une pluralité de tuyaux d'air (L65, L67, L69) adaptés pour guider l'air comprimé vers le cylindre à air (60, 160) et prévus collectivement sur le châssis (6) comme groupe de tuyaux.

3. Unité de bobinage de fil selon la revendication 2, dans laquelle le dispositif de berceau (100) comporte par ailleurs un premier segment de connexion (103) adapté pour connecter le cylindre à air (60, 160) et les tuyaux d'air (L65, L67, L69),
les tuyaux d'air (L65, L67, L69) sont pourvus d'un deuxième segment de connexion (107) adapté pour être connecté au premier segment de connexion (103), et
le deuxième segment de connexion (107) comporte une soupape (107b) adaptée pour laisser passer l'air comprimé des tuyaux d'air (L65, L67, L69) vers le premier segment de connexion (103) lorsque le premier segment de connexion (103) est connecté, et pour couper l'air comprimé des tuyaux d'air (L65, L67, L69) lorsque le premier segment de connexion (103) n'est pas connecté.

4. Unité de bobinage de fil selon l'une quelconque de la revendication 1 à la revendication 3, dans laquelle le bras de berceau (71) comporte:

deux bras de maintien (71a, 71b) adaptés pour maintenir le paquet (45), et
des segments de maintien de paquet (105) prévus respectivement sur les bras de maintien (71a, 71b) et adaptés pour maintenir le paquet (45) de manière rotative par les bras de maintien (71a, 71b),
le dispositif de berceau respectif (100) comporte:

un arbre oscillant (70) adapté pour permettre l'oscillation du bras de berceau (71),
un segment de support (101) adapté pour supporter l'arbre oscillant (70) et le segment d'entraînement (60, 160) et fixé au châssis (6), et
un arbre d'ouverture et fermeture (71c) adapté pour ouvrir et fermer le bras de berceau (71) en déplaçant l'un des bras de maintien (71a, 71b) entre une position de maintien pour maintenir le paquet (45) et une position de dégagement pour dégager le paquet (45), l'arbre d'ouverture et fermeture (71c) étant situé opposé aux segments de maintien de paquet (105) par rapport à l'arbre oscillant (70).

5. Machine de bobinage de fil comprenant l'unité de bobinage de fil selon la revendication 1, dans laquelle
une pluralité de dispositifs de berceau (100) correspondants, chacun des dispositifs de berceau (100) étant un module indépendant, sont prévus de manière amovible sur le châssis (6).

6. Machine de bobinage de fil selon la revendication 5, dans laquelle le segment d'entraînement (60, 160) est un cylindre à air,
la machine de bobinage de fil comprenant par ailleurs:

une source d'air comprimé (65, 69) adaptée pour alimenter de l'air comprimé vers le cylindre

à air de chacun des dispositifs de berceau (100), et

une pluralité de tuyaux d'air (L65, L67, L69) adaptés pour guider l'air comprimé de la source d'air comprimé (65, 69) vers le cylindre à air (60, 160) de chacun des dispositifs de berceau (100) et prévus collectivement sur le châssis (6) comme groupe de tuyaux.

7. Machine de bobinage de fil selon la revendication 6, dans laquelle chacun des dispositifs de berceau (100) comporte par ailleurs un premier segment de connexion (103) adapté pour connecter le cylindre à air (60, 160) et les tuyaux d'air (L65, L67, L69),

les tuyaux d'air (L65, L67, L69) sont pourvus d'un deuxième segment de connexion (107) adapté pour être connecté au premier segment de connexion (103), et

le deuxième segment de connexion (107) comporte une soupape (107b) adaptée pour laisser passer l'air comprimé des tuyaux d'air (L65, L67, L69) vers le premier segment de connexion (103) lorsque le premier segment de connexion (103) est connecté, et pour couper l'air comprimé des tuyaux d'air (L65, L67, L69) lorsque le premier segment de connexion (103) n'est pas connecté.

