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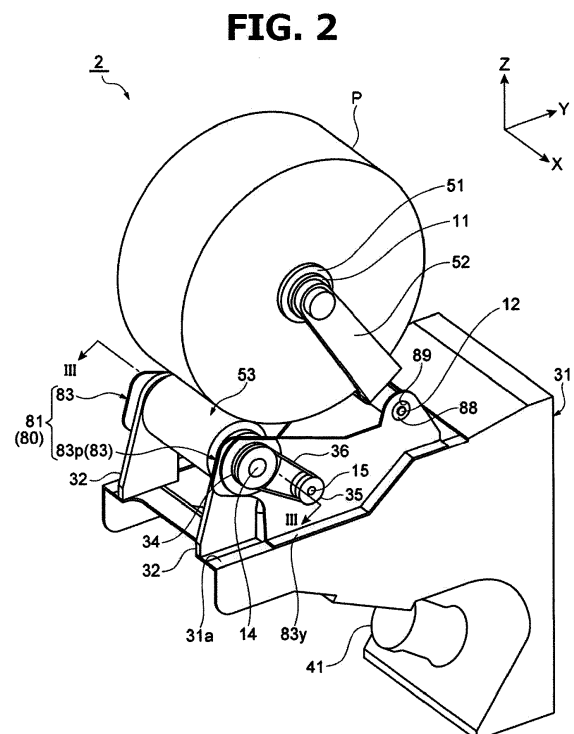
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(54) **YARN WINDING MACHINE AND SPINNING MACHINE**

(57) A spinning machine (1) includes a drafting device (7), an air spinning device (9), a yarn accumulating device (22), a winding device (26), and a movement section (80). The winding device (26) includes a winding drum (53) and a cradle (52). The winding drum (53) rotates while being in contact with a winding bobbin (51) or a package (P). The cradle (52) is arranged at a higher level than the drafting device (7) and the air spinning device (9) in a height direction during a winding operation, and rotatably supports the winding bobbin (51). The movement section (80) moves a bobbin supporting section (11) from an upward position in the height direction with respect to the winding drum (53) to a downward position on an operator's working passage side.



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

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

2. Description of the Related Art

[0002] Automatic winders, as explained in Patent Document 1 below, for example, in which a supply yarn replacing device, a yarn jointing device, and a winding device are mounted on a frame, are known in the art. In the automatic winder disclosed in Patent Document 1 (Japanese Patent Application Laid-open No. 2015-118258), the winding device, which is mounted on an upper portion of the frame, is designed to independently move from a winding operation position to a maintenance and inspection position.

[0003] Yarn winding machines in which a package into which a yarn is wound by a winding section is supported at a higher level in a height direction compared to a yarn supplying section are known in the art. In such a yarn winding machine, in operations requiring access to a package (for example, in yarn end preparation and the like), it may be difficult for an operator to reach the package with his hands, and / or hassles such as needing a step ladder may occur, potentially resulting in lowered workability.

SUMMARY OF THE INVENTION

[0004] It is an object of the present invention to provide a yarn winding machine and a spinning machine capable of improving workability in operations requiring access to a package.

[0005] According to an aspect of the present invention, a yarn winding machine includes a yarn supplying section that supplies a yarn; a winding section that is arranged at a higher level than the yarn supplying section in a height direction and winds the yarn around a winding bobbin to form a package. The winding section includes a winding drum that rotates while being in contact with the winding bobbin or the package, and a bobbin supporting section that rotatably supports the winding bobbin. The yarn winding machine further includes a movement section that moves the bobbin supporting section from an upward position in the height direction with respect to the winding drum to a downward position on an operator's working passage side, and / or from an upward position toward the operator's working passage.

[0006] In the above yarn winding machine, when a package that is arranged at a higher level than the yarn supplying section in the height direction needs to be accessed, by moving the bobbin supporting section by the movement section, the package can be easily moved,

for example, to be easily accessible to the operator. Consequently, it is possible to improve the workability during operations requiring access to the package.

[0007] In the above yarn winding machine, the movement section includes a pivoting mechanism that pivots the bobbin supporting section so that the bobbin supporting section moves to the downward position in the height direction. According to this configuration, it is possible to simplify the configuration of the movement section.

[0008] In the above yarn winding machine, the pivoting mechanism pivots the bobbin supporting section around a rotating shaft of the winding drum. According to this configuration, it is possible to achieve the rotation of the winding drum and the pivoting of the bobbin supporting section by using the same shaft.

[0009] In the above yarn winding machine, the movement section includes a sliding mechanism that slides the bobbin supporting section so that the bobbin supporting section moves to the downward position in the height direction. According to this configuration, labor can be saved by effectively using the weight of at least the package while moving the bobbin supporting section to the downward position in the height direction.

[0010] In the above yarn winding machine, the movement section includes a both-end supporting section that supports each of one side and other side of the bobbin supporting section in a shaft direction of the package. According to this configuration, the movement section can support the bobbin supporting section by having a high rigidity.

[0011] In the above yarn winding machine, the movement section includes a driving device that drives the bobbin supporting section so that the bobbin supporting section moves downward in the height direction with respect to the winding drum. According to this configuration, for example, even if the package is heavy, the bobbin supporting section can be operated easily and properly by the driving device.

[0012] The above yarn winding machine can include a driving operating member that is operated by an operator and starts driving of the bobbin supporting section by the driving device; and a controlling section that inhibits, when the driving operating member is operated, a winding operation by the winding section. According to this configuration, for example, when plural yarn winding machines are arranged side-by-side, the winding operation is not performed by only the winding device in the spinning unit for which the driving operating member is operated, and the winding operation by the winding devices in the other spinning units can be continued.

[0013] In the above yarn winding machine, the movement section includes a manually operating mechanism that moves the bobbin supporting section when operated by the operator. According to this configuration, the operator can manually move the bobbin supporting section.

[0014] The above yarn winding machine further includes a case storing section that is arranged at a lower level than the yarn supplying section in the height direc-

tion, and can store a sliver case that accommodates a sliver, which is raw material of the yarn. According to this configuration, even if the height (distance between the installation surface of the yarn winding machine and the upper side of the winding device) of the entire yarn winding machine is higher for the operator due to the height of the sliver case, by moving the bobbin supporting section through the movement section, the operator can easily move the package, for example, so that the package is accessible to the operator.

[0015] According to another aspect of the present invention, a spinning machine includes a drafting device that drafts a fiber bundle; an air spinning device that generates a yarn by applying twists to the fiber bundle drafted by the drafting device; a winding section that is arranged at a higher level than the air spinning device in a height direction, and winds the yarn around a winding bobbin to form a package. The winding section includes a bobbin supporting section that rotatably supports the winding bobbin. The spinning machine further includes a movement section that moves the bobbin supporting section downward in the height direction and / or toward an operator's working passage.

[0016] In this spinning machine, when a package that is arranged at a higher level than a yarn supplying section in the height direction needs to be accessed, by moving the bobbin supporting section by the movement section, the package can be easily moved, for example, to be easily accessible to the operator. Consequently, it is possible to improve the workability during operations requiring access to a package.

[0017] According to the present invention, it is possible to provide a yarn winding machine and a spinning machine capable of improving workability during operations requiring access to a package.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

FIG. 1 is a side view of a schematic configuration of a spinning unit that constitutes a spinning machine according to an embodiment.

FIG. 2 is a perspective view of main sections of the spinning unit.

FIG. 3 is a partial cross-sectional view along a line III-III shown in FIG. 2.

FIG. 4 is a perspective view showing a state during a winding operation performed by the spinning unit.

FIG. 5 is a perspective view explaining pivoting of a cradle in the spinning unit.

FIG. 6 is another perspective view explaining the pivoting of the cradle in the spinning unit.

FIG. 7 is a view explaining sliding of the cradle in the spinning unit.

DETAILED DESCRIPTION

[0019] Exemplary embodiments of the present invention are explained below with reference to the accompanying drawings. Identical elements or corresponding elements are indicated by the same reference symbols in the drawings and redundant explanation thereof is omitted.

