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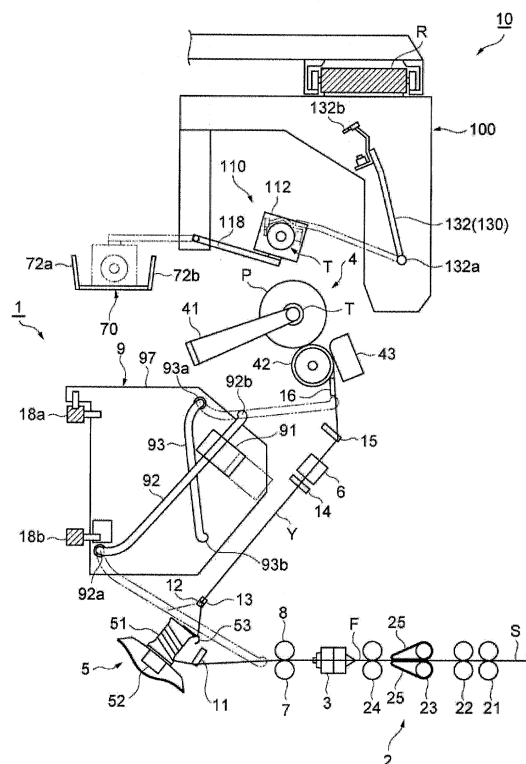
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(54) **Bobbin holding device, bobbin setting device, and yarn winding machine**

(57) A bobbin tube bobbin holding device (110) includes a receiving section (112) adapted to receive a bobbin (T) conveyed by a belt conveyor (70); a bobbin holding section (114) adapted to directly hold the bobbin (T); and a moving section (116, 120) adapted to move the receiving section (112) and the bobbin holding section (114) together to a first position of receiving the bobbin (T) conveyed by the belt conveyor (70) with the receiving section (112) and a second position different from the first position.

FIG. 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a bobbin holding device, a bobbin setting device, and a yarn winding machine.

2. Description of the Related Art

[0002] In a yarn winding machine, when a yarn is wound around a bobbin and a package is fully wound, the package is doffed by a doffing device, and a new bobbin tube is set in a cradle by a supply device (gripper). A device described in JP 3-213529 A, for example, is known for a device adapted to supply the bobbin tube to the doffing device. In a bobbin preparing device described in JP 3-213529 A, a bobbin tube is conveyed by a conveyor arranged along a direction in which spinning units are arranged side by side, and a bobbin catcher knocks away the bobbin tube conveyed by the conveyor and supplies a bobbin tube with respect to a bobbin magazine of the doffing device stopped at a position of a spinning unit where doffing request is made.

BRIEF SUMMARY OF THE INVENTION

[0003] In the doffing device described above, a gripper acquires, from the bobbin magazine, the bobbin tube knocked away to the bobbin magazine, and the gripper sets a bobbin tube in the cradle. The doffing device may not be equipped with the bobbin magazine. In the case of such configuration, a structure that holds the bobbin tube conveyed by the conveyor and directly supplies the bobbin tube to the gripper is required.

[0004] It is an object of the present invention to provide a bobbin holding device, a bobbin setting device, and a yarn winding machine capable of directly holding the bobbin tube conveyed by the conveyor.

[0005] A bobbin holding device according to one aspect of the present invention includes a receiving section adapted to receive a bobbin tube conveyed by a conveyor; a first holding section adapted to directly hold the bobbin tube; and a moving section adapted to move the receiving section and the first holding section together to a first position of receiving the bobbin tube conveyed by the conveyor with the receiving section and a second position different from the first position.

[0006] The bobbin holding device receives the bobbin tube conveyed by the conveyor with the receiving section and directly holds the bobbin tube with the first holding section. The bobbin holding device thus can directly hold the bobbin tube conveyed by the conveyor. Furthermore, the bobbin holding device moves the receiving section and the first holding section together to the first position of receiving the bobbin tube and the second position dif-

ferent from the first position by means of the moving section. The bobbin holding device thus moves the first holding section to the second position of supplying the bobbin tube to the gripper with the moving section, for example, to directly supply the bobbin tube to the gripper.

[0007] A bobbin holding device according to another aspect of the present invention includes a receiving section adapted to receive a bobbin tube conveyed by a conveyor; and a first holding section arranged in the receiving section and adapted to directly hold the bobbin tube.

[0008] The bobbin holding device receives the bobbin tube conveyed by the conveyor with the receiving section and directly holds the bobbin tube with the first holding section. The bobbin holding device thus can directly hold the bobbin tube conveyed by the conveyor.

[0009] According to one embodiment, the bobbin holding device may further include a moving section adapted to move the first holding section to a first position of receiving the bobbin tube conveyed by the conveyor with the receiving section and a second position different from the first position. The bobbin holding device thus moves the first holding section to the second position of supplying the bobbin tube to the gripper with the moving section, for example, to directly supply the bobbin tube to the gripper.

[0010] According to one embodiment, the first holding section may be positioned in an internal space of the hollow bobbin tube to hold the bobbin tube from an inner side of the bobbin tube. The bobbin tube is, for example, formed to a tubular shape with paper. Therefore, if the bobbin tube is gripped from the outer circumferential surface side, the bobbin tube has a possibility of being crushed. The first holding section is thus positioned on the inner side of the bobbin tube to hold the bobbin tube.

The bobbin tube has a strength with respect to the force applied from the inner side. Therefore, the first holding section can hold the bobbin tube without crushing the bobbin tube. Normally, when the bobbin tube is conveyed by the conveyor, the bobbin tube is conveyed in a laid state (state in which at least a part of the outer circumferential surface of the bobbin tube is brought into contact with the conveyor). Thus, in the bobbin holding device, the end (end face) of the bobbin tube can be received with the receiving section, and at the same time, the first holding section can be positioned in the internal space of the bobbin tube.

[0011] According to one embodiment, the bobbin holding device further includes a switching section adapted to switch the first holding section to a first state of not holding the bobbin tube and a second state of holding the bobbin tube; wherein the first holding section may not make contact with the inner side of the bobbin tube in the first state, and may make contact with the inner side of the bobbin tube in the second state. Thus, in the bobbin holding device, the bobbin tube can be held and released by switching the state of the first holding section with the switching section.

[0012] According to one embodiment, the moving sec-

tion includes an arm section adapted to support the receiving section and the first holding section; and a drive section adapted to drive the arm section. Thus, the bobbin tube can be moved from the first position to the second position in the bobbin holding device.

[0013] A bobbin setting device according to the present invention includes the bobbin holding device described above, and a supply device adapted to receive the bobbin tube from the bobbin holding device and supply the bobbin tube to a target position.

[0014] In the bobbin setting device, the supply device receives the bobbin tube held by the bobbin holding device and supplies the bobbin tube to the target position. The bobbin setting device thus can supply the bobbin tube conveyed by the conveyor to the target position.

[0015] A yarn winding machine according to another further aspect of the present invention includes the bobbin setting device described above; a conveyor adapted to convey a bobbin tube; and a plurality of yarn winding units, each of the plurality of yarn winding units including a second holding section adapted to rotatably hold the bobbin tube and a winding device adapted to wind a yarn around the bobbin tube held by the second holding section to form a package; wherein the bobbin setting device supplies the bobbin tube to the second holding section, which is a target position, by the supply device.

[0016] In the yarn winding machine, the supply device receives the bobbin tube held by the bobbin holding device and the supply device supplies the bobbin tube to the second holding section. The configuration of the yarn winding machine can be simplified since the supply device supplies the bobbin tube received from the first holding section of the bobbin holding device to the yarn winding unit as it is.

[0017] According to one embodiment, the yarn winding machine further includes a control section adapted to control an operation of the bobbin setting device; wherein the control section may cause the first holding section to hold another bobbin tube conveyed by the conveyor when the supply device is supplying the bobbin tube to the second holding section. Thus, the yarn winding machine can simultaneously perform two operations, and hence can enhance the operation efficiency of the yarn winding machine.