8. Machine de bobinage de fil selon l'une quelconque de la revendication 5 à la revendication 7, dans laquelle le bras de berceau (71) comporte:

deux bras de maintien (71a, 71b) adaptés pour maintenir le paquet (45), et

des segments de maintien de paquet (105) prévus respectivement sur les bras de maintien (71a, 71b), et adaptés pour maintenir le paquet (45) de manière rotative par les bras de maintien (71a, 71b),

le dispositif de berceau respectif (100) comporte:

un arbre oscillant (70) adapté pour permettre l'oscillation du bras de berceau (71),

un segment de support (101) adapté pour supporter l'arbre oscillant (70) et le segment d'entraînement (60, 160) et fixé au châssis (6), et

un arbre d'ouverture et fermeture (71c) adapté pour ouvrir et fermer le bras de berceau (71) en déplaçant l'un des bras de maintien (71a, 71b) entre une position de maintien pour maintenir le paquet (45) et une position de dégagement pour dégager le paquet (45), l'arbre d'ouverture et fermeture (71c) étant situé opposé aux segments de maintien de paquet (105) par rapport à l'arbre oscillant (70).

9. Machine de bobinage de fil selon la revendication 8, comprenant par ailleurs un dispositif de retrait (59) adapté pour effectuer une opération de retrait du paquet (45) par rapport au dispositif de berceau (100), dans laquelle le dispositif de retrait (59) comporte un segment d'actionnement de berceau (89) adapté pour ouvrir et fermer le bras de berceau (71).

10. Machine de bobinage de fil selon l'une quelconque de la revendication 5 à la revendication 9, comprenant par ailleurs:

un dispositif étireur (7) adapté pour étirer un faisceau de fibres (8), et

un dispositif de filature à jet d'air (9) adapté pour filer à l'aide d'un flux d'air tourbillonnant le faisceau de fibres (8) étiré par le dispositif étireur (7).