[0020] As shown in FIG. 1, a spinning machine (a yarn winding machine) 1 includes plural spinning units 2 arranged side-by-side, and a not-shown machine-frame controlling device that centrally controls the plural spinning units 2. Each of the spinning units 2 generates a yarn T by spinning a fiber bundle F, and winds the yarn T to form a package P. In the explanation below, "upstream" and "downstream" refer to upstream and downstream in a traveling direction of the fiber bundle F and the yarn T during spinning.

[0021] Each of the spinning units 2 includes a drafting device (a yarn supplying section) 7, an air spinning device (the yarn supplying section) 9, a yarn accumulating device 22, a yarn jointing device 23, a yarn monitoring device 25, and a winding device (a winding section) 26 in this order from upstream to downstream. Each device included in the spinning unit 2 is controlled by a not-shown unit controller arranged in the spinning unit 2. Each device included in the spinning unit 2 is mounted on a frame 31 (see FIG. 2). Alternatively, each device included in the spinning unit 2 can be controlled by the machine-frame controlling device. The spinning unit 2 includes a case storing section 18 that can store a sliver case 17 that contains a sliver S, which is raw material of the yarn T. The case storing section 18 is formed by a space secured in the frame 31. The sliver case 17 is arranged at a lower level than the drafting device 7 and the air spinning device 9 in a height direction. The sliver case 17 is accommodated inside the case storing section 18.

[0022] The drafting device 7 stretches (drafts) the sliver S supplied from the sliver case 17 via a sliver guide until a predetermined fiber amount (or thickness) is obtained to form the fiber bundle F. The drafting device 7 includes a back roller pair 71, a third roller pair 72, a middle roller pair 73, and a front roller pair 74. An apron belt 75b and an apron belt 75a are stretched over a top roller and a bottom roller of the middle roller pair 73, respectively.

[0023] The air spinning device 9 generates the yarn T by applying twists by using a swirling air current to the fiber bundle F drafted by the drafting device 7. In more detail (however, not shown in drawings), the air spinning device 9 includes a spinning chamber, a fiber guiding section, a swirling air current generating nozzle, and a hollow guiding shaft. The fiber guiding section guides the fiber bundle F supplied from the drafting device 7 located upstream to the spinning chamber. The swirling air current generating nozzles are arranged surrounding a traveling path of the fiber bundle F. A swirling air current is generated in the spinning chamber by jetting air from

the swirling air current generating nozzles. The fiber ends of the fibers constituting the fiber bundle F are reversed and whirled by this swirling air current. The hollow guiding shaft guides the yarn T from the inside of the spinning chamber to the outside of the air spinning device 9.

[0024] A first guide 61 that guides the yarn T is arranged downstream of the air spinning device 9. The first guide 61 guides the yarn T to the yarn accumulating device 22. The first guide 61 is movable so that it can pull the yarn T to the yarn accumulating device 22 when performing yarn jointing and the like.

[0025] The yarn accumulating device 22 is arranged downstream of the first guide 61. The yarn accumulating device 22 includes a yarn accumulating roller 41, an electric motor 42 that drives the yarn accumulating roller 41 to rotate, a yarn hooking member 43, and a residual yarn sucking device 45. The yarn T is temporarily accumulated by being wound around the outer circumferential surface of the yarn accumulating roller 41.

[0026] The yarn hooking member 43 is mounted on a downstream end portion of the yarn accumulating roller 41. The yarn hooking member 43 is supported in a rotatable manner relatively to the yarn accumulating roller 41. A permanent magnet is attached to one of the yarn hooking member 43 and the yarn accumulating roller 41, and a magnetic hysteresis member is attached to the other one of the yarn hooking member 43 and the yarn accumulating roller 41. These magnetic means generate a torque against a relative rotation of the yarn hooking member 43 with respect to the yarn accumulating roller 41. Only when a force overcoming the torque is applied (when a yarn tension of a predetermined amount or larger is applied) on the yarn hooking member 43, the yarn hooking member 43 is rotated relatively to the yarn accumulating roller 41 so that the yarn T wound around the yarn accumulating roller 41 can be unwound. On the other hand, when such a force is not applied to the yarn hooking member 43, the yarn accumulating roller 41 and the yarn hooking member 43 are integrally rotated so that the yarn T is accumulated around the yarn accumulating roller 41.

[0027] In this manner, the yarn accumulating device 22 operates such that the yarn T is unwound when the yarn tension on the downstream is increased, and the yarn T is prevented from being unwound when the yarn tension is decreased (when the yarn T is about to have a slack). With this operation, the yarn accumulating device 22 can remove the slack of the yarn T and apply an appropriate tension on the yarn T. Furthermore, because the yarn hooking member 43 operates to absorb a variation of the tension applied on the yarn T between the yarn accumulating device 22 and the winding device 26, the variation of the tension is prevented from affecting the yarn T between the air spinning device 9 and the yarn accumulating device 22.

[0028] The residual yarn sucking device 45 is arranged in an upstream end portion area of the yarn accumulating roller 41. The residual yarn sucking device 45 is connect-

ed to a not-shown blower, and can generate suction airflow. By rotating the yarn accumulating roller 41 in the reverse direction while generating the suction airflow in the residual yarn sucking device 45, the yarn T remained in the yarn accumulating roller 41 after the yarn T is cut and the like can be removed.

[0029] A second guide 62 that regulates the movement of the yarn T unwound from the yarn accumulating roller 41 is arranged downstream of the yarn accumulating roller 41. The yarn jointing device 23 is arranged downstream of the second guide 62. The yarn jointing device 23 joints a yarn T from the air spinning device 9 and a yarn T from the package P when the yarn T becomes discontinuous between the air spinning device 9 and the package P due to some reason. The yarn jointing device 23 is a splicer device that twists and joints the yarn ends by using the swirling air current generated by compressed air. The yarn jointing device 23, however, is not limited to the splicer device, and can be, for example, a mechanical knitter, and the like.

[0030] The spinning unit 2 includes a first catching and guiding device 27 and a second catching and guiding device 28 that guide the yarn T to the yarn jointing device 23.

[0031] The first catching and guiding device 27 is pivotable vertically around a base end portion thereof as a pivoting center. The first catching and guiding device 27 is hollow. The first catching and guiding device 27 is connected to the blower, and can generate the suction airflow. The first catching and guiding device 27 can catch an end of the yarn T from the air spinning device 9 by pivoting downward. The first catching and guiding device 27, after catching the yarn T from the air spinning device 9, guides the yarn T from the air spinning device 9 to the yarn jointing device 23 by pivoting upward.

[0032] The second catching and guiding device 28 is pivotable vertically around a base end portion thereof as a pivoting center. The second catching and guiding device 28 also is hollow. The second catching and guiding device 28 is connected to the blower, and can generate the suction airflow. The second catching and guiding device 28 can catch an end of the yarn T from the package P by pivoting upward. The second catching and guiding device 28, after catching the yarn T from the package P, guides the yarn T from the package P to the yarn jointing device 23 by pivoting downward.

[0033] By driving the yarn jointing device 23 while being in a state in which the yarn T from the air spinning device 9 and the yarn T from the package P have been guided in the yarn jointing device 23, the yarn T from the air spinning device 9 and the yarn T from the package P are jointed, thereby causing the yarn T to be in a continuous state between the air spinning device 9 and the package P. With this action, the winding of the yarn T around the package P can be resumed.

[0034] The yarn monitoring device 25 monitors a thickness of the traveling yarn T with a not-shown optical transmission type sensor. The yarn monitoring device 25

transmits, upon detecting a yarn defect (a part in which the thickness of the yarn T and the like is abnormal) in the yarn T, a yarn-defect detection signal to the unit controller. Upon receiving the yarn-defect detection signal, the unit controller drives a cutter 24 included in the yarn monitoring device 25, or stops the drafting device 7 to stop the supply of the sliver S, to cut the yarn T. The sensor with which the yarn monitoring device 25 monitors the thickness of the yarn T is not limited to the optical transmission type sensor, and can, for example, be a capacitance type sensor. The yarn monitoring device 25 can monitor a foreign substance contained in the yarn T as the yarn defect. As long as the cutter 24 is arranged between the yarn accumulating device 22 and the winding device 26, the cutter 24 can be arranged separately from the yarn monitoring device 25.