[0018] A yarn winding machine according to another further aspect of the present invention includes the bobbin setting device described above; a conveyor adapted to convey a bobbin tube; a plurality of yarn winding units, each of the plurality of yarn winding units including a second holding section adapted to rotatably hold the bobbin tube and a winding device adapted to wind a yarn around the bobbin tube held by the second holding section to form a package; and a storage section arranged in correspondence to each of the plurality of yarn winding units and adapted to store the bobbin tube supplied from the bobbin setting device; wherein the bobbin setting device moves the bobbin tube from the conveyor to the storage section by a moving section of the bobbin holding device,

and supplies the bobbin tube from the storage section to the second holding section, which is the target position, by the supply device.

[0019] The yarn winding machine includes a storage section adapted to store the bobbin tube supplied from the bobbin setting device. Thus, in the yarn winding machine, the bobbin tube can be supplied from the storage section to the second holding section, and hence the operation efficiency can be enhanced.

[0020] A yarn winding machine according to another further aspect of the present invention includes the bobbin setting device described above; a conveyor adapted to convey a bobbin tube; and a plurality of yarn winding units, each of the plurality of yarn winding units including a second holding section adapted to rotatably hold the bobbin tube and a winding device adapted to wind a yarn around the bobbin tube held by the second holding section to form a package; wherein the bobbin holding device is arranged in each of the plurality of yarn winding units.

[0021] The yarn winding machine has the bobbin holding device arranged in each of the plurality of yarn winding units. Thus, the yarn winding machine can receive the bobbin from the conveyor when the bobbin tube is necessary in each yarn winding unit.

[0022] According to the present invention, the bobbin tube conveyed by the conveyor can be directly held.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

FIG. 1 is a side view of a spinning machine, which is a yarn winding machine, according to one embodiment;

FIG. 2 is a view illustrating a configuration of the spinning machine;

FIG. 3(a) is a view illustrating a first state of the bobbin holding device, and FIG. 3(b) is a view illustrating a second state of the bobbin holding device;

FIG. 4 is a view illustrating an operation of the bobbin holding device; and

FIG. 5 is a view illustrating the operation of the bobbin holding device.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0024] Preferred embodiments of the present invention will be hereinafter described in detail with reference to the accompanying drawings. The same reference numerals are denoted on the same or corresponding elements in the description of the drawings, and the redundant description will be omitted.

[0025] As illustrated in FIGS. 1 and 2, a spinning machine (yarn winding machine) 10 includes a plurality of spinning units (yarn winding units) 1, a bobbin preparing device 60, a belt conveyor 70, a doffing device (bobbin setting device) 100, and a machine control device (con-

trol section) 140. The plurality of spinning units 1 are arranged to be adjacent to each other along a predetermined direction. As illustrated in FIG. 2, the machine control device 140 comprehensively manages each of the spinning units 1, the bobbin preparing device 60, the belt conveyor 70, and the doffing device 100.

[0026] As illustrated in FIG. 1, the spinning unit 1 spins a fiber bundle F fed from a draft device 2 with a spinning device 3 to produce a yarn Y, and winds the produced yarn Y with a winding device 4 to form a package P. In the present embodiment, an upstream in a traveling direction of the yarn Y is simply referred to as upstream, and a downstream in the traveling direction of the yarn Y is simply referred to as downstream. In the present embodiment, a side (right side in the plane of drawing of FIG. 1) on which a passage for an operator is provided with respect to the spinning machine 10 is referred to as a front side, and the opposite side is referred to as a back side. An upper side in a machine height direction is simply referred to as an upper side, and a lower side in the machine height direction is simply referred to as a lower side.

[0027] The spinning unit 1 includes the draft device 2, the spinning device 3, a yarn accumulating device 5, a yarn monitoring device 6, and the winding device 4 in such order from the upstream along a traveling path of the yarn Y. The spinning unit 1 includes a yarn joining device 9. Each section of the spinning unit 1 is controlled by a unit controller provided for each spinning unit 1.

[0028] The draft device 2 is adapted to draft a sliver S to produce the fiber bundle F. The draft device 2 includes a back roller pair 21, a third roller pair 22, a middle roller pair 23 provided with apron belts 25, and a front roller pair 24 in order from the upstream. Each roller pair 21, 22, 23, 24 feeds the sliver S supplied from a can (not illustrated) from the upstream toward the downstream while drafting.

[0029] As illustrated in FIG. 1, the spinning device 3 is adapted to spin the fiber bundle F produced in the draft device 2 with a whirling airflow to produce the yarn Y. Specifically (although not illustrated), the spinning device 3 includes a fiber guiding section, a whirling airflow generating nozzle, and a hollow guide shaft body. The fiber guiding section is adapted to guide the fiber bundle F fed from the draft device 2 to a spinning chamber in the spinning device 3. The whirling airflow generating nozzle is arranged at a periphery of a path of the fiber bundle F to generate the whirling airflow in the spinning chamber. Thus, the fiber end is inverted and whirled in the spinning chamber. The hollow guide shaft body is adapted to guide the spun yarn Y from the spinning chamber to outside the spinning device 3. The yarn Y produced by the spinning device 3 is nipped by a delivery roller 7 and a nip roller 8, and fed toward the yarn accumulating device 5. The delivery roller 7 and the nip roller 8 may be omitted, and the yarn Y may be pulled out from the spinning device 3 by the yarn accumulating device 5.

[0030] The yarn accumulating device 5 includes a yarn accumulating roller 51, a drive motor 52, and a yarn hook-

ing member 53. The drive motor 52 rotates the yarn accumulating roller 51. The yarn hooking member 53 winds the yarn Y around the yarn accumulating roller 51. The yarn accumulating device 5 winds the yarn Y around the yarn accumulating roller 51 to temporarily accumulate the yarn Y.

[0031] The yarn hooking member 53 is supported in a relatively rotatable manner with respect to the yarn accumulating roller 51. A permanent magnet is attached to one of the yarn accumulating roller 51 or the yarn hooking member 53, and a magnetic hysteresis material is attached to the other component. Such magnetic means generates a torque counteracting the relative rotation of the yarn hooking member 53 with respect to the yarn accumulating roller 51. Therefore, only when a force exceeding the torque is applied on the yarn hooking member 53 (when a tension greater than or equal to a predetermined value is applied on the yarn Y), the yarn hooking member 53 is relatively rotated with respect to the yarn accumulating roller 51, and the yarn Y wound around the yarn accumulating roller 51 is unwound. When a force exceeding the torque is not applied on the yarn hooking member 53, the yarn hooking member 53 is integrally rotated with the yarn accumulating roller 51, and the yarn Y is wound around the yarn accumulating roller 51.

[0032] Therefore, the yarn accumulating device 5 unwinds the yarn Y when the tension of the yarn Y rises at the downstream of the yarn accumulating device 5, and accumulates the yarn Y when the tension of the yarn Y lowers (when the yarn Y starts to slacken) at the downstream of the yarn accumulating device 5. Thus, the yarn accumulating device 5 can resolve the slackening of the yarn Y and apply an appropriate tension on the yarn Y. Furthermore, the yarn accumulating device 5 can absorb the fluctuation in the tension of the yarn Y at the downstream of the yarn accumulating device 5, and prevent the fluctuation of the tension from influencing the traveling of the yarn Y at the upstream of the yarn accumulating device 5.

[0033] A first guide 11 is arranged in proximity to the upstream of the yarn accumulating device 5. The first guide 11 guides the yarn Y to the yarn accumulating device 5. A pair of second guide 12 and third guide 13 is arranged in proximity to the downstream of the yarn accumulating device 5. The pair of second guide 12 and third guide 13 stabilizes the behavior of the yarn Y unwound from the yarn accumulating device 5. The first guide 11 and the second guide 12 are movable to draw the yarn Y toward the yarn accumulating device 5 when performing a yarn joining operation, and the like.

[0034] The winding device 4 is adapted to wind the yarn Y produced by the spinning device 3 to form the package P. The winding device 4 includes a cradle arm 41, a winding drum 42, and a yarn pull-out device 43.

