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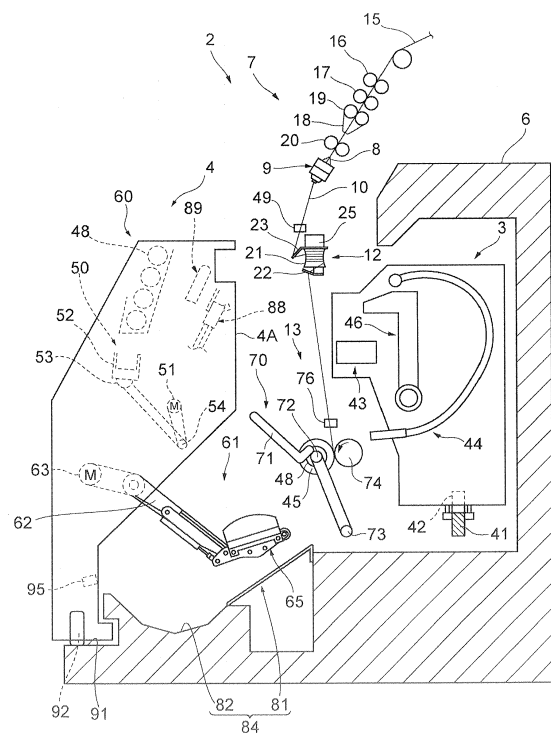
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(54) **Bobbin setting device and yarn winding machine**

(57) A doffing device (60) includes a bobbin holding section (52) adapted to hold a bobbin (48) around which a spun yarn (10) is to be wound and to perform an operation to supply the bobbin (48) to a target position (70) and a doffing device control section (31) adapted to prohibit the supplying operation performed by the bobbin holding section (52) when an obstacle that interferes with the supplying operation exists at the target position (70).

FIG. 2



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

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

2. Description of the Related Art

[0002] Japanese Patent Application Laid-open No. 2012-086923 discloses a yarn winding machine including a doffing device provided with a supplying mechanism adapted to supply a bobbin to a cradle capable of holding the bobbin, and a doffing mechanism adapted to move a fully-wound package, which is formed by winding a yarn around the bobbin, from a cradle to a discharge section.

SUMMARY OF THE INVENTION

[0003] An object of the present invention is to provide a bobbin setting device and a yarn winding machine that are capable of favorably supplying the bobbin.

[0004] This object is achieved by the subject matter as defined in the independent claims.

[0005] The present invention is based on the inventor's finding that in a known doffing device, e.g. a doffing device as described above, when moving the package from the cradle to the discharge section by the doffing mechanism, a state in which the package is not discharged to the discharge section and remains at the cradle occurs in some cases, for example, by a defect in which the bobbin of the package is too fit into the cradle, or the like. In this state, when the supplying mechanism tries to supply the bobbin to the cradle, the supplying mechanism and the package make contact with each other. Consequently, the package remaining at the cradle may be damaged, or the supplying mechanism may be damaged.

[0006] A bobbin setting device according to one aspect of the present invention includes a bobbin holding section adapted to hold a bobbin around which a yarn is to be wound and to perform a supplying operation to supply the bobbin to a target position, and a control section adapted to prohibit the supplying operation performed by the bobbin holding section when an obstacle that interferes with the supplying operation exists at the target position.

[0007] In the bobbin setting device, for example, the control section prohibits the supplying operation performed by the bobbin holding section when a package to be the obstacle exists at the target position, which is the cradle, for example, in other words, when the cradle cannot receive the bobbin. Accordingly, in the bobbin setting device, when the bobbin holding section tries to perform the operation of supplying the bobbin, the bobbin holding section and the obstacle (the package) can be

prevented from making contact with each other. In the bobbin setting device, therefore, when supplying the bobbin to the cradle, the package and/or the bobbin holding section can be prevented from being damaged. Consequently, the bobbin setting device can favorably supply the bobbin.

[0008] In one embodiment, the control section may control the bobbin holding section to supply the bobbin to the target position when the obstacle does not exist at the target position. In this manner, since the control section controls the bobbin holding section to supply the bobbin when the obstacle does not exist at the target position, in other words, for example, when the cradle is capable of receiving the bobbin, the bobbin holding section can supply the bobbin to the target position without making contact with the obstacle. The bobbin setting device thus can favorably supply the bobbin.

[0009] In one embodiment, the bobbin setting device may further include a detecting section adapted to detect the obstacle. The control section may determine a presence and/or an absence of the obstacle at the target position in accordance with a result detected by the detecting section. Accordingly, the control section can accurately determine the presence and/or the absence of the obstacle at the target position and further appropriately control the bobbin holding section. In the bobbin setting device, therefore, the bobbin holding section and the obstacle can be further prevented from making contact with each other.

[0010] In one embodiment, the control section may determine the presence and/or the absence of the obstacle at the target position after a predetermined period of time elapses from an operation performed to remove the package from a package holding section adapted to hold the package, which is formed by winding the yarn around the bobbin. For example, if the determination of the presence and/or the absence of the obstacle is made immediately after the operation is performed to remove the package from the package holding section, a wrong determination that the package is the obstacle may be made in spite of a fact that the package has been removed from the package holding section. The control section thus determines the presence and/or the absence of the obstacle after the predetermined period of time elapses from the operation performed to remove the package from the package holding section. Accordingly, the control section can be prevented from making the wrong determination that the package immediately after having been removed is the obstacle.

[0011] In one embodiment, the bobbin setting device may further include a supporting section adapted to support a package which is formed by winding the yarn around the bobbin, and a moving section adapted to move the supporting section to a standby region, a first position, which is a position where the supporting section receives the package, and a second position, which is a position where the supporting section releases the package received at the first position. The control section may

determine the presence and/or the absence of the obstacle at the target position after the moving section has moved the supporting section from the first position to the standby region. Accordingly, since the determination of the presence and/or the absence of the obstacle is made after the supporting section has been located at the standby region, the control section can be prevented from making the wrong determination that the package supported by the supporting section is the obstacle.

[0012] In one embodiment, the bobbin setting device may further include a notifying section adapted to notify an occurrence of abnormality when the obstacle exists at the target position. Accordingly, the bobbin setting device can notify a worker and the like that a situation in which the operation of supplying the bobbin cannot be performed has occurred.

[0013] A yarn winding machine according to another aspect of the present invention includes the above-described bobbin setting device, a plurality of yarn winding units each adapted to wind the yarn around the bobbin to form a package and including a package holding section adapted to hold the package. The target position is a position where the bobbin is held by the package holding section.

[0014] Accordingly, in the bobbin setting device, when the bobbin holding section tries to perform the operation of supplying the bobbin, the bobbin holding section and the obstacle (the package) can be prevented from making contact with each other. In the yarn winding machine provided with the bobbin setting device, therefore, when the bobbin is supplied to the package holding section, the package and/or the bobbin holding section can be prevented from being damaged. Consequently, the yarn winding machine can favorably supply the bobbin.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

FIG. 1 is a front view illustrating a spinning machine according to an embodiment;

FIG. 2 is a side view illustrating a spinning unit included in the spinning machine of Fig. 1;

FIG. 3 is a block diagram illustrating a configuration of a doffing device;

FIG. 4 is a side view illustrating a state in which a package supporting section is located at a standby position;

FIG. 5 is a side view illustrating a state in which the package supporting section is located at a first position; and

FIG. 6 is a side view illustrating a state in which the package supporting section is located at a second position.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0016] A preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings. In description of the drawings, the same reference numerals are denoted for the same or corresponding elements, and redundant description will be omitted. The dimensional ratios in the drawings do not necessarily match with the description. In the present specification, "upstream" and "downstream" respectively indicate upstream and downstream in a travelling direction of a spun yarn (yarn) 10 at the time of spinning.