FIG. 1

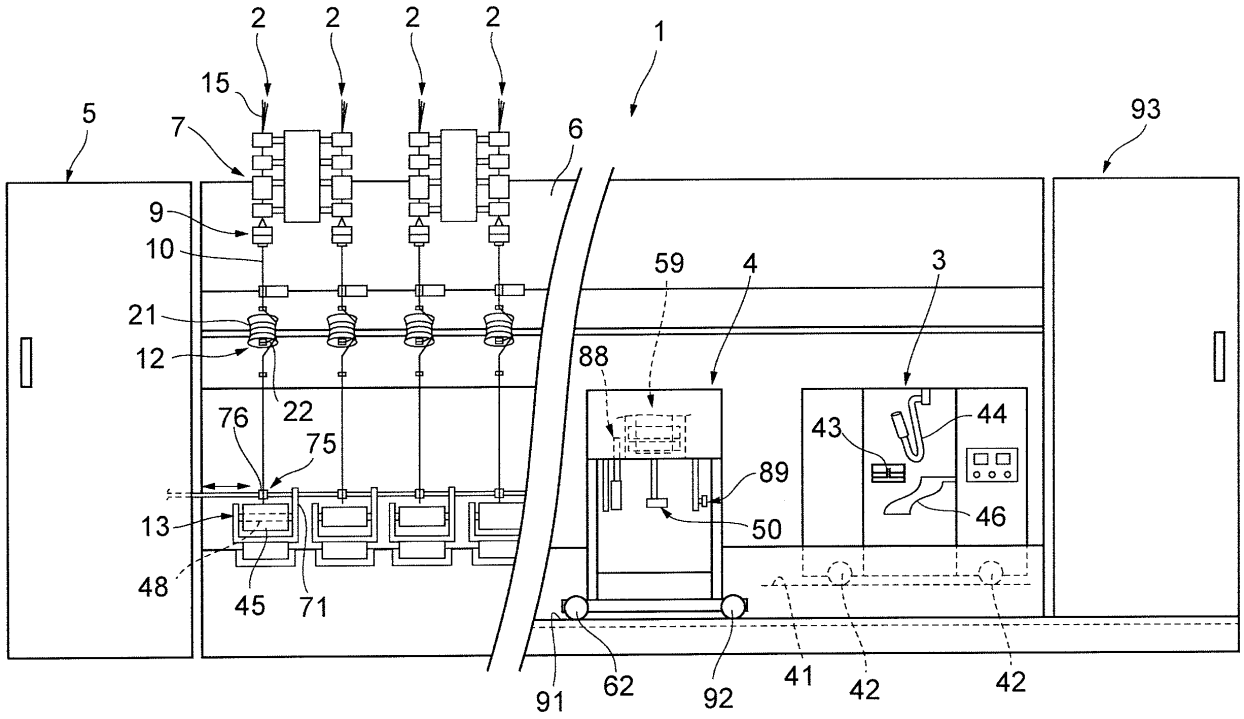

2
2
2
2
1
15
5
7
6
93
9
10
59
4
3
21
12
88
22
76
75
43
44
89
13
50
46
48
45
71
91
62
92
41
42
42