[0035] The cradle arm (second holding section) 41 is adapted to rotatably hold a bobbin T for winding the yarn Y. The cradle arm 41 can be swung to the upper side and the lower side with a basal end as a center, and is

biased to swing toward the lower side with the basal end as the center. Thus, the cradle arm 41 can bring the package P into contact with the winding drum 42 at an appropriate pressure even if the yarn Y is wound around the bobbin T and the diameter of the package P gradually becomes large.

[0036] When a drive force of the drive motor (not illustrated) is transmitted, the winding drum 42 is rotated while making contact with an outer circumferential surface of the bobbin T or the package P. A traverse groove for traversing the yarn Y at a predetermined width is formed on an outer circumferential surface of the winding drum 42. Therefore, the winding drum 42 can wind the yarn Y around the bobbin T while traversing the yarn Y to form the package P.

[0037] The yarn pull-out device 43 is arranged in proximity to the upstream of the winding drum 42. The yarn pull-out device 43 is adapted to generate an airflow so as to flow toward the lower side along the outer circumferential surface of the package P when performing the yarn joining operation, and the like. Thus, the yarn pull-out device 43 can pull out the yarn Y from the package P, and guide the yarn Y from the package P to a fourth guide 16 arranged in proximity to the upstream of the yarn pull-out device 43. A downstream yarn conveying section 93 of the yarn joining device 9, to be described later, is thus swung toward the upper side with a basal end 93a as a center to cause a distal end 93b to be positioned in proximity to the upstream of the fourth guide 16, thus catching the yarn Y from the package P with a suction airflow.

[0038] The yarn monitoring device 6 is adapted to monitor the thickness of the traveling yarn Y with an optical sensor. When detecting a yarn defect (area with abnormality in thickness, and the like of the yarn Y), the yarn monitoring device 6 transmits a yarn defect detection signal to the unit controller. Upon receiving the yarn defect detection signal, the unit controller operates a cutter 14 arranged in proximity to the upstream of the yarn monitoring device 6 and causes the cutter 14 to cut the yarn Y. The yarn monitoring device 6 is not limited to the optical sensor, and may be, for example, a capacitance type sensor, and the like. The yarn monitoring device 6 may detect foreign substances contained in the yarn Y. Instead of arranging the cutter 14 separate from the yarn monitoring device 6, the yarn monitoring device 6 may include the cutter. The cutter 14 may be omitted, and a spinning operation by the spinning device 3 may be stopped to cut the yarn Y.

[0039] As illustrated in FIG. 1, the yarn joining device 9 is adapted to carry out the yarn joining operation of the yarn Y in the spinning unit 1. In other words, when the yarn Y is disconnected between the spinning device 3 and the package P for some reason in the spinning unit 1, the yarn joining device 9 joins the yarn Y from the spinning device 3 and the yarn Y from the package P at a yarn joining position in the spinning unit 1.

[0040] The yarn joining device 9 includes a yarn joining

section 91, an upstream yarn conveying section 92, the downstream yarn conveying section 93, and a carriage main body 97. The carriage main body 97 is movable along a pair of rails 18a, 18b.

[0041] The yarn joining section 91 is a splicer device adapted to carry out the yarn joining operation by twisting the yarn Y from the spinning device 3 and the yarn Y from the package P with the whirling airflow. The yarn joining section 91 is not limited to the splicer device, and may be, for example, a mechanical knotter, and the like.

[0042] The upstream yarn conveying section 92 is adapted to convey the yarn Y from the spinning device 3 to the yarn joining section 91 when the yarn joining section 91 carries out the yarn joining operation in the spinning unit 1. The upstream yarn conveying section 92 is configured to a pipe-form, and is attached to the carriage main body 97 so as to be swingable to the upper side and the lower side with a basal end 92a as a center. When swung toward the lower side with the basal end 92a as the center, the upstream yarn conveying section 92 causes the distal end 92b to be positioned in proximity to the downstream of the delivery roller 7 and the nip roller 8 to catch the yarn Y from the spinning device 3 with the suction airflow. When swung toward the upper side with the basal end 92a as the center, the upstream yarn conveying section 92 conveys the yarn Y from the spinning device 3 to the yarn joining section 91.

[0043] The downstream yarn conveying section 93 is adapted to convey the yarn Y from the package P to the yarn joining section 91 when the yarn joining section 91 carries out the yarn joining operation in each of a first spinning unit 1a and a second spinning unit 1b. The downstream yarn conveying section 93 is configured to a pipe-form, and is attached to the carriage main body 97 so as to be swingable to the upper side and the lower side with the basal end 93a as a center. When swung toward the upper side with the basal end 93a as the center, the downstream yarn conveying section 93 causes the distal end 93b to be positioned in proximity to the upstream of the winding device 4 to catch the yarn Y from the package P with the suction airflow. When swung toward the lower side with the basal end 93a as the center, the downstream yarn conveying section 93 conveys the yarn Y from the package P to the yarn joining section 91.

[0044] The bobbin preparing device 60 (not illustrated in FIG. 1) supplies a bobbin (bobbin tube) T around which the yarn is not wound. For example, the bobbin preparing device 60 is arranged at one end side of the machine in the direction in which the plurality of spinning units 1 are arranged side by side. A plurality of bobbins T is stored in the bobbin preparing device 60. The bobbin preparing device 60 is adapted to supply the bobbin tube to the belt conveyor 70 based on a command of the machine control device 140. When supplying the bobbin T to the belt conveyor 70, the bobbin preparing device 60 supplies the bobbin T while aligning the direction of the bobbin T to a predetermined direction. The bobbin T has a substantially circular truncated cone shape (cone shape) that is ta-

pered from one end (large diameter end) toward the other end (small diameter end), and has a hollow structure. In the conveying direction of the belt conveyor 70, the bobbin preparing device 60 supplies the bobbin T to the belt conveyor 70 with one end side (end with larger diameter) of the bobbin T on the front.

[0045] The belt conveyor 70 is adapted to convey the bobbin T supplied from the bobbin preparing device 60. The belt conveyor 70 is extended along the direction in which the plurality of spinning units 1 are arranged side by side, and is arranged at the upper part on the back side of the spinning machine 10 in the machine. As illustrated in FIG. 1, the belt conveyor 70 includes a pair of guides 72a, 72b adapted to prevent the dropping of the bobbin T. When the bobbin T is supplied from the bobbin preparing device 60, the belt conveyor 70 conveys the bobbin T up to a stopping position of the doffing device 100. The belt conveyor 70 is operated based on the command of the machine control device 140.

[0046] As illustrated in FIG. 1, the doffing device 100 travels the upper side of the spinning unit 1 along the rail R arranged in the machine, and stops at the position of the spinning unit 1 of the fully wound package P to carry out the doffing operation. The rail R is extended along the direction in which the spinning units 1 are arranged side by side, and is arranged at the upper part on the front side of the spinning machine 10. The doffing device 100 includes a bobbin holding device 110 and a bobbin replacing device 130. The bobbin holding device 110 and the bobbin replacing device 130 are operated based on a command of the machine control device 140.

[0047] The bobbin holding device 110 receives and holds the bobbin T conveyed by the belt conveyor 70, and supplies the bobbin T to the bobbin replacing device 130. As illustrated in FIGS. 3 to 5, the bobbin holding device 110 includes a receiving section 112, a bobbin holding section (first holding section) 114, an air cylinder (switching section) 116, an arm section (moving section) 118, and a drive section (moving section) 120.

[0048] The receiving section 112 receives the bobbin T conveyed by the belt conveyor 70. The receiving section 112 is a plate-shaped member, and has a receiving surface 112s adapted to receive the bobbin T (to make contact with the bobbin T). The receiving surface 112s is greater than the diameter of the bobbin T. As illustrated in FIG. 3, when the bobbin T is conveyed by the belt conveyor 70, the receiving section 112 waits on the belt conveyor 70 so that a plane direction of the receiving surface 112s intersects (becomes orthogonal with) the conveying direction.