[0017] As illustrated in Figs. 1 and 2, a spinning machine (a yarn winding machine) 1 includes a plurality of spinning units 2, a yarn joining vehicle 3, a doffing vehicle 4, a blower box 5A, a motor box 5B, and a machine control device 30 (see Fig. 3). The blower box 5A accommodates, for example, an air suction source adapted to generate suction flow in each section of the spinning unit 2 and/or an air supply source adapted to generate whirling flow in each section of the spinning unit 2. The motor box 5B accommodates, for example, a motor adapted to supply power to each section of the spinning unit 2. The machine control device 30 is adapted to perform various types of control processing in the spinning machine 1.

[0018] First, the spinning unit 2 will be described. The plurality of spinning units 2 are arranged in a row. Each of the spinning units 2 is adapted to produce the spun yarn 10 and to wind the produced spun yarn 10 around a package 45. Each spinning unit 2 includes as main components, a drafting device 7, a spinning device 9, a yarn accumulating device 12, and a winding device 13 in this order from upstream to downstream. Each spinning unit 2 includes a unit controller (not illustrated) adapted to perform the various types of control processing in the spinning unit 2.

[0019] The drafting device 7 is provided in proximity to an upper end of a frame 6 of the spinning machine 1. The spinning device 9 is adapted to spin a fiber bundle 8 fed from the drafting device 7. The spun yarn 10 produced by the spinning device 9 is wound by the winding device 13 via a yarn accumulating roller 21. Accordingly, the package 45 is formed. In the following description, a bobbin 48 with yarn layers wound therearound is referred to as the package 45.

[0020] The drafting device 7 is adapted to produce the fiber bundle 8 by stretching a sliver 15. The drafting device 7 includes four pairs of rollers, which are a pair of back rollers 16, a pair of third rollers 17, a pair of middle rollers 19 with an apron belt 18 equipped to each roller thereof, and a pair of front rollers 20. A bottom roller of each pair of rollers 16, 17, 19, and 20 is driven by power from the motor box 5B or power of an electric motor (not illustrated) arranged in each spinning unit 2. Each pair of rollers 16, 17, 19, and 20 is respectively driven at rotational speeds that are different from one another. Consequently, the sliver 15 supplied from upstream is

stretched and formed into the fiber bundle 8, and the fiber bundle 8 is fed to the spinning device 9 located downstream.

[0021] The spinning device 9 is adapted to twist the fiber bundle 8 by use of whirling flow to produce the spun yarn 10. Although detailed description and drawings are omitted, the spinning device 9 includes a fiber guiding section, a whirling flow generating nozzle, and a hollow guide shaft body. The fiber guiding section is adapted to guide the fiber bundle 8 fed from the drafting device 7 to a spinning chamber formed inside the spinning device 9. The whirling flow generating nozzle is arranged around a path of the fiber bundle 8 and is adapted to generate the whirling flow in the spinning chamber. By the whirling flow, a fiber end of the fiber bundle 8 inside the spinning chamber is inverted and whirled. The hollow guide shaft body is adapted to guide the spun yarn 10 from the spinning chamber to outside the spinning device 9. The spinning device 9 is controlled to be driven/stopped by the unit controller.

[0022] The yarn accumulating device 12 is adapted to temporarily accumulate the spun yarn 10 fed from the spinning device 9. The yarn accumulating device 12 mainly includes the yarn accumulating roller 21, a yarn engaging member 22, an upstream guide 23, and an electric motor 25.

[0023] The yarn accumulating roller 21 is adapted to accumulate the spun yarn 10 by winding the spun yarn 10 around an outer peripheral surface thereof. The yarn accumulating roller 21 is rotationally driven at a constant rotational speed by the electric motor 25 controlled by the unit controller. The yarn engaging member 22 is supported in a relatively rotatable manner with respect to the yarn accumulating roller 21. The yarn engaging member 22 is configured such that torque (resistance torque) against the relative rotation of the yarn engaging member 22 with respect to the yarn accumulating roller 21 is generated by a torque generating means formed of a magnetic means and the like, for example.

[0024] In a case where the spun yarn 10 is engaged with the yarn engaging member 22 in the yarn accumulating device 12, when tension applied to the spun yarn 10 is greater than the resistance torque, the yarn engaging member 22 rotates independently from the yarn accumulating roller 21 and unwinds the spun yarn 10 from the yarn accumulating roller 21. When the tension applied to the spun yarn 10 is smaller than the resistance torque, the yarn engaging member 22 rotates integrally with the yarn accumulating roller 21 and winds the spun yarn 10 around the yarn accumulating roller 21. By such operations of the yarn accumulating device 12, the spun yarn 10 can be continuously drawn from the spinning device 9 while eliminating a slackening of the spun yarn 10 and applying appropriate tension to the spun yarn 10.

[0025] The upstream guide 23 is arranged slightly upstream of the yarn accumulating roller 21. The upstream guide 23 is adapted to appropriately guide the spun yarn 10 to the outer peripheral surface of the yarn accumulat-

ing roller 21. The upstream guide 23 prevents twists of the spun yarn 10 that propagate from the spinning device 9 from propagating to downstream of the upstream guide 23.

[0026] A yarn clearer 49 is provided on a front side of the frame 6 of the spinning machine 1 and between the spinning device 9 and the yarn accumulating device 12. The yarn clearer 49 is adapted to monitor a thickness of the travelling spun yarn 10, and/or a presence and/or an absence of a foreign substance in the spun yarn 10. The yarn clearer 49 transmits a yarn defect detection signal to the unit controller when detecting a yarn defect of the spun yarn 10.

[0027] Upon receipt of the yarn defect detection signal, the unit controller immediately stops injection of compressed air from the whirling flow generating nozzle of the spinning device 9. Accordingly, the whirling flow is stopped and thereby twisting of the fiber bundle 8 is stopped, and feeding of the fiber bundle 8 to the spinning device 9 is also stopped. Then, a continuous state of fibers is disconnected in the spinning device 9, and the spun yarn 10 is disconnected. Subsequently, the unit controller further stops the drafting device 7 and the like.

[0028] The unit controller transmits the yarn defect detection signal to the machine control device 30. The machine control device 30 that has received the yarn defect detection signal transmits a control signal to the yarn joining vehicle 3, which is to be described later, to cause the yarn joining vehicle 3 to travel to the relevant spinning unit 2. Then, the unit controller activates the spinning device 9 and the like again, causes the yarn joining vehicle 3 to perform a yarn joining operation, and restarts winding by the spinning unit 2. At this time, during a period of time after the spinning device 9 has restarted spinning until the winding is restarted, the yarn accumulating device 12 eliminates a slackening of the spun yarn 10 by accumulating the spun yarn 10, which is continuously fed from the spinning device 9, around the yarn accumulating roller 21.

[0029] The winding device 13 is adapted to wind the spun yarn 10 supplied from the yarn accumulating device 12 around the bobbin 48 to form the package 45. As illustrated in Fig. 2, the winding device 13 includes a cradle (a package holding section) 70, a winding drum 74, and a traverse guide 76.

[0030] The cradle 70 includes a cradle arm 71 swingable with a support shaft 73 as a center and bobbin holders 72 adapted to rotatably hold both end portions of the bobbin 48. The winding drum 74 is adapted to rotate while making contact with an outer peripheral surface of the bobbin 48 or an outer peripheral surface of the package 45. The traverse guide 76 is arranged to be capable of guiding the spun yarn 10 supplied from the yarn accumulating device 12.

[0031] The winding device 13 drives the winding drum 74 by an electric motor (not illustrated) while reciprocating the traverse guide 76 by a drive means (not illustrated). Accordingly, the bobbin 48 or the package

45 being in contact with the winding drum 74 is rotated, and the winding device 13 winds the spun yarn 10 around the bobbin 48 or the package 45 while reciprocating the spun yarn 10.