[0035] The winding device 26 winds the yarn T generated by the air spinning device 9 around a winding bobbin 51 thereby forming the package P. The winding device 26 includes a cradle 52 and a winding drum 53. A yarn path from the yarn accumulating device 22 to the winding device 26 is guided by a downstream guide 63.

[0036] The cradle 52 rotatably supports the winding bobbin 51 around which the yarn T is to be wound. Specifically, a bobbin supporting section 11 that rotatably and removably supports each end portion of the winding bobbin 51 is arranged at each end portion of the cradle 52. The bobbin supporting section 11 is a bobbin holder that is rotatably supported via bearings at each end portion of the cradle 52. A pivoting shaft 12 is arranged at a base end portion of the cradle 52. The cradle 52 is pivotable around the pivoting shaft 12. By pivoting around the pivoting shaft 12, the cradle 52 absorbs increase in a diameter of the package P due to the winding of the yarn T around the winding bobbin 51. With this configuration, even when a diameter of the package P increases with the winding of the yarn T around the winding bobbin 51, the winding of the yarn T can be continued properly.

[0037] The winding drum 53 rotates while being in contact with an outer circumferential surface of the winding bobbin 51 or the package P because of a driving force transmitted from a winding-drum driving motor 54 (see FIG. 3). A not-shown traverse groove is formed on an outer circumferential surface of the winding drum 53, and the yarn T can be traversed to a predetermined width by using this traverse groove. With this configuration, the winding device 26 can form the package P by winding the yarn T around the winding bobbin 51 while traversing the yarn T. In this manner, because a separate winding-drum driving motor 54 is arranged for each spinning unit 2 in the spinning machine 1, the winding drum 53 of each spinning unit 2 can be rotated individually.

[0038] In the spinning unit 2 having the configuration explained above, the winding device 26 is arranged at a higher level than the drafting device 7 and the air spinning device 9 in the height direction (vertical direction with respect to an installation surface (floor) where the spinning machine 1 has been installed) during the operation

of winding the yarn T (hereinafter, simply referred to as "during the winding operation"). Specifically, during the winding operation, the package P, the cradle 52, and the bobbin supporting section 11 and the bearings thereof are arranged at a higher level than the drafting device 7 and the air spinning device 9 in the height direction (for example, above the operator's head). Moreover, in each spinning unit 2, the yarn accumulating device 22 that is arranged between the air spinning device 9 and the winding device 26 changes the traveling direction of the yarn T.

[0039] A surrounding configuration of the package P in the spinning unit 2 is explained below in detail with reference to FIGS. 2 and 3. In the explanation, the height direction is explained as a Z direction, the shaft direction of the package P (the winding bobbin 51) as an X direction, and the direction perpendicular to the X direction and Z direction as a Y direction.

[0040] As shown in FIGS. 2 and 3, in the spinning unit 2, the winding drum 53 is rotatably supported by stays 32 that are arranged on an upper surface 31a of the frame 31 in the standing manner. Specifically, the two stays 32 are arranged opposite to each other at both end portions in the X direction on the upper surface 31a. The winding drum 53 is arranged such that a rotating shaft 14 thereof is arranged along the X direction, and the rotating shaft 14 is inserted into the stays 32 via bearings 33.

[0041] A winding drum pulley 34 is fixed to one end portion of the rotating shaft 14. The winding drum pulley 34 is linked via a belt 36 to a drum motor pulley 35 that is fixed to a rotating shaft 15 of the winding-drum driving motor 54. With this configuration, the winding drum pulley 34 and the drum motor pulley 35 are rotatable in synchronization with each other, and the driving force of the winding-drum driving motor 54 is transmittable to the winding drum 53.

[0042] The spinning unit 2 includes a movement section 80, an operation button (a driving operating member) 95, and a winding controlling section (a controlling section) 97. The movement section 80 moves the bobbin supporting section 11 downward in the Z direction. Specifically, the movement section 80 moves the bobbin supporting section 11, with respect to the winding drum 53, from an upward position in the Z direction to a downward position on an operator's working passage side that is explained later. The movement section 80 can move the bobbin supporting section 11 between a higher position compared to the winding drum 53 and a lower position on the operator's working passage side compared to the winding drum 53. The movement section 80 can move (lower) at least the package P downward in the Z direction. The movement section 80 can move the cradle 52 so that the package P moves downward on the operator's working passage side in the Z direction, with respect to the winding drum 53. The movement section 80 includes a pivoting mechanism 81 that pivots the cradle 52 around the rotating shaft 14 of the winding drum 53, and a motor (a driving device) 82 that drives the pivoting mechanism

81.

[0043] The pivoting mechanism 81 includes a pair of supporting plates 83. For the supporting plate 83, the X direction is a thickness direction, and each of the supporting plates 83 includes a main surface along the Z direction and the Y direction. The supporting plates 83 are arranged in a pair, opposite to each other at the both end portions in the X direction on the upper surface 31a of the frame 31.

[0044] A through-hole 85 is formed on one side of each of the two supporting plates 83 in the Y direction. The rotating shaft 14 of the winding drum 53 is rotatably inserted into the through-holes 85 via bearings 84. With this configuration, the supporting plates 83 are pivotably supported around the rotating shaft 14. An edge among the edges of the supporting plate 83 that is positioned at a downward side during the winding operation has a shape that follows the upper surface 31a of the frame 31. The edges of the supporting plates 83 include flanges 83y that bent outside in the X direction. The flanges 83y come into contact with the upper surface 31a of the frame 31 during the winding operation.

[0045] In a supporting plate 83p that is adjacent to the winding drum pulley 34 between the two supporting plates 83, a through-hole 87 is formed at the center thereof in the Y direction. The rotating shaft 15 of the winding-drum driving motor 54 is rotatably inserted into the through-hole 87 via a bearing 86. A main body 54a of the winding-drum driving motor 54 is fixed to the supporting plate 83p. With this configuration, the supporting plate 83p supports the winding-drum driving motor 54 by making the rotating shaft 15 rotatable.

[0046] A through-hole 89 is formed in the Y direction on other side of each of the two supporting plates 83. The pivoting shaft 12 of the cradle 52 is pivotably inserted into the through-holes 89 via bearings 88. With this configuration, the pair of the supporting plates 83 pivotably provides both-end support to the both end portions of the pivoting shaft 12. Each of the two supporting plates 83 supports one side and the other side of the bobbin supporting section 11 in the X direction, respectively. The pair of the supporting plates 83 forms a both-end supporting section.

[0047] The supporting plate 83p includes a pulley member 90 that is arranged in the periphery of the through-hole 85. The pulley member 90 has a circular shape, and is linked via a belt 92 to a motor pulley 91 that is explained later. With this configuration, the motor pulley 91 and the pulley member 90 are rotatable in synchronization with each other, and the driving force of the motor 82 is transmittable to the supporting plate 83p. The pulley member 90 has a larger inner diameter than the outer diameter of the rotating shaft 14 so that the pulley member 90 does not come into contact with the rotating shaft 14 of the winding drum 53.

[0048] The motor 82 is a driving device that drives the cradle 52 so that the bobbin supporting section 11 moves to the downward position in the Z direction with respect

to the winding drum 53. The motor pulley 91 is fixed to a tip end part of a rotating shaft 16 of the motor 82. The motor pulley 91 is linked to the pulley member 90 of the supporting plate 83p via the belt 92. By rotating the rotating shaft 16 of the motor 82 to rotate the motor pulley 91, the driving force to rotate the pulley member 90 around the rotating shaft 14 is transmitted to the pulley member 90. With this configuration, the supporting plate 83p pivots around the rotating shaft 14. Consequently, the cradle 52 that is supported by the supporting plate 83p, the package P that is supported by the cradle 52, and the winding-drum driving motor 54 held by the supporting plate 83p pivot in an integrated manner around the rotating shaft 14.