[0049] The bobbin holding section 114 directly holds the bobbin T. The bobbin holding section 114 is arranged on the receiving surface 112s side of the receiving section 112. The bobbin holding section 114 is positioned in an internal space K of the bobbin T to hold the bobbin T from the inner side. The bobbin holding section 114 includes a pair of holding portions 114a, 114b, an elastic portion 114c, and a displacement portion 114d. The holding por-

tions 114a and 114b are, for example, column-shaped members, and are arranged on an edge side of the receiving surface 112s of the receiving section 112. The holding portions 114a and 114b are arranged to extend substantially parallel to each other with a predetermined interval in the receiving section 112. The holding portions 114a and 114b are arranged to freely move in a direction of approaching to each other and a direction of separating from each other in the receiving section 112. When moving in the direction of approaching to each other, the movement of the pair of holding portions 114a and 114b is limited after reaching smaller than or equal to a predetermined interval so as not to move any further. The holding portions 114a and 114b are supported by the receiving section 112 in a freely swinging manner, and may be configured to swing with a shaft on the basal end side as the center. According to such configuration as well, the pair of holding portions are arranged to freely move in the direction of approaching to each other and the direction of separating from each other.

[0050] The elastic portion 114c is attached to the holding portions 114a and 114b. The elastic portion 114c is, for example, a rubber, a coil spring, and the like, and has an annular shape. The elastic portion 114c is arranged to surround the holding portions 114a and 114b at the basal end side of the holding portions 114a and 114b. The elastic portion 114c biases the pair of holding portions 114a and 114b in a direction of approaching each other.

[0051] The displacement portion 114d is arranged between the pair of holding portions 114a and 114b. The displacement portion 114d has, for example, a substantially circular truncated cone shape. The displacement portion 114d is arranged such that the diameter becomes smaller toward the receiving section 112. A piston rod 116a of the air cylinder 116 is coupled to the displacement portion 114d. The displacement portion 114d displaces to a position (FIG. 3(a)) spaced apart from the receiving section 112 and a position (FIG. 3 (b)) close to the receiving section 112 according to the movement of the piston rod 116a. When moved by the receiving section 112, a diameter of the displacement portion 114d gradually becomes larger with respect to the pair of holding portions 114a and 114b making contact with the side surfaces of the displacement portion 114d, so that the displacement portion 114d moves the pair of holding portions 114a and 114b in the direction of separating away from each other.

[0052] In the bobbin holding section 114, the holding and the releasing of the bobbin T by the holding portions 114a and 114b are carried out by the displacement of the displacement portion 114d. As illustrated in FIG. 3(a), in the bobbin holding section 114, when the displacement portion 114d is at a position spaced apart from the receiving section 112, the pair of holding portions 114a and 114b are positioned at a predetermined position (initial position) by the elastic portion 114c, and an inner surface Ts of the bobbin T and the pair of holding portions 114a

and 114b are spaced apart (first state). In this case, the bobbin holding section 114 does not hold the bobbin T. As illustrated in FIG. 3(b), in the bobbin holding section 114, when the displacement portion 114d is at the position close to the receiving section 112, the pair of holding portions 114a and 114b are moved by the displacement portion 114d in the direction of separating away from each other, and the inner surface Ts of the bobbin T and the pair of holding portions 114a and 114b are brought into contact (second state). In this case, the bobbin holding section 114 holds the bobbin T. The bobbin holding section 114 is switched to the first state of not holding the bobbin T and the second state of holding the bobbin T according to the operation of the piston rod 116a.

[0053] The arm section 118 is coupled to the receiving section 112, and is adapted to support the receiving section 112 and the bobbin holding section 114. The arm section 118 is, for example, a column-shaped member. One end of the arm section 118 is coupled to the receiving section 112, and the other end is coupled to the drive section 120. As illustrated in FIG. 4, the arm section 118 is swung with a shaft 118a as the center by the drive section 120 (e. g. , motor) . When the arm section 118 is swung, the receiving section 112 and the bobbin holding section 114 are moved together to a first position of receiving the bobbin T conveyed by the belt conveyor 70 with the receiving section 112, and a second position (position different from the first position) of transferring the bobbin T to a gripper (supply device) 132, to be described later.

[0054] As illustrated in FIG. 5, the arm section 118 is swung and positioned at the position of transferring the bobbin T to the gripper 132, and furthermore, when the bobbin T is gripped by the gripper 132 and the holding of the bobbin T by the bobbin holding section 114 is released (when the bobbin holding section 114 is in the first state), the bobbin holding section 114 is moved (swung) in a direction (right side in FIG. 5) of separating away from the bobbin T (grripper 132) with a shaft 118b as the center by the drive section (not illustrated).

[0055] A description will now be made on the operation of the bobbin holding device 110 having the configuration described above. When the bobbin T is supplied from the bobbin preparing device 60, the bobbin holding device 110 positions the receiving section 112 on the belt conveyor 70 to wait there, as illustrated in FIG. 3. In this case, the displacement portion 114d of the bobbin holding section 114 is positioned spaced apart from the receiving section 112, and the bobbin holding section 114 is in the first state of not holding the bobbin T. When the bobbin T is conveyed by the belt conveyor 70, the bobbin holding device 110 receives the bobbin T with the receiving section 112. The bobbin holding section 114 is positioned in an internal space K of the bobbin T in this case.

[0056] After the bobbin holding section 114 is positioned in the internal space K of the bobbin T, the bobbin holding device 110 contracts the piston rod 116a of the air cylinder 116. The bobbin holding section 114 is then

switched to the second state of holding the bobbin T. Thus, the pair of holding portions 114a and 114b of the bobbin holding section 114 is brought into contact with the inner surface Ts of the bobbin T, whereby the bobbin holding section 114 holds the bobbin T. As illustrated in FIGS. 1 and 4, when the bobbin holding section 114 holds the bobbin T, the bobbin holding device 110 swings the arm section 18 by means of the drive section 120, and moves the receiving section 112 and the bobbin holding section 114 from the first position on the belt conveyor 70 to the second position. The bobbin T is gripped by the gripper 132 at the second position, and the bobbin holding device 110 releases the bobbin T from the bobbin holding section 114. After releasing the bobbin T, the bobbin holding device 110 swings the arm section 118 with the shaft 118b as the center by means of the drive section 120 and removes the bobbin holding section 114 from the internal space K of the bobbin T, as illustrated in FIG. 5.

[0057] As illustrated in FIG. 1, the bobbin replacing device 130 includes the gripper (supply device) 132. The gripper 132 receives the bobbin T held by the bobbin holding device 110, and sets the bobbin T in the cradle arm 41. The gripper 132 is arranged to be swingable around the shaft 132a as the center, and is adapted to be swung in a downward direction to move to the second position of the bobbin holding section 114 of the bobbin holding device 110 to grip the bobbin T with a chuck nail 132b provided at the distal end. The gripper 132 is further swung in the downward direction from the position of receiving the bobbin T from the bobbin holding section 114 to arrange the bobbin T at a predetermined position (target position) of the cradle arm 41.

[0058] In addition to the gripper 132, the bobbin replacing device 130 includes a yarn catching device, an opener, and a yarn guiding lever, all of which are not illustrated. The yarn catching device is adapted to pull up the yarn Y to the upper side of the winding drum 42 and interpose the yarn Y between the cradle arm 41. The opener is adapted to make contact with a cradle lever (not illustrated) arranged in the cradle arm 41 and open/close the cradle arm 41 through the cradle lever to enable doffing of the package P and attachment of the bobbin T. The yarn guiding lever is adapted to guide the yarn Y pulled up by the yarn catching device so as to be sandwiched between the large diameter end of the bobbin T and a bobbin holder (not illustrated).

[0059] Next, a description will be made on the operation of the doffing device 100.

[0060] When the package P rotated at high speed by the winding drum 42 is fully wound, the spinning unit 1 operates the cutter 14 to cut the yarn Y and terminates the winding operation of the package P. At the same time as the operation of the spinning unit 1, the doffing device 100 travels along the rail R and stops at immediately above the fully wound package P of the spinning unit 1. The bobbin preparing device 60 supplies the bobbin T to the belt conveyor 70.

[0061] When the doffing device 100 is stopped at immediately above the fully wound package P, the bobbin replacing device 130 of the doffing device 100 pivots the opener to open the cradle arm 41 and detach (doff) the package P. The package P is mounted on a conveying device (not illustrated) by way of a package guide (not illustrated) and conveyed to a predetermined place.