[0032] A spring (not illustrated) is mounted to the cradle arm 71. The spring is adapted to constantly apply an urging force in a standing direction to the cradle arm 71. Therefore, as a wound diameter of the package 45 becomes greater, the cradle arm 71 is inclined towards a front side of the winding device 13 and thereby a position of an axis of the package 45 moves forward. A drive section (a cylinder, for example), which is not illustrated, is coupled to the cradle arm 71. By an instruction of the unit controller, the cradle arm 71 can be controlled to actively swing in a direction to be away from the winding drum 74 or in a direction to be close to the winding drum 74. With such a configuration, when the package 45 is fully-wound, the cradle arm 71 is swung in the direction to be away from the winding drum 74 to prevent a driving force from being transmitted to the package 45. Even after the package 45 has been moved away from the winding drum 74, the package 45 continues rotation by inertia (hereinafter referred to as inertial rotation).

[0033] Next, the yarn joining vehicle 3 will be described. The yarn joining vehicle 3 is adapted to perform yarn joining operation in a spinning unit 2 where the spun yarn 10 has been disconnected. The yarn joining vehicle 3 includes a housing 3A provided with travelling wheels 42. A splicer 43, a suction pipe 44, and a suction mouth 46 are mounted to the housing 3A. After a yarn breakage or a yarn cut has occurred in a certain spinning unit 2, by the control signal from the machine control device 30, the yarn joining vehicle 3 travels on a rail 41 fixed to the frame 6 to such a spinning unit 2 and stops to perform the yarn joining operation.

[0034] The suction pipe 44 is vertically swingable with an axis as a center. The suction pipe 44 sucks and catches a yarn end (an upper yarn) fed from the spinning device 9, and guides the caught yarn end to the splicer 43. The suction mouth 46 is vertically swingable with an axis as a center. The suction mouth 46 sucks and catches a yarn end (a lower yarn) from the package 45 supported by the winding device 13, and guides the caught yarn end to the splicer 43. Although a detailed description on the splicer 43 is omitted, the upper yarn and the lower yarn can be joined by twisting the yarn ends together using whirling flow.

[0035] Next, the doffing vehicle 4 will be described. The doffing vehicle 4 is a device adapted to perform a bobbin setting operation of supplying the bobbin 48 to the cradle 70 and preparing for winding of the spun yarn 10, and a doffing operation of removing a fully-wound package 45 from the cradle 70. The doffing vehicle 4 includes a housing 4A provided with travelling wheels 92. A doffing device (a bobbin setting device) 60 and a doffing mechanism 61 are provided to the housing 4A. When the package 45 is fully wound in a certain spinning unit 2, by a control signal from the machine control device 30, the

doffing vehicle 4 travels on a travelling path 91 formed on the frame 6 to such a spinning unit 2 and stops to perform only the doffing operation, or both of the doffing operation and the bobbin setting operation.

[0036] The doffing device 60 includes a bobbin supplying mechanism 50, a suction pipe 88, and a cradle operating arm 89 as a configuration to perform the bobbin setting operation to set the bobbin 48 to the cradle 70 (a supplying operation to supply the bobbin 48 to the cradle 70).

[0037] As illustrated in Fig. 2, the bobbin supplying mechanism 50 is arranged to be swingable with a swing shaft 54 as a center. The bobbin supplying mechanism 50 is swung with the swing shaft 54 as a center by a driving force of a motor 51. In the bobbin supplying mechanism 50, a bobbin holding section 52 adapted to hold the bobbin 48 is provided at an end portion opposite to an end portion where the swing shaft 54 is provided. The bobbin supplying mechanism 50 is adapted to receive the bobbin 48 from a bobbin accommodating section and to supply the bobbin 48 to the bobbin holders 72 of the cradle 70, which is a target position, by swinging while holding the bobbin 48. The bobbin supplying mechanism 50 includes a bunch-winding roller 53 adapted to perform bunch winding. The "bunch winding" is to form a straight winding of the spun yarn 10 around the bobbin 48 to fix the spun yarn 10 to the bobbin 48.

[0038] The suction pipe 88 is arranged to be capable of swinging with a swing shaft (not illustrated) as a center and extending/contracting. In the suction pipe 88, a suction section (not illustrated) is formed at an end portion opposite to an end portion where the swing shaft is provided. The suction pipe 88 is adapted to catch the spun yarn 10 discharged from the spinning device 9 by sucking the spun yarn 10 with the suction section and to guide the caught spun yarn 10 to the winding device 13.

[0039] The cradle operating arm 89 is arranged to be swingable with a swing shaft (not illustrated) as a center. As illustrated in Fig. 5, in the cradle operating arm 89, an operating section 89A is provided at an end portion opposite to an end portion where the swing shaft is provided. The operating section 89A is capable of moving one of the bobbin holders 72 away from the other of the bobbin holders 72. In other words, the cradle operating arm 89 performs an operation of opening the cradle arm 71 to remove the fully-wound package 45 from the cradle 70 or an operation of closing the cradle arm 71 to set a new bobbin 48 to the cradle 70.

[0040] As illustrated in Fig. 2, the doffing device 60 includes a doffing mechanism 61 as a configuration to perform a doffing operation of removing the fully-wound package 45 from the cradle 70 and guiding the removed package 45 to a package receiving section 84.

[0041] The package receiving section 84 will be described. The package receiving section 84 includes an inclined portion 81 for rolling and moving the package 45 and a placing section 82 on which the package 45 is temporarily placed. The placing section 82 is continuous-

ly arranged at an end portion of the inclined portion 81. The inclined portion 81 and the placing section 82 are both adapted to make contact with a peripheral surface of the package 45. The inclined portion 81 and the placing section 82 are arranged at a position lower than the bobbin holders 72.

[0042] In the present embodiment, the placing section 82 is configured as a conveyor and transports the package 45 in a direction in which the plurality of spinning units 2 are arranged. That is, the conveyor successively transports the package 45 discharged to the placing section 82 by the doffing device 60. A transporting movement of the conveyor is controlled by a control signal from the machine control device 30.

[0043] The doffing mechanism 61 includes a swing arm (a moving section) 62, a motor 63, and a package supporting section (a supporting section) 65 as main components. The package supporting section 65 is adapted to support the package 45. By the swing arm 62, the package supporting section 65 can be moved to a first position P1 (see Fig. 5) where the package supporting section 65 receives the package 45, a second position P2 (see Fig. 6) where the supporting section 65 releases the package 45 received at the first position P1, and a standby position P0 (see Fig. 4).

[0044] The swing arm 62 is swung, for example, in a counterclockwise direction in Fig. 5 by a driving force of the motor 63. Accordingly, the doffing mechanism 61 is caused to advance from the doffing vehicle 4 towards the winding device 13, and thereby a tip-end side (the package supporting section 65) of the doffing mechanism 61 is moved close to the package 45 (see Fig. 5). In other words, by swinging in the counterclockwise direction, the swing arm 62 moves the package supporting section 65 from the standby position P0 to the first position P1.

[0045] The swing arm 62 is swung, for example, in a clockwise direction in Fig. 4 by the driving force of the motor 63. Accordingly, the doffing mechanism 61 is moved towards the doffing vehicle 4, and thereby the tip-end side (the package supporting section 65) of the doffing mechanism 61 is moved away from the package 45 placed on the placing section 82. In other words, by swinging in the clockwise direction, the swing arm 62 moves the package supporting section 65 from the first position P1 to the second position P2, and from the second position P2 to the standby position P0 (see Fig. 4). The standby position P0 is a position where the package supporting section 65 does not make contact with the package 45 delivered to the placing section 82 at the second position P2. In the present embodiment, the standby position P0 is a start position where the package supporting section 65 departs for the first position P1 and a returning position where the package supporting section 65 is returned from the second position P2 or the like, both set as an identical position. However, the departing position and the returning position may be different. The standby position P0 may be a region where the package supporting section 65 does not make contact

with the package 45 placed on the placing section 82.