FIG. 2

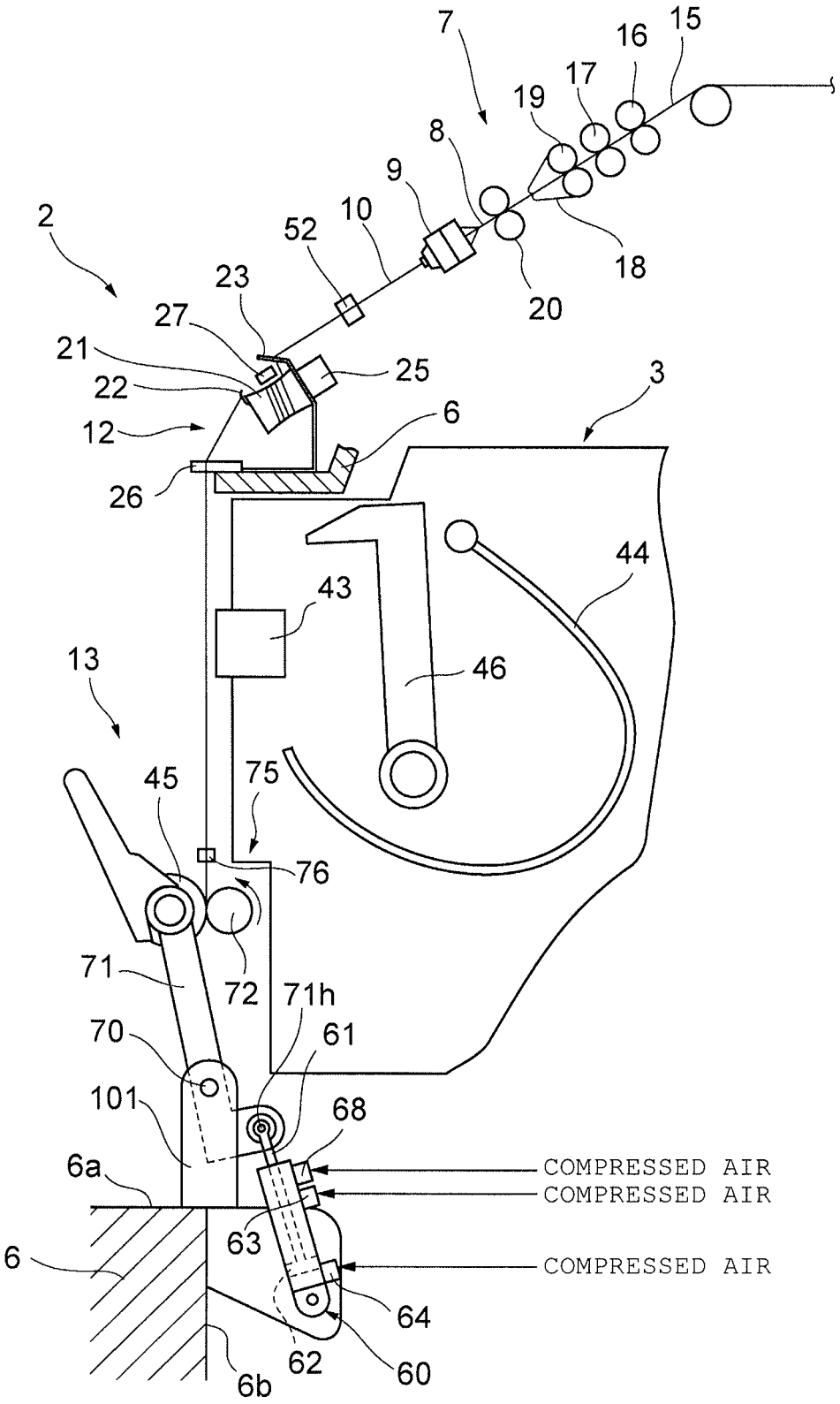

7
16
15
17
19
8
9
10
52
2
23
27
21
22
25
12
6
3
26
20
18
44
43
46
13
45
75
76
71
72
71h
70
61
101
68
6a
COMPRESSED AIR
COMPRESSED AIR
63
COMPRESSED AIR
6
64
62
60
6b

FIG. 3

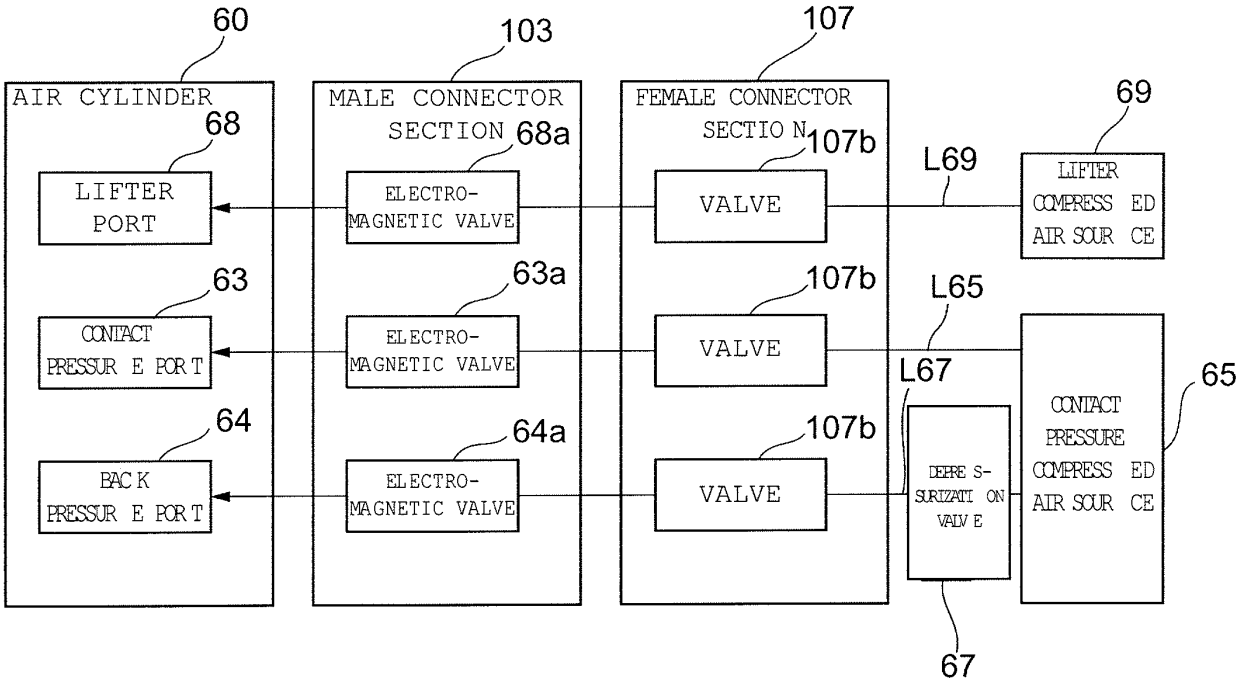

60
AIR CYLINDER
68
LIFTER PORT
63
CONTACT PRESSUR E PORT
64
BAC K PRESSUR E PORT
103
MALE CONNECTOR SECTION
68a
ELECTRO-MAGNETIC VALVE
63a
ELECTRO-MAGNETIC VALVE
64a
ELECTRO-MAGNETIC VALVE
107
FEMALE CONNECTOR SECTIO N
107b
VALVE
107b
VALVE
107b
VALVE
L69
L65
L67
DEPRE S-SURIZATI ON VALV E
67
69
LIFTER COMPRESS ED AIR SOUR CE
CONTACT PRESSURE COMPRESS ED AIR SOUR CE
65