[0062] The bobbin replacing device 130 detaches (doffs) the package P from the cradle arm 41, and then again opens the cradle arm 41 with the opener. The yarn catching device of the bobbin replacing device 130 catches the yarn Y spun out from the spinning device 3, and pulls the yarn Y up to the vicinity of the winding device 4. The bobbin replacing device 130 guides the yarn Y to a bunch winding position with the yarn guiding lever. After the yarn guiding lever guides the yarn Y to the bunch winding position, the bobbin replacing device 130 swings the gripper 132 toward the winding drum 42. When the bobbin replacing device 130 pulls up the yarn Y to the vicinity of the winding device 4, a seed yarn is pulled out from a seed yarn bobbin (not illustrated) held by the bobbin replacing device 130, the seed yarn and the yarn Y from the spinning device 3 are joined with the yarn joining section 91, the yarn Y is caught by the yarn catching device of the bobbin replacing device 130, and the yarn Y is pulled up to the vicinity of the winding device 4.

[0063] As illustrated in FIG. 3, after receiving the bobbin T conveyed by the belt conveyor 70 at the first position, the bobbin holding device 110 of the doffing device 100 causes the bobbin T to be held by the bobbin holding section 114, and positions the bobbin holding section 114 at the second position (transfer position) of transferring the bobbin T to the gripper 132, as illustrated in FIG. 4. When the bobbin T is gripped by the chuck nail 132b of the gripper 132 at the transfer position, the bobbin holding device 110 removes the bobbin holding section 114 from the internal space K of the bobbin T, as illustrated in FIG. 5.

[0064] When the bobbin T is gripped by the gripper 132, the machine control device 140 issues a command to the bobbin preparing device 60 to supply a new bobbin T to the belt conveyor 70. The machine control device 140 then issues a command to the bobbin holding device 110 to hold the bobbin T newly conveyed by the belt conveyor 70. The bobbin holding device 110 receives the new bobbin T and holds the bobbin T based on such command. The bobbin holding device 110 can transfer the holding bobbin T to the gripper 132 in the next doffing operation.

[0065] After the gripper 132 grips the bobbin T held by the bobbin holding device 110, the gripper 132 arranges the bobbin T between the bobbin holder of the cradle arm 41 opened by the opener. The bobbin replacing device 130 closes the cradle arm 41 with the bobbin T making contact with the winding drum 42. As a result, the bobbin T is sandwiched in a freely rotating manner by the bobbin holder of the cradle arm 41. Thus, the yarn Y is sandwiched by the large diameter end of the bobbin T and

the bobbin holder to be in a state the bunch winding can be carried out.

[0066] After a series of operations from the doffing of the package P by the doffing device 100 to the attachment of the bobbin T is terminated, the spinning unit 1 carries out the bunch winding, and then rotates the bobbin T at high speed while traversing the yarn Y in the axial direction of the bobbin T by the winding drum 42 to start the winding of the package P.

[0067] As described above, the bobbin holding device 110 of the spinning machine 10 of the present embodiment receives the bobbin T conveyed by the belt conveyor 70 with the receiving section 120 and directly holds the bobbin T with the bobbin holding section 114. The bobbin holding device 110 thus can directly hold the bobbin T conveyed by the belt conveyor 70. Furthermore, the bobbin holding device 110 moves the receiving section 112 and the bobbin holding section 114 together to the first position of receiving the bobbin T and the second position different from the first position by means of the arm section 118 and the drive section 120. The bobbin holding device 110 thus moves the bobbin holding section 114 to the second position of supplying the bobbin T to the gripper 132 with the arm section 118 and the drive section 120 to directly supply the bobbin T to the gripper 132. Therefore, the spinning machine 10 does not need to separately have the configuration of receiving the bobbin T and the configuration of moving the bobbin T from the belt conveyor 70, whereby the configuration can be simplified.

[0068] In the present embodiment, the bobbin holding section 114 is positioned in the internal space K of the hollow bobbin T to hold the bobbin T from the inner side of the bobbin T. The bobbin T is, for example, formed to a tubular shape with paper. Therefore, if the bobbin T is gripped from the outer circumferential surface side, the bobbin T may be crushed. The bobbin holding section 114 is thus positioned on the inner side of the bobbin T to hold the bobbin T. The bobbin T has a strength with respect to the force applied from the inner side. Therefore, the bobbin holding section 114 can hold the bobbin T without crushing the bobbin T. Normally, when the bobbin T is conveyed by the belt conveyor 70, the bobbin T is conveyed in a laid state (state in which at least a part of the outer circumferential surface of the bobbin T is brought into contact with the belt conveyor 70). Thus, the bobbin holding device 110 can receive the end (end face) of the bobbin T with the receiving section 112, and at the same time, position the bobbin holding section 114 in the internal space K of the bobbin T.

[0069] In the present embodiment, the bobbin holding device 110 includes the air cylinder 116 adapted to switch the bobbin holding section 114 to the first state of not holding the bobbin T and the second state of holding the bobbin T. The bobbin holding section 114 does not make contact with the inner surface Ts of the bobbin T in the first state, and makes contact with the inner surface Ts of the bobbin T in the second state. Thus, the bobbin

holding device 110 can carry out the holding and the releasing of the bobbin T by switching the state of the bobbin holding section 114 with the air cylinder 116.

[0070] In the present embodiment, the machine control device 140 has the bobbin holding section 114 hold another bobbin T conveyed by the belt conveyor 70 while supplying the bobbin T to the cradle arm 41 of the winding device 4 by the gripper 132. Thus, the spinning machine 10 simultaneously performs two operations, and hence can enhance the operation efficiency. The bobbin holding device 10 can immediately transfer the holding bobbin T held by the bobbin holding section 114 to the gripper 132 in the next doffing operation. Therefore, the spinning machine 10 can rapidly carry out the doffing operation.

[0071] The present invention is not limited to the embodiment described above. For example, in the embodiment described above, the spinning machine 10 is described as the yarn winding machine by way of example, but the yarn winding machine may be an automatic winder.

[0072] In the embodiment described above, the configuration in which the bobbin holding device 110 is arranged in the doffing device 100 is described by way of example, but the bobbin holding device 110 may be arranged in each spinning unit 1.

[0073] In the embodiment described above, the air cylinder 116 is described as the switching section of the bobbin holding device 110 by way of example, but the switching section is not limited to the air cylinder and may be other mechanisms.

[0074] In the embodiment described above, the configuration in which the bobbin T is gripped by the gripper 132, and after the bobbin holding section 114 releases the bobbin T, the bobbin holding section 114 is removed from the internal space K of the bobbin T is described by way of example, but a configuration in which the bobbin T is moved in a direction of being extracted from the bobbin holding section 114 by the gripper 132 to remove the bobbin holding section 114 from the internal space K of the bobbin T may be adopted.

[0075] In the embodiment described above, the configuration in which the bobbin holding device 110 receives the new bobbin T and sets the bobbin T in the cradle arm 41 in the doffing operation is described by way of example, but the reception of the new bobbin T by the doffing device 100 may be carried out when the doffing operation is not being carried out, that is, during standby.

[0076] In the embodiment described above, the configuration in which the bobbin holding section 114 is positioned in the internal space K of the bobbin T to hold the bobbin T is described by way of example, but the method of holding the bobbin T is not limited thereto, and merely needs to be a configuration capable of directly holding the bobbin T.

[0077] In the embodiment described above, the configuration in which the bobbin T held by the bobbin holding device 110 is directly transferred with respect to the gripper

132 of the bobbin replacing device 130 is described by way of example, but the bobbin holding device 110 may transfer the bobbin T to a bobbin stocker (storage section) arranged in each spinning unit 1. In this case, the gripper 132 of the bobbin replacing device 130 acquires the bobbin T from the bobbin stocker. Thus, in the yarn winding machine, the bobbin can be supplied from the bobbin stocker to the cradle arm, and hence the operation efficiency can be enhanced. The bobbin holding device 110 may be equipped with the bobbin stocker (storage section).