[0049] By operating the operation button 95, the driving of the cradle 52 by the motor 82 is started. The operation button 95 is electrically connected to the motor 82. The operation button 95 outputs, when operated by the operator, a driving start signal to the motor 82 to rotate the rotating shaft 16 of the motor 82, and starts pivoting the supporting plate 83p and thereby the cradle 52. Moreover, the operation button 95 is electrically connected to the winding controlling section 97. The operation button 95 outputs, when operated by the operator, a winding inhibiting signal to the winding controlling section 97.

[0050] When the operation button 95 is operated by the operator, the winding controlling section 97 inhibits the winding operation by the winding device 26. When the winding inhibiting signal is output from the operation button 95, the winding controlling section 97 controls the winding-drum driving motor 54, if the rotating shaft 15 of the winding-drum driving motor 54 is rotating, to stop the rotation of the rotating shaft 15, or if the rotating shaft 15 of the winding-drum driving motor 54 is not rotating, to maintain the stop state.

[0051] In the spinning unit 2 explained above, during the winding operation, as shown in FIG. 4, the package P is supported by the cradle 52 and contacts the winding drum 53. The pair of the supporting plates 83 provides the both-end support to the both end portions of the pivoting shaft 12 of the cradle 52. Each of the two supporting plates 83 supports one side and the other side of the bobbin supporting section 11 in the X direction, respectively. The bobbin supporting section 11 is arranged at the upward position in the Z direction with respect to the winding drum 53. The supporting plates 83, while being in contact with the upper surface 31a of the frame 31, are pivotably supported by the rotating shaft 14 of the winding drum 53. In this manner, during the winding operation, the supporting plates 83 are pressed against the upper surface 31a of the frame 31 by the weight of the package P and the cradle 52, and are in a stable state (a non-pivoting state without being aware of the disturbance force).

[0052] In the state of winding operation as shown in FIG. 4, when lowering the package P, the operation button 95 is operated by the operator, and the rotating shaft 16 of the motor 82 starts rotating in one direction. Simul-

taneously, the rotation of the rotating shaft 15 of the winding-drum driving motor 54 is inhibited thereby inhibiting the winding operation. As shown in FIG. 5, the supporting plates 83 pivot the flanges 83y in a separating direction from the upper surface 31a in an A direction around the rotating shaft 14. Following the pivoting of the supporting plate 83, the cradle 52, the bobbin supporting section 11, and the package P pivot in the A direction. Consequently, while being in contact with the winding drum 53, the package P is moved over the winding drum 53 and protrudes to the front side in the Y direction, and the pivoting shaft 12 of the cradle 52 is positioned at a higher level than the bobbin supporting section 11. The "front side" explained in the present embodiment is a front side (the left side shown in FIGS. 4 to 6) of the spinning unit 2, and is the operator's working passage side where the operator walks. The operator's working passage side is a side where a large space is secured around the spinning unit 2 on one or the other side of the spinning unit 2 in the Y direction. In the present embodiment, an inlet (upstream) of the drafting device 7 is arranged on the operator's working passage side, resulting in easy access to the drafting device 7 for the operator. In the spinning unit 2, for the yarn path during the winding operation of the package P, the first catching and guiding device 27 and the second catching and guiding device 28 are arranged on the opposite side of the operator's working passage. Moreover, the pivoting shaft 12 of the cradle 52 is arranged on the opposite side of the operator's working passage with respect to the winding drum 53.

[0053] The rotating shaft 16 of the motor 82 is continued to be rotated in the one direction. As shown in FIG. 6, the supporting plates 83 pivot in an A direction, and the cradle 52, the bobbin supporting section 11, and the package P pivot in the A direction. By this action, the package P achieves the state of being suspended from the rotating shaft 14 via the cradle 52. In this state, the package P, the cradle 52, the bobbin supporting section 11 of the cradle 52 and the bearings thereof are positioned at a lower position in the Z direction compared to the winding drum 53, and at separate positions from the winding drum 53 toward the front side in the Y direction (nearer to the operator's working passage than the winding drum 53). In this state, the rotation of the rotating shaft 16 of the motor 82 is stopped. With the operation explained above, the package P moves downward in the Z direction with respect to the winding drum 53 (see FIGS. 4 and 6).

[0054] When the operation button 95 is operated again by the operator to rotate the rotating shaft 16 of the motor 82 in the other direction that is an opposite direction of the one direction, the winding device 26 returns to the state during the winding operation shown in FIG. 4 after passing through the state shown in FIG. 5 from the state shown in FIG. 6. In other words, the package P moves upward in the Z direction with respect to the winding drum 53 such that the package P returns to the position assumed during the winding operation.

[0055] In the spinning machine 1 according to the present embodiment, when it is necessary to access to and / or touch the package P during the operations and the like, the package P that is positioned at a higher level than the drafting device 7 and the air spinning device 9 during the winding operation can be moved by the movement section 80 to the downward position in the Z direction and toward the operator's working passage. With this action, the package P can be easily lowered and can be drawn toward the operator's working passage to make the package P accessible to the operator.

[0056] Consequently, it is possible to improve the workability during the operations requiring access to the package P. The hassle of carrying a step ladder and the like from a storage room, installing or removing the step ladder can be avoided and a decrease in the working efficiency and the operational efficiency of the spinning unit 2 can be inhibited. The operator can easily access the package P that is at the higher position during the winding operation at a low cost, i.e., without requiring a step ladder and the like.

[0057] In the spinning machine 1, the movement section 80 includes the pivoting mechanism 81 that is provided with the supporting plates 83. The pivoting mechanism 81 pivots the cradle 52 along the A direction so that the package P is moved downward in the Z direction. According to this configuration, it is possible to simplify the configuration of the movement section 80.

[0058] In the spinning machine 1, the supporting plates 83 of the pivoting mechanism 81 pivot the cradle 52 along the A direction around the rotating shaft 14 of the winding drum 53. According to this configuration, it is possible to achieve the rotation of the winding drum 53 and the pivoting of the cradle 52 in the A direction by using the same shaft.

[0059] In the spinning machine 1, each of the two supporting plates 83 supports each end portion of the pivoting shaft 12 of the cradle 52. According to this configuration, the movement section 80 can provide both-end support to the cradle 52, can support the cradle 52 by having high rigidity, and can prevent the damage of the winding device 26 due to lowering of the package P.

[0060] The spinning machine 1 includes the motor 82. The cradle 52 is operated by the driving force of the motor 82, without requiring a human power, to lower the package P. According to this configuration, even if the package P and the cradle 52 are heavy, the cradle 52 can be operated easily and properly by the motor 82.

[0061] In the spinning machine 1, when the operation button 95 is operated by the operator, driving by the motor 82 starts and the winding operation by the winding device 26 is inhibited by the winding controlling section 97. According to this configuration, in the spinning machine 1 in which the plural spinning units 2 are arranged side-by-side, the winding operation is not performed by only the winding device 26 in the spinning unit 2 for which the operation button 95 is operated so that the winding operation by the winding devices 26 in the other spinning

units 2 can be continued.

[0062] The spinning machine 1 further includes the case storing section 18 that can store the sliver case 17 that is arranged at a lower level than the drafting device 7 and the air spinning device 9 in the Z direction. According to this configuration, even if the height (distance between the installation surface of the spinning machine 1 and the upper side of the winding device 26) of the entire spinning machine 1 is higher for the operator due to the height of the sliver case 17, the operator can easily move the package P, for example, so that the package P is accessible to the operator by moving the bobbin supporting section 11 through the movement section 80.

[0063] In the spinning machine 1, the cradle 52 and surrounding sections thereof (the package P, the cradle 52, and the winding-drum driving motor 54) can be collectively lowered by the action of the movement section 80. In the spinning machine 1, as long as the package P and the cradle 52 can be lowered, the spinning machine 1 can be configured so that the winding-drum driving motor 54 is not lowered.