FIG. 4

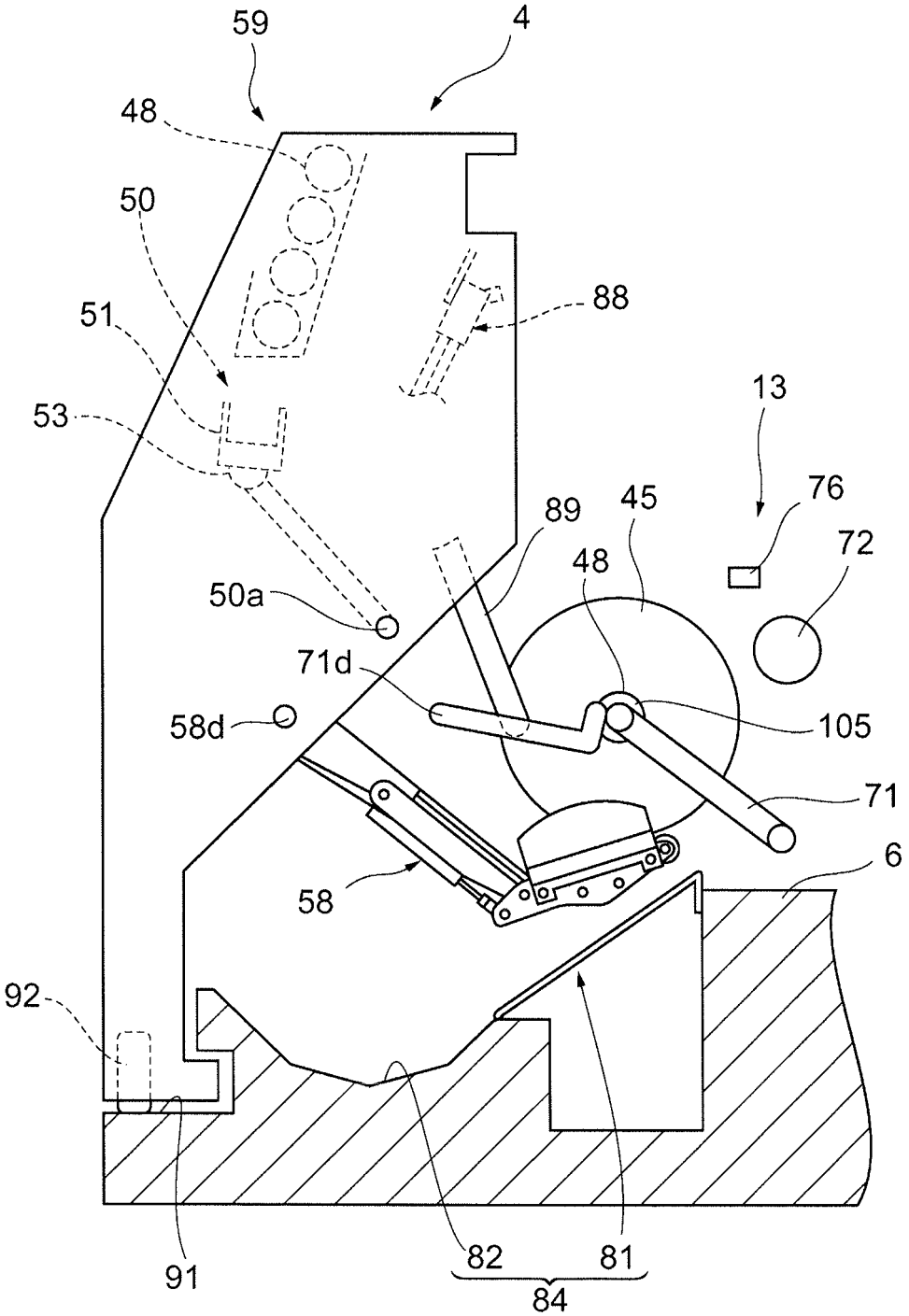

59
4
48
50
88
51
53
13
76
89
45
72
48
50a
71d
58d
105
71
6
58
92
91
82
81
84

FIG. 5