[0078] In the embodiment described above, the configuration of detaching the fully-wound package P from the cradle arm 41 in the doffing device 100 and conveying the package P is described by way of example, but the doffing device 100 may only have the function of replacing the bobbin T.

[0079] In the embodiment described above, the configuration in which the bobbin T has a circular truncated cone shape (cone shape) is described by way of example, but the shape of the bobbin T may be, for example, a circular column shape (cylindrical shape).

[0080] In the embodiment described above, the case in which the bobbin T is made of paper is described by way of example, but the bobbin T may be made from materials such as plastic, and the like, for example.

Claims

1. A bobbin holding device (110) comprising:

a receiving section (112) adapted to receive a bobbin tube (T) conveyed by a conveyor (70);
a first holding section (114) adapted to directly hold the bobbin tube (T); **characterized by**
a moving section (118, 120) adapted to move the receiving section (112) and the first holding section (114) together to a first position of receiving the bobbin tube (T) conveyed by the conveyor (70) with the receiving section (112) and a second position different from the first position.

2. A bobbin holding device (110) **characterized by**
a receiving section (112) adapted to receive a bobbin tube (T) conveyed by a conveyor (70); and
a first holding section (114) arranged in the receiving section (112) and adapted to directly hold the bobbin tube (T).

3. The bobbin holding device (110) according to claim 2, further **characterized by** a moving section (118, 120) adapted to move the first holding section (114) to a first position of receiving the bobbin tube (T) conveyed by the conveyor (70) with the receiving section (112) and a second position different from the first position.

4. The bobbin holding device (110) according to any one of claims 1 to 3, **characterized in that** the first holding section (114) is positioned in an internal space of the hollow bobbin tube (T) to hold the bobbin tube (T) from an inner side of the bobbin tube (T). 5
5. The bobbin holding device (110) according to claim 4, further comprising a switching section (116) adapted to switch the first holding section (114) to a first state of not holding the bobbin tube (T) and a second state of holding the bobbin tube (T), **characterized in that** the first holding section (114) does not make contact with the inner side of the bobbin tube (T) in the first state, and makes contact with the inner side of the bobbin tube (T) in the second state. 10 15
6. The bobbin holding device (110) according to claim 1 or 3, **characterized in that** the moving section (118, 120) includes an arm section (118) adapted to support the receiving section (112) and the first holding section (114); and a drive section (120) adapted to drive the arm section (118). 20
7. A bobbin setting device (100) comprising: 25
- a bobbin holding device (110) according to any one of claims 1 to 6; and
- a supply device (132) adapted to receive the bobbin tube (T) from the bobbin holding device (110) and supply the bobbin tube (T) to a target position. 30
8. A yarn winding machine (10) comprising: 35
- a bobbin setting device (100) according to claim 7;
- a conveyor (70) adapted to convey a bobbin tube (T); and
- a plurality of yarn winding units (1), each of the plurality of yarn winding units including a second holding section (41) adapted to rotatably hold the bobbin tube (T) and a winding device (4) adapted to wind a yarn around the bobbin tube held by the second holding section (41) to form a package; **characterized in that** 40 45
- the bobbin setting device (100) supplies the bobbin tube (T) to the second holding section (41), which is a target position, by the supply device (132). 50
9. The yarn winding machine (10) according to claim 8, further comprising a control section (140) adapted to control an operation of the bobbin setting device (100), **characterized in that** 55
- the control section (140) causes the first holding section (114) to hold another bobbin tube (T) conveyed by the conveyor (70) while the supply device (132)

is supplying the bobbin tube (T) to the second holding section (41).

10. A yarn winding machine (10) comprising:

a bobbin setting device (100) according to claim 7;

a conveyor (70) adapted to convey the bobbin tube (T);

a plurality of yarn winding units (1), each of the plurality of the yarn winding units including a second holding section (41) adapted to rotatably hold the bobbin tube (T) and a winding device (4) adapted to wind a yarn around the bobbin tube (T) held by the second holding section (41) to form a package; and

a storage section arranged in correspondence to each of the plurality of yarn winding units (1) and adapted to store the bobbin tube (T) supplied from the bobbin setting device (100); **characterized in that**

the bobbin setting device (100) moves the bobbin tube (T) from the conveyor (70) to the storage section by the moving section (118, 120) of the bobbin holding device (110), and

supplies the bobbin tube (T) from the storage section to the second holding section (41), which is a target position, by the supply device (132).

11. A yarn winding machine (10) comprising:

a bobbin holding device (110) according to any one of claims 1 to 6;

a conveyor (70) adapted to convey the bobbin tube (T); and

a plurality of yarn winding units (1), each of the plurality of yarn winding units including a second holding section (41) adapted to rotatably hold the bobbin tube (T) and a winding device (4) adapted to wind a yarn around the bobbin tube (T) held by the second holding section (41) to form a package; **characterized in that**

the bobbin holding device (110) is arranged in each of the plurality of yarn winding units (1).