[0064] The spinning machine 1 can include a not-shown stopper) to regulate the operation of the movement section 80 during the winding operation, in other words, the pivoting of the supporting plates 83 around the rotating shaft 14. The spinning machine 1 can exert redundant force on the movement section 80 by applying a standby current to the motor 82 to regulate the operation of the movement section 80. In these cases, a change in the state of the winding device 26 from the state shown in FIG. 4 as the movement section 80 is unintentionally operated by, for example, vibrations and the like, can be regulated. As the stopper, for example, a latching mechanism can be employed.

[0065] The embodiments of the present invention are explained above. The present invention, however, is not limited to the above embodiments.

[0066] In the above embodiments, the configuration of the spinning unit 2 is not limited to the configuration where it includes the pivoting mechanism 81 that pivots the package P, the bobbin supporting section 11, and the cradle 52. The spinning unit 2 can include a sliding mechanism 93 that slides the cradle 52 so that the bobbin supporting section 11 moves to a downward position in the Z direction, for example, as shown in FIGS. 7A and 7B. In brief, the spinning machine 1 can include a movement section that moves the bobbin supporting section 11 to the downward position in the Z direction and / or toward the operator's working passage.

[0067] In the examples shown in the drawings, the upper surface 31a of the frame 31 has an inclined surface that is inclined with respect to a horizontal surface (the installation surface of the spinning machine 1). The sliding mechanism 93 supports the cradle 52, and is movable in a straight line along the upper surface 31a. An air cylinder 94 is arranged as a driving device that drives the sliding mechanism 93. In a state during the winding operation shown in FIG. 7A, when the operation button 95

is operated, the air cylinder 94 starts the driving of the sliding mechanism 93. The cradle 52 slides, by using the sliding mechanism 93, on the upper surface 31a so that the bobbin supporting section 11 moves downward in the Z direction on the operator's working passage side (see FIG. 7B). With this configuration, labor can be saved by effectively using the weight of the package P and the cradle 52 while moving the bobbin supporting section 11 to a downward position in the Z direction on the operator's working passage side.

[0068] In the above embodiments, though the pivoting mechanism 81 (the supporting plates 83) pivots around the rotating shaft 14 of the winding drum 53, the pivoting mechanism 81 can be caused to pivot around other shaft. For example, a shaft, different from the rotating shaft 14, can be arranged, and the pivoting mechanism 81 can pivot around this shaft.

[0069] In the above embodiments, the spinning unit 2 includes the motor 82 as a driving device, but the driving device is not limited to the motor 82. The spinning unit 2 can include any other actuator as a driving device. As long as the device can drive the cradle 52 so that the package P moves downward in the Z direction, other known driving means can be employed.

[0070] In the above embodiments, the movement section 80 of the spinning unit 2 includes a driving device. Alternatively, in addition to or instead of the driving device, the movement section 80 can include a manually operating mechanism with which the operator can manually operate the cradle 52. For example, as the manually operating mechanism, a configuration including one or more gears and an operation lever can be used. For example, in the configuration shown in FIG. 3, the one or plural gears can be linked to the pulley member 90 of the supporting plate 83p, and the supporting plate 83p is pivoted by the operator by operating these gears through the operation lever. With the manually operating mechanism, the operator can manually move the cradle 52.

[0071] In the above embodiments, for example, when the pivoting shaft 12 of the base end portion of the cradle 52 is arranged on the operator's working passage side, the package P can be moved downward in the Z direction by rotating the cradle 52 toward the operator's working passage around of the pivoting shaft 12. In this case, the above embodiments need not include a two-stage pivoting mechanism, that is, a mechanism in which the supporting plates 83 pivotably support the cradle 52 with the pivoting shaft 12, and the rotating shaft 14 of the winding drum 53 pivotably supports the supporting plates 83. In this case, the pivoting shaft 12 constitutes the pivoting mechanism.

[0072] In the above embodiments, the pair of the supporting plates 83 provides the both-end support to the pivoting shaft 12 of the cradle 52. However, if the supporting plate 83p is sufficiently rigid, one end portion of the pivoting shaft 12 of the cradle 52 can be supported by the supporting plate 83p. The yarn winding machine (the spinning machine) of the present invention can in-

clude a both-end supporting section that supports both end portions of the cradle in the X direction in which the bobbin supporting section is arranged, or can include a one-end supporting section that supports one or the other end portion of the cradle in the X direction in which the bobbin supporting section is arranged.

[0073] In the above embodiments, the yarn accumulating device 22 includes a function that pulls the yarn T from the air spinning device 9; however, a delivery roller and a nip roller can be used to pull the yarn T from the air spinning device 9. When pulling the yarn T from the air spinning device 9 by using the delivery roller and the nip roller, instead of the yarn accumulating device 22, a slack tube that absorbs the slack of the yarn T by using the suction airflow, or a mechanical compensator, and the like can be provided. In the above embodiments, for example, when the package P is fully wound, the bobbin supporting section 11 can move from the position during the winding operation to the opposite side of the operator's working passage side, and can guide the package P to a not-shown package loading section (such as conveyor) that is installed on the back side of the spinning unit 2 in the Y direction.

[0074] In the above embodiments, when the diameter of the package P increases by winding of the yarn T, and when the bobbin supporting section 11 is moved to the downward position by the movement section 80, the uppermost end position of the winding drum 53 may be at a higher position than the uppermost end position of the package P. In the above embodiments, the yarn T can be wound into a cheese-shaped package P or a cone-shaped package P. The material and shape of various components explained above are not limited to those mentioned here, and it is possible to adopt various materials and shapes. The application of the yarn winding machine of the present invention is not limited to the spinning machine 1, and it can be applied to other yarn winding machines such as an automatic winder or an open-end spinning frame.

[0075] In the above embodiment, the movement section 80 moves the bobbin supporting section 11 with respect to the winding drum 53 from the upward position toward the operator's working passage (front side) (see FIG. 5), and then moves the bobbin supporting section 11 to the downward position with respect to the winding drum 53 (see FIG. 6). In the yarn winding machine (spinning machine) of the present invention, however, there are situations in which the movement section only moves the bobbin supporting section from the upward position with respect to the winding drum to the downward position on the operator's working passage side. Moreover, there are situations in which the movement section only moves the bobbin supporting section from the upward position with respect to the winding drum toward the operator's working passage (front side) (for example, move the bobbin supporting section 11 to a state between the FIG. 4 and FIG. 5).

Claims

1. A yarn winding machine (1) comprising:

a yarn supplying section (7,9) that supplies a yarn;
a winding section (26) that is arranged at a higher level than the yarn supplying section in a height direction, and winds the yarn around a winding bobbin to form a package, the winding section including

a winding drum (53) that rotates while being in contact with the winding bobbin or the package, and
a bobbin supporting section (11) that rotatably supports the winding bobbin; and

a movement section (80) that moves the bobbin supporting section from an upward position in the height direction with respect to the winding drum to a downward position on an operator's working passage side, and / or from an upward position toward the operator's working passage.

2. The yarn winding machine as claimed in Claim 1, wherein

the movement section includes a pivoting mechanism (81) that pivots the bobbin supporting section so that the bobbin supporting section moves to the downward position in the height direction.

3. The yarn winding machine as claimed in Claim 2, wherein the pivoting mechanism pivots the bobbin supporting section around a rotating shaft of the winding drum.

4. The yarn winding machine as claimed in any one of Claims 1 to 3, wherein the movement section includes a sliding mechanism (93) that slides the bobbin supporting section so that the bobbin supporting section moves to the downward position in the height direction.

5. The yarn winding machine as claimed in any one of Claims 1 to 4, wherein the movement section includes a both-end supporting section (83) that supports each of one side and other side of the bobbin supporting section in a shaft direction of the package.

6. The yarn winding machine as claimed in any one of Claims 1 to 5, wherein the movement section includes a driving device (82) that drives the bobbin supporting section so that the bobbin supporting section moves downward in the height direction with respect to the winding drum.

7. The yarn winding machine as claimed in Claim 6,

comprising:

a driving operating member (95) that is operated by an operator and starts driving of the bobbin supporting section by the driving device; and 5
a controlling section (97) that inhibits, when the driving operating member is operated, a winding operation by the winding section.