[0046] By being swung in an upper direction, the package supporting section 65 can make contact with the package 45 held by the bobbin holders 72. Accordingly, the package supporting section 65 can stop the inertial rotation of the package 45. The package supporting section 65 also guides the package 45 to the inclined portion 81 while supporting weight of the package 45 received from the cradle 70. Furthermore, the package supporting section 65 continues to support the package 45 even after the package 45 has made contact with the inclined portion 81, and guides the package 45 to the placing section 82 along the inclined portion 81.

[0047] As illustrated in Fig. 3, the doffing device 60 includes a detecting section 95, a doffing device control section 31, and a notifying section 96 as a configuration to regulate the bobbin setting operation.

[0048] The detecting section 95 is adapted to detect an obstacle and is fixed to the housing 4A. The detecting section 95 detects as the obstacle, the package 45 located at the cradle 70, for example. The detecting section 95 is, for example, an optical sensor and is capable of detecting the package 45 located at the cradle 70 by detecting light reflected from the package 45 located at the cradle 70 or by detecting light blocked by the package 45 located at the cradle 70. The detecting section 95 outputs detection information indicating a detection result to the doffing device control section 31. The obstacle to be detected by the detecting section 95 is not limited to the package 45. The detecting section 95 is capable of detecting an object located at or around the cradle 70 that is the target position where the bobbin 48 is supplied.

[0049] The doffing device control section 31 performs various types of control processing in the doffing device 60 such as movement of the package supporting section 65, movement of the bobbin holding section 52, and the like. The machine control device 30 is formed of a Central Processing Unit (CPU), a Read Only Memory (ROM), a Random Access Memory (RAM), a hard disc, and the like. The control performed by the doffing device control section 31 is realized, for example, by loading a program stored in the ROM onto the RAM and implementing the program in the CPU.

[0050] Upon receipt of the detection information output from the detecting section 95, the doffing device control section 31 determines a presence and/or an absence of the package 45 at the cradle 70 based on the detection information. Specifically, the doffing device control section 31 determines the presence and/or the absence of the package 45 at the cradle 70 after the package supporting section 65 has been moved to the standby position P0 by the swing arm 62. A definition of "after the package supporting section 65 has been moved to the standby position P0" includes a time when the package supporting section 65 is located at the standby position P0. In other words, the doffing device control section 31 may determine the presence and/or the absence of the package 45 at the same time as when the package sup-

porting section 65 reaches the standby position P0. Alternatively, based on the control signal for controlling the motor 63 that moves the package supporting section 65 or a detection signal of an origin sensor (not illustrated) adapted to detect that the package supporting section 65 is located at the standby position P0, information that the package supporting section 65 has reached the standby position P0 can be obtained.

[0051] When a determination is made that the package 45 exists at the cradle 70, the doffing device control section 31 controls the bobbin supplying mechanism 50 to stop (prohibit) the supplying operation of the bobbin supplying mechanism 50. In other words, when the package 45 exists at the cradle 70 and the cradle 70 cannot receive the bobbin 48, the doffing device control section 31 controls the bobbin supplying mechanism 50 to stop the supplying operation (the bobbin setting operation) of the bobbin supplying mechanism 50. When the determination is made that the package 45 exists at the cradle 70, the doffing device control section 31 outputs abnormality information to the notifying section 96.

[0052] When a determination is made that the package 45 does not exist at the cradle 70, the doffing device control section 31 controls the bobbin supplying mechanism 50 to perform the supplying operation. In other words, when the package 45 does not exist at the cradle 70 and the cradle 70 can receive the bobbin 48, the doffing device control section 31 supplies the bobbin 48 to the cradle 70 by the bobbin holding section 52 of the bobbin supplying mechanism 50.

[0053] When the obstacle exists at the cradle 70, the notifying section 96 notifies an occurrence of abnormality. That is, upon receipt of the abnormality information output from the doffing device control section 31, the notifying section 96 notifies the occurrence of the abnormality. The notifying section 96 is a lamp, for example. The notifying section 96 may be a segment display adapted to display a predetermined error code, a buzzer, or the like.

[0054] Next, the doffing operation and the bobbin setting operation in the doffing device 60 will be described with reference to Figs. 4 to 6.

[0055] When a sensor (not illustrated) detects that the package 45 has been fully-wound in a certain spinning unit 2, the unit controller performs control to stop operations of the spinning device 9 and the conveyor, and the machine control device 30 performs control to move the doffing vehicle 4 to such a spinning unit 2. Almost simultaneously with this, the unit controller performs control to swing the cradle arm 71 to a left side in Fig. 2 (the front side of the winding device 13). Accordingly, the fully-wound package 45 is moved away from the winding drum 74, and thus the driving force from the winding drum 74 is not transmitted to the package 45. Even after the package 45 has moved away from the winding drum 74, the package 45 is rotated by inertia.

[0056] After the doffing vehicle 4 has arrived at a certain spinning unit 2, as illustrated in Fig. 5, the doffing

device 60 moves the package supporting section 65 close to the package 45 by swinging the swing arm 62 in the counterclockwise direction. That is, the doffing device 60 moves the package supporting section 65 from the standby position P0 to the first position P1.

[0057] Next, as illustrated in Fig. 6, the doffing device 60 swings the package supporting section 65 in the upper direction (in the counterclockwise direction) at the first position P1 to be made into contact with a peripheral surface of the package 45 (the package supporting section 65 indicated by a two-dot chain line in Fig. 6). Accordingly, the peripheral surface of the package 45 held by the cradle 70 is braked by friction with the package supporting section 65, and the inertial rotation of the package 45 is stopped.

[0058] The doffing device 60 moves the cradle operating arm 89 to a position illustrated in Fig. 5 before the inertial rotation of the package 45 is completely stopped. After the rotation of the package 45 has been completely stopped, the doffing device 60 removes the fully-wound package 45 from the cradle 70 by operating the cradle arm 71 with the cradle operating arm 89 such that one of the bobbin holders 72 is moved away from the other of the bobbin holders 72.

[0059] The doffing device 60 swings the package supporting section 65 in a lower direction (in the clockwise direction). Next, as illustrated in Fig. 6, the doffing device 60 swings the swing arm 62 in the clockwise direction. In other words, the doffing device 60 moves the package supporting section 65 to the second position P2. Accordingly, the package 45 is guided to the placing section 82 in a rolling manner along the inclined portion 81 while being supported by the package supporting section 65.

[0060] After the package 45 has been guided to the placing section 82, the doffing device 60 further swings the swing arm 62 in the clockwise direction to move the package supporting section 65 to the standby position P0. After confirming that the package supporting section 65 has returned to the standby position P0, the machine control device 30 restarts a transportation movement of the conveyor. That is, the package 45 transported to the placing section 82 is transported by the conveyor.

[0061] After confirming that the package supporting section 65 has returned to the standby position P0, the doffing device control section 31 determines the presence and/or the absence of the package 45 at the cradle 70 in accordance with the detection result of the detecting section 95. When the determination is made that the package 45 does not exist at the cradle 70, the doffing device control section 31 controls the bobbin supplying mechanism 50 to perform the bobbin setting operation (the supplying operation).

[0062] When the determination is made that the package 45 exists at the cradle 70, the doffing device control section 31 controls the bobbin supplying mechanism 50 to stop (prohibit) the supplying operation. Simultaneously with this, the notifying section 96 notifies that the occurrence of abnormality.

[0063] As described above, the doffing device 60 of the spinning machine 1 according to the present embodiment includes the doffing device control section 31 that stops the operation of supplying the bobbin 48 performed by the bobbin holding section 52 when an obstacle exists at the cradle 70 to which the bobbin 48 is to be supplied. When the obstacle, for example, the package 45 exists at the cradle 70, in other words, when the cradle 70 cannot receive the bobbin 48, the doffing device control section 31 stops the supplying operation performed by the bobbin holding section 52. When the obstacle does not exist at the cradle 70, in other words, when the cradle 70 can receive the bobbin 48, the doffing device 60 supplies the bobbin 48 to the cradle 70 by the bobbin holding section 52. Accordingly, in the doffing device 60, when the bobbin holding section 52 tries to perform the operation of supplying the bobbin 48, the bobbin holding section 52 and the package 45 can be prevented from making contact with each other. In the doffing device 60, the package 45 and/or the bobbin holding section 52 thus can be prevented from being damaged. Consequently, the doffing device 60 can favorably supply the bobbin 48.

[0064] The doffing device 60 of the present embodiment includes the detecting section 95 that detects an obstacle. The doffing device control section 31 determines the presence and/or the absence of the obstacle at the cradle 70 in accordance with the detection result by the detecting section 95. Accordingly, the doffing device control section 31 can accurately determine the presence and/or the absence of the obstacle at the cradle 70 and more appropriately control the bobbin holding section 52. In the doffing device 60, therefore, the bobbin holding section 52 and the package 45 can be further prevented from making contact with each other.

[0065] The doffing device control section 31 of the present embodiment determines the presence and/or the absence of the obstacle at the cradle 70 after the package supporting section 65 has been moved from the first position P1 to the standby position P0 by the swing arm 62. A wrong determination that the package 45 supported by the package supporting section 65 is the obstacle can be thus prevented from being made. In the doffing device 60, therefore, since an operation stop by the wrong determination of the doffing device control section 31 is prevented, reduction in operation efficiency can be also prevented.

[0066] The doffing device 60 of the present embodiment includes the notifying section 96 that notifies the occurrence of abnormality when the obstacle exists at the cradle 70. Accordingly, the doffing device 60 can notify a worker that a situation in which the operation of supplying the bobbin 48 cannot be performed has occurred. Consequently, since a recovery operation by the worker can be promptly performed, reduction in the operation efficiency can be prevented.

[0067] Although an embodiment of the present invention has been described, the present invention is not limited to the above-described embodiment, and various

modifications may be made as long as these do not depart from the essence of the present invention.

[0068] In the above-described embodiment, the doffing device control section 31 determines the presence and/or the absence of the package 45 at the cradle 70 after the package supporting section 65 has been moved to the standby position P0 by the swing arm 62. However, the timing to determine the presence and/or the absence of the package 45 by the doffing device control section 31 may be another timing. For example, the doffing device control section 31 may determine the presence and/or the absence of the package 45 after a predetermined period of time elapses from an operation performed to remove the package 45 from the cradle 70 (the operation of moving one of the bobbin holders 72 away from the other of the bobbin holders 72 by the cradle operating arm 89). The predetermined period of time can be appropriately set. If the determination of the presence and/or the absence of the obstacle is made immediately after the operation of removing the package 45 has been performed, the wrong determination that the package 45 is the obstacle may be made in spite of a state in which the package 45 has been removed from the cradle 70. The doffing device control device 31 thus determines the presence and/or the absence of the obstacle after the predetermined period of time elapses from the operation performed to remove the package 45 from the cradle 70. Accordingly, the doffing device control section 31 can be prevented from making the wrong determination that the package 45 immediately after having been removed is the obstacle. Therefore, since an operation stop caused by the wrong determination by the doffing device control section 31 is prevented in the doffing device 60, reduction in operation efficiency can be prevented.

[0069] In the above-described embodiment, an example in which the placing section 82 is configured as a conveyor is described, but the present invention is not limited thereto. For example, the placing section 82 may be configured as a planar portion on which the package 45 can be placed, without being configured as a transportation mechanism such as a conveyor. In this case, the package 45 on the placing section 82 is manually collected by the worker.

[0070] In the above-described embodiment, an example in which the placing section 82 is arranged inside the travelling path 91 of the doffing vehicle 4 (a right side in Fig. 2 and a side where the winding device 13 is provided) is described. However, the present invention is not limited thereto. For example, the placing section 82 may be arranged outside the travelling path 91 of the doffing vehicle 4 (the left side in Fig. 2).

[0071] In the above-described embodiment, a configuration in which the detecting section 95 is arranged in the doffing device 60 is described as an example, but the detecting section 95 may be arranged in the spinning unit 2. In a case where the detecting section 95 is arranged in the doffing device 60, since merely one detecting section 95 is required to be arranged, a configuration can be

simplified.

[0072] In the above-described embodiment, the package 45 is detected by the detecting section 95, and the doffing device control section 31 determines the presence and/or the absence of the obstacle at the cradle 70 in accordance with the detection result. However, the obstacle at the cradle 70 may be detected by another method. For example, a load applied to the cradle 70 may be obtained, and the obstacle (the package 45) at the cradle 70 may be detected based on the load. Alternatively, a contact sensor may be provided at a tip end of the bobbin holding section 52, and the obstacle at the cradle 70 may be detected in accordance with a detection result by the contact sensor.

[0073] In the above-described embodiment, an example in which one yarn joining vehicle 3 and one doffing vehicle 4 are provided for a plurality of the spinning units 2 is described. However, the present invention is not limited thereto. In a configuration of a spinning machine according to the above-described embodiment and variant embodiments, for example, a plurality of yarn joining vehicles and/or a plurality of doffing vehicles may be provided in accordance with the number of the spinning units 2.

[0074] In the above-described embodiment, an example in which the yarn path is arranged such that the spun yarn 10 travels in the lower direction from the drafting device 7 located in an upper portion towards the winding device 13 located at a lower portion is described. However, the present invention is not limited thereto and may be applied to a spinning machine or a spinning unit where a yarn path in which a spun yarn travels from the lower portion towards the upper portion is arranged.

[0075] In the above-described embodiment, an example in which the doffing device 60 includes the doffing device control section 31 as a dedicated controller adapted to perform various types of control processing in the doffing device 60 is described. However, the present invention is not limited thereto. The configuration of the spinning machine of the above-described embodiment and the variant embodiments may be a configuration, for example, in which the machine control device 30 (a control section) collectively performs various types of control processing of the spinning unit 2, the yarn joining vehicle 3, and the doffing vehicle 4.

Claims

1. A bobbin setting device (60) comprising:

a bobbin holding section (52) adapted to hold a bobbin (48) around which a yarn (10) is to be wound and to perform a supplying operation to supply the bobbin (48) to a target position (70); and

a control section (31; 30) adapted to prohibit the supplying operation performed by the bobbin

holding section (52) when an obstacle that interferes with the supplying operation exists at the target position (70).

2. The bobbin setting device (60) according to claim 1, wherein the control section (31; 30) is adapted to control the bobbin holding section (52) to supply the bobbin (48) to the target position (70) when the obstacle does not exist at the target position (70).

3. The bobbin setting device (60) according to claim 1 or claim 2, further comprising a detecting section (95) adapted to detect the obstacle, wherein the control section (31; 30) is adapted to determine a presence and/or an absence of the obstacle at the target position (70) in accordance with a result detected by the detecting section (95).

4. The bobbin setting device (60) according to claim 3, wherein the control section (31; 30) is adapted to determine the presence and/or the absence of the obstacle at the target position (70) after a predetermined period of time elapses from an operation performed to remove a package (45) from a package holding section (70), the package holding section (70) being adapted to hold the package (45) which is formed by winding the yarn (10) around the bobbin (48).

5. The bobbin setting device (60) according to claim 3, further comprising:

a supporting section (65) adapted to support a package (45) which is formed by winding the yarn (10) around the bobbin (48); and

a moving section (62) adapted to move the supporting section (65) to a standby region (P0), a first position (P1), and a second position (P2), the first position (P1) being a position where the supporting section (65) receives the package (45), and the second position (P2) being a position where the supporting section (65) releases the package (45) received at the first position (P1),

wherein the control section (31; 30) is adapted to determine the presence and/or the absence of the obstacle at the target position (70) after the moving section (62) has moved the supporting section (65) from the first position (P1) to the standby region (P0).

6. The bobbin setting device (60) according to any one of claim 1 through claim 5, further comprising a notifying section (96) adapted to notify an occurrence of abnormality when the obstacle exists at the target position (70).

7. A yarn winding machine (1) comprising:

the bobbin setting device (60) according to any one of claim 1 through claim 6; and
a plurality of yarn winding units (2), each of the yarn winding units (2) being adapted to wind the yarn (10) around the bobbin (48) to form a pack- 5
age (45), and including a package holding section (70) adapted to hold the package (45),
wherein the target position (70) is a position where the bobbin (48) is held by the package 10
holding section (70).

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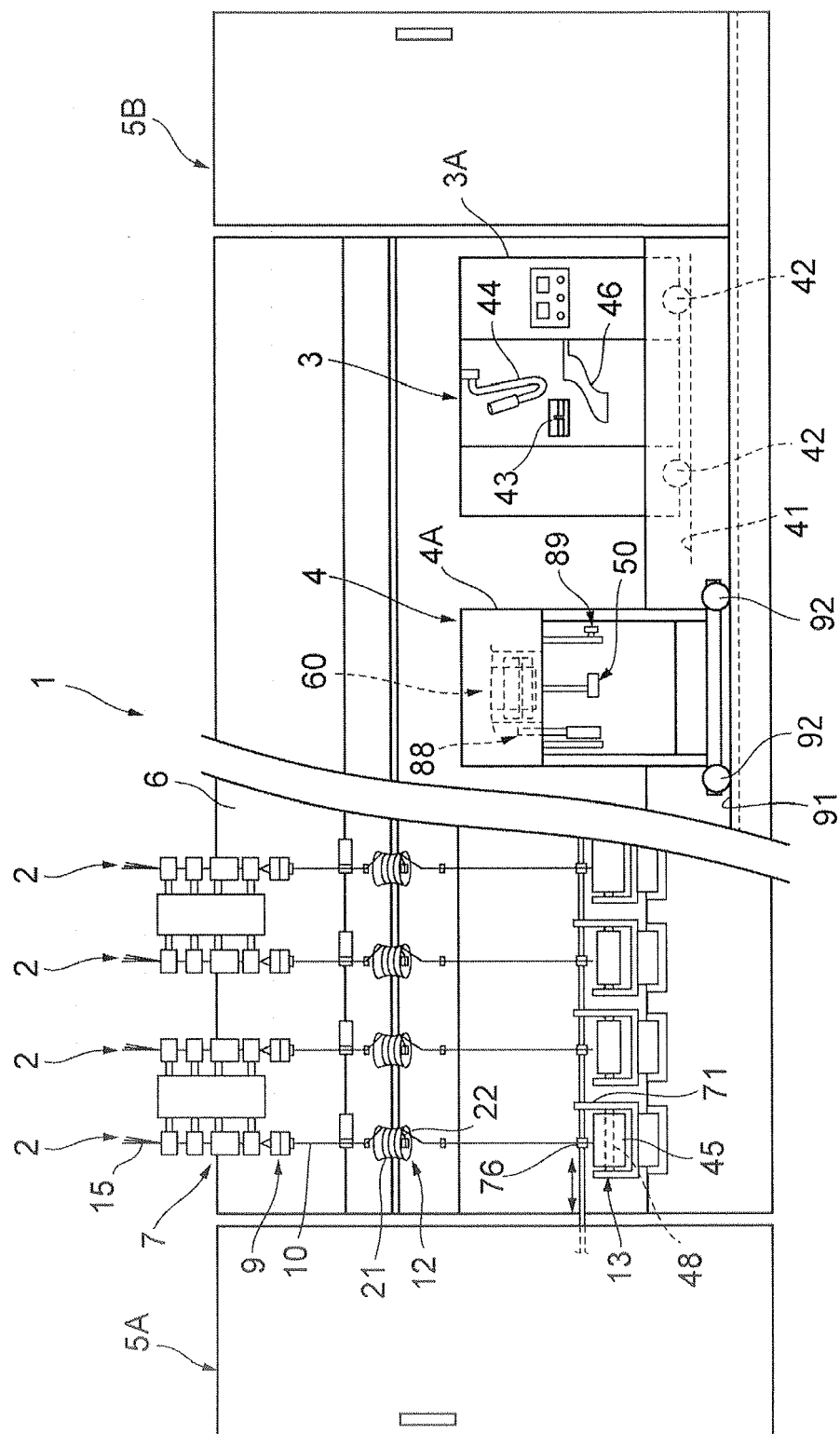


FIG. 2

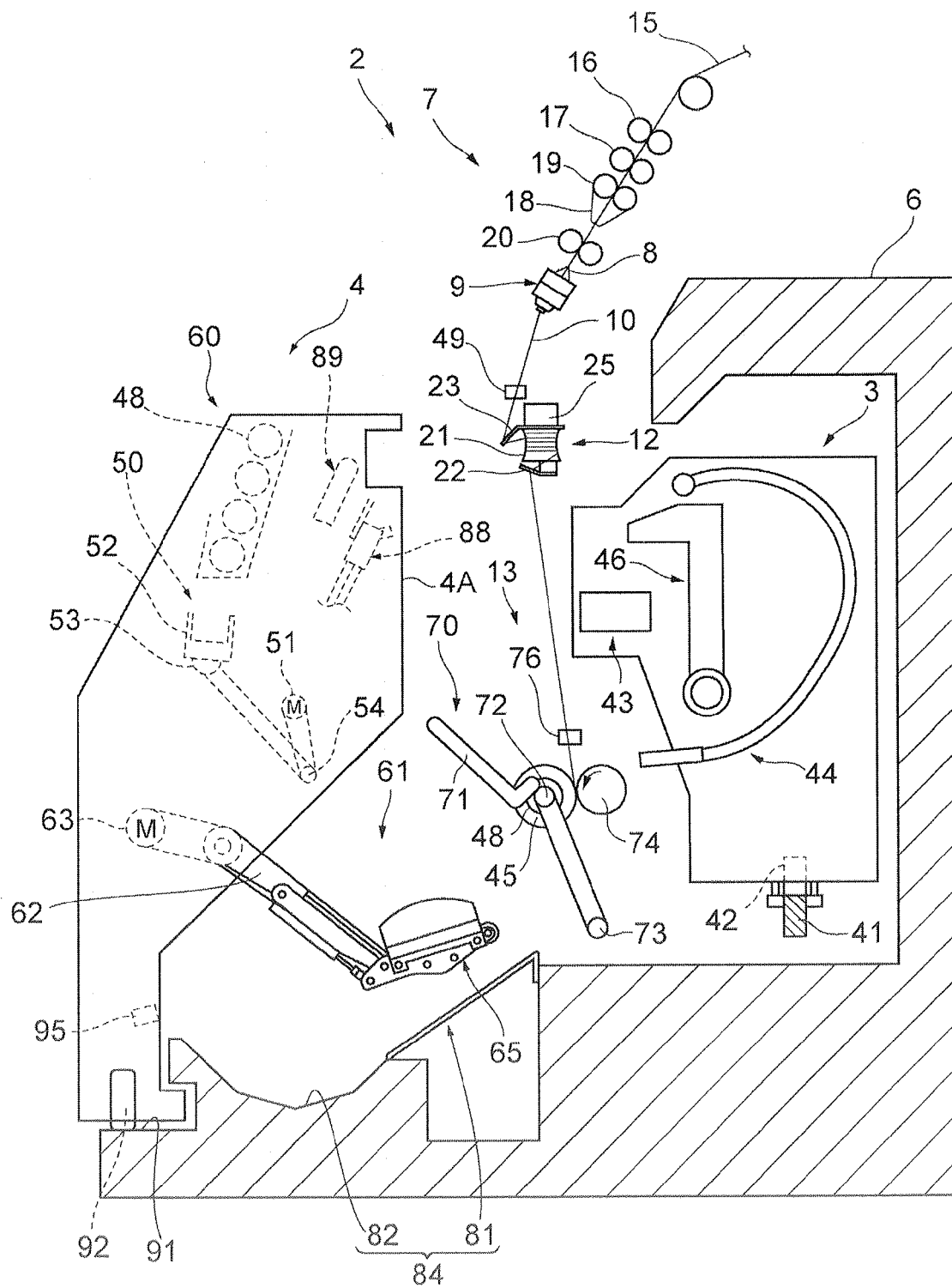


FIG. 3

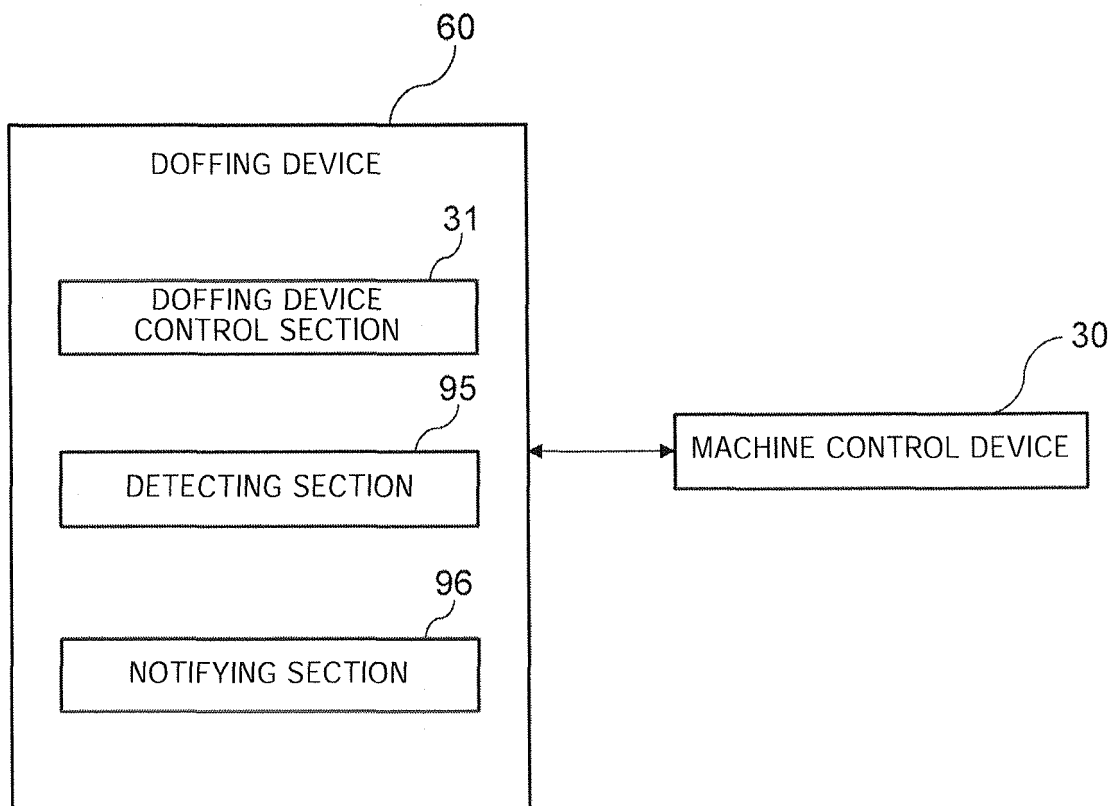


FIG. 4

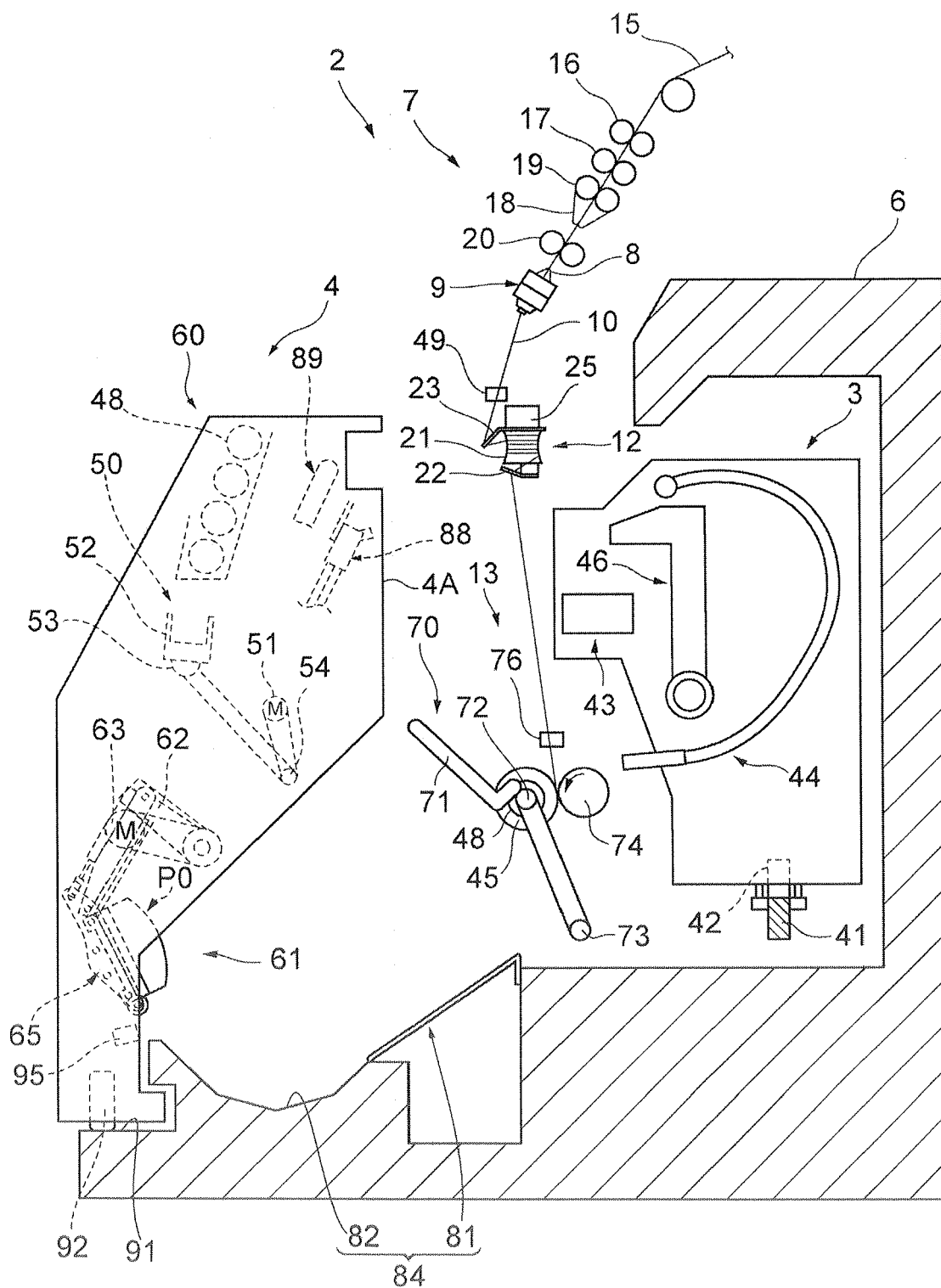


FIG. 5

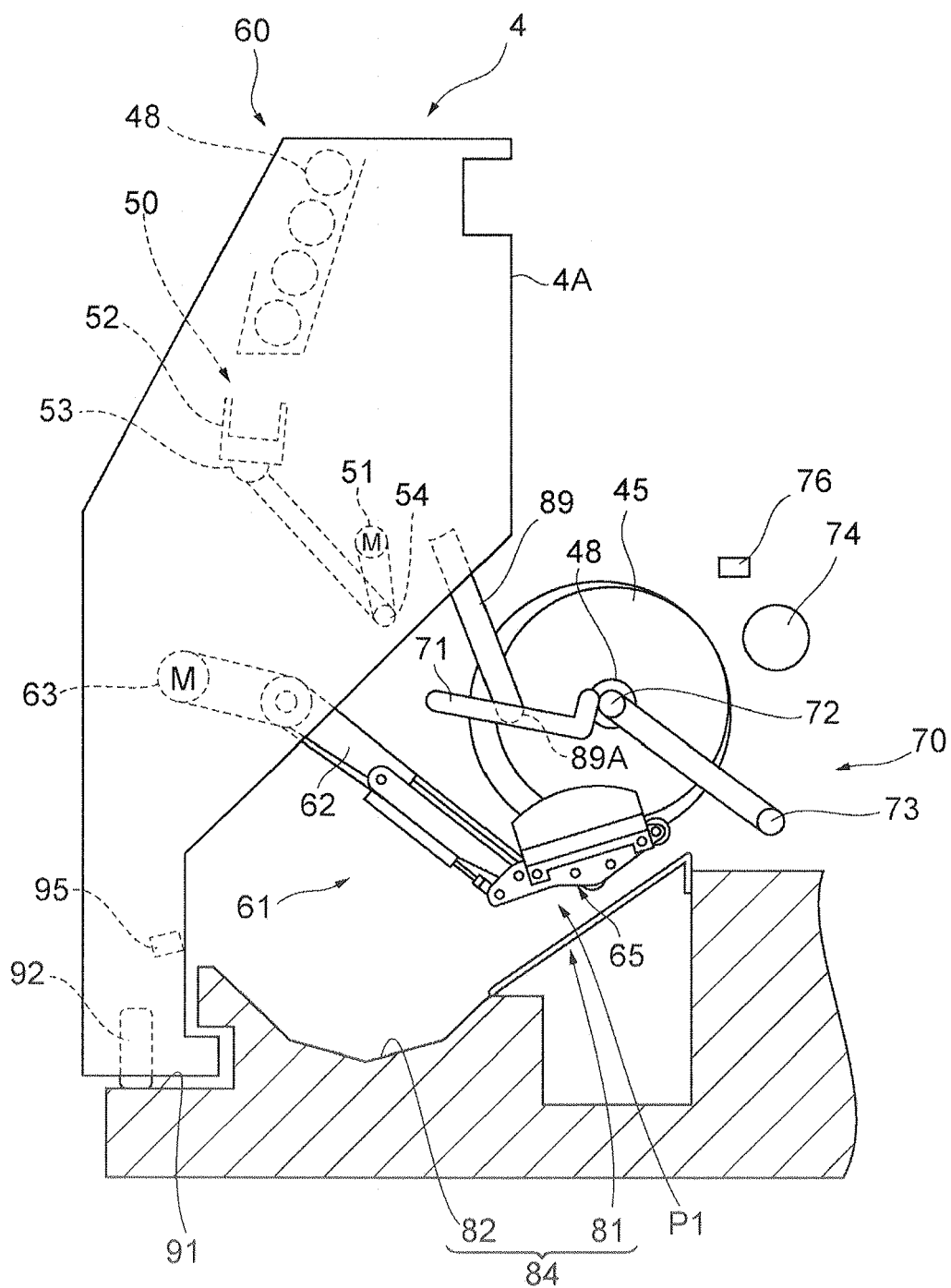
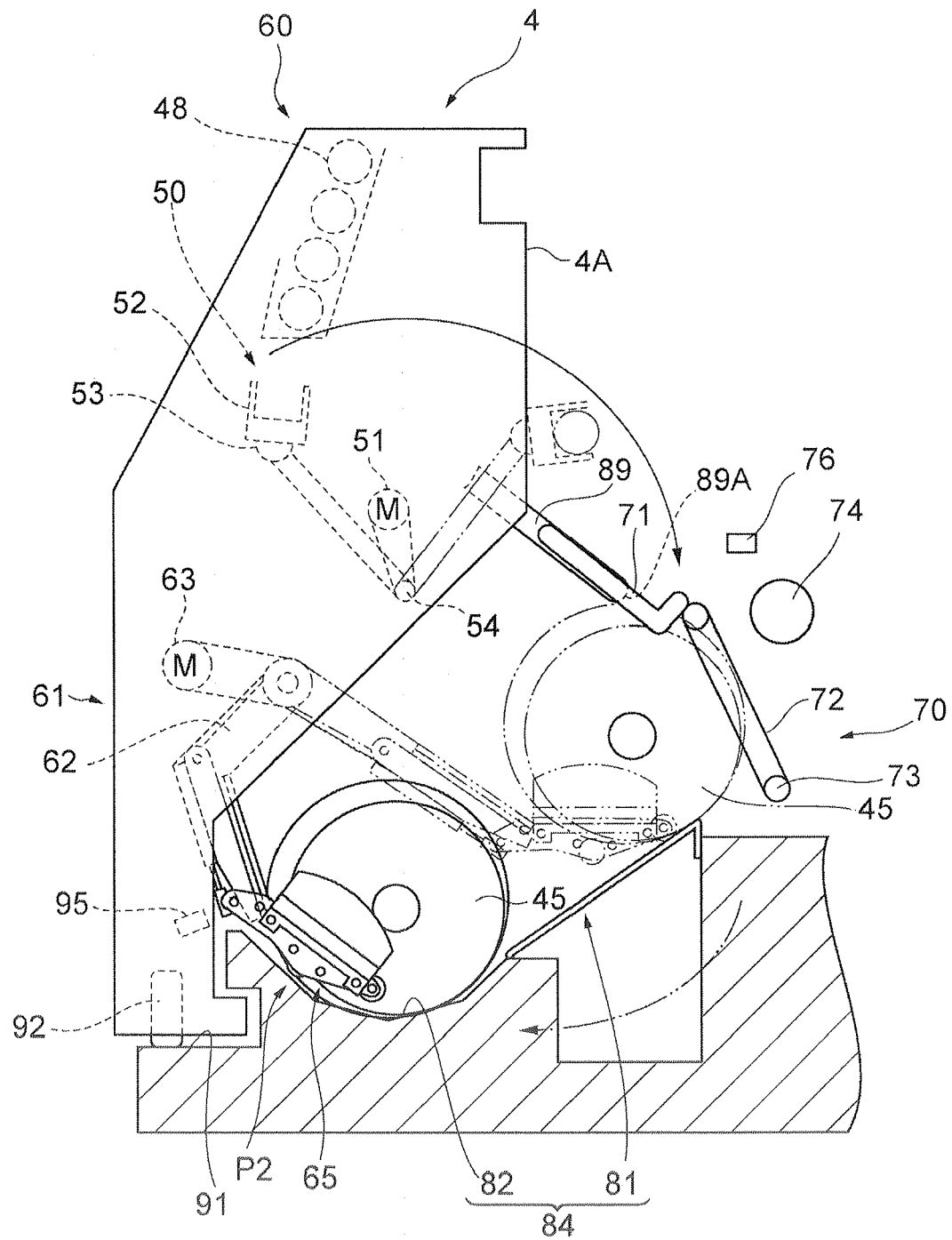


FIG. 6





EUROPEAN SEARCH REPORT

Application Number
EP 15 15 1963

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 19 June 2015	Examiner Lemmen, René
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