FIG. 1

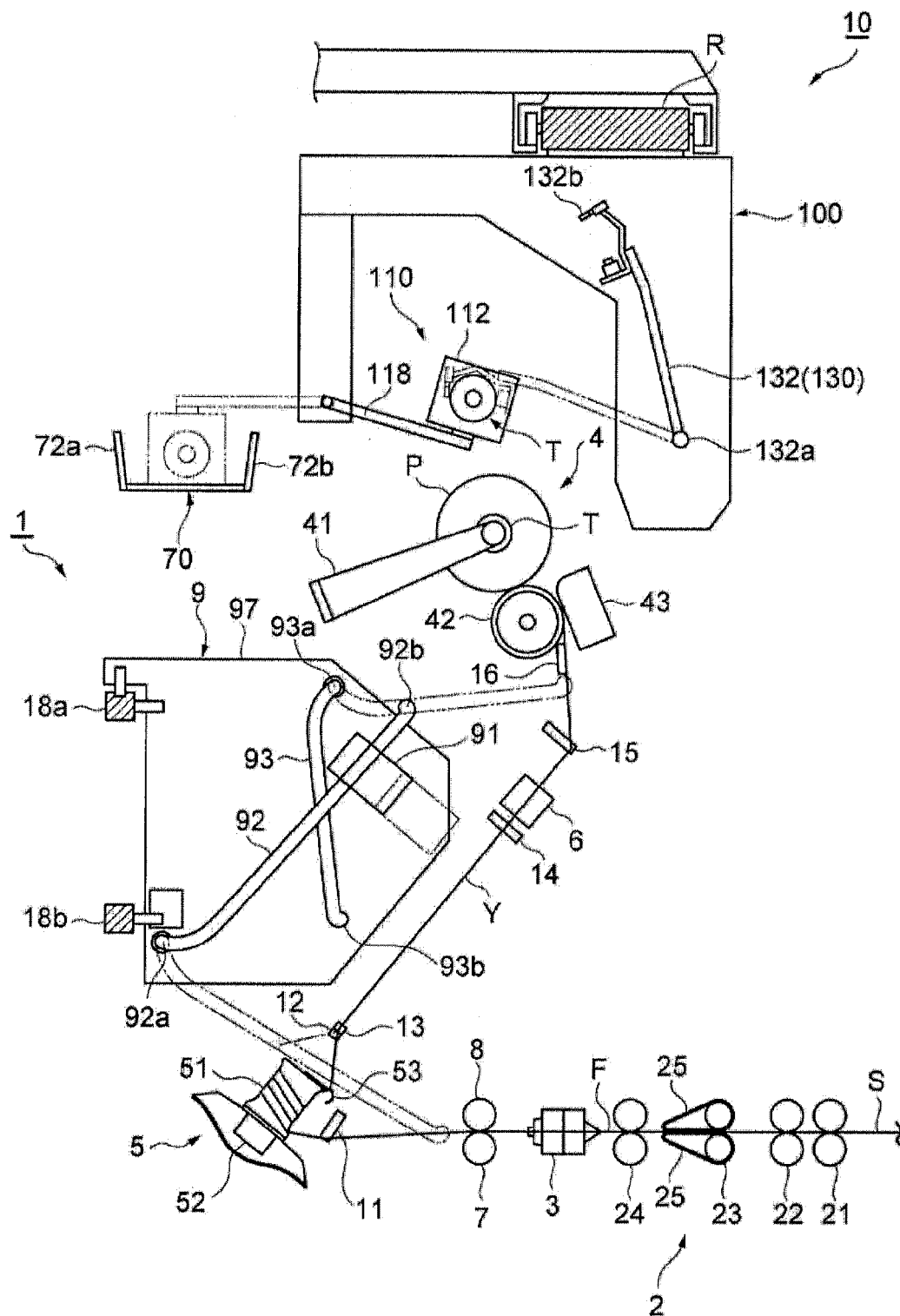


FIG. 2

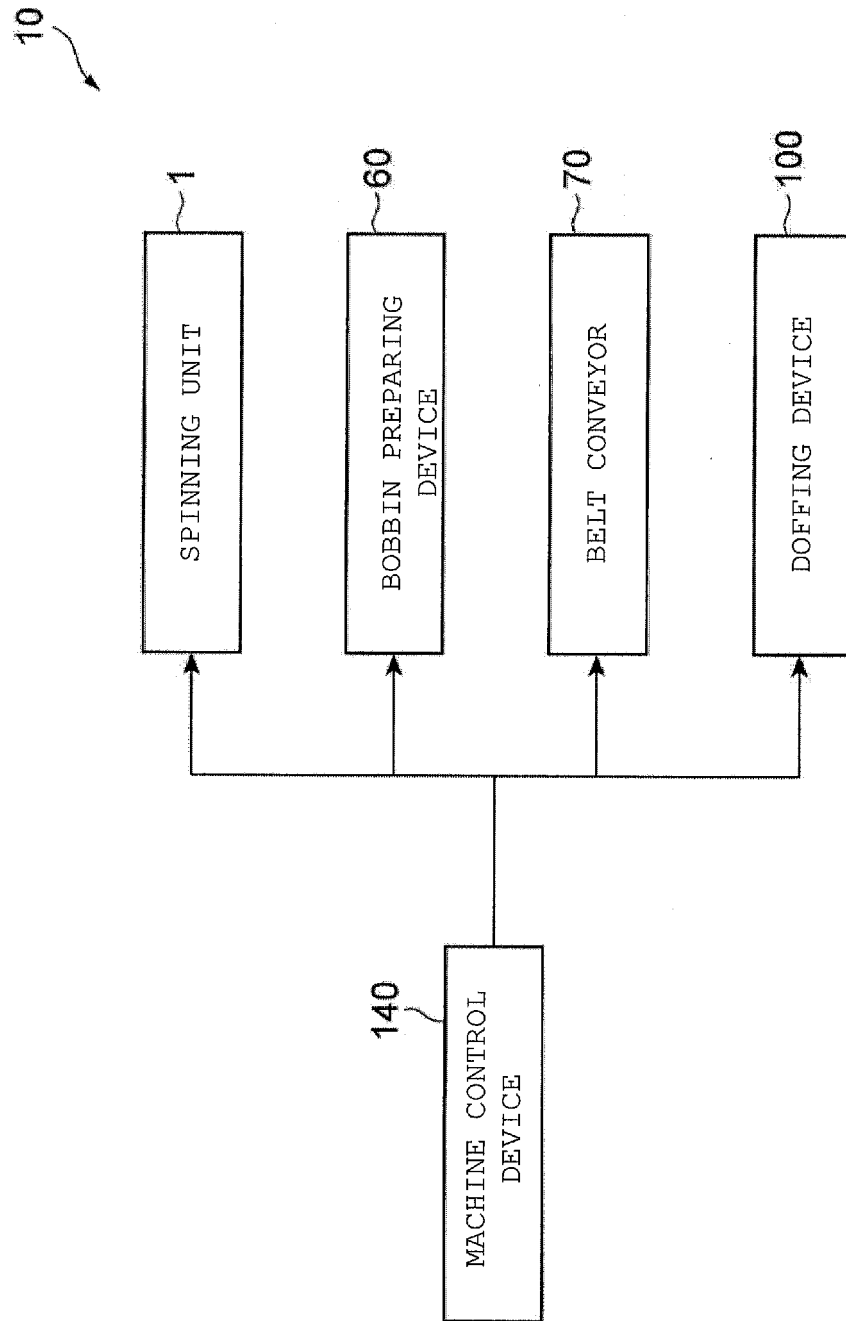


FIG. 3.

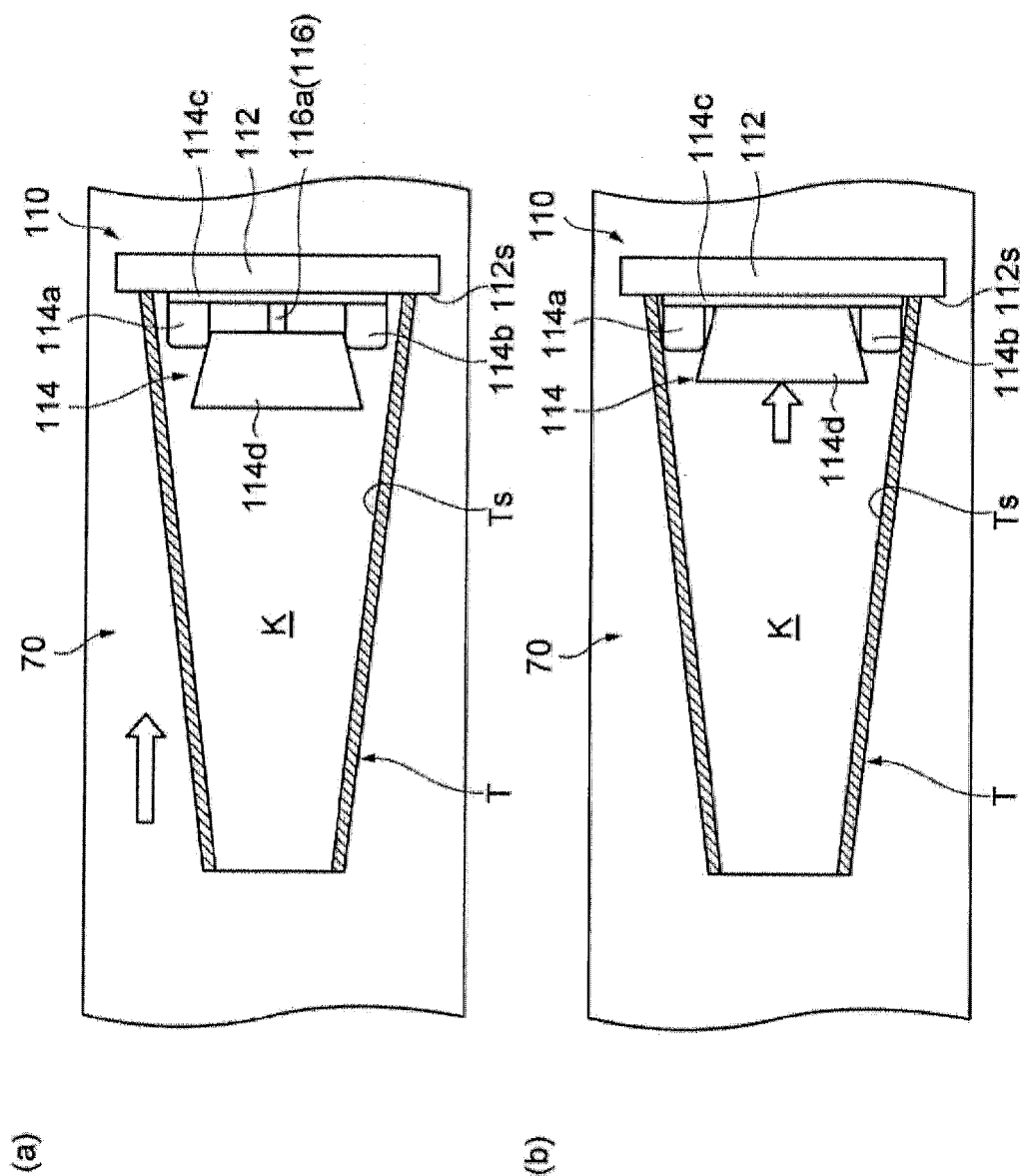


FIG. 4.