8. The yarn winding machine as claimed in any one of Claims 1 to 7, wherein the movement section includes a manually operating mechanism that moves the bobbin supporting section when operated by the operator. 10

9. The yarn winding machine as claimed in any one of Claims 1 to 8 further comprising a case storing section (18) that is arranged at a lower level than the yarn supplying section in the height direction, and can store a sliver case that accommodates a sliver, 15
which is raw material of the yarn. 20

10. A spinning machine comprising:

a drafting device (7) that drafts a fiber bundle; 25
an air spinning device (9) that generates a yarn by applying twists to the fiber bundle drafted by the drafting device;
a winding section (26) that is arranged at a higher level than the air spinning device in a height 30
direction, and winds the yarn around a winding bobbin to form a package, the winding section including a bobbin supporting section (11) that rotatably supports the winding bobbin; and
a movement section (80) that moves the bobbin 35
supporting section downward in the height direction and / or toward an operator's working passage.

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FIG. 1

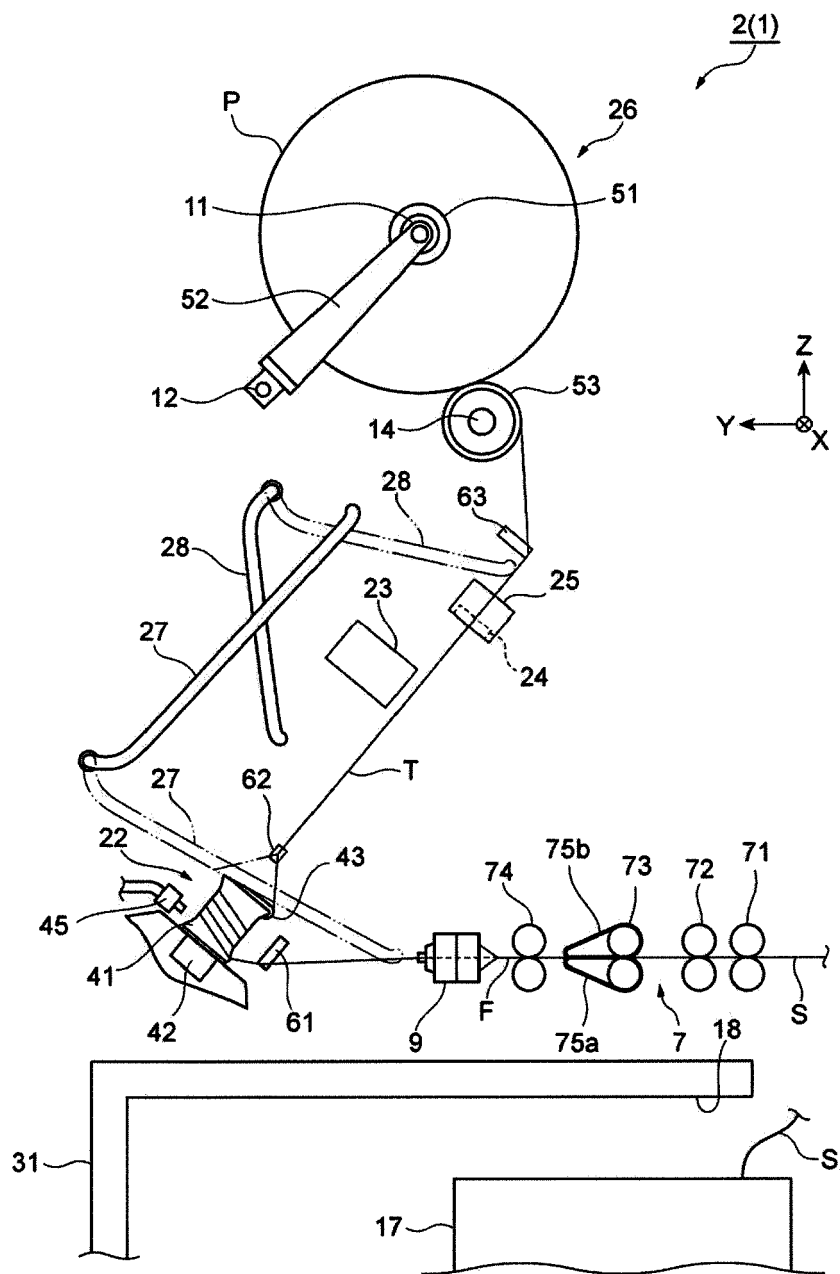


FIG. 2

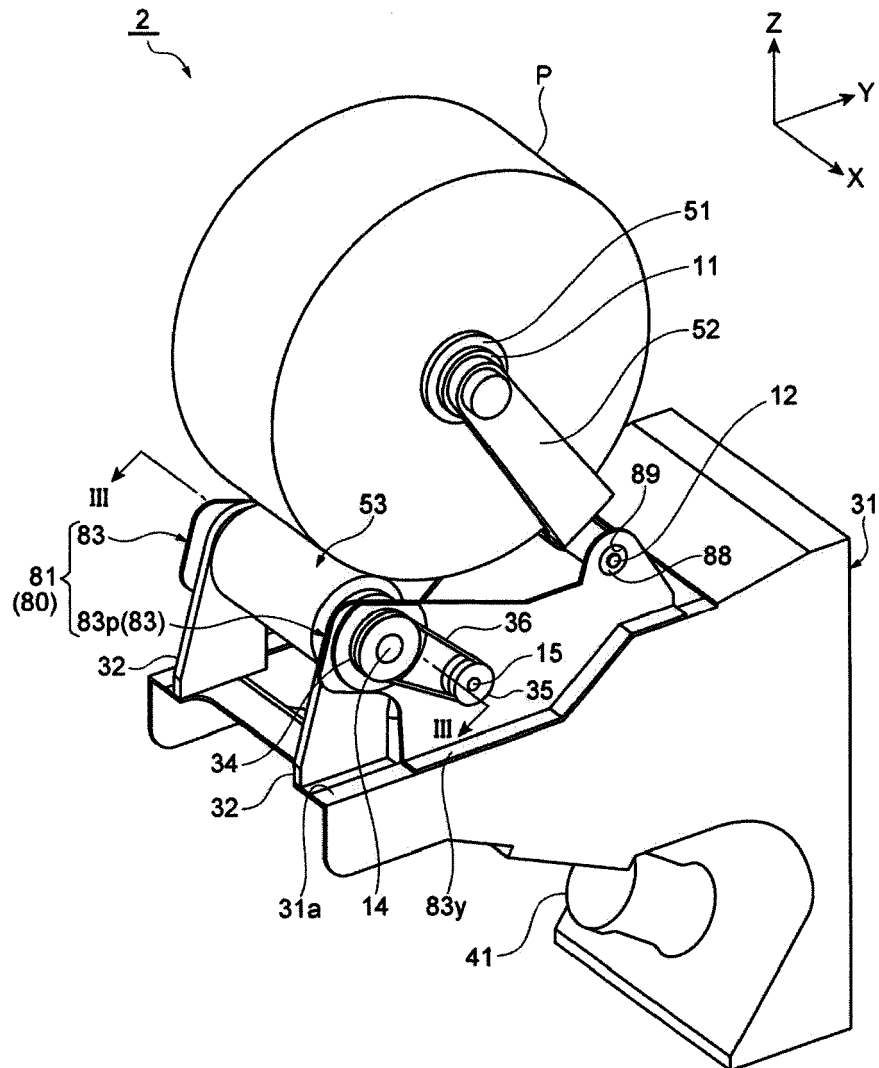


FIG. 3

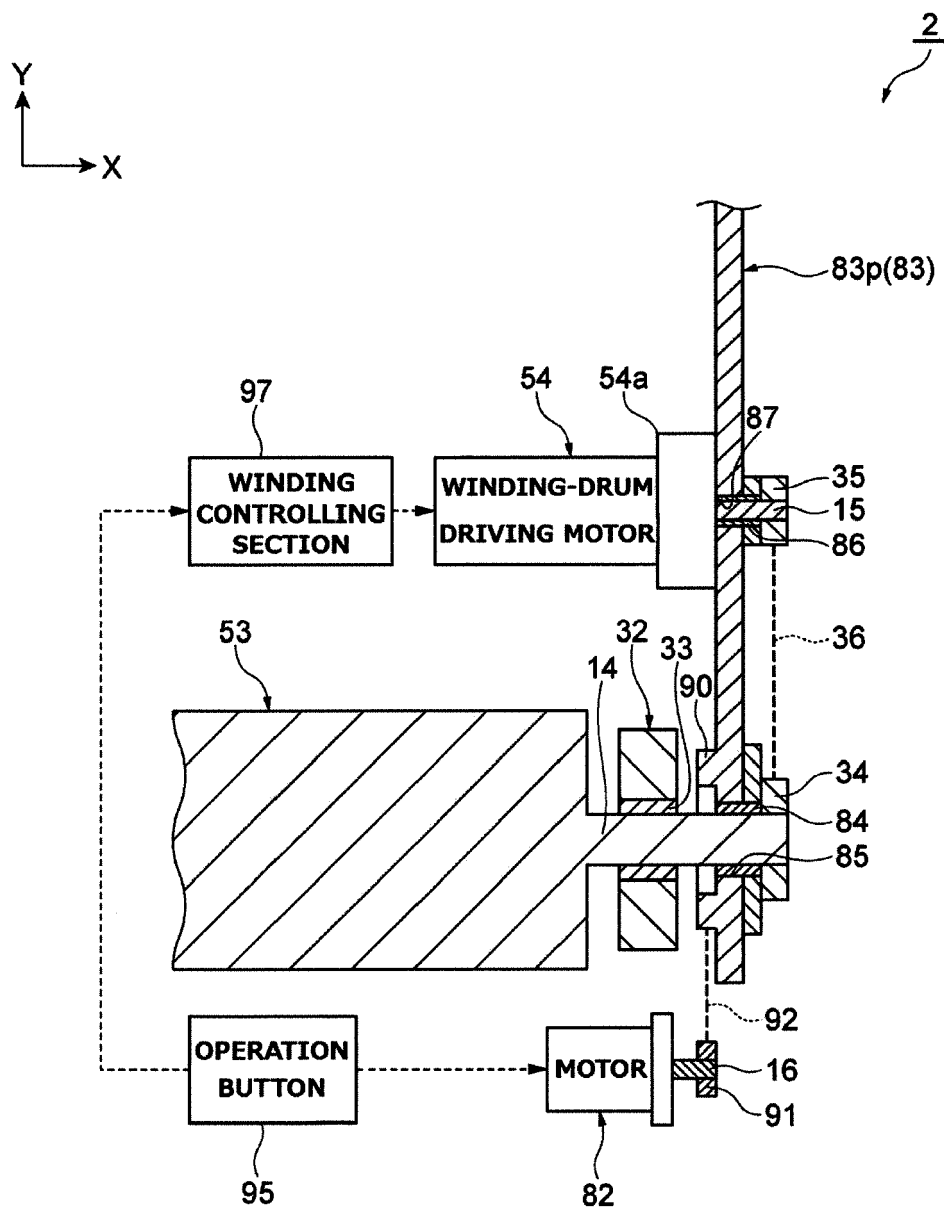


FIG. 5

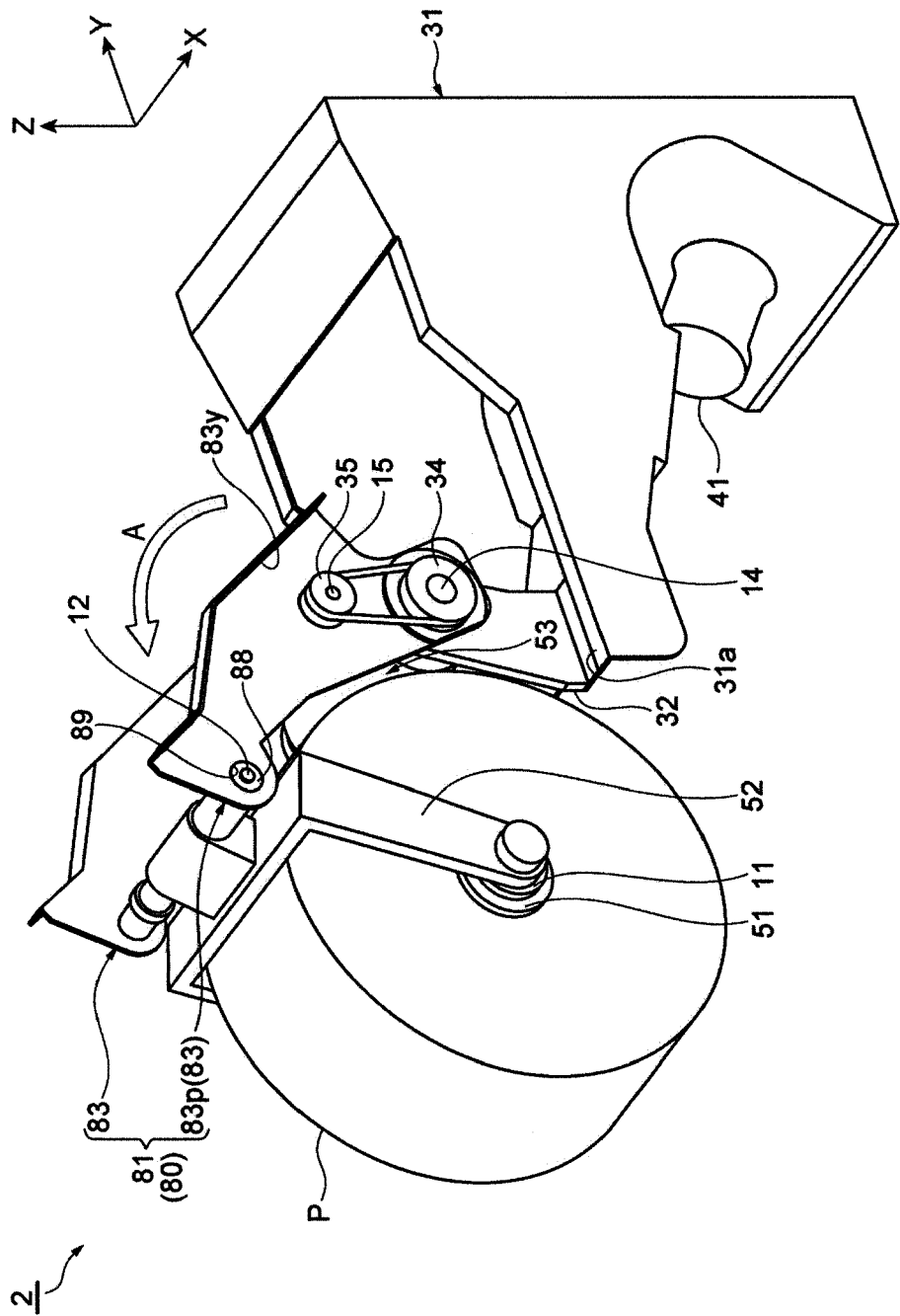


FIG. 6

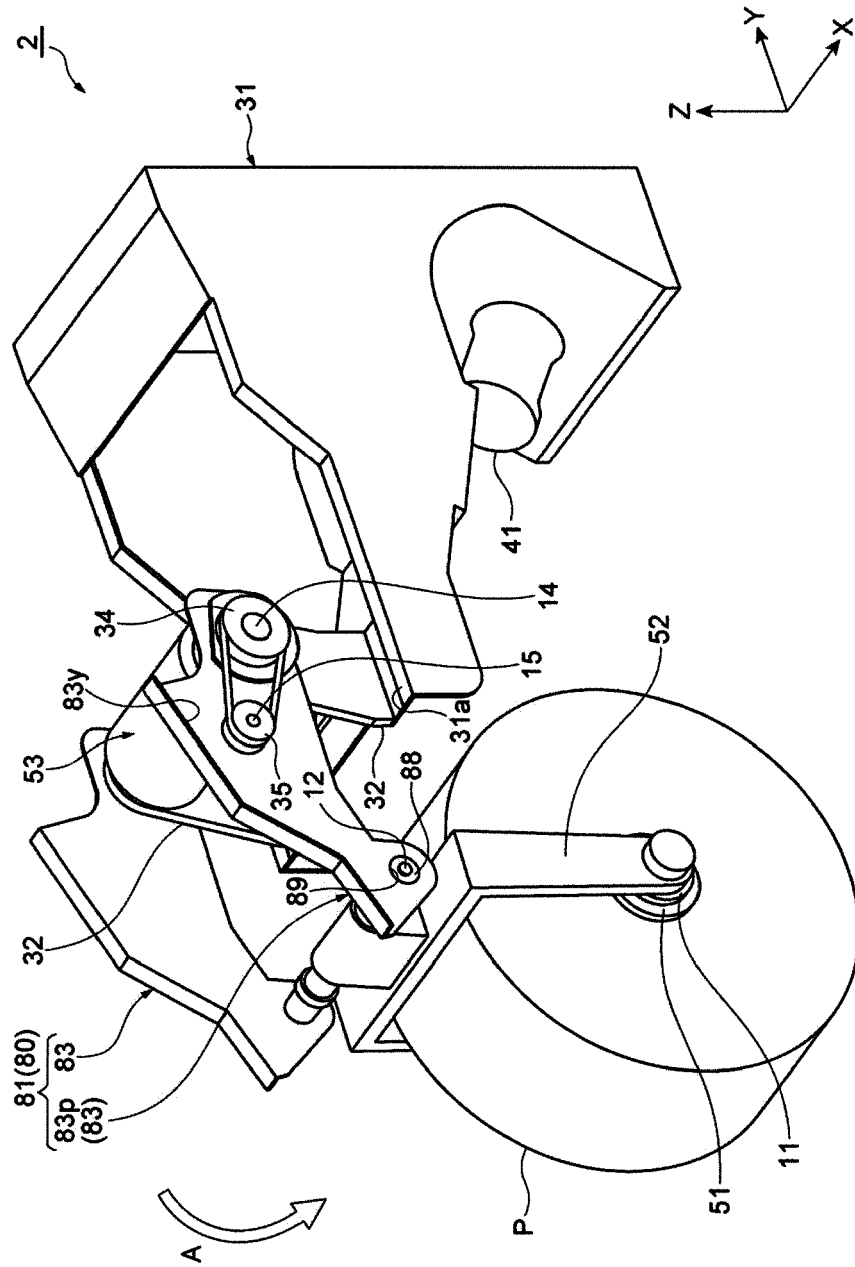


FIG. 7B

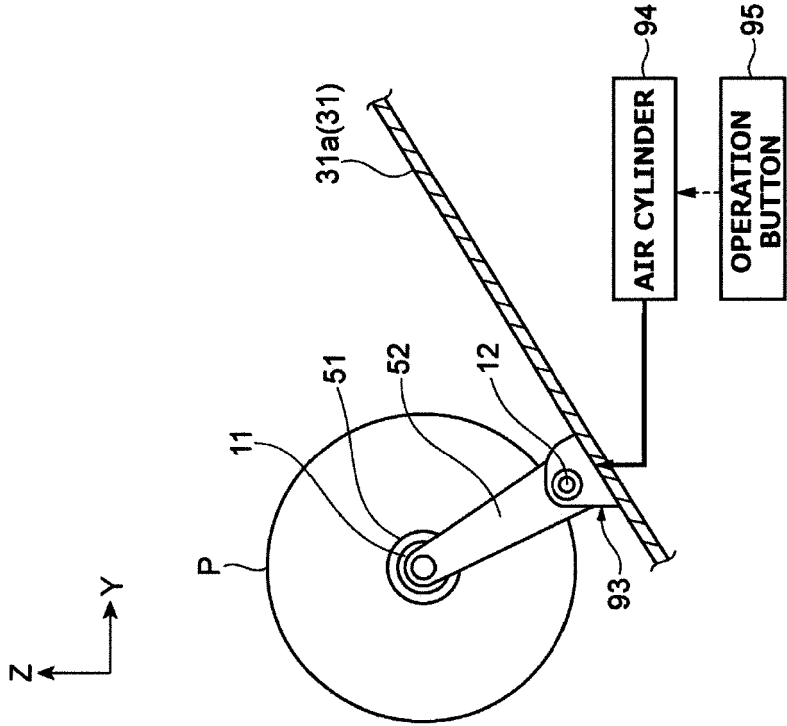
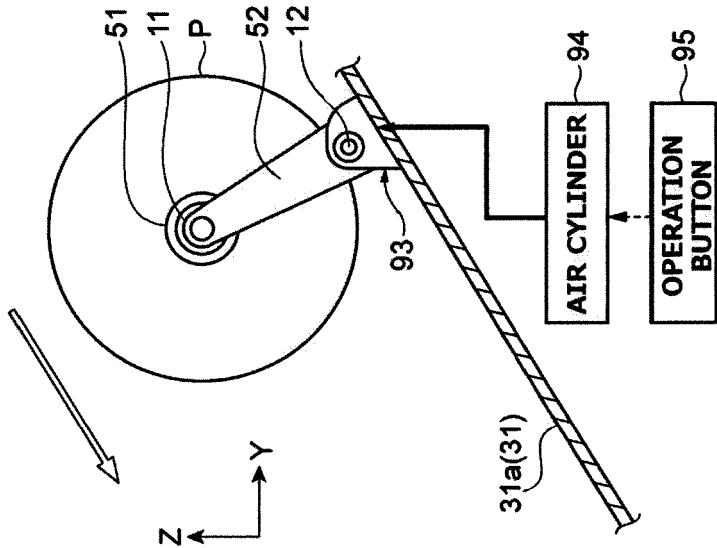


FIG. 7A





EUROPEAN SEARCH REPORT

Application Number
EP 16 17 2616

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 810 944 A1 (RIETER AG MASCHF [CH]) 25 July 2007 (2007-07-25) * paragraphs [0015], [0023]; figure 6 *	1	INV. B65H67/04 D01H9/02
A	US 5 853 137 A (STRAATEN PAUL [DE] ET AL) 29 December 1998 (1998-12-29) * column 4, lines 34-49; figure 2 *	1-10	
A	EP 0 104 415 A1 (RIETER AG MASCHF [CH]) 4 April 1984 (1984-04-04) * page 2, line 19 - page 3, line 20; figure 1 *	1-10	
A	US 2009/094958 A1 (WEIDE THOMAS [DE] ET AL) 16 April 2009 (2009-04-16) * paragraphs [0039] - [0042]; figure 5 *	1-10	
A	EP 2 366 817 A1 (MURATA MACHINERY LTD [JP]) 21 September 2011 (2011-09-21) * paragraph [0027]; figures 1,3 *	1-10	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65H D01H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 6 October 2016	Examiner Wendl, Helen
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ON EUROPEAN PATENT APPLICATION NO.**

EP 16 17 2616

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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06-10-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1810944 A1	25-07-2007	NONE	
US 5853137 A	29-12-1998	DE 19650932 A1 EP 0846640 A2 JP 4181235 B2 JP H10175778 A TR 9701453 A2 US 5853137 A	10-06-1998 10-06-1998 12-11-2008 30-06-1998 22-06-1998 29-12-1998
EP 0104415 A1	04-04-1984	DE 8322304 U1 EP 0104415 A1 FR 2532336 A3 JP S5943126 A	10-11-1983 04-04-1984 02-03-1984 10-03-1984
US 2009094958 A1	16-04-2009	CN 101171374 A DE 102005022187 A1 EP 1907612 A1 JP 4801146 B2 JP 2008540861 A US 2009094958 A1 WO 2006122605 A1	30-04-2008 16-11-2006 09-04-2008 26-10-2011 20-11-2008 16-04-2009 23-11-2006
EP 2366817 A1	21-09-2011	CN 102216505 A EP 2366817 A1 JP 2012031523 A WO 2010061533 A1	12-10-2011 21-09-2011 16-02-2012 03-06-2010

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2015118258 A [0002]