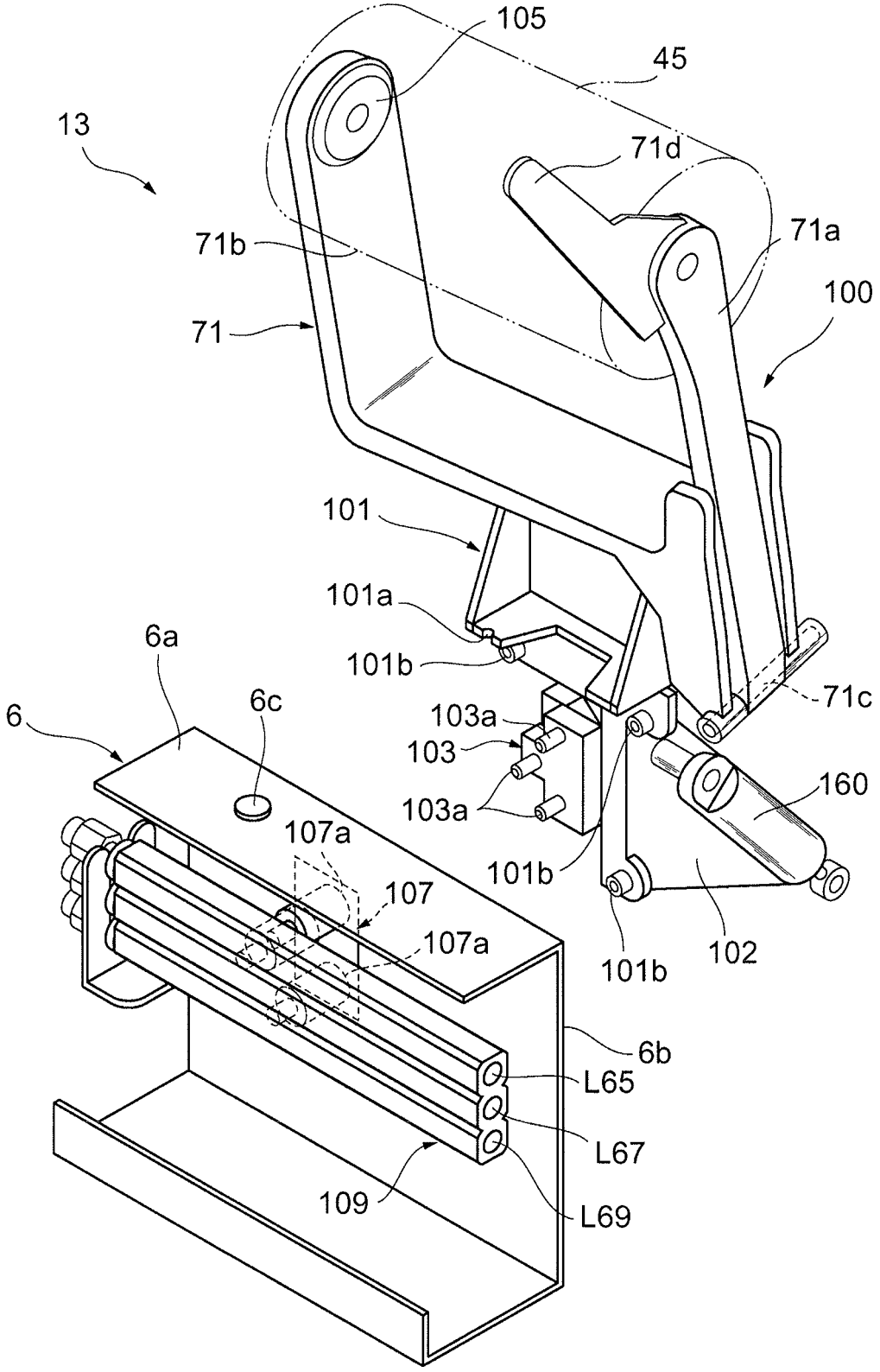

105
45
13
71d
71b
71a
100
71
101
101a
6a
101b
6c
71c
6
103a
103
160
103a
107a
101b
107
107a
101b
102
6b
L65
L67
109
L69

FIG. 6

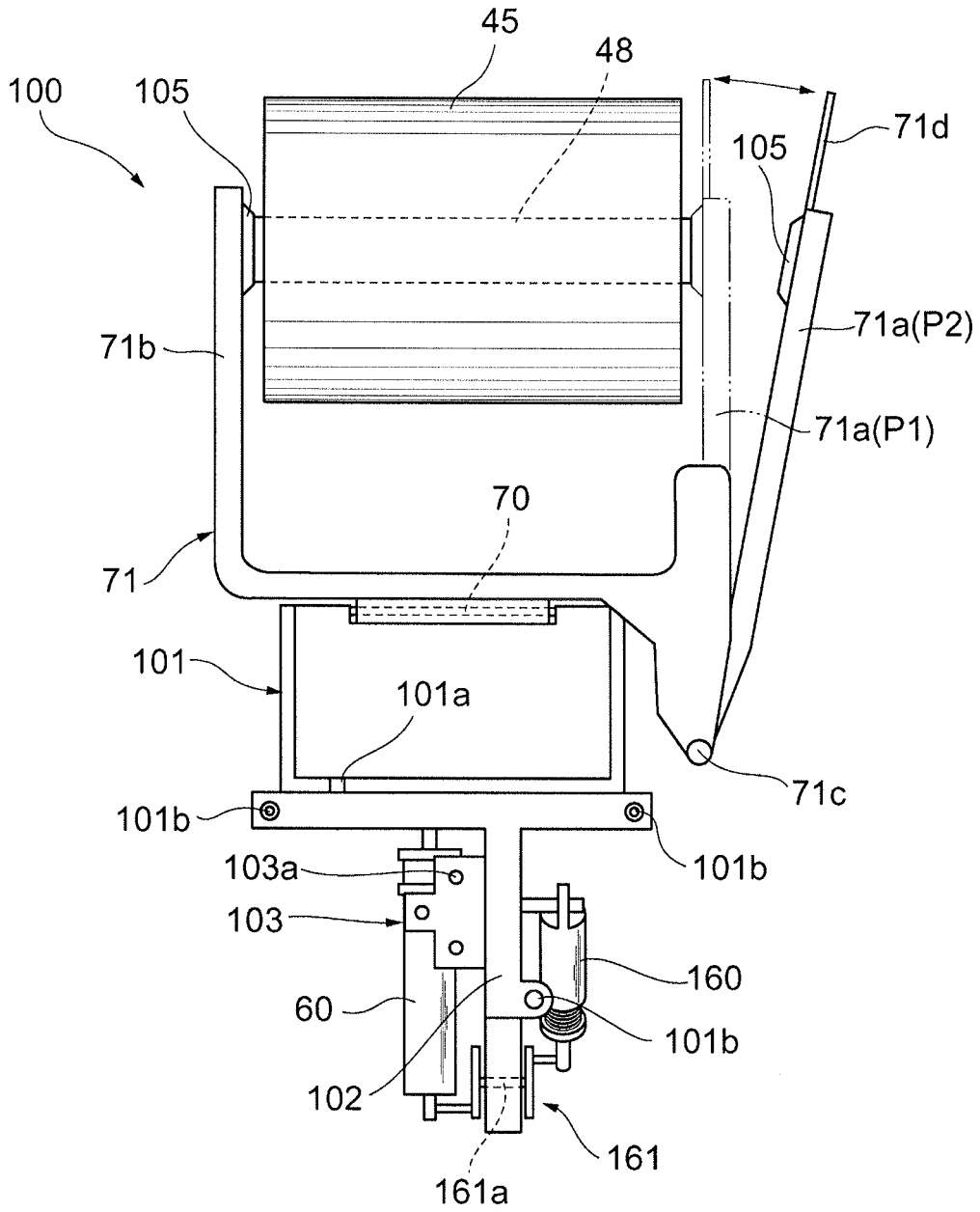
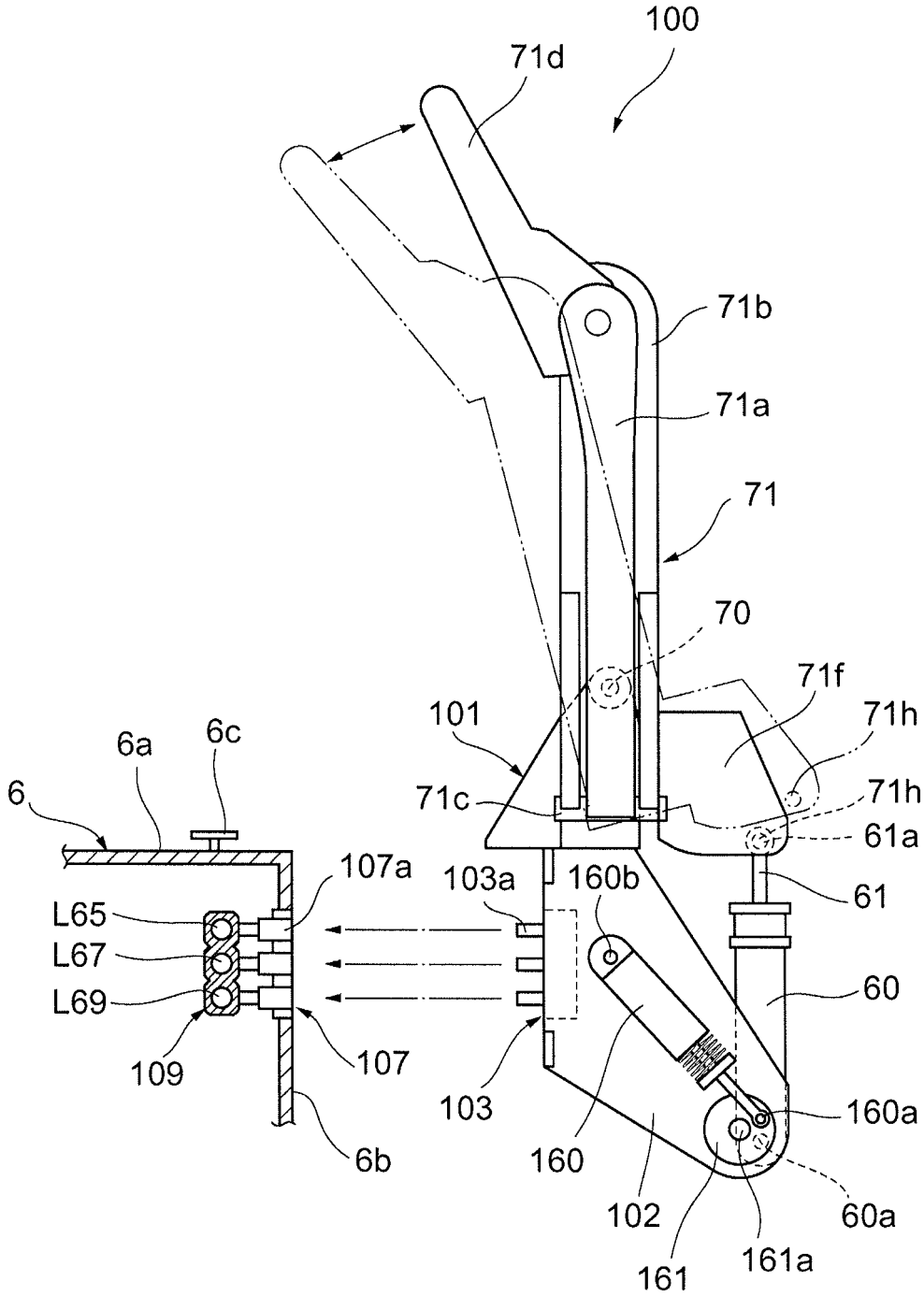

45
48
100
105
105
71d
71a(P2)
71b
71a(P1)
70
71
101
101a
71c
101b
101b
103a
103
160
60
101b
102
161
161a

FIG. 7


100
71d
71b
71a
71
70
71f
71h
101
71c
71h
61a
6a
6c
6
107a
103a
160b
61
L65
L67
L69
60
109
107
103
160a
160
6b
102
60a
161
161a

REFERENCES CITED IN THE DESCRIPTION

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