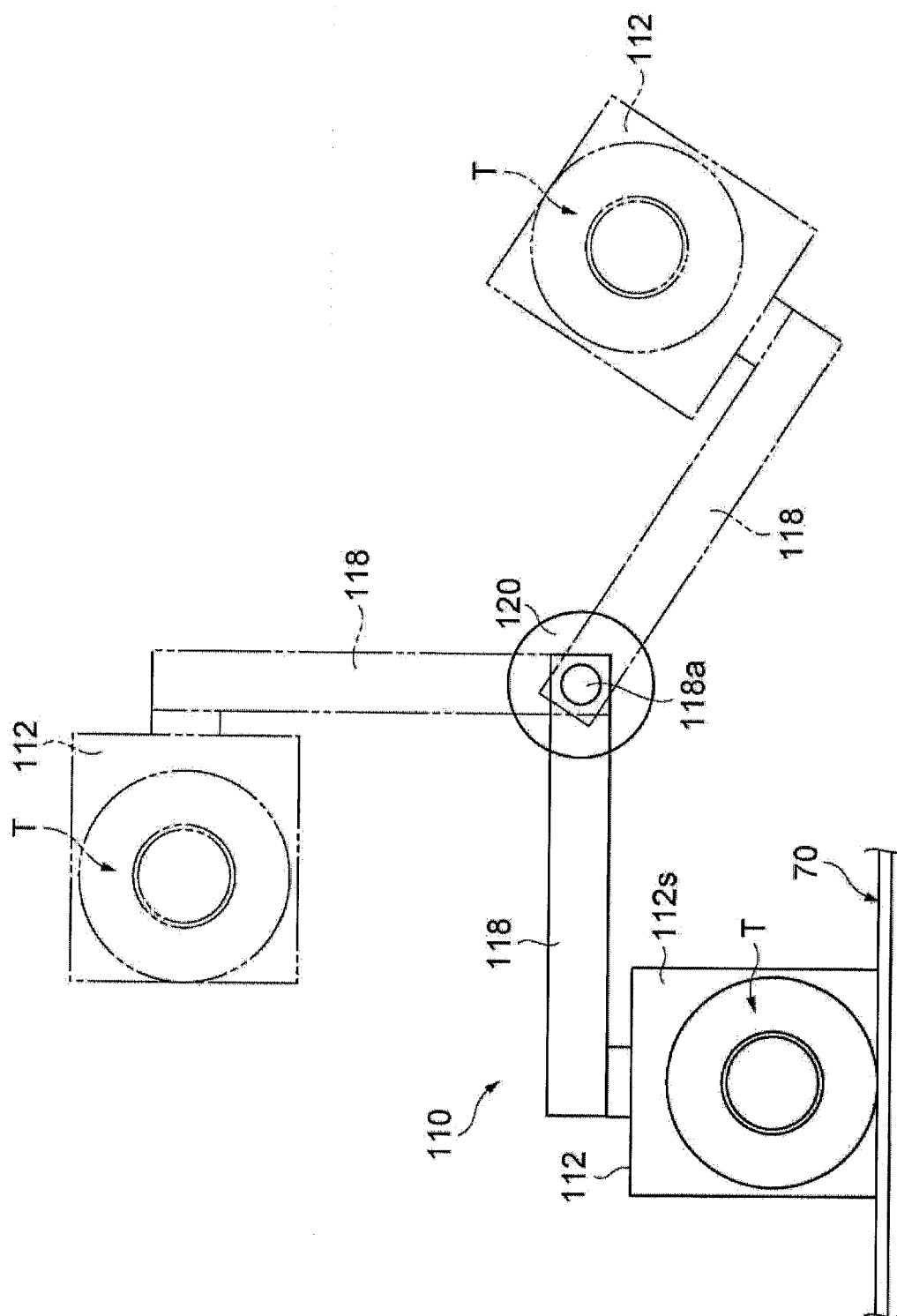
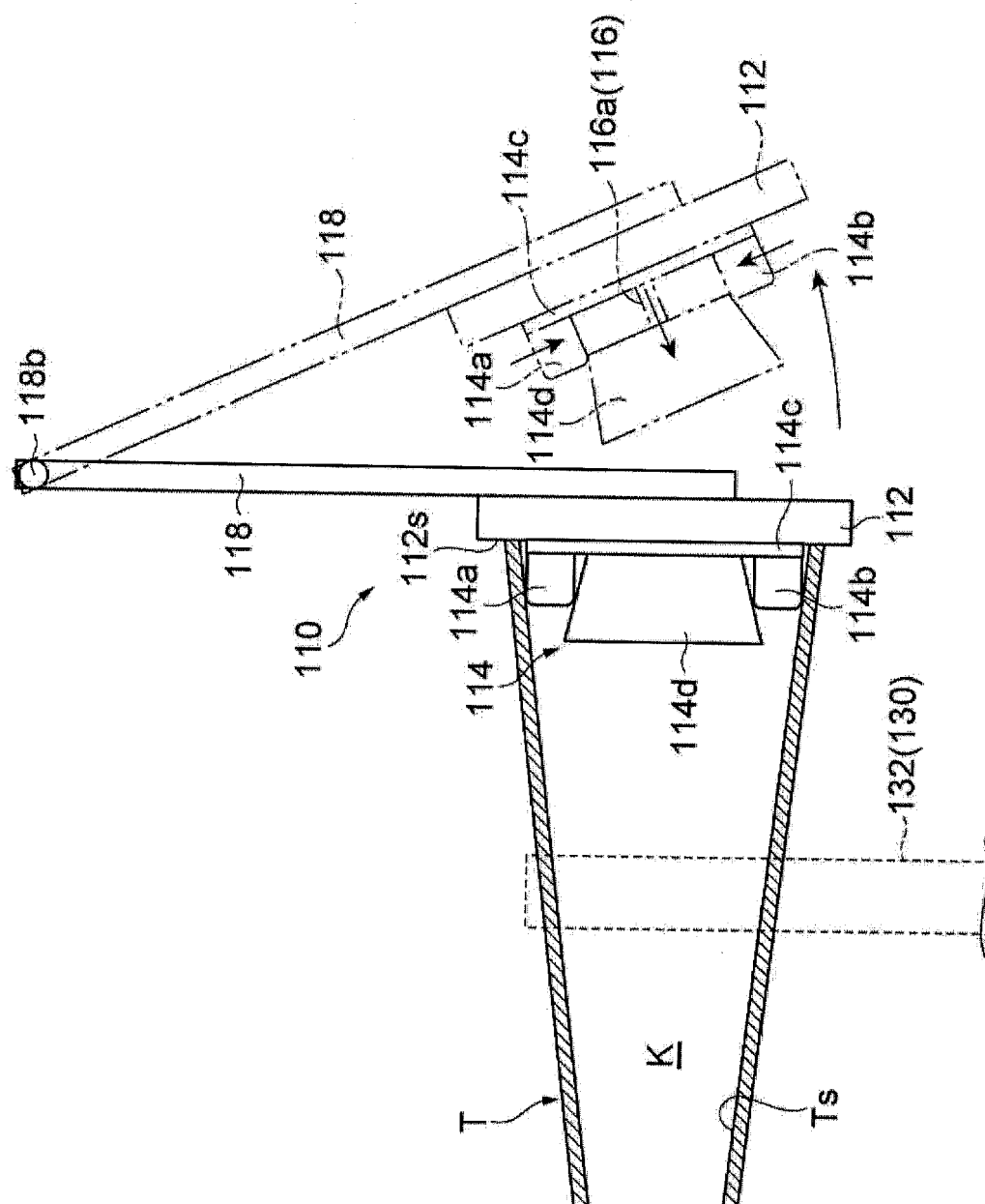


FIG. 5.





EUROPEAN SEARCH REPORT

 Application Number
 EP 14 19 3939

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search The Hague		Date of completion of the search 17 April 2015	Examiner Lemmen, René